Cliticization
and the
Evolution of Morphology:

A Cross-linguistic Study on
Phonology in Grammaticalization

René Schiering

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Hey, get rhythm when you get the blues
Hey, get rhythm when you get the blues
Yes a jumpy rhythm makes you feel so fine
It'll shake all the trouble from your worried mind
Get rhythm when you get the blues
(Johnny Cash)

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0. Introduction

Like other components of grammar, morphological systems are subject to change. The forms of morphemes as well as the functions and meanings that are associated with them can change over time. Categories once expressed overtly may be lost, others may be introduced. A key question in the diachrony of morphology is which mechanisms are responsible for the creation of new markers. Acknowledging the relevance of borrowing as an external source for morphology, the most common source of morphological markers is to be found in material already existing in the language. Members of compounds can be reinterpreted as derivational affixes, derivational affixes can be reinterpreted as inflectional affixes, and inflectional markers with restricted lexical domains can be overgeneralized as basic exponents of a grammatical category. A relatively common pathway for the evolution of morphology involves the cliticization of once free-standing words. Classical examples for this mechanism are to be found in the bonding of postpositions, which results in the creation of new case morphology, or the bonding of auxiliary verbs to create new tense-aspect-mood morphology (see Joseph 1998 for an overview).

The idea that bound morphology evolves from once free-standing words has a long tradition in linguistic thought covering several hundred years. This process is only one aspect of the more general mechanism of language change which has become known under the heading of the linguistic cycle (Hodge 1970). This concept has a large number of adherers, ranging from Wilhelm von Humboldt to Max Müller, August Schleicher, William Dwight Whitney, Carl Meinhof, Antoine Meillet and Georg von der Gabelentz (see Plank 1992 for an overview). The latter expressed this very idea as follows:

> "Nun bewegt sich die Geschichte der Sprachen in der Diagonale zweier Kräfte: des Bequemlichkeitstriebes, der zur Abnutzung der Laute führt, und des Deutlichkeitstriebes, der Abnutzung nicht zur Zerstörung der Sprache ausarten lässt. Die Affixe verschleifen sich, verschwinden am Ende spurlos; ihre Functionen aber oder ähnliche bleiben und drängen wieder nach Ausdruck. Diesen Ausdruck erhalten sie, nach der Methode der isolierenden Sprachen, durch Wortstellung oder verdeutlichende Wörter. Letztere unterliegen wiederum mit der Zeit dem Agglutinationsprozesse, dem Verschliffe und Schwunde, und derweile bereitet sich für das Verderbende neuer Ersatz

> vor: periphrastische Ausdrücke werden bevorzugt; mögen sie syntaktische Gefüge oder wahre Composita sein (englisch *I shall see*, -lateinisch *videbo* = *vide-fuo*): immer gilt das Gleiche: die Entwicklungslinie krümmt sich zurück nach der Seite der Isolation, nicht in die alte Bahn, sondern in eine annähernd parallele. Darum vergleiche ich sie der Spirale." (Gabelentz [1891] ²1901: 256)

Starting from a diachronic stage in which a language exhibits flexive morphology, Gabelentz outlines the successive evolutionary steps that such a language will take in the course of history. Presumably, morphological markers in the form of affixes are subject to erosion, which will force the language to express grammatical functions by isolating means, i.e. word order and particles. The latter will be agglutinated to other material, and through periphrasis and compounding new bound morphology will arise. These markers will then again be subject to erosion and are bound to disappear when the language enters the next round of cyclic evolution.

In more recent work on grammaticalization, the concept of the linguistic cycle has experienced a certain degree of renaissance. Here it is assumed that content items can turn into function words, which turn into clitics, and then affixes, before they are finally lost due to erosion (Hopper & Traugott 1993: 7). A classic example of such a grammaticalization cline is to be found in the pathway for the evolution of case morphology outlined by Lehmann (1985). In this domain, relational nouns denoting parts of space like *top*, entering into constructions with a noun phrase, such as *on top of* NP, can develop into adpositions. When these adpositions become bound to noun phrases or nouns their status changes to that of agglutinative case affixes. As the bonding of these markers becomes tighter they finally behave like fusional affixes. Although the resemblance to the cyclic change expressed in the classic works of the 19th century is obvious, it is still not evident whether the path of evolution outlined concerns only isolated instances of grammaticalization, certain domains of grammar, entire languages or even entire language types (Heine, Claudi & Hünnemeyer 1991: 245). In its strongest interpretation, the concept of the linguistic cycle would predict language change along these lines for whole language types, such that isolating languages will evolve into agglutinative, agglutinative languages into inflectional and, going full circle, inflectional languages back into isolating (see e.g. Croft 2003: 252). Focusing on one sub-process of grammaticalization, namely cliticization, the process by which function

words become bound, this study aims at commenting on the feasibility of the assumptions made in grammaticalization and diachronic typology.

Grammaticalization can be conceived of as a number of interdependent processes on all levels of linguistic description, namely phonology, morpho-syntax and semantics. The various phonetic, morpho-syntactic and functional processes which constitute grammaticalization are summarized in Table 1, adapted from the essential reading in grammaticalization, cf. Lehmann [1982] 1995, 1985; Heine & Reh 1984; Heine, Claudi & Hünnemeyer 1991; Hopper & Traugott 1993; Diewald 1997.

Table 1: Phonetic, morpho-syntactic and functional processes in grammaticalization

	Content word	Function word	Clitic	Affix	Zero
Phonetic processes	Adaptation, erosion, fusion, and loss				
Morpho-syntactic processes	Permutation, cliticization, affixation, and fossilization compounding				
Functional processes	Desemanticization, expansion, simplification, and merger				

Concentrating on cliticization as a sub-process of grammaticalization, progression on the *function word* > *clitic* > *affix* cline is associated with a number of interdependent processes which lead to a change in the grammatical status of the element in question. In morpho-syntax, the distribution of an element is subject to change. Whereas a full word may be free to appear in various slots within a sentence, a cliticized function word will typically appear in a fixed position with respect to a phrasal constituent and thus become syntactically bound. A second step in distributional specialization is observed when the element in question becomes dependent on a word, thus progressing from being bound to a phrasal domain to being bound to a word domain and thus morphologically bound (this second step is referred to as 'morphologization' by Lehmann [1982] 1995 and 'affixation' by Heine & Reh 1984). The most obvious functional correlate of change in morpho-syntactic status is change in scope properties. When a function word becomes bound to a phrasal domain, it will have scope over this very phrase; for instance, a clitic postposition will have scope over its complement NP, even if it consists of two conjunct NPs. When an element has become bound to a word domain, its scope will be restricted to this domain. In the example of two conjunct NPs,

each member should be marked for case. Another possible semantic correlate of cliticization may be desemanticization, especially when the cliticized element can be traced back to an item which has retained its lexical meaning (see Heine & Reh 1984: 33f. for an example).

The phonological effects of grammaticalization remain an understudied aspect within the grammaticalization research paradigm. The most detailed overview of possible phonetic processes is to be found in Heine & Reh (1984: 17ff.), who distinguish between adaptation, erosion, fusion and loss. Generally speaking, elements that acquire a new grammatical status will show some kind of adaptation to the phonological environment, i.e. we expect to encounter assimilation processes. This adjustment to phonological context may manifest itself as assimilation or dissimilation and may operate over the grammaticalized element in its entirety or only at the morpheme boundary, i.e. at the juncture. The second phonological process which has received considerable attention in the grammaticalization literature is erosion, i.e. the reduction of phonological substance of a morpheme (cf. *attrition* in Lehmann's terminology). Like adaptation, erosion can operate on different domains: in syllabic erosion, whole syllables are reduced; in junctural erosion, only segments at the morpheme boundary are lost; in peripheral erosion, word-final or word-initial segments tend to be reduced; and finally in non-segmental erosion, contrasts in the tonal or segmental specification of morphemes may be reduced. Fusion describes the process by which morpheme boundaries disappear, and thus two elements are reduced to only one (cf. *univerbation* and *coalescence* in Lehmann's terminology). Going back to the concept of the linguistic cycle, the reduction of segments in ongoing grammaticalization will ultimately lead to the loss of grammatical markers altogether. Taking this typology of phonological processes as our starting point for a typology of phonological effects of cliticization, we would expect to observe assimilation processes and reduction phenomena when a function word becomes bound on a phrasal constituent and, even more so, on a word. Deaccentuation and fusion have so far received some attention in the discussion of the place of cliticization in grammaticalization (see also Jeffers & Zwicky 1980). The questions of how far these phonological processes interact and if they are subject to cross-linguistic variation have, however, seldom been approached.

The present research aims at commenting on the assumptions and predictions made in the grammaticalization literature with respect to phonological effects of cliticization. The data discussed in this study come from a cross-linguistic sample of cliticization phenomena which contains clitic elements from nineteen genetically unrelated languages. The prosodic and segmental behavior of these elements will be studied in some detail in order to isolate the various properties which make up phonological dependency. We will demonstrate that the distribution of a number of the documented phonological rules applying in cliticization can be predicted by a rhythm-based typology of language which distinguishes between mora-, syllable- and stress-based languages on an evolutionary cline. Ultimately, deaccentuation and fusion is only one option for the prosodic and segmental treatment of cliticized elements and is prototypical for stress-based rhythm. Especially with respect to erosion, i.e. the reduction and deletion of syllables in clitics, languages of the different rhythmic types differ significantly. Whereas mora- and syllable-based languages retain syllables of cliticized elements, stress-based phonologies show a strong erosive force in reducing and deleting unstressed syllables of clitics. Although our predictions are based on the comparison of synchronic data, this typological distinction should also be traceable in language change.

This study comes in five chapters and is organized as follows. The first chapter presents the empirical basis for our study on linguistic rhythm and the phonology of cliticization. It will introduce the sampling method used in this study and will lay out how the nineteen languages of the present sample have been chosen. For all of these languages, clitic elements have been isolated on the basis of phonological, morphological and syntactic criteria which follow from the more general characterization of clitics as elements that are phonologically bound, like affixes, but follow syntactic rules of distribution, like words. The various clitic elements compiled by the sampling method can be arranged on an evolutionary cline of different types of clitics, namely fast speech forms, simple clitics, special clitics, and phrasal affixes, connecting the two extremes on a cline from word to affix. The various types of clitics which belong to the word classes of particles, adpositions, pronouns, verbs, and articles, as well as some miscellaneous cases, will be illustrated, and relevant grammaticalization paths in the evolution of morphology will be outlined.

The second chapter of this study has essentially two purposes. Firstly, it will present the phonological properties of clitics in prosodic and segmental phonology, as documented for the languages of our sample. This survey will refine our understanding of the cross-linguistic diversity in the phonological dependency of clitics. In prosody, phonological dependency manifests itself differently in the various prosodic types. Whereas the lack of stress and the ability to take stress within the host-clitic combination are symptoms of phonological dependency in stress phonologies, clitics come with tonal specification in tonal phonologies and are subject to rules of tonal sandhi which neutralize or change tone specifications and impose restrictions on adjacent tones as for instance in OCP effects. In intonation phonologies, clitics are gradually integrated into the intonational phrase and may or may not take the intonation peak realized in this domain. In segmental phonology, phonological dependency comes in the form of rules which apply to junctural segments at the morpheme boundary or to whole syllables across a host-clitic combination. In all phonological contexts of junctural consonant clusters, vowel clusters and intervocalic consonants at clitic boundaries, segments may be subject to processes of structure preservation, for example in the blocking of deletion rules, assimilation, weakening, for instance in cluster reduction and consonant weakening, and strengthening by rules of epenthesis. With respect to syllabic effects of cliticization, processes applying to vowels in clitics, i.e. vowel preservation, vowel harmony, vowel reduction/deletion and vowel lengthening, are of special salience. Secondly, the synchronic data compiled in the various sections of this chapter will be employed to deduce prosodic and segmental clines in cliticization. Prosodic clines for cliticization in stress phonologies include the sub-processes of stress reduction and prosodic integration into the word domain. In tone languages, cliticization may be accompanied by tone neutralization, tone change and integration into the word domain with respect to rules of tonal Sandhi, e.g. OCP effects. Loss of the ability to carry the intonation peak and gradual integration into the word domain are characteristic for cliticization in intonation phonologies. Segmental clines for cliticization describe the various combinations of the processes of structure preservation, assimilation, weakening and strengthening as evidenced in the progression from word to affix. In principle, the segmental composition of a cliticized element may be preserved, assimilated, weakened and strengthened. Whereas structure preservation

can continue in affixation, assimilation in cliticization may be followed by subsequent structure preservation or deletion. Segmental weakening can ultimately be followed by deletion or may be hindered in structure preservation. Finally, strengthening of an element in cliticization can be followed by structure preservation.

Chapter 3 will lay the ground for a systematization of the processes encountered in cliticization. In this chapter, we establish and defend a rhythm-based typology of language which relies on a number of interdependent properties in phonology. The rationale for bringing linguistic rhythm into the discussion of cliticization stems from the idea that phonological processes in cliticization are ultimately constrained, if not determined, by the linguistic rhythm of a language. Following a consensus in the literature on linguistic rhythm, we will abandon the conception that the isochrony of mora, syllable and feet characterizes linguistic rhythm. We will adhere to a recent understanding of linguistic rhythm as being the result of a number of interdependent prosodic, phonotactic and morphophonological properties. Ten such parameters will be tested on the basis of the sample of nineteen languages which has been compiled for this study. The six parameters of phonetic strength of stress, segmental effects of stress, distribution of tone, syllable complexity, length contrasts, and the distribution of vowel harmony could be positively tested as showing a systematic distribution in different rhythmic types. On the basis of the cross-linguistic evidence, linguistic rhythm can best be thought of as an evolutionary continuum ranging from mora-based to syllable-based to stress-based rhythm. Certain languages in our sample can be regarded as prototypical representatives of the various types in showing all defining properties.

In Chapter 4, an attempt will be made to correlate the occurrence of phonological effects of cliticization, as discussed in Chapter 2, with the occurrence of rhythm-related properties in prosody and phonotactics, as introduced in Chapter 3. Syllabic processes which apply to vowels of cliticized elements show a principled co-variation with the rhythm-related prosodic parameters of phonetic strength of stress and segmental effects of stress. In mora- and syllable-based languages, which exhibit phonetically weak stress or none at all and which have not developed segmental effects of stress, the vowels of cliticized elements will be either retained or assimilated in vowel harmony. However, they will not be reduced or lengthened. Stress-based languages, on the other hand, show high degrees of vowel reduction, vowel deletion or

even vowel lengthening in cliticization. The application of these processes follows from phonetically strong stress and the high degrees of segmental effects of stress characteristic for the languages of this linguistic rhythm. With respect to junctural processes, the rhythm-based typology defended in this study, can only tentatively predict the frequency of occurrence of junctural consonant clusters, vowel clusters, intervocalic consonants at clitic boundaries, and the segmental processes associated with these contexts. Whereas the simple syllable structure of mora- and syllable-based phonologies decreases the likelihood of junctural consonant clusters, it increases the likelihood of junctural vowel clusters and intervocalic consonants at the clitic boundary. Of the processes affecting consonants in the latter context, the presence of length contrasts in consonants in mora-based rhythm allows the gemination of such consonants. Stress-based phonologies with their complex syllable structure, on the other hand, will exhibit junctural consonant clusters and processes applying in this context more frequently, whereas they are less likely to show junctural vowel clusters and intervocalic consonant clusters at the clitic boundary with their associated processes.

Finally, we can conclude that cliticization is determined by the linguistic rhythm in significant ways. Especially with respect to phonology in grammaticalization, we found that neither adaptation nor erosion can be considered intrinsic concomitants in grammaticalization. The phonological effects which accompany ongoing grammaticalization are determined and constrained by the phonological make-up of a language. As for erosion, we can make a principled distinction between languages which show high degrees of syllabic erosion, namely stress-based ones, and those which retain the segmental composition of cliticized elements. Accordingly, grammaticalization is not universally associated with erosion. Since the reductive tendencies of such languages characterize the phonological system as a whole, we may also expect the erosion of elements which do not undergo grammaticalization. With respect to the evolution of morphology, this distinction predicts the emergence of morphological markers of different forms resulting from cliticization in the respective phonological climates. Whereas systematic reduction in stress-based languages leads to subminimal clitics and affixes, the systematic lack of reduction in mora- and syllable-based languages leads to disyllabic clitics and affixes. Fortunately, such cross-linguistic findings on principled typological distinctions in the phonology of

cliticization will inform future work on clitics in the grammaticalization framework and phonological theory.

1. Clitics: a cross-linguistic overview

The study of clitics has its origins in the tradition of the Greek grammarians, who used the term to refer to words which have no accent, and which cause a secondary accent to be laid on the last syllable of the word which they follow. It has been analogously applied to a number of Latin particles which show a comparable phonological behavior and have served as clitics *par excellence* ever since (cf. Simpson & Weiner (eds.) 1989: 212 and Zwicky 1994b). The long tradition of the linguistic interest in clitics implies that the phenomenon has been studied from a number of philological and theoretical angles. In the hundred years between 1892 and 1991 approximately 1500 linguistic studies have been published on the topic, especially since the release of Zwicky's (1977) seminal paper, which continues to inspire a number of researchers until the present day (see Nevis et al. 1994). However, given this huge amount of literature on the phenomenon, relatively little attention has been paid to the typological dimensions of cliticization. It is predominantly syntactic theory which acknowledges the cross-linguistic variation, for instance, in clitic placement (see for instance Klavans 1985, Anderson 1992). In phonology, discussion revolving around the status of clitic groups usually draws data from a rather restricted set of languages, most of them European (see among others Nespor & Vogel 1986: 145ff.).

This chapter presents the data for our typology of clitics. In what follows, we will first introduce the sampling method that was used to construct a variety sample of nineteen languages (1.1.). After a short discussion of the languages chosen for this study, the language sample will be compared to other samples, and its appropriateness for addressing the research questions of the present study will be evaluated. Second, we will introduce the definition of cliticization we adopt in this study (1.2.). On the basis of the more traditional understanding of the term a number of typological parameters for the study of clitics are deduced. We will also exemplify how the data on clitic phenomena in our language sample have been documented in a FileMaker Pro database. The idea that cliticization is a gradual diachronic process will be defended by discussing varying degrees of cliticity in the data compiled. Finally, we will give an overview of the various clitic elements, which have been documented for the languages of our

sample (1.3.). We will give representative examples of clitic particles, adpositions, pronouns, verbs, articles and of some miscellaneous cases. For each group, we will discuss possible diachronic sources and grammaticalization paths proposed in the literature.

1.1. Sampling the languages of the world

Any linguistic study which acknowledges cross-linguistic variation has to cope with a number of problems revolving around the question of which languages have to be considered. Given the lack of documentation for most of the world's languages, and time and space restrictions every research project is subject to, only a subset of languages can be represented in a language sample. Since the design of the sample has direct consequences on the plausibility of generalizations drawn from the data, the sampling method for each sample should be as explicit as possible. In the case of typological studies on clitics, at least one generalization in the literature suffers from ill-formedness of the language sample considered. Kaisse's (1982: 4) pseudo-universal, which states that "all languages with S' clitics place those clitics in second position", is clearly misguided, since the sample studied is to be considered a convenience sample of second position phenomena.

1.1.1. Sampling method

For the phonology of cliticization, relatively little attention has been paid to cross-linguistic variation. It is therefore far from clear which phonological parameters are relevant for the typological study of clitics and cliticization. Given the explorative nature of the present investigation, the construction of a *variety sample* seems the most appropriate way to compile our dataset (cf. Rijkhoff & Bakker 1998: 265). This sample technique maximizes the likelihood of capturing as much of the linguistic diversity for the phenomenon as possible (Croft 2003: 21). We can therefore expect to isolate relevant parameters and to encounter as much variation as possible within these parameters in a sample constructed along these lines. The design of the present language

sample is inspired by the sampling method developed by Rijkhoff, Bakker, Hengeveld & Kahrel (1993) and Rijkhoff & Bakker (1998).

After the explorative nature of the present study had been made clear, and the form of a variety sample was chosen over the possibilities of constructing a convenience or probability sample, a reasonable sample size had to be decided on. To evaluate the time needed to collect reliable information on clitics and the phonology of a given language, a pilot study of ten randomly chosen languages was conducted. It soon became clear that within the time and space limitations of the present study no more than twenty languages could be considered. This practical restriction does not allow us to consider subtle statistical techniques for determining an appropriate sample size, as was for example proposed by Perkins (1989). Given the requirement that a sample must contain at least one representative from each independent language family in order to account for linguistic variation across independent genetic groupings (Rijkhoff & Bakker 1998: 268), the sample size of around twenty languages seems to be incompatible with Voegelin & Voegelin's (1977) or Grimes' (ed.) (1997) language classifications, which distinguish around 50 and 120 families, respectively. However, this minimum requirement can be met when Ruhlen's (1991) classification is used to genetically stratify the language sample. Following Rijkhoff & Bakker (1998) in subsuming language isolates as one quasi-phylum and in ignoring unclassified languages, we are left with nineteen language phyla, from each of which one language was chosen for the sample: i) Afro-Asiatic ii) Altaic iii) Amerind iv) Austrian v) Austric vi) Caucasian vii) Chuckchi-Kamchatkan viii) Elamo-Dravidian ix) Eskimo-Aleut x) Indo-Hittite xi) Indo-Pacific xii) Khoisan xiii) Language Isolates xiv) Na-Dene xv) Niger-Kordofanian xvi) Nilo-Saharan xvii) Pidgins & Creoles xviii) Sino-Tibetan xix) Uralic-Yukaghir. The small sample size of the present sample hinders us from taking diversity values within language phyla as a guide for the selection of languages, since diversity values only help when we have to choose several languages from one and the same phylum. A helpful guide for the selection of representatives for each phylum has been found in the availability and quality of descriptive grammars. Since the Lingua Descriptive Studies' questionnaire explicitly asks for clitic elements (Comrie & Smith 1977: 55f.), grammars of this series, of the following Routledge Descriptive Grammars series and of the Mouton Grammar Library, were first taken into consideration. A

second criterion in the choice of languages for the sample was the availability of detailed phonetic and phonological descriptions and studies on cliticization phenomena in the language. Most of the time, these criteria enabled us to find a suitable language within each of the various language families.

1.1.2. The languages of the sample

The following world map with its accompanying table presents the languages actually chosen for the sample. Figure 1 shows the approximate geographical distribution of the languages in our sample. Table 1 gives information on the area in which the languages are spoken and the respective classifications. The order in which the languages are presented follows from the alphabetical order of Ruhlen's phyla, as listed above.

The majority of the languages in our sample have been studied in depth and therefore high quality descriptions and analyses are available. For some languages, resources are limited to a descriptive grammar and maybe an analysis of clitic phenomena. This is true for Amele, for which we only consider two publications, i.e. Roberts (1987, 1996). The synchronic and diachronic aspects of cliticization are rarely studied for an individual language. For Tariana, however, a number of aspects of cliticization have been studied from both perspectives (Aikhenvald 2000, 2002, 2003a). It is only for the Khoisan languages that we do not have sufficient information to answer all forthcoming questions on cliticization. For !Xóõ a detailed phonological and phonetic description and a dictionary with a brief grammatical sketch are available (Traill 1985, 1994). Since both publications do not make explicit reference to cliticization, data and analysis of clitic phenomena in this language remain tentative.

Data from the respective languages will always be given in the orthography employed in the descriptive works. Principles of interlinear morpheme translations as used in the reference grammars will be followed. Where necessary and possible, we will indicate the difference between phonemic and phonetic transcription by the use of different brackets, /…/ for phonemic and […] for phonetic transcription.

Figure 1: Geographical distribution of the languages in the sample

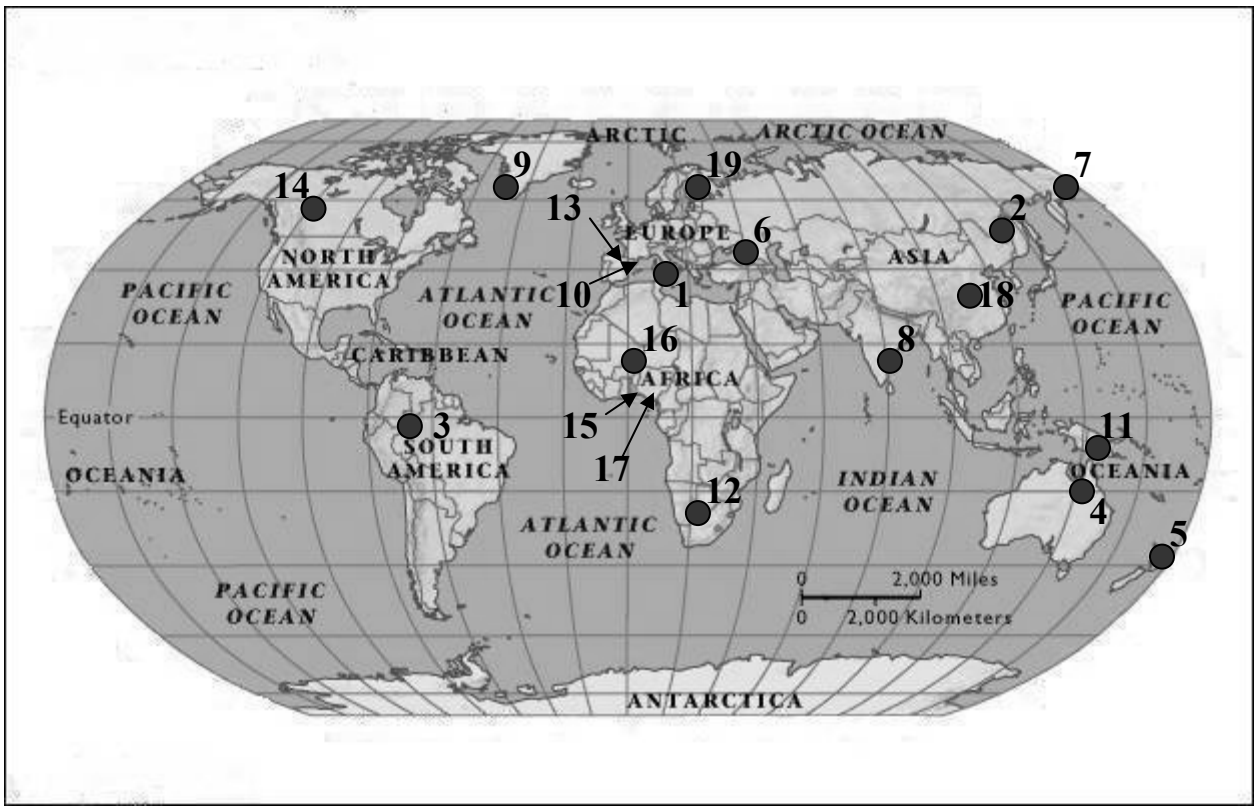


Table 1: Language Sample

Nr.	Language	Macroarea, Area, Country	Classification
1	Maltese	Europe, Malta	Semitic
2	Udihe	Eurasia, Eastern Siberia, Russia	Tungus-Manchu
3	Tariana	South America, Northwest Amazonia, Brazil, Colombia	Arawak
4	Kayardild	Australia, Queensland	Tangkic
5	Maori	Oceania, New Zealand	Polynesian
6	Georgian	Eurasia, Georgia, Turkey, Iran	Kartvelian
7	Chukchi	Eurasia, North Eastern Siberia, Russia	Chuckchi-Kamchatkan
8	Tamil	South Asia, India	Dravidian
9	West Greenlandic	Europe, Greenland	Eskimo-Aleut
10	Catalan	Europe, Spain, France, Sardinia	Indo-European, Romance
11	Amele	Oceania, Papua New Guinea	Gum
12	!Xóõ Bushman	Africa, Botswana, Namibia	Southern Khoisan
13	Basque	Europe, Spain, France	Language Isolate
14	Slave	North America, Canada	Na-Dene
15	Yoruba	Africa, Nigeria	Niger-Congo
16	Koyra Chiini	Africa, Mali, Timbuktu	Songhai
17	Nigerian Pidgin	Africa, Nigeria	Pidgin, English-Based
18	Mandarin Chinese	South East Asia, China	Sinitic
19	Finnish	Europe, Finland	Uralic

1.1.3. Evaluation

The most controversial aspect of this sampling procedure may be found in the fact that it relies on the most dubious language classification available. The reality of a number of Ruhlen's phyla is still discussed or even dismissed. The most notorious case is the Amerind phylum which hardly anybody accepts (cf. the discussion in Ruhlen's postscript 1991: 384ff.). Other cases include Caucasian, for which genetic affiliation has been denied (Hewitt 1995: 1), and Khoisan for which there is still no reliable evidence of genetic affiliation (Traill 1985: 6). The relationship of closely affiliated languages in the phyla is another reason for controversy, for instance, the declaration of 'Indo-Hittite' implies that Hittite lies outside, though closely related to, the Indo-European languages. Since this list of problems with Ruhlen's classification is far from exhaustive, we will restrict ourselves to the more finely-grained language families in the classification row in Table 1. However, it should be kept in mind that the language classification is only utilized as a means of stratifying the sample; as Bell (1978: 138) puts it, "if genetic affiliation is used as a category, the researcher need not agonize about the justification of a particular classification" (see also Rijkhoff, Bakker, Hengeveld & Kahrel 1993: 173f. for a similar position).

With a total of nineteen languages, the present sample is relatively small compared to other samples employed in typological research. Bybee, Perkins & Pagliuca (1994) for example, arrive at a sample size of ninety-four languages, from which seventy-six were actually chosen for the Gramcats sample. This sample size is already beneath the recommended sample size of around one hundred languages (Perkins 1989). The methodological restriction this imposes on our study is that we are not in a position to apply statistics to evaluate our findings. Since the objective of this study is to establish relevant parameters in the phonological typology of cliticization, representative statistical evaluations have to be left for future research. It should be noted that the relatively small sample size allows for more careful examination of the phenomena documented in the sample. Given the fact that the identification of clitics in a language is not a trivial task, this has to be regarded as an advantage of the present sample.

Another shortcoming of this sampling procedure is the fact that geographical bias cannot be controlled. North and South America are seriously underrepresented while Europe and Africa are obviously overrepresented (for the relevance of large linguistic areas in language sampling see Dryer 1989, 2000). However, at least in the case of the African languages, this has to be taken as an advantage as it maximizes the structural diversity manifested in the sample. From the point of view of phonological typology, the four African languages exhibit different prosodic systems. Whereas Koyra Chiini is a pure stress system, Nigerian Pidgin is a combined stress/tone system. Yoruba and !Xóõ are both tonal, but show different levels of complexity in tonal phonology.

Although all methodological shortcomings of the sampling method are fully acknowledged, the sample method ensures high structural diversity with relatively little effort and therefore suites the requirements of this explorative research.

1.2. Parameters for a typological study of clitics

In order to identify clitic elements in the languages of our sample we first of all need a definition of the phenomenon in question. Therefore, we will define the term 'clitic' in the following section. We will operationalize this definition by deducing phonological, morphological and syntactic parameters for a typological study of clitics. After the key concepts have been introduced, we take a look at the process of cliticization from a grammaticalization perspective and establish the idea of varying degrees of cliticity along a cliticization cline.

1.2.1. Towards a definition of 'clitic'

A number of linguistic terms and concepts suffer from the fact that they are ill-defined, controversial or even superfluous for some languages. The term "clitic" is one such term and a generally accepted definition has not yet been arrived at. It seems, quite to the contrary, that the term is used to designate linguistic elements which cannot easily be grouped together under a less controversial cover term. This is primarily due to the fact that identification of clitic elements relies on analysis of all levels of linguistic

description, namely phonology, morphology, syntax, and semantics, and on the identification of other form classes, such as affixes and words. This leads Sadock to his sociological definition: "a clitic is an element whose distribution linguists cannot comfortably consign to a single grammatical component" (1995: 260). The far reaching consequences this may have are documented by Zwicky's (1994a) collection of descriptions using "clitic" as an umbrella term for all elements which are neither clearly words nor clearly affixes.

The most general definition of clitics can be formulated if one takes the classic Greek and Latin grammarians' tradition as a point of departure. The following quote from the *Oxford English Dictionary* summarizes the history of the adjective *enclitic*:

> "That 'leans its accent on the preceding word' (Liddell and Scott): in Greek grammar the distinctive epithet of those words which have no accent, and which (when phonetic laws permit) cause a secondary accent to be laid on the last syllable of the word which they follow. Hence applied to the analogous Latin particles *-que*, *-ve*, *-ne*, etc., and in mod. use (with extension of sense) to those unemphatic words in other langs. that are treated in pronunciation as if forming part of the preceding word" (Simpson & Weiner (eds.) 1989: 212).

There are at least two properties which all of the above mentioned elements share. First, they are all classified as words of some sort. Secondly, they all lack independent accent and therefore form a domain with their preceding word for some phonological rules. A closer look at the Latin particles mentioned in the above quote will illustrate some language particular properties of Latin clitics in phonology and syntax. Take, for example, the connective particle *-que*, which conjoins phrases in Latin and which is illustrated in the examples (1) and (2).

(1) Senātus populus**que** Rōmānus. Latin
'The Senate and people of Rome'

(2) Ibi mortuus sepultus**que** Alexander.
'There Alexander died and was buried' (Gildersleeve & Lodge 1895: 300)

The first striking property of this particle is its rather unusual distribution. It appears after the first word in the last of a sequence of conjoined phrases, i.e. in second position within a phrase (Anderson 1992: 202). Note that its distribution does not rely on the

word class of the preceding word, to which it is attached: in (1) it attaches to a noun and in (2) it attaches to a participle. The evidence for the bound status of this element comes from prosodic phonology. Here, the host word *populus* and the particle *-que* form a unit with respect to stress assignment. In Latin, stress is placed on the penultimate syllable of a word if it is heavy; otherwise it is placed on the antepenultimate syllable. Therefore *populus* would be stressed on the antepenult: *pópulus*. If this word happens to be followed by the unstressed particle *-que*, however, stress is assigned to the syllable immediately preceding *-que* yielding *populúsque*. Note that this rule of stress assignment does not make reference to the weight of the syllable preceding *-que*. Even if this syllable happens to be light, it will receive stress, as observed in *rosáque* 'and the rose (nom.)'. This behavior in stress assignment justifies the postulation of a domain in prosodic phonology which encompasses both the host word and the clitic particle in a clitic group (see Nespor & Vogel 1986, Jacobs 1997 for discussion).[1] This constellation of properties can best be captured by saying that elements like the Latin *-que* "are words from the syntactic point of view but are phonologically dependent […] upon a neighboring word" (Zwicky 1994b: 572). In the following we will adhere to this general characterization of clitic elements, which means that we will consider elements which are phonologically bound and thus behave like affixes and which are at the same time distributed with respect to a phrasal domain and thus behave like words.

The question which immediately arises is, to what extent are the facts about clitic particles in Latin universal properties of clitic elements, and to what extent are they merely language particulars. With respect to the syntactic placement, we know that second position is only one of a number of available options. The most comprehensive typology of clitic placement can be found in Anderson (1992: 202), who distinguishes initial, final, second, penultimate, pre-Head and post-Head position within phrases as options for the placement of clitics. In phonology, phonological dependency can be manifested by a number of phonological rules which, in principle, could apply to clitic groups (see Nespor & Vogel 1986: 145ff. for a short overview). Pre-stressing, as reported for Latin, is only one of various options in the prosodic phonology of

[1] It should be noted that among Latinists certain facts about stress placement in host-enclitic combinations are still debated. For instance, hosts like *kórpora* 'corpus' retain their antepenultimate stress in host-clitic combinations like *kórporáque*, arguably as secondary stress. See Plank (2005) and references given there for discussion.

cliticization. The cross-linguistic behavior of host-clitic combinations in prosodic and segmental phonology will be addressed in Chapter 2, in which the phonology of the clitics in our data will be discussed. It will become clear that phonological dependency manifests itself in various ways across the different phonological systems which are represented in the languages of our sample.

1.2.2. Typological parameters for the study of clitics

Given the fact that our definition of clitics seems to be rather general, we need to seek a way to isolate clitic elements across languages and distinguish them from affixes and words. The most promising strategy is to be found in the parameterization of phonological bonding and syntactic distribution. Following this line of thought, a number of formal properties of morphemes in phonology, morphology, syntax, and semantics can be identified to distinguish these form classes. The number of parameters for the typological study for clitics proposed in the literature ranges from three (Klavans 1985) to fifteen (Aikhenvald 2002), each allowing for a number of values. In what follows, we will summarize the parameters that are used to isolate clitic elements in the nineteen languages of our sample. They were taken from literature explicitly dealing with distinguishing form classes, in particular Zwicky (1977, 1985, 1994a, 1994b), Zwicky & Pullum (1983), Klavans (1985), Anderson (1992), Mel'čuk (1997: 212-221), Aikhenvald (2002), and Haspelmath (2002), among others. The values which were fixed for the respective parameters of an element in a given language have been documented in a FileMaker Pro database. This enables us to do searches on variables of each parameter and gives us quick access to information on clitic elements in our language sample. A sample entry is given in Table 2 for the clitic particle *kO* 'interrogative' in Finnish. Discussing the information given in each cell will allow us to illustrate how this strategy of collecting data on clitics works.

Table 2: Database entry for the clitic particle *kO* 'interrogative' in Finnish

Language	Finnish
Affiliation	Uralic
Clitic	kO
Full form	[NO]
Word-class	Sentence particle
Semantics	Interrogative
Example	(1) On=**ko** Pertti naimisissa? is=**Q** Pertti married 'Is Pertti married?' (2) Pertti=**kö** on naimisissa? Pertti=**Q** is married 'Is it Pertti who is married?' (Nevis 1986: 9f.)
Liaison	Enclitic
Prosodic phonology	Unstressed, regularly secondary stressed
Segmental phonology	Undergoing vowel harmony
Morphophonological idiosyncrasies	[NO]
Host	Verb, noun, participle, etc.
Order	Outside derivational/inflectional morphology
Template	=POSS=PARTICLE CLITICS
Paradigmaticity	[N.A.]
Paradigm	[N.A.]
Paradigm full form	[N.A.]
Domain	S
Placement	2P
Classification	Clitic, particle clitic, bound word
Rationale	Phonological behavior, syntactic distribution
Sources	Sulkala & Karjalainen (1992), Nevis (1986d)
Comment	2P or phrase final?
Sample	A - 19 (Pilot)

Each database entry gives the name and affiliation of the language considered and a base form of the clitic element in question. What follows is the specification of its properties in phonology, morphology and syntax, as well as some general information.

1.2.2.1. General information

Full form gives information on the relationship the clitic element has to a non-clitic form. This is one of Zwicky's (1977) diagnostics to distinguish between *simple clitics*, which can be associated with a non-clitic form in the language, and *special clitics*, which cannot be associated with a non-clitic form (see also 1.2.3.1.). In the case of the Finnish clitic particle *kO* there is no corresponding full form. The fields *word-class*, *semantics*, and *example* give some general information on the element. In the case under discussion here, we can safely attribute the element to the class of sentence particles and

gloss its meaning as interrogative. Before the respective properties in phonology, morphology and syntax are specified, an illustrative *example* is given.

The final fields of a given database entry provide information on the *classification* the element in question has previously been given. The literature considered is listed in the *source* field, as well as the *rationale* for the respective classifications. An additional *comment* field allows for notes on remaining questions and on aspects of the element's properties. In the case exemplified, the syntactic distribution may also be considered as final on the topicalized phrase in the examples given. The last field links the entry to the sample design in specifying the number in the language *sample* and its membership in the pilot study (see 1.1.).

1.2.2.2. Phonological parameters

With respect to phonology, clitics resemble affixes in being phonologically bound. For both form classes, phonological dependency on adjacent bases can be described by four parameters: in which direction they attach to their base, how they behave with respect to rules in prosodic and segmental phonology, and in how far they exhibit morphophonological idiosyncrasies.

Liaison, taken from Klavans (1985), describes whether the element attaches to its host as a proclitic, enclitic, or endoclitic. This resembles the possible attachment properties of affixes as prefixes, suffixes, or infixes. However, unlike affixes, certain clitics allow more than one direction of attachment. A well-known case is the attachment of Romance pronominal clitics, which attach proclitic to finite verbal hosts, and enclitic to non-finite verbal hosts. In Catalan for instance, pronominal object clitics are enclitic to infinitives, gerunds and positive imperatives; with all other verb forms, however, they attach to their host as proclitics (Hualde 1992: 345). The liaison of *kO*, as well as of all other Finnish clitics, is enclitic. Note that although endoclitics have been documented for languages like Udi (Harris 2002), none of the languages in our sample shows this kind of liaison.

Prosodic phonology describes the phonological behavior of a clitic in terms of stress, tone or intonation phonology with respect to its host. Like other bound morphemes, clitics should form a phonological unit with their host for the sake of, for instance, stress assignment. The Finnish clitic particle in Table 2 is unstressed but may,

however, be secondary stressed under certain circumstances. For the sake of secondary stress assignment, suffixes and enclitics in Finnish form a unit with their stem and host (see Chapter 2.1.1. for discussion). Although being unstressed has been taken as a defining property of clitics, it is only one of a number of options. The degree of variation encountered in the languages of our sample with respect to stress, tone and intonation phonology will be discussed in detail in Chapter 2.1.

Segmental phonology lists the segmental rules that apply to the host-clitic combination. Again, clitics and affixes resemble each other in possibly triggering segmental alternations in the form of allomorphy. This behavior can be taken as evidence for bound status. As can be inferred from the examples given in Table 2, *kO* undergoes vowel harmony triggered by the vowels of the host word. This is one of the more characteristic segmental rules that apply to bound morphemes (Zwicky 1985), but is far from being the only. The variation among possible segmental rules applying to consonants and vowels at the host-clitic boundary or across syllables in clitic groups will be studied in detail in Chapter 2.2.

Morphophonological idiosyncrasies are generally associated with inflected words rather than with clitic groups (Zwicky & Pullum 1983). Here, affixes and clitics should differ. Accordingly, the lack of such idiosyncrasies in most of the cases documented in our sample suggests that we are dealing with clitics rather than affixes. However, it should be noted that we can also encounter such idiosyncrasies in clitic clusters. An example for this would be the Catalan 3rd person singular dative clitic *li*, which is replaced by *hi* in combination with accusative clitics (Hualde 1992: 346).

1.2.2.3. Morphological parameters

Apart from their phonological properties, clitics are also characterized by a specific morphological behavior. Whereas clitics usually resemble affixes with respect to their bound status in phonology, a defining morphological property that distinguishes them from affixes is their appearance outside morphological word domains. Whereas affixes attach to roots and stems, clitics attach to morphological words after all affixation processes are completed.

One symptom of the lack of morphological distribution is found in the degree of selectivity morphemes exhibit with respect to the word class of the base they attach to.

Prototypical affixes should attach only to one specific word class, for instance tense markers are expected to appear affixed to verbs. Clitics on the other hand attach to hosts belonging to different word-classes (Zwicky & Pullum 1983). The Finnish interrogative clitic can take verbs, nouns, participles and the like as its *host* and is therefore characterized by a low degree of selectivity. Closely related to this property is the parameter of *order*, which describes the sequence of bound morphemes. Following the assumption that all affixation precedes cliticization, we would expect clitic elements to appear outside derivational and inflectional morphology. The Finnish clitic *kO* again shows prototypical clitic behavior in this respect, i.e. it appears outside derivational and inflectional morphology. It has long been noted that the placement of clitics follows complex rules and that more than one clitic can appear in a syntactic slot (see Halpern 1995 and Halpern & Zwicky (eds.) 1996 on the placement and morphology of clitics). Some researchers even claim that generalizations can be drawn as to which clitics will appear closer to the host in clitic clusters. For instance, it has been proposed that derivational clitics should precede inflectional clitics (Klavans 1983, Anderson 1992). In Finnish, possessive clitics generally precede clitic particles, an observation documented in the field *template*. Note that this speaks against the generalization formulated by Klavans and Anderson.

Some elements which are subject to cliticization come in a paradigm of forms. This would, for instance, be true for pronominal clitics, which should encode all possible person/number distinctions of a language. When such elements cliticize, one encounters certain splits within the paradigm. For instance, it is not uncommon to find clitic behavior only with 3rd person pronouns. In Kayardild for instance, only the 3rd person nominative pronoun *niya* gets contracted to *ni* in postverbal position, whereas none of the other pronouns show any sign of phonological or morphological bonding (Evans 1993: 201).[2] Such gaps in the expression of categories is, however, rather unusual for inflectional paradigms, where each cell will have some sort of marking for the respective stem-exponent combinations. To capture the degree of *paradigmaticity* we introduce a parameter which could be specified for the values low, high, or full (but see Zwicky & Pullum 1983 for a different interpretation of paradigmaticity). For the sake of illustration, for an element which comes with a paradigm of forms this

[2] See McConvell (1981) on the loss of pronominal clitics in the Tangkic group and Evans (1993: 424ff.) for discussion.

paradigm of forms will be given in the relevant field of the database, if it is associated with non-clitic forms, the paradigm of the full forms will also be given in the field *paradigm full form*. Since the interrogative particle *kO* in Finnish does not come with a paradigm of forms, none of parameters are applicable.

1.2.2.4. Syntactic parameters

In syntax, clitics behave like words with respect to their appearance in certain syntactic slots within phrases. The *domain* specifies the phrase in which the element is located. In principle, any kind of phrase, such as sentence, verb phrase, noun phrase, prepositional phrase among others, can serve as the domain for clitic placement. Some clitics may appear in any phrasal domain, like focus clitics which can attach to any focused constituent of a sentence. As an example for this we can mention the additive focus clitic *dA* 'too, and, as well, even' in Udihe, which attaches to focused constituents (Nikolaeva & Tolskaya 2001: 441f.). Others clitics may be specialized for a certain domain, for instance clitic articles will typically appear in noun phrases. The Finnish clitic particles appear within a sentence, therefore their domain is S. As mentioned above, within this phrasal domain, clitics can appear either in initial, second, penultimate, final, pre-Head or post-Head position. In our database, information on the position of clitics within a phrase is given in the cell *placement*. Within the sentential domain, the Finnish particle clitic *kO* appears in second position, abbreviated with 2P in Table 2.

1.2.2.5. Summary

The identification of clitic elements in the languages of our sample relies on the specification of values on phonological, morphological and syntactic parameters for the study of form classes. The procedure allows us to only consider elements that fall under the clitic definition developed at the beginning of this chapter and to exclude genuine affixes and words from our analysis. As mentioned repeatedly in the discussion of the various parameters, the cross-linguistic diversity in the phonology, morphology and syntax of clitics is considerably higher than suggested in most of the work on clitics and cliticization. In this study, we will concentrate on the aspect of phonological dependency. We will survey the phonological properties of clitic elements in our

sample, and will try to correlate these with properties in the phonological profile of the languages in question. Similar studies on morphological and syntactic properties of clitics and possible correlations with other properties of the grammar of the languages in question have to be left for future research.

1.2.3. Degrees of cliticity

The admittedly wide definition of clitics adhered to in the preceding section embraces a number of elements which do not necessarily share all properties in phonology, morphology and syntax. In fact, within this group, various types of clitics can be distinguished. In this section we will outline the major types of clitics found in the data, and will try to establish a cliticization cline which reflects ongoing grammaticalization from words to clitics to affixes. Finally, the synchronic variation within clitic-like elements in Nigerian Pidgin, a language of our sample, will serve to illustrate the various degrees of cliticity along this cliticization cline.

1.2.3.1. A typology of clitics

In the literature on clitics, a number of classifications for the heterogeneous class of elements being phonological bound and following a syntactic distribution have been proposed. Zwicky's (1977) distinction between *simple clitics* and *special clitics* has become accepted as the most fundamental one. Two other kinds of clitic-like elements, namely *fast speech forms* and *phrasal affixes* will also be considered in this study.

The term *fast speech form* stems from Kaisse's (1985) seminal work on the phonology of cliticization. In her account, phonological rules in connected speech may either be "dependent only on factors such as speech rate, syllabification and the features of the focus and determinant" or "sensitive to the syntactic or morpholexical environment in which their phonological terms appear" (Kaisse 1985: 1). For rules of the former sort she coined the term *fast speech rules*; for rules of the latter sort she uses the traditional term *external Sandhi*. Kaisse (1985: 25ff.) discusses the rule of Flapping in English as one example of a fast speech rule. In Flapping intervocalic ambisyllabic /t/ gets voiced and sometimes sonorantized. The domain for the application of this rule is, however, not restricted by the morpho-syntactic context. It operates across the word

boundary between a noun and verb (*The fruitba[D] achieved wide distribution*), between a noun and a noun (*We elected the fruitba[D] ambassador*) and between a noun and the indefinite article (*We gave the fruitba[D] a shower*). Note with respect to the last case that the unstressed function word *a* behaves exactly like the stressed content words in the first two examples. The phonological bonding of this clitic-like form is a purely phonological matter and relies in this case on processes of syllabification. The case of the proclitic preposition *lil* 'to' in Maltese, which often reduces to *'(i)l*, provides an example for a rule which is dependent on speech rate. Here, the final /l/ of this element assimilates to a following noun only in fast speech (Borg & Azzopardi-Alexander 1997: 137). In this case, the phonological bonding and reduction of the element is dependent on speech rate and the clitic element can thus be referred to as a *fast speech form*.

Apart from the *fast speech forms* discussed in the preceding paragraph, a group of *simple clitics* can be distinguished. Zwicky (1977: 5ff.) defines an element which is unaccented and phonologically subordinated to a neighboring word as a *simple clitic*. Bound morphemes of this sort can be related to free morphemes, of which they form a reduced variant. His own example comes from the pairs of full and reduced object pronouns in English. In a sentence like *She met him*, the object pronoun may be realized in its full form *him* or in a reduced, cliticized form *'m*. The major difference between these two variants lies not in their morpho-syntactic distribution but in the fact that the full variant appears as a free morpheme and the reduced form as a bound form. Although similar pairs of full/free forms and reduced/bound forms are documented for a number of languages in our sample, cliticization is not always accompanied by phonological reduction. A number of elements in Tariana retain their segmental substance when they encliticize to a preceding word. Accordingly, a more general characterization of a *simple clitic* would describe it as a phonologically bound morpheme which can be related to a free form.

In contrast to simple clitics, certain clitic elements cannot be related to free morphemes in the language. Unlike the pairs of free and bound variants of pronominal elements hinted at in the preceding paragraph, the members of certain such pairs cannot be related to one another. Whereas English *'m* can be considered a reduced variant of *him*, no phonological derivation could relate the French proclitic subject pronoun *je* to

its full counterpart *moi*. In cases where the clitic cannot be related to a free form, Zwicky (1977: 6) uses the term *special clitic* to refer to such elements. Another defining property of these elements lies in their special syntax. The French object clitics, for example, appear in preverbal position in declarative sentences but other object NPs appear postverbally (compare *Je* ***le*** *vois* and *Je vois* ***Jean***). Simple clitics and special clitics therefore share the property of being phonological bound to a neighboring word. With respect to their relationship to corresponding free morphemes, however, they differ in that the former exhibit such a relationship, whereas the latter lack such a relationship. Also, special clitics show a special syntax when compared to other non-clitic elements with corresponding functions.

Finally, a fourth type of element is subsumed under the heading "clitics." These morphemes resemble affixes in being phonologically bound and in expressing morpho-syntactic categories. They cannot be related to corresponding free forms or non-clitic elements, and show a special syntactic distribution. An example for such a *phrasal affix* can be found in the English group genitive. The morpheme *'s* expresses the morpho-syntactic category of genitive case for the head noun of a noun phrase. Its distribution at the rightmost edge of the NP, however, may separate it from its head and it may be attached to whichever word appears in front of it. Accordingly, in *the person who jumped****'s*** *opinions*, the morpheme marks genitive case for the head noun *person* but is attached to the neighboring word *jumped* to which no morphological, syntactic or semantic relationship exists (Zwicky 1994b: 576).

With respect to the languages in our sample, few grammatical descriptions acknowledge this diversity in elements which behave as clitics in being phonologically bound and in following a syntactic distribution. Locating the clitic elements documented in the database on this cline, presupposes a detailed analysis of form classes in the respective languages. Unfortunately, this demanding task cannot be fulfilled in this study (see for instance the detailed analyses of the clitic definite article in varieties of German by Nübling 1992 and Schiering 2005). Therefore, we will concentrate on a few cases which have been sufficiently discussed in the literature when we need to address differences in the phonology of the different types of clitics, and especially when we discuss possible evolutionary clines for cliticization.

1.2.3.2. A cliticization cline

Within grammaticalization theory, cliticization is conceived as an evolutional continuum. Therefore, clitics need not be viewed as a homogeneous class sharing a fixed set of features. When a function word merges into morphology, it undergoes a number of gradual processes in phonology and morpho-syntax which cannot be segmented into discrete units (see Heine & Reh 1984: 15 for such a view on grammaticalization clines). From this point of view, fast speech forms, simple clitics, special clitics and phrasal affixes form a cliticization cline between words and affixes. The parameters introduced in 1.2.2. can be utilized to determine to degree of cliticity on such a cline for the clitic-like elements in question. The cliticization cline is schematized in Table 3 (see also Jeffers & Zwicky 1980, Nübling 1992, Hopper & Traugott 1993).

Table 3: A cliticization cline

	Fast speech form Simple clitic Special clitic Phrasal affix
Non-clitic form	Yes·····No
Prosodic phonology	Phrasal domain·····Word domain
Segmental phonology	Phrasal domain·····Word domain
Paradigmaticity	Low·····High
Selectivity	Low·····High
Placement	Phrasal domain·····Word domain

With respect to the first dimension of this cline, the relationship between a clitic element and its corresponding non-clitic form may become more remote and may finally be lost when the cliticized element undergoes cliticization. This could be due to different phonological processes which affect only one of the two forms, for instance when the cliticized element undergoes substantial reduction and is thus hardly reminiscent of its corresponding full form in its segmental composition. Another reason for the divergence of pairs of clitic and non-clitic elements may be different distributional specializations of the elements in question. For instance, the clitic may specialize for immediate postverbal position whereas the non-clitic element appears in

all other morpho-syntactic contexts (see Hopper & Traugott 1993: 116–120 on divergence in grammaticalization). In prosodic as well as segmental phonology, the cliticized element may be subject to rules of lower level domains. The loosest phonological bonding is caused by phonological rules applying to the utterance, the intonation phrase or the phonological phrase (see Selkirk 1984, Nespor & Vogel 1986 for this prosodic hierarchy). The further the element grammaticalizes, the further it will be subject to rules applying within the phonological word domain. Since this study focuses on such phonological effects of cliticization we will not go into detail here (see Chapter 2 on the behavior of clitics in prosodic and segmental phonology).

In morpho-syntax, elements which come in a paradigm of forms, such as pronouns, may differ with respect to their grammaticalization status. Certain members of the paradigm may be grammaticalized further than others. The degree of paradigmaticity describes how many members of the paradigm have cliticized. When only a few members are cliticized this would be an instance of a low degree of paradigmaticity; a situation of full paradigmaticity arises when all members are cliticized. For inflectional affixes, as the final extreme on the cline, we would prototypically expect full paradigmaticity. Selectivity and placement are interdependent processes. When an element cliticizes, it may first specialize for a special position within a phrasal domain, for instance for second position within the sentence. In a second step, the cliticized element may specialize for a position in immediate adjacency to the phrasal head. In the case of cliticized pronouns this would be the verb, i.e. they specialize for pre- or post-Head position as preverbal or postverbal clitics. Finally, the grammaticalized element may be completely integrated into the morphological word domain and be affixed to a stem. In the example of pronouns, the final step in grammaticalization would be their affixation to the verb. Note that this syntactic specialization is accompanied by various degrees of selectivity. Whereas an element appearing in second position of the sentence may in principle take hosts of any word class, elements specialized for pre- or post-Head position will only attach to hosts of the head word class, e.g. verbs for verb phrases. When such elements are fully grammaticalized to affixes, they are highly selective on a particular stem.

In essence, grammaticalization along the cliticization cline as discussed in the preceding paragraphs can be sub-divided into two sub-processes of cliticization:

phonological bonding and morpho-syntactic specialization. Whereas the former process describes the gradual integration of the cliticized element in the phonological word domain, the latter describes the gradual integration of the cliticized element into the morphological word domain.

1.2.3.3. An illustrative example

Some of the reference grammars consulted for this study, both implicitly and in some cases explicitly, acknowledge the complexity of cliticization in the discussion of clitic elements in the languages being described. Hualde's (1992) grammar of Catalan, for example, offers a grammatical description where phonological and morpho-syntactic cliticization can be distinguished. A number of short function words, such as the articles, some prepositions, the complementizer *que* and the object pronouns, are always unstressed and therefore lean on a adjacent word for prosodic support (see also Wheeler 1979: 34). The term *clitic* proper, however, is reserved for pronouns bound to the verb as pro- and enclitics. Apart from being unstressed and phonologically bound, these elements also exhibit some special morpho-syntactic properties, like placement in immediate pre- or postverbal position and participation in the syntactic process of clitic climbing (Hualde 1992: 345). A similar point has been made for Koyra Chiini as described by Heath (1999). As in Catalan, a number of short function words are regularly unstressed and pattern as pro- or enclitics to adjacent words. Cliticization as a "formal feature of the grammar", however, is only discussed with the postverbal pronominal objects and pronominal prepositional phrases (Heath 1999: 49). Here, the rationale of positing syntactic cliticization comes from a number of morpho-syntactic properties which the elements in question exhibit, namely fixed order in immediate postverbal position and idiosyncratic allomorphy in some clitic combinations (Heath 1999: 243).

Nigerian Pidgin offers an intriguing example of the synchronic variation encountered within clitic-like elements of one language. This language has a number of function words which are unstressable, namely bound pronouns, the preposition *fọ̀r*, the article *dì*, the pluralizer *dèm*, the focus introducer *nà* and the copular verb *bì* (Faraclas 1989: 562). Clitic object and subject clitics and the clitic auxiliary verbs *gò* 'irrealis modality' and *dè* 'incompletive aspect' can be related to non-clitic counterparts. It is

only with the free 1st person subject pronoun *mi* and the clitic form *à* that no relationship between free and clitic pronominal elements is transparent. Differences between the two sets of elements are, however, found in their phonology, such that the non-clitic elements are always stressed and high-toned and the clitic elements are always unstressed and low-toned or even toneless. With respect to prosodic phonology, they are subject to rules of stress placement and tonal Sandhi applying within the domain of the phonological phrase (see 2.1.2. for discussion). In segmental phonology, they are subject to general rules such as epenthesis, consonantal weakening, vowel centralization and vowel assimilation. The 3rd person object pronoun *am* appears within a phonological word domain with respect to the segmental rule of *r*-deletion, which deletes word-final *r* but is blocked by the presence of a vowel-initial clitic (see discussion in 2.2.1.1.). Morpho-syntactically specialized clitics are only found in the domain of phonologically bound object pronouns, which immediately follow the verb and in the domain of bound auxiliaries, where at least the incompletive aspectual auxiliary *dè* immediately precedes the verb (Faraclas 1989: 502ff.). In these cases, the cliticized elements have specialized for a phrasal position immediately adjacent to the syntactic head of the phrase, in this case the verb phrase. Accompanied by this specialization, the cliticized elements show a high degree of selectivity in only attaching to verbal hosts. In Nigerian Pidgin, the pronominal clitic which has been grammaticalized the furthest is the 3rd person object pronoun *-am*. It obligatorily follows the verb immediately and in some basilectal varieties also allows clitic doubling. Interestingly, this element blocks the deletion of word final consonants in the host, suggesting that it forms a phonological word with the verbal host. It thus seems that morpho-syntactic specialization and the phonological integration of clitics are interdependent processes. A tentative cline for clitic-like elements in Nigerian Pidgin is given in Table 4.

Table 4: A cliticization cline for Nigerian Pidgin

Fast speech form	Simple clitic	Special clitic	Phrasal affix
	fòr 'at, on, in, etc.' *dì* 'the' *dèm* 'plural' *nà* 'focus' *bì* 'copula'	*dè* 'incompletive' *mì* '1sg' *yù* '2sg' *òs* '1pl' *ùnà* '2pl' *dèm* '3pl'	*am* '3sg'

The Nigerian Pidgin case illustrates the fact that different degrees of cliticity may be observed within the clitic elements of a single language. Within the set of bound object pronouns, we even encounter different degrees of cliticity within a set of forms which constitute a paradigm. The observations made in the context of the highly grammaticalized 3rd person object clitic *am* suggest that tighter morpho-syntactic bonding is paralleled by tighter phonological bonding. Since this study is primarily concerned with phonological effects of cliticization, we cannot address questions revolving around different degrees of cliticity within clitic inventories of specific languages and across languages. Also, the degree of interdependence between the various parameters and processes involved in cliticization deserve a more careful study. For instance, the question of whether the observed interdependence of tighter morpho-phonological specialization and tighter phonological integration is obligatory in cliticization needs to be studied in more detail. We will return to this question in the final chapter of this study, when we discuss the role of phonology in cliticization and grammaticalization.

1.3. A cross-linguistic survey of clitics

The objective of this section is to represent the data that have been collected using the sampling method and the strategy of identifying clitics presented above. In total, some 355 clitic elements were identified for the nineteen languages of our sample. The following overview is organized according to the word-classes to which the cliticized elements in our database belong. The overall distribution of these elements in the languages of our sample is summarized in Table 5.

Table 5: Distribution of clitics in the language sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Particle	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+
Adposition	+	-	-	-	+	+	+	+	-	+	+	+	-	+	-	+	+	-	-
Pronoun	+	-	+	+	+	-	-	-	+	+	-	-	+	-	+	+	+	-	+
Verb	-	-	+	-	-	+	-	+	-	-	-	-	+	-	-	+	+	-	-
Article	+	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	+	-	-
Misc.	-	-	+	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-

Table 5 only gives information about the occurrence of the various clitic elements in the languages of our sample. Quantities such as the exact number of clitic elements within a language and across the nineteen languages of the sample cannot reliably be provided on the basis of the data extracted from descriptive grammars. For example, it is not known whether the description of clitics in a language given in such grammars is exhaustive and representative for the language. In cases where clitic elements constitute paradigms, the number of clitic elements depends on whether we count all members of the paradigm or the paradigm as a whole. It is also far from clear to what extent the various clitic elements are comparable across languages. Given these methodological drawbacks, a quantitative evaluation of the distribution of clitic elements in the languages of our sample will not be attempted.

In the following sections, we will successively present the most salient clitics in the domain of particles, adpositions, pronouns, verbs and articles, as well as some miscellaneous cases, following the order emerging from the frequency of occurrence of such elements in the sample. Where possible, we will also briefly hint at relevant grammaticalization paths for the source of the elements in question and for their further morphological evolution (for an overview of possible paths see Lehmann [1982] 1995; Compes, Kutscher & Rudorf 1993; and Heine & Kuteva 2002). The following survey is

not meant to be exhaustive but merely tries to demonstrate the diversity of the phenomenon cliticization from a cross-linguistic and diachronic perspective.

1.3.1. Particles

Every language in our sample shows a number of function words which do not fit into a major word class and are therefore termed particles. The vast majority of languages in our sample, i.e. eighteen languages, exhibit bound behavior of some of these elements in phonology. In Chinese linguistics, the description of these elements is part of the philological tradition. Examples (3), (4) and (5) exemplify the usages of the locative particle *shang* 'on, top', the sentence particle *a* 'exclamation' and the adverbial particle *de*, respectively.[3]

(3) zai zhuozi-**shang** xiezi — Mandarin Chinese
at table **on** write:characters
'Write characters on the table' — (Liu 1998: 48)

(4) chángchéng duō měi **a**.
long-wall how beautiful **A**
'How beautiful The Great Wall is!' — (Lin 2001: 119)

(5) tāmen gāoxìng **de** huí jiā le.
they happy **DE(ad)** return home LE
'They happily returned home.' — (Lin 2001: 118)

Another rather common set of clitic elements in the inventories of the languages studied here are various kinds of topic/focus clitics.[4] Udihe, for example, has a number of clitic particles marking different types of focus. In (6), the clitic particle *dA* puts additive focus on the pronoun *bi* 'me'. Kayardild has an enclitic focus marker *(a)ka* which is illustrated in (7).

[3] See also Matisoff (1991) for the grammaticalization of such elements in Southeast Asian languages.
[4] Focus clitics constitute intriguing examples with respect to their prosodic phonology in a number of languages. In Latin, such focus clitics contribute to the stress assignment in the host-clitic combination (see Plank 2005). In Bengali, such elements come with a lexical specification for high tone (see Lahiri & Fitzpatrick-Cole 1999). For the related case of the Tamil interrogative particle *aa*, which obligatorily is realized with a high-low intonation contour, see 2.1.3.

(6) Ag'a bi-**de** ŋene-ze-mi. Udihe
brother me-**FOC** go-SUBJ-1SG
'Brother, I will also go.' (Nikolaeva &Tolskaya 2001: 441)

(7) marri-ja ri-ya-**ka** marri-ja ri-ya-**k**! Kayardild
listen-IMP east-NOM-**FOC** listen-IMP east-NOM-**FOC**
'Listen to the EAST, listen to the EAST!' (Evans 1995a: 392)

Closely related to focus clitics are interrogative particles, which also foreground the questioned constituent. We already saw an example of such a clitic particle in Table 2 with the Finnish interrogative particle *kO*. Another language which shows this phenomenon is Tamil. Here, the clitic particle *aa* marks interrogative as well as emphasis. (8) gives an example in which the clitic particle has sentential scope with interrogative meaning and appears in sentence final position as an enclitic on the verb.

(8) avan vantaan**aa** Tamil
he come-past-3sm-**ip**
'Did he come?' (Asher 1982: 4)

West Greenlandic has a large number of clitic particles with sometimes quite specific meanings. One such clitic particle is *aasiit* in (9) whose meaning is rendered in English as 'again as usual, the same old story, just like him'.

(9) piuma-nngil-aq=**aasiit** West Greenlandic
want not 3s.indic. **as.usual**
'He doesn't want to again (as usual).' (Fortescue 1984: 310)

Though information about clitics in this language is scarce, the exclamatory particle *ko* in !Xóõ seems to be an enclitic in sentence final position. An example is given in (10).

(10) !gabate /ʔa: /i **ko** !Xóõ
mortars broken stative **exclamatory**
'The mortars are broken!' (Traill 1985: 43)

For the vast majority of clitic particles, and particles in general, information on the diachronic sources of these markers is rare in the descriptive grammars consulted. Without going into philological details, at least some possible grammaticalization clines can be reconstructed.

The clitic focus marker *dA* in Udihe has been borrowed from the Chinese coordinator *de* (Nikolaeva & Tolskaya 2001: 20). Apart from the English superstrate properties of Nigerian Pidgin, there is also evidence for clitic borrowing in Tariana, where the augmentative enclitic *pù* has been borrowed from Tucano. Closely related to the function of focus clitics, is the clitic *(i)da* 'same' in Kayardild, which is used to refer back to referents previously referred to. This element probably derives from a postposed nominal *niida* 'the same' (Evans 1995a: 390). The emphatic focus clitic *(a)ka*, on the other hand, seems to have a widespread distribution in the languages of Australia, suggesting that it is relatively old; it is also a focus marker in Lardil and a subordinator clitic in Yukulta (Evans 1995a: 393). Though there is little information on the origins of focus clitics, some possible grammaticalization paths for their further evolution can be inferred from the synchronic data. The most usual phenomenon is their fusion with other function words, especially pronouns, to derive new grammatical markers. Udihe *da* is also used to derive non-specific indefinite pronouns from interrogative pro-nouns and pro-adverbs (Nikolaeva & Tolskaya 2001: 355). In Georgian, the clitic particle *c(a)* 'too, also' combines with the clitic emphatic particle *ga* to form specific indefinites, and derives relative pronouns when attached to interrogative pronouns (Hewitt 1995: 81, 83). In Tamil, a number of clitic particles also have a derivational function. For instance, the dubitative clitic *oo* combines with *etu* 'which' to form a non-referential indefinite *etoo*. It also combines with interrogative pronouns to form indefinite pronouns/quantifiers, e.g. *yaaroo* 'someone'. The coordination and focus clitic *um* combines with WH-interrogatives to form all-inclusives and universals. Finally, the emphatic clitic *ee* combines with the locative case marker to form superlatives of adjectives and thus enters derivational morphology (Asher 1982: 140, 146; Schiffman 1999: 158, 127). A close affinity between focus and coordination function is exemplified by the ambiguity of some markers that function both ways, e.g. the clitic *um* in Tamil mentioned above. In this context, the combination of *qeluq* 'because' and the emphatic clitic *ʔm* to form the conjunctive particle *qeluq=ʔm* 'because' in Chukchi is noteworthy (Dunn 1999).

Some sentence particles seem to originate from verbal forms. The Tamil quotative clitic *ŋŋu* is related to the past participle of *en* 'say'. The interrogative particle */V* in !Xóõ, where V is a placeholder for a vowel which surface form depends on the

context, may be related to the verb */îi* 'to be' (Traill 1985: 174). The Slave past tense clitic *íle* may historically be an auxiliary verb in the perfective aspect. For the Georgian quotative clitic *o*, 'spreading' of this element to various elements of a sentence has been documented in various North Eastern dialects (Manning 1995). Generally, a possible further development of such elements lies in the evolution of tense/aspect/mood markers. The enclitic mood markers in Amele present an example where these elements already seem to be part of the verbal complex (Roberts 1987, 1996). The clitic postverbal particles in Slave also show clitic behavior and could be interpreted as a source for new tense/aspect morphology in the verb complex (Rice 1989c).

The so-called locative particles in Chinese continue to be a rather controversial set of elements, since they cannot be positively attributed to a single word class. The analyses proposed in the literature range from particle to postposition to noun (see Liu 1998 for discussion). The form *shàng* in (3) is also used as an adverb and is homophonous to a motion verb 'to go up'. Therefore it seems likely that what we encounter in this case is closely related to the grammaticalization path *verb* > *adverb* > *postposition*, which initiates the morphologization of new case markers (see below on the grammaticalization of adpositions).

A possible diachronic source for complementizers is documented with the coordinating conjunction *ǂʔV́* in !Xóõ, which is cognate with the verb *ǂʔábV* 'have' (Traill 1985: 174). We already encountered the possibility of cliticization leading to derivational morphology with the use of the Tamil emphatic clitic *ee* in superlative formation. Another case is observed with the Slave relative clause complementizer *i*, which also functions as a nominalizer (Rice 1989a).

1.3.2. Adpositions

The second largest group of clitic elements belongs to the word class of adpositions. Clitic adpositions are documented for at least eleven languages in our sample. We can distinguish between clitic prepositions, clitic postpositions and cliticized adpositional phrases. In all cases, the phonological liaison of the elements in question can be proclitic or enclitic. Five languages in our sample exhibit mono-syllabic prepositions

which show phonological affinity to a following host word as proclitics: Maltese, Maori, Catalan, !Xóõ and Nigerian Pidgin.

(11) Marret l-isptar **ma**r-raġel — Maltese
went-3f.sg the-hospital **with**-the-man
'She went to hospital with her husband.'
(Borg & Azzopardi-Alexander 1997: 148)

(12) **ki** a 'raatou — Maori
to pers IIIpl
'to them' (Bauer 1993: 508)

(13) ve de l' estació — Catalan
come.3s from the station
'He is coming from the station' (Hualde 1992: 262)

(14) saa **ka** /qhuũ — !Xóõ[5]
go **to** white.man
'Go to the white man!' (Traill 1985: 48)

(15) A de **fòr** haws. — Nigerian Pidgin
1sP cvF **p** house
'I am at the house.' (Faraclas 1989: 128)

Six languages in our sample exhibit clitic postpositions. Georgian is the most salient case, since it has around fourteen bound postpositions which attach to their host words as enclitics. The benefactive postposition *tvis* is exemplified in (16).

(16) kal-is(a)**-tvis** — Georgian
woman-GEN-**FOR**
'for the woman' (Hewitt 1995: 70)

In Amele, eight mono-syllabic postpositions are bound to a preceding host word as enclitics. Example (17) illustrates the locative postposition *na*.

(17) maha=**na** — Amele
ground=**LOC**
'on the ground' (Roberts 1996: 7)

[5] See Collins (2003) for an elaborate syntactic analysis of such elements in the Khoisan languages Ju|'hoansi and ǂHoan.

In Tamil, postpositions form a heterogeneous class with members ranging from fully bound to fully free (Asher 1982: 102). Example (18) shows the usage of the phonologically bound postposition *kiṯṯe* 'near'.

(18) avan marattu **kiṯṯe** okkaantirukkaraa — Tamil
he tree-obl **near** be.sitting-pres-3sm
'He's sitting near the tree.' — (Asher 1982: 104)

In Chukchi, two postpositions are bound to their preceding host word. One of them, *reen* 'with' is given in (19).

(19) ətlʔa-ɣ **reen** n-ə-twa-qen ənnen ɣiik — Chukchi
mother-LOC **with.PP** HAB-E-be-3sg one year.3sgABS
'It stays with its mother for one year.' — (Dunn 1999: 77)

In the context of cliticized adpositions another phenomenon is worth mentioning. In some languages, adpositions are more tightly bound to their hosts when they govern a pronominal complement. In Slave, for example, a set of postpositions can show some phonological affinity to a following verb when they govern a nominal complement. When their complement is pronominal, however, they are obligatorily bound to the following verb. This kind of behavior is shown in (20) where the benefactive postposition *ghá* and its 3rd person bound pronoun are attached to the left margin of the verb.

(20) ts'a se**ghá**nį̨ʔǫ — Slave
hat 3.gave.1sg.
'(s)he gave me the hat' — (Rice 1989a: 770)

Within Athapaskan linguistics, there seems to be no agreement on the grammatical status of these elements. Rice (1989a: 770ff.) refers to these postpositions in Slave as 'loosely incorporated postpositions'. McDonough (2000), taking a wider perspective, regards the leftmost elements of the verbal word in Athapaskan as proclitics (see also Leer's 1994 comparative Na-Dene verb templates).

A similar case can be observed in Koyra Chiini, where postpositions with pronominal complements show clitic behavior in postverbal position. This behavior is

illustrated in (21) where the 3rd person dative postpositional phrase *a se* is contracted with the preceding verb *noo* 'give'.

(21) ay noo͡ **a se** X — Koyra Chiini
'I gave X **to him (her)**.' — (Heath 1999: 33)

Note that enclitic indirect object markers in Maltese could also be analyzed as prepositional phrases with pronominal complements. In this line of thought, the 2nd person singular indirect object marker *lek*, given in example (22) of the following section, is composed of the preposition *l* 'to' and the bound 2nd person singular marker *-ek* (Sutcliffe 1936: 158).

In a restricted number of cases, the database also reflects historical data obtainable from the sources. For instance, it is generally assumed that adpositions can diachronically derive from relational nouns, certain verb forms or adverbs. The diachronic source of some Tamil postpositions is accordingly to be found in participle forms of verbs: *runtu* 'from' is related to the past participle *iruntu* of the verb *iru* 'to be', *aaka* 'for' goes back to the infinitive form *aaku* of the verb 'become', and *koɳʈu* 'with' originated from the homophonous past participle of the verb *koɭ* 'to take' (Asher 1982: 111, 59f., 112). The possible verbal source of the Mandarin Chinese locative particles has already been discussed in 1.3.1. The Georgian bound postposition *tan* also appears as an adverb hinting at the possible reanalysis of an adverb as an adposition. The most common pathway of these elements seems to be morphologization as case markers. Georgian and Tamil show a relatively large number of postpositional elements with an intermediate position on this cline. In most of the cases, the cliticized postpositions combine with already existing case morphology on their nominal host and phonologically fuse with the elements of the case categories. This accretion of what was originally a postposition onto a case suffix is also evidenced in the evolution of case marking in Finno-Ugric and represented by Finnish in our sample (Joseph 1998: 354, Grünthal 2003). The most salient fact about clitic prepositions is their contraction with other, subsequent function words like articles and pronouns. In our sample, this is documented for Catalan, Maltese and Maori. However, this behavior of prepositions is also attested for other Romance and Semitic languages, as well as in German and Celtic languages (see Napoli & Nevis 1987; Olmsted Gary & Gamal-Eldin 1982: 59f.;

Hammond 1981: 137; Schiering 2002, 2005; McGonagle 1991: 20f. and Kabak & Schiering 2006 for a formal analysis of such phenomena in the framework of Prosodic Phonology).

As for cliticized adpositional phrases with pronominal complements on verbal hosts, their most likely fate lies in their grammaticalization as agreement suffixes cross-referencing indirect objects and the like. In Maltese, we encounter the final stages of this development. This phenomenon is most closely related to the morphologization of pronouns to agreement suffixes, which is discussed in the following section.

1.3.3. Pronouns

In some philological traditions, such as Romance and Bantu linguistics, the term clitic is closely related to, if not reserved for, pronominal elements bound to the verb. In our cross-linguistic sample, 11 languages exhibit cliticization of pronominal morphemes.

In Maltese, both direct and indirect object pronouns are encliticized to verbs, prepositions and adverbs. With the exception of the 1st person singular, the same set of pronominal enclitics marks possession on nouns. Example (22) illustrates the usage of the enclitic 2nd person indirect object pronoun *lek*.

(22) Ktibt**lek** ittra — Maltese
wrote.1sg=**2sg** letter
'I wrote you a letter.' (Borg & Azzopardi-Alexander 1997: 254)

In Catalan, personal pronouns in direct and indirect object function, as well as reflexive pronouns, are cliticized to the verb. Examples (23) and (24) illustrate the 1st person singular direct object clitic *em ~ me* in preverbal and postverbal position.

(23) a. **em** veu — b. **m'**estima — Catalan
1sg see.3sg — **1sg** love.3sg
'He sees me.' — 'He loves me.' — (Hualde 1992: 243)

(24) veure**'m** — estimar**-me** — Catalan
see.inf-**1sg** — love.inf-**1sg**
'To see me' — 'To love me' — (Hualde 1992: 243)

As mentioned in 1.2.2., pronominal clitics appear in postverbal position after infinitives and in preverbal position after finite verbs. In the first case they attach as enclitics, in the latter as proclitics.

In the African languages of our sample, Yoruba, Koyra Chiini and Nigerian Pidgin come with paradigms of pronominal object enclitics. An example for each language is given in (25), (26) and (27), respectively.

(25) ó kọ́ **mi** — Yoruba
he/she/it teach **me**
'he/she/it taught me' — (Akinlabi & Liberman 2000: 39)

(26) a kar **ey** — Koyra Chiini
she hit **me**
'She hit me.' — (Health 1999: 20)

(27) A folo-**am** go. — Nigerian Pidgin
1sP followF+**-am** go+
'I went with him/her.' — (Faraclas 1989: 553)

All these examples of pronominal enclitics show a high degree of cliticization, such that they are both phonologically integrated with their host, and syntactically placed in immediate pre- or postverbal position. In Yoruba, proclitic subject pronouns, on the other hand, are not as closely affiliated with their host and are arguably only phonologically cliticized, with no special syntactic operation determining their placement. The pronominal allomorphs presented in (28) and (29) for Tariana and Kayardild may also be considered cliticized, since they show some phonological affinity to the preceding host word.

(28) nuhua i-na nu-kalite-ka=**nhuà** — Tariana
I 2pl-OBJ 1sg-tell=REC.P.VIS=**I**
'I have told you (you have to listen to me).' — (Aikhenvald 2003a: 571)

(29) wanjii-ja **ni** — Kayardild
go.up-ACT **3sg.NOM**
'he went up' — (Evans 1993: 93)

In Maori, singular pronouns attach to possessive prepositions and show clitic-like behavior in never being stressed. One example of this would be the combination *'maaku*, where the possessive preposition *maa* fuses with the first person singular pronoun (Bauer 1993: 507).

Clitic possessive pronouns are reported in a number of languages. In Maltese, as mentioned above, these elements have, with one exception, the same form as the object pronouns. The clitic possessive pronouns in Yoruba, Nigerian Pidgin, and Finnish are illustrated in (30), (31) and (32), respectively.

(30) ọkọ̀ **ọ̀ẹ̀** Yoruba
vehicle **his/her/its**
'his/her/its vehicle' (Akinlabi & Liberman 2000: 47)

(31) D̲ẹ̀m gò si **dẹ̀m** nyam. Nigerian Pidgin
6sP -R see **6sP** yam
'They will see their yams.' (Faraclas 1989: 304)

(32) Hän on tyttäre**mme** Finnish
s/he be-(3sg) daughter-**1plposs**
'She is our daughter.' (Sulkala & Karjalainen 1992: 351)

Both clitic personal pronouns and clitic possessive pronouns have received some attention in the literature on certain languages and on cliticization in general. Demonstrative pronouns, on the other hand, have seldom been mentioned in the literature on cliticization. Demonstrative pronouns are bound to a preceding nominal host by phonological processes in West Greenlandic, Basque and Koyra Chiini.

(33) Maalia-m=**una** mattak tama-at niri-sima-gaa West Greenlandic
Maalia-rel.=**that** mattak all-3s eat-perf.-3s.3s.part.
'It's Maalia who ate all the mattak.' (Fortescue 1984: 74)

(34) mendi=**hau** Basque
'this mountain' (Hualde 1991: 49)

(35) ni wane kamba futu‿**woo** Koyra Chiini
'your bad hand' (Heath 1999: 35)

Sentence initial interrogative pronouns procliticize to a following word in Tariana (36) and Maltese (37).

(36) **kwa**=yáphini=nhà wa-ná khesaɾakana — Tariana
what=thing=PRES.VIS.INTER 1pl-OBJ muck.around
'What is mucking around with respect to us?' — (Aikhenvald 2003a: 55)

(37) **X**=emmen? — Maltese
what=believe.3.masc.sg
'What did he believe?' — (Borg & Azzopardi-Alexander 1997: 275)

Following Givón (1976, 2001: 400), the cliticization of pronouns is part of the diachronic scenario in which person agreement arises.[6] Following this line of thought, cliticized subject pronouns can become agreement affixes cross-referencing the subject NP; cliticized object pronouns can become agreement affixes cross-referencing the object NP; for more peripheral arguments like indirect objects, cliticized pronominal adpositional phrases may be grammaticalized to agreement affixes. Little is known about the sources of pronouns in the languages of our sample, the grammaticalization of agreement morphology, however, can be traced in a couple of cases. In cases where the bound pronoun may be doubled by its free standing counterpart, this development is presumably completed. In basilectal varieties of Nigerian Pidgin this evolutionary step is reached with the 3rd person singular marker *am*.

For Romance languages, the status of clitic pronouns is still debated; however, there is agreement that these elements are highly grammaticalized as special clitics or affixes on the grammaticalization cline outlined above (see Kaiser 1992 for a detailed analysis of French subject clitics and Portuguese object clitics). A possible scenario for the grammaticalization of possessive pronouns to new genitive/possessive case morphology is observed in Maltese, Finnish and Yoruba. However, it should be noted that these pronouns are not the only diachronic source for clitic genitive markers. The history of the English genitive *'s*, which is not derived from a once free standing pronoun, will be outlined in our discussion of the possessive plural morpheme in Amele (see 1.3.6.).

[6] See also Butt (2005) for a summary of research on the topic and a perspective from South Asian languages.

1.3.4. Verbs

In six languages of our sample, verbs cliticize to neighboring host words. The most common verbal word to cliticize in our sample is the auxiliary verb. Tamil, Nigerian Pidgin and Basque have clitic auxiliaries denoting aspectual information, which are exemplified in (38), (39) and (40) respectively.

(38) naan aŋke pooratukku munnaaʈiyee, Tamil
I there go-pres-noml-dat before-emph
avan aŋke vant**iruntaan**
he there come-**perf-past-3sm**
'Before I got there, he had arrived.' (Asher 1982: 159)

(39) A **gò** slip. Nigerian Pidgin
1sP **-R** sleep
'I will sleep.' (Faraclas 1989: 540)

(40) aita lan-era joa-n=**d-a** Basque
father(sA) work-s.all go-prf **3A-prs-(aux1)**
'Father has gone to work.' (Saltarelli 1988: 64)

In Georgian, the copula *aris* 'to be' has an enclitic counterpart *a*, whose usage is illustrated in (41).

(41) kart+ul(ena)-ze gada+targmn+il-i**-a** Georgian
Georgian(language)-on translated-NOM-**is**
'It is translated into Georgian.' (Hewitt 1995: 535)

A rather unusual case of cliticized verbs is found in Tariana, where verbal roots appear bound in the verbal enclitic template. These so-called Aktionsart enclitics demonstrate the rare possibility of having clitics with rather lexical meanings, as opposed to purely grammatical meaning. Some of them are closely related to otherwise free standing verbs. Example (42) shows how the verbal root *hala* 'be open' is used in combination with negation affix *kade* to form a full phonological and morphological word. The same element appears as the Aktionsart enclitic *hala* 'spread over entire surface' in postverbal position in example (43).

(42) **hala**-kade=pidana yakoleka Tariana
open-NEG=REM.P.REP door
'The door was not open.' (Aikhenvald 2003a: 347)

(43) pi-yekwa=nuku matʃa pi-atha=**hala** Tariana
2sg-face=TOP.NON.A/S well 2sg-wipe=**OPEN.SPACE**
'Wipe the whole of your face clean.' (Aikhenvald 2003a: 348)

The place of auxiliary verbs in grammaticalization is generally assumed to be intermediate on a cline from full verbs to tense/aspect/mood morphology (Lehmann [1982] 1995: 25ff., Heine 1993). Some tense/aspect/mood markers in Koyra Chiini and Nigerian Pidgin can be traced back to auxiliary verbs in the language. The imperfective particle *go ~ o* in Koyra Chiini is related to the verb *goo* 'to be' and its negative counterpart *si* is related to the verb *sii* 'not be' (Heath 1999: 125). The irrealis modality marker *gò* and the incompletive aspect marker *dè* in Nigerian Pidgin may be said to derive from the main verb *go* 'to go' and the locative/existential copular verb *de*, respectively (Faraclas 1987; 1989: 565).

The Tariana Aktionsart enclitics exemplify grammaticalization of a different sort. For some of these elements, non-bound verbs and adverbs are attested in the language. The verbal root *dhala* 'come unstuck, peel, be scratched', for instance, may also be used as an independent adverb 'unstick' or as an Aktionsart enclitic meaning 'touch the surface, unsticking or scratching it' in the verbal template (Aikhenvald 2003a: 343f.). This is highly suggestive of a *verb* > *adverb* > *TAM* cline, in which these elements show synchronic representatives for each evolutionary step. However, there are some cases in Tariana where an Aktionsart clitic cannot be related to an adverbial. The diachronic scenario for the evolution of these elements makes reference to language contact and grammaticalization, such that they grammaticalized out of verb root compounding, which in turn has by and large been borrowed from East-Tucano languages (see Aikhenvald 2000 for details).

1.3.5. Articles

Since articles are rather uncommon across the languages of our sample, clitic articles are only documented for four languages in the sample. In Catalan the form of the proclitic definite article comes in a paradigm of forms: *el* (masc.sg), *la* (fem.sg), *els* (masc.pl), *les* (fem.pl). The indefinite article comes with two inflectional forms, namely *un* (masc.sg) and *una* (fem.sg), which procliticize to a following host. Three languages have definite articles which procliticize to the following word: Maltese *il*, Maori *te*, Nigerian Pidgin *dí*.

Definite articles are said to originate from demonstrative pronouns, and to progress to gender markers (Greenberg 1978). The instances of cliticized demonstrative pronouns in (33), (34) and (35) may therefore be related to the grammaticalization of article-like elements. The evolution of the definite article, however, does not necessarily point to the creation of bound gender markers. The most common phenomenon with regard to these elements is the contraction with preceding function words; especially prepositions (see 1.3.2. and literature given there). Indefinite articles usually originate from the numeral 'one' in the languages of the world. In this context, the cliticization of the numeral *bat* 'one' in Basque given in (44) can be interpreted as a step in the grammaticalization of an indefinite article.

(44) lagun=**bat** — Basque
friend=**one**
'one friend' — (Hualde 1991: 56)

1.3.6. Miscellaneous

What remains in five languages of the sample is a number of clitic elements that cannot be attributed to one of the classes discussed so far. First, there are some instances of cliticized adverbs in the languages of the Americas in our sample. In Tariana, a number of the Aktionsart enclitics already exemplified in (43) are related to free standing adverbs. Additionally, the adverb *pita* 'again' can be phonologically cliticized to a host word. A quasi-minimal pair of the bound and free versions of this morpheme is given in (45) and (46).

(45) di-dia di-uka-pidana-**pita** pani-si-se Tariana
3sgnf-return 3sgnf-arrive-REM.P.REP-**AGAIN** house-NPOSS-LOC
di-ha-do du-sata dhuma-pidana-**pita**
3sgnf-parent-FEM 3sgf-greet 3sgf+hear-REM.P.REP-**AGAIN**
'He came back. His mother asked him again.' (Aikhenvald 2003a: 340)

(46) di-a-pidana **pita** Tariana
3sgnf-say-REM.P.REP **again**
'He said, again.' (Aikhenvald 2003a: 340)

There is a negative morpheme *du* in Slave, which is phonologically bound to some verbs in the leftmost prefix position of the verb template, see example (47). In some related dialects, namely Hare and Fort Liard Slavey, this element also appears as an independent negative, suggesting that it became part of the prefix complex in Slave by a diachronic process of cliticization.

(47) **du**megháindi Slave
'I left it' (Rice 1989a: 777)

An element which behaves like an affix in its morphophonology but nevertheless appears in a phrasal position is documented for Amele. Here, the 'plural possessed' morpheme *ul* is attached to the NP as a whole and is phonologically bound to the preceding word. However, its plural meaning is associated with the possessed noun *jo* and not with the possessive noun *asag* to which it is attached.

(48) jo as-ag-**ul** Amele
house grandparent-3s.Poss-**Pl**
'the boss of the houses' (Roberts 1996: 8)

Since the morpheme in question is not relatable to a specific word class or a corresponding non-clitic word, it cannot neatly be grouped with any of the clitic elements discussed so far.

If one follows Anderson (1992) in conceiving clitics as phrase-level morphology, one could also consider suprasegmental processes which operate over a phrasal domain and express a specific grammatical meaning to be non-segmental clitics. Anderson's (1992: 212) own example is the 'definite accent' in Tongan, where definiteness is marked by a stress shift from the penultimate mora to the final mora of

the entire NP. Similar cases are documented for Yoruba and Mandarin Chinese in our sample. In Yoruba, the subject NP is marked by high tone on the last vowel of the entire NP (Akinlabi & Liberman 2000: 35ff.). For Mandarin Chinese, Chao (1968: 812) attributes morphemic status as particles to certain tones, which are placed on the margins of a phrase. The falling ending, for instance, in one of its various functions is used to mark 'vocative'. We will restrict our attention to segmental clitics in the remainder of this study.

As already discussed in 1.3.4., cliticized adverbs can be morphologized as tense/aspect/mood affixes. Tariana *pita* 'again', exemplified in (45) and (46), is only one Aktionsart enclitic from a rather large inventory with related unbound adverbial elements. The cliticization of negative adverbs to develop negative affixes as discussed for Slave is also found in other languages, for instance the widely discussed case of the cliticized/affixed *n't* in English (Zwicky & Pullum 1983). The diachronic origin of phrasal possessive affixes like those found in Amele, could lie in cliticized possessive pronouns. However, for the English genitive *'s*, which behaves in a similar fashion in that it morphophonologically shows affix-like properties but is attached to the rightmost word in a NP, we know that de-cliticization/de-grammaticalization has to be held responsible for the odd behavior of this morpheme (see e.g. Plank 1995). This should remind us that continua stated on the basis of synchronic data alone cannot justify the reconstruction of grammaticalization clines. Likewise, none of the evolutionary clines of morphologization surveyed in this section are necessarily unidirectional.

1.4. Summary

In this chapter, we made our methodology for the collection of cross-linguistic data on clitics transparent. In order to achieve as much structural diversity as possible within the given time and place restrictions of this study, we constructed a variety sample of nineteen languages, comprising one representative of each of Ruhlen's (1991) language phyla. Information on these languages has been gathered from descriptive grammars and detailed studies on relevant aspects of their phonetics, phonology and cliticization. The choice of the respective representatives has been defended and the resulting sample

has been evaluated in the context of current typological work. Clitic elements have been identified for these nineteen languages on the basis of a number of phonological, morphological and syntactic parameters. The information obtained by setting the values of the various clitic elements on these parameters allows us to specify varying degrees of cliticity within and across the clitic inventories of the languages of our sample. The diversity of elements that cliticize in these languages has been illustrated in the last section of this chapter. Possible grammaticalization paths for the evolution of these elements have also been introduced in this context. In what follows, we will examine more closely the various properties the clitic elements in our dataset exhibit with respect to the two phonological parameters of prosodic phonology and segmental phonology. Chapter 2 presents a detailed survey of the phonology of cliticization and represents the body of data of this study.

2. Clitics in prosodic and segmental phonology

The objective of this chapter is to survey the diversity of phonological behavior of clitics in the languages of our sample and to establish relevant phonological clines of cliticization. It is meant to represent the empirical basis of the present study, and therefore comments on each language in some detail. We will start by looking at the various ways in which clitics relate to their host words in different prosodic systems, such as stress, pitch-accent, tone and intonation phonologies, and combinations thereof (2.1.). Whereas cliticization is associated with stress reduction and prosodic integration in stress systems, clitics are subject to rules of tone neutralization, tonal sandhi and tonal change in tone systems. In intonation phonology, cliticization leads to the loss of an intonation peak and the gradual integration into a neighboring intonation phrase. Secondly, we will lay out segmental rules that apply to consonants and vowels of clitic elements, host words or the host-clitic boundary (2.2.). In essence, four possibilities need to be distinguished: structure preservation, assimilation, weakening and strengthening.[1] Each of these possibilities is encountered with segments at the morpheme boundary or in processes that apply over whole syllables of the host-clitic combination. For the first group, we will use the cover term junctural phenomena, for the latter the cover term syllabic phenomena. Finally, we will summarize our findings in terms of clines of cliticization in prosodic and segmental phonology (2.3.).

2.1. Clitics in prosodic phonology

As summarized in Chapter 1, the literature on cliticization is still characterized by a noticeable bias towards European languages. In these languages, deaccentuation seems to be a prosodic process commonly associated with cliticization. However, generalizations on cliticization should also be informed by cross-linguistic data. For tone languages that do not make use of stress, the question of how clitics are

[1] For the concepts of weakening and strengthening in phonology see Hyman (1975: 161ff.), Hooper (1976: 205ff.) and Donegan & Stampe (1979).

characterized in the prosodic system immediately arises (cf. Heine & Reh 1984: 32ff. on African tone languages). By summarizing the prosodic properties of clitic elements in the languages of our sample, we intend to widen the perspective on cliticization and to establish reasonable prosodic clines that correlate with ongoing grammaticalization.

2.1.1. Stress phonology

Following Hyman (2001), prototypical stress systems can be characterized by eight properties. First, the distribution of stress is usually culminative, i.e. there can only be one primary stress per word. Second, words constitute the lexical domain for stress placement. Third, the prototypical function of stress is demarcative in that it imposes a metrical structure at the left or right edge of a constituent. Fourth, stress is prototypically realized in a complex manner combining pitch, duration, and intensity. Fifth, stress has a non-contained effect on phonology, i.e. the presence or absence of stress can affect segmental or tonal phonology. Sixth, stress is often affected by syllable weight, such that long vowels or closed syllables attract stress (Hyman 1985). Seventh, stress is often strongly integrated into the grammatical system of languages. Finally, stress rules differ from segmental rules in being hierarchically ordered (see also Hyman 1977 and Bybee et al. 1998).

In demarcating the word domain, stress facts are crucial to establish the grammatical status of a morpheme. In losing stress, clitics cease to initiate a lexical word domain for the placement of primary stress. Not qualifying as phonological words, they need to be integrated into the prosodic domain of another word, i.e. they lean on this word. The crucial question then is how they relate to the demarcative stress that is realized on the host word. Will they remain outside the edge-based metrical grid or will they be included? We will address this question by first describing the general stress placement of the respective stress languages in our sample and then relating the behavior of clitic elements to these rules. In some cases, pairs of clitic and non-clitic forms in the synchronic data allow us to formulate prosodic cliticization clines. We will start our discussion with languages that use stress to demarcate the left word boundary and will then proceed to languages in which stress marks the right word boundary. Table 1 gives an overview of the stress systems in the languages of our sample, and

specifies the placement rules for primary and secondary stress. Whereas the first five languages in this list can be said to demarcate the left word boundary by primary stress placement, the remaining languages mark the right word boundary by primary stress placement.

Table 1: Stress placement in the stress languages of our sample

	Primary stress	Secondary stress
Finnish	Initial	Every second syllable after the stressed syllable; if 3rd syllable is short and 4th is long, on 4th syllable and every second syllable after that
Chukchi	Initial, second (phonologically conditioned)	Every second syllable before and after the stressed syllable
Kayardild	Initial	All non-initial long vowels and non-initial short vowels followed by a coda trill; penultimate syllables, except in trisyllables whose second and third syllables begin with liquids or semi-vowels; the first syllable of the second member in a compound, of a plurisyllabic inflectional suffix, or of any derivational suffix
Georgian	Initial	Antepenultimate syllable
Tamil	Initial	[Not reported]
Udihe	Final, penultimate (weight sensitive)	[Not reported]
Catalan	Final, penultimate, antepenultimate (morphologically conditioned)	Every second syllable before the primary stress
Amele	Final (weight sensitive, morphologically conditioned)	[Not reported]
Maltese	Penultimate, final (weight sensitive)	[Not reported]
Tariana	Penultimate, final (morphologically conditioned)	Lexically specified for enclitics
Maori	Last four morae: long/double vowel; in the absence of a long/double vowel, the first non-final diphthong, in the absence of both, the first vowel	If a word contains more than four vowels the rules are applied again counting leftwards from the fifth vowel from the end
Koyra Chiini	Non-final	[Not reported]

2.1.1.1. Left word boundary demarcation

Five languages in our sample demarcate the left word boundary by means of initial stress: Finnish, Chukchi, Kayardild, Georgian and Tamil. In what follows, we will outline the rules of primary and secondary stress placement and will discuss how clitics behave with respect to the domains of these rules.

In Finnish, primary stress is constantly placed on the first syllable of a word. Secondary stress falls on every second syllable after the stressed syllable, i.e. on the third, fifth, etc. syllable. If the third syllable is short and the fourth is long, secondary stress can fall on the fourth syllable and every second syllable after that. Invariably, the second and final syllable of a word remain unstressed. According to these rules, the word [ˈvɑliˌtuksisˌtɑ**mme**] (complain-D-pl-ela=**1plpos**) has primary stress on the first and secondary stress on the third and fifth syllable (Sulkala & Karjalainen 1992: 381). Note that the clitic possessive pronoun *mme* '1pl' falls within the domain of these stress placement rules. If it were outside the domain for word stress, the fifth syllable would be the last syllable of the word and would have to remain unstressed. Since this syllable is regularly secondary stressed we can infer that the clitic is part of the phonological word. In clusters of particle clitics, like *Lúnta=**kò**=**han**?* 'Some snow?', the non-final clitic will regularly receive secondary stress. In the example given, the interrogative clitic *ko* carries secondary stress as the third syllable of the word while the final clitic softener *han* remains unstressed as the final syllable of the word (Nevis 1986: 28). To summarize, Finnish enclitics are unstressed and are not candidates for word initial primary stress. However, they are regularly secondary stressable and therefore integrated into the word domain.

Chukchi partly resembles Finnish in having default initial stress and trochaic secondary stress placement within the word. Here, primary stress is placed on the first syllable of a word with consonant onset and a full vowel. Secondary stress is realized on every second syllable before and after that. Accordingly, a word like *ˈnutecˌqəcəˌkukin* 'something from the surface of the ground' has primary stress on the first syllable and secondary stress on the third and fifth syllable, respectively. Initial syllables with reduced vowels or lacking an onset consonant cannot take stress, as exemplified with *qəˈjetɣˀi* 'come!' and *aˈmoktoɾˌka* 'without a doctor' (Dunn 1999: 53f.). With respect to clitics, the details of their prosodic behavior are far from clear. It seems like elements

that optionally encliticize at least in some cases have a non-clitic variant which is stressed. As enclitics these elements would not take primary stress but would fall within the stress domain of their host word. As for secondary stress, all these elements seem to be regularly stressable according to the placement rules of trochaic secondary stress (Michael Dunn, p.c.). Chukchi enclitics are therefore unstressed and are regularly included in the phonological word domain by secondary stress placement rules.

In Kayardild, primary stress is always placed on the first syllable of a word. Additionally, secondary stress placement is governed by a number of more complicated rules: a) all non-initial long vowels and non-initial short vowels followed by a coda trill b) penultimate syllables, except in trisyllables whose second and third syllables begin with liquids or semi-vowels c) the first syllable of the second member in a compound, of a plurisyllabic inflectional suffix, or of any derivational suffix will take secondary stress (Evans 1995a: 79ff., 571). Note that in contrast to Finnish and Chukchi, secondary stress assignment in Kayardild does not result in an even trochaic beat. Accordingly, the word *warra-a-jarri* 'go-M-NEGACT' will be stressed [wárà:iɖàrɪ], with primary stress on the first syllable, secondary stress on the non-initial long vowel [a:] and on the first syllable of the disyllabic suffix *-THarri* 'negative actual'. With respect to the stress properties of the enclitics, there is little data and information available. None of the elements in questions takes primary stress; therefore none will constitute its own phonological word. Since most enclitics constitute the final syllable of a word and secondary stress does not fall on the final syllable, they would remain unstressed in most cases. In clitic clusters like *dungka=**tha=ka*** 'person=**THA=FOC**', however, the clitic *tha*[2] which constitutes the penultimate syllable receives regular secondary stress (Nick Evans, p.c.). We can therefore conclude that Kayardild enclitics are unstressed and are regularly included in the phonological word domain by secondary stress placement rules.

Stress still continues to be an understudied aspect of Georgian grammar. Due to its weak phonetic realization, researchers still debate stress placement rules in the language. The most widely held believe is that words are usually stressed on the first syllable of a word, even if this is a prefix. It is the first member in a compound that will

[2] The clitic *tha* is only documented as a syllabic filler in a Kayardild incantation text, but is also known as a clitic in Lardil (Evans 1995a: 596).

receive primary stress. Additionally, secondary stress may be realized on the antepenultimate syllable in polysyllabic words. In this is respect it resembles Kayardild in not systematically distributing trochaic meter over the word. According to these rules, a word like *másts'awlèbeli* 'teacher' will receive primary stress on the initial syllable and secondary stress on the antepenult (Tschenkéli 1958: LIXf.). In some works on Georgian, the antepenultimate stress is described as the primary word stress.[3] The examples in (1) illustrate the behavior of the neutral negative marker *ar(a)* as a free word and as an optionally procliticized bound morpheme.

(1) a. merab-i ekim-i **ár** áris — Georgian
Merab-NOM doctor-NOM **NEG** he.be
'Merab is not a doctor.'

b. puli **ara**=m-ákvs
money **NEG**=1sg.OBL-have
'I don't have any money.'

c. puli **ára**=m-akvs
money **NEG**=1sg.OBL-have
'I don't have any money.' — (Harris 2002b: 236)

In (1a.), *ar* forms a phonological word on its own and takes primary stress to the same extent that the form of the auxiliary 'to be' does. In (1b.), the morphologically conditioned allomorph *ara* cliticizes to the following word. Note that here the host-clitic combination only takes one primary stress. However, the proclitic is still outside the domain of initial stress placement. Finally, the proclitic is integrated into this domain in (1c.) and therefore receives regular primary stress. What we encounter here is a gradual integration of the cliticized word into the phonological word. As for enclitics, their stress properties are harder to pin down. In combinations like *sakartvelo=**ši*** 'in Georgia' the enclitic postposition *ši* does not take primary stress and is included in the stress domain of the preceding phonological word. Essentially, with respect to secondary stress there are two options for the behavior of these elements. First, if the elements fall outside this domain, they will not be counted as the final syllable of the word and secondary stress will accordingly be placed on the ante-antepenultimate syllable of the

[3] Certain surnames seem to be stressed on the penultimate syllable (Hewitt 1995: 29).

host-clitic combination. However, if they are included in this domain, they will count as the final syllable and secondary stress will be placed on the antepenultimate syllable of the host-clitic combination. Unfortunately, there is not enough data to decide which option is actually chosen. In summary, proclitics in Georgian are unstressed and unstressable or stressable within the domain they form with their host words. The prosodic integration into the phonological word is to be considered a matter of degree. Enclitics are unstressed and, given word initial stress placement, not candidates for receiving stress within the larger domain they form with their host. Their status with respect to secondary stress placement cannot be satisfactorily decided on.[4]

Tamil is often described as a language with very weak stress or as even lacking stress altogether. This is due to the general impression that utterances consist of successions of evenly stressed syllables (Asher 1982: 230). More subtle phonetic studies enable us to infer rules of word stress placement from higher level intonation patterns. An utterance comprising the words [kɑːðɛ] 'ear-acc.', [t̪ɑɻəʊi] 'felt' and [pɑːʈ̪ʈ̪ãː] 'he saw' will be pronounced [ˈkɑːðɛt̪ˈt̪ɑɻəʊippɑʈ̪ʈ̪ãː] 'He felt the ear', with initial stress on the first and second word (Balasubramanian 1980: 456). As for clitics, since all of them attach to their host word as enclitics, none of them will receive primary stress. Since no other prosodic cues, such as secondary stress, can be utilized to decide what kind of domain they form with their host word, we have to conclude that enclitics in the language are unstressed and presumably unstressable.[5]

2.1.1.2. Right word boundary demarcation

Six languages in our sample demarcate the right word boundary by means of final, penultimate, or antepenultimate stress: Udihe, Catalan, Amele, Maltese, Tariana and Maori. In these cases we encounter the mirror image of the phenomena we discussed with respect to initial stress languages. Again, we will outline the rules of primary and, if possible, of secondary stress placement in these languages and will discuss how clitics relate to the domains of these rules.

In Udihe, stress is placed on the rightmost bimoraic vowel of a word; if there is no long vowel in a word the default locus of primary stress is on the final vowel.

[4] On the behavior of certain clitics in intonational phonology see 2.2.2.2.
[5] On the behavior of certain clitics in intonational phonology see 2.1.3.

Accordingly, a word like *mamasaˈla* 'old woman (LOC)' will be stressed on the last vowel, whereas a word like *ˈaːntaziga* 'women (PL)' will be stressed on the rightmost long vowel, in this case the first vowel. Another complication arises from the fact that word-final syllables with the high vowels /i/ and /u/ are extrametrical and do not take stress. In these cases, stress will be placed on the penult. The enclitic focus markers are, unlike genuine suffixes, opaque with respect to stress. As we just saw, a suffix like the locative marker *-lA* will take final stress, if there is no stress-attracting long vowel in the word. In clitic groups like *abuˈga=**da*** 'and the father', however, stress falls on the syllable preceding the clitic. Therefore, Udihe clitics are unstressed and unstressable outside the stress domain (Nikolaeva & Tolskaya 2001: 90ff., 87).[6]

In Catalan, primary stress can appear on one of the last three syllables of a word. The unmarked pattern is final stress for words ending in a consonant, e.g. *general* 'general', and penultimate for words ending in a vowel, e.g. *testimóni* 'testimony'. In some cases, the antepenultimate syllable unpredictably receives stress, e.g. *brúixola* 'compass'. This general pattern is obscured by a number of morphologically conditioned stress placement rules. For instance, verbs in certain tenses are stressed on the last syllable of the root in all persons but the first and second person plural (Hualde 1992: 385ff., Wheeler 1979: 33ff.). Secondary stress is placed on every other syllable from the primary stress, e.g. *gèneràlität* 'generality'. A number of short words, such as the articles, some prepositions, the complementizer *que* and the clitic pronouns, are always unstressed. The behavior of object enclitics is illustrated in the examples in (2).

(2) a. donár**=nos=en** — Catalan
give=us=partit
'to give us some' — (Wheeler 1979: 34)

b. Canta**=m=hó** — Majorcan Catalan
sing**=me=it**
'Sing it to me!' — (Mascaró & Rigau 2002: 11)

In (2a.), stress appears on the last syllable of the host word following the general rule for stress placement given above. The enclitic pronouns are outside the domain for word

[6] Note that some of these clitics can combine to clitic-only words, e.g. *keˈde* 'indefinite pronouns particle'. These combinations constitute an independent phonological word with regular final primary stress (Nikolaeva & Tolskaya 2001: 88).

stress, remain unstressed and are unstressable. (2b.) allows a glimpse at the dialectal variation within Catalan and illustrates the complete integration of the pronominal clitics into the word stress domain. In Majorcan Catalan, the unstressed pronouns are stressable when they enter this domain and therefore the clitic *ho* receives primary stress. Again, what we encounter here is the gradual integration of a cliticized element into the stress domain of an adjacent host word.

In Amele, stress assignment depends on the morphological composition of the word. In monomorphemic words, stress is placed on the first closed syllable or, if there are no closed syllables, on the first syllable. As the first closed syllable of a word is often its final syllable, words frequently surface with word final stress. For verbs with subject agreement affixes, aspectual/mood/negative markers and certain verb stems different rules of stress placement apply (Roberts 1987: 357ff.). As for host-clitic combinations, details of stress placement are not thoroughly described. A simple word such as *ˈmaha* 'ground' will be stressed on the first syllable, whereas the combination *maˈha=**na*** 'on the ground', with the enclitic locative postposition *na* exhibits penultimate stress (Roberts 1996:7). In principle, the rules of stress placement should assign stress to the first syllable in both cases, since none of them includes a closed syllable. One possible interpretation of these facts is to consider the clitic element pre-stressing. What is uncontroversial is that enclitics in Amele are unstressed and unstressable and adjoin to the stress domain of the host word. As for the phrasal possessive affixes on nouns, they always constitute the stressed syllable of the stress domain they form with their host word. Accordingly, in possessive noun phrases like *jo as-ag=**úl*** (house grandparent-3s.Poss=**Pl**) 'the boss of the houses' (Roberts 1996: 8), the final syllable of the word will be stressed.

Unlike Udihe, Catalan, and Amele, where stress is most frequently realized on the final syllable, the default stress placement in Maltese is on the penultimate syllable. Stress is attracted by closed syllables with a long vowel or with CC codas. Accordingly, a word like *fantażija* 'fantasy' will carry penultimate stress whereas a word like *ersáqt* 'I approached' will carry stress on the final CVCC syllable (Borg & Azzopardi-Alexander 1997: 319ff, Borg 1997: 277f.). Proclitics, like the monosyllabic preposition *bi* 'with' are unstressed and appear outside the domain for word stress, as exemplified in ***bi** trávu* 'with a beam'. Pronominal enclitics are also unstressed but are

integrated into the word stress domain and will receive primary stress if they constitute a penultimate syllable. In a combination like *ftaħt=**híe=lek*** ‘he opened it for you’ (Borg & Azzopardi-Alexander 1997: 358ff.), the pronominal clitic *ha* ‘3sg.fem’, surfacing as *hie* in the example given, is regularly stressed according to the placement rules outlined above. Clitics in Maltese are therefore to be considered unstressed, whereas enclitics are stressable within the word domain, proclitics are unstressable.

In Tariana, stress placement follows a number of partly interacting mechanisms. In monomorphemic words with at least two syllables, primary stress frequently falls on the penultimate syllable. In polymorphemic words the stress properties of the respective morphemes determine stress placement. For instance, some roots shift stress to the pre-root vowel and some suffixes come with a lexical specification for stress. In some cases, stress can also fall on the final syllable. Accordingly, a monomorphemic word like *mawína* ‘pineapple’ is stressed on the penultimate syllable (Aikhenvald 2003a: 37ff.). Some monosyllabic function words like *kay* ‘thus’ can form independent phonological words or may procliticize to following word.

(3) a. **káy** dú-ni di-kesi-pé=nukù du-kalité=**pidanà**… Tariana
thus 3sgf-do 3sgnf-friend-PL=TOP.NON.A/S 3sgf-tell=**REM.P.REP**
‘After she acted this way (not any other way), she told his friends...’

b. **kay**=ná-ni ná-yha nemháni=**pidanà**
thus=3pl-do 3pl-swim 3pl+walk=**REM.P.REP**
‘Thus (lit. having done thus), they drowned’ (Aikhenvald 2002: 61)

In (3a.) *kay* is realized with a primary stress and thus behaves like a phonological word of its own. In (3b.) *kay* as a proclitic is unstressed and gets included into the stress domain of the host word. When such a proclitic combines with an enclitic in a ‘clitic-only’ word, the combination will form an independent word with the primary stress on the proclitic, e.g. ***né=pidanà*** (**then=remote.past.reported**). Unlike proclitics, enclitics obligatorily bear a secondary stress. The tense-evidential clitic *pidanà* ‘remote past reported’ in the examples in (3), for instance, does not carry primary stress and therefore leans on the primary stress of the host word. Its last syllable, however, is obligatorily secondary stressed. In a number of cases enclitics can be related to independent words. The Aktionsart enclitic *thepì*, for instance, also appears as an

independent adverb *thepí* ‘into water’. When such adverbs are cliticized, their primary stress is reduced to secondary stress and they fall within the primary stress domain of their hosts. In summary, procliticization is associated with stress reduction and, depending on the host-clitic combination, with prosodic integration of the proclitic into the word domain of the host. Encliticization, on the other hand, is associated with reduction of primary stress to secondary stress and the encliticized element remains unstressable with respect to primary stress (Aikhenvald 2002: 61ff.).

In Maori, rules of stress placement make reference to the last four vowels, i.e. morae, of a word. These mora-based stress placement rules can be summarized as follows: a) if there is a long/double vowel it will receive stress b) in the absence of a long/double vowel, the first non-final diphthong will receive stress c) in the absence of both long/double vowels and non-final diphthongs the first vowel will be stressed d) if a word contains more than four vowels the rules are applied again to assign secondary stress, counting leftwards from the fifth vowel from the end. Accordingly, a word like [ˌwha.ka.ˈmaa.ra.ma] ‘make clear, illuminate’ will receive primary stress on the first long/double vowel of the last four morae and secondary stress on the first vowel of the remaining morae left from the last four morae (Biggs 1973: 172; Bauer 1993: 555ff.). With respect to the monosyllabic proclitics, such as TAM particles, prepositions and articles, they are usually unstressed but are regularly included in the domain of stress placement rules. For instance, the combination of the TAM particle *ka* and the verb *haere* ‘move’, shows regular stress placement on the non-final diphthong of the verb: ***ka*** ***ʰaere*** ‘he went’. In some cases, proclitics will receive regular primary stress. When the TAM particle *ka* combines with *hore* to form the negative, for instance, the combination will surface as [ˈ**kaa**hore] ‘No’. Note that none of the underlying forms has a long/double vowel or diphthong. Therefore, the first vowel of this combination will receive primary stress, i.e. the vowel of the proclitic. The lengthening of this vowel may be interpreted as a segmental effect of stress (see 2.2.2.2.). A similar case could be made for the combination of the article *te* ‘the’ and the deictic particle *nei*, which leads to the derivation of a demonstrative. Since this combination lacks long/double vowels or non-final diphthongs, the first vowel will be stressed, again accompanied by vowel lengthening: [ˈ**tee**nei] ‘this’ (Bauer 1993: 506f.). To summarize, Maori clitics are

inherently unstressed but regularly stressable in the domain for word stress which they form with their host word.

In Koyra Chiini, as described by Heath (1999: 48f.), stress plays a marginal role in the phonology of the language and its grammar, i.e. it is nonphonemic and has no lexical or grammatical impact. In multisyllabic words final syllables appear to have reduced stress compared to other syllables in the word. A number of monosyllabic function words are regularly unstressed and therefore pattern as proclitics or enclitics to stressed lexical stems, such as nouns and verbs. In some cases, we encounter pairs of stressed and unstressed allomorphs of such a function word. This would for instance be true for the 1st person singular pronoun *ay* which is used as a subject marker, but is realized as *ey* with less natural stress as an enclitic object marker. Unfortunately, there is too little information and analysis of the prosodic system of Koyra Chiini to exhaustively classify the clitic-like elements in the language. However, it seems to be the case that if words like the pronouns encliticize, their stress will be reduced. All clitics seem to remain unstressed and are unstressable in the domain for stress placement.

2.1.1.3. Summary

In all of the languages discussed so far, the property of lacking independent primary stress is shared by all clitic elements. In one case, namely the Amele possessive marker, an enclitic appears to be auto-stressed, i.e. it attracts the primary stress of the host-clitic combination. It is also possible that a clitic element comes with a specification for the realization of secondary stress. This behavior is documented for the Tariana enclitics. The elements that lack both primary and secondary stress can extrametrically appear outside the domain of stress placement and are to be considered unstressable. This phenomenon is attested in eight languages in our sample. In this respect, clitics may show a unique prosodic behavior different from both independent words and fully integrated affixes. However, clitics can also be integrated into the domain of word stress and may be stressable according to the rules of primary and secondary stress placement. Note that in some cases, e.g. the case of Georgian proclitics, there is free variation between the option unstressed/unstressable and unstressed/stressable.

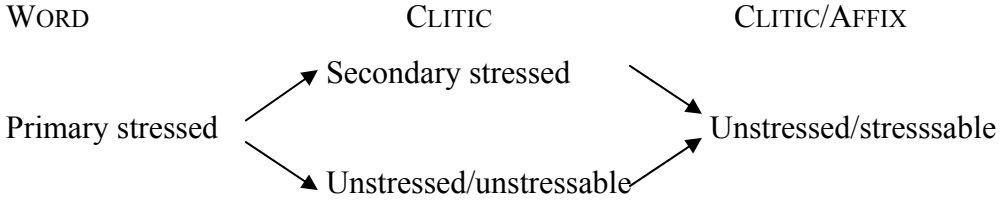
The various options for the prosodic behavior of clitics in the twelve stress languages of our sample are summarized in Table 2.

Table 2: Prosodic behavior of clitics in the stress languages of our sample

	Proclitic	Enclitic
Finnish	-	Unstressed/stressable (secondary stress)
Chukchi	-	Unstressed/stressable (secondary stress)
Kayardild	-	Unstressed/stressable (secondary stress)
Georgian	Unstressed/unstressable, unstressed/stressable	Unstressed/stressable (?) (secondary stress)
Tamil	-	Unstressed/unstressable (?)
Udihe	-	Unstressed/unstressable
Catalan	Unstressed/unstressable	Unstressed/unstressable unstressed/stressable
Amele	-	Unstressed/unstressable (?), auto-stressed
Maltese	Unstressed/unstressable	Unstressed/stressable
Tariana	Unstressed/unstressable, unstressed/stressable	Unstressed/unstressable (primary), secondary stressed
Maori	Unstressed/stressable	[Not reported]
Koyra Chiini	Unstressed/unstressable (?)	Unstressed/unstressable (?)

From a grammaticalization perspective, the synchronic data compiled in this section are highly suggestive of a gradual process of cliticization combining the prosodic sub-processes of stress reduction and prosodic integration.[7] This prosodic cline is illustrated in Figure 1.

Figure 1: A prosodic cline for stress phonologies



[7] See also Booij (1996) who discusses cliticization in Dutch as evidence for prosodic integration.

In the cases where function words also have a clitic counterpart, we saw that the free word retains its primary stress, cf. Georgian *ar(a)* 'negative', the optionally procliticizing Tariana function word *kay* 'thus' and the encliticized Tariana adverb *thepi* 'into water', above. An essential ingredient of cliticization is therefore the reduction of primary stress. This can manifest itself as a reduction of a primary stress to a secondary stress, as evidenced in the Tariana encliticization of *thupí* to *=thupì*. Or it can manifest itself as the complete loss of stress, as discussed for Georgian or Tariana procliticization. Once a cliticized element has lost its primary stress, it will be gradually integrated into the domain for stress placement. Initially, remaining outside this domain, cliticized elements will be unstressed and unstressable. With ongoing prosodic integration into their host, they will, however, become primary or secondary stressable within this domain. Note that the cliticized elements will behave like genuine affixes with respect to stress placement once they are completely integrated into the phonological word domain (see also Selkirk 1995 for various ways to prosodize function words as prosodic words, free clitics, internal clitics and affixal clitics within Prosodic Phonology). The special status of unstressed, unstressable clitics constitutes only one step on an evolutionary cline that leads to the full integration into the phonological word domain of the host. However, even when such elements are completely integrated prosodically, they may still count as clitics with respect to their distributional and functional properties.

2.1.2. Tonal phonology

Contrasting tone with stress systems, Hyman (2001) proposes eight prototypical properties of tone systems within the parameters introduced above for stress languages. First, tones show distributional freedom such that multiple identical or non-identical tones may occur in the same word. Second, the prototypical lexical domain for tone placement is not the word but the morpheme. Third, tones do not fulfill a demarcative function but are distinctive. Fourth, tone is realized phonetically by pitch (F_0). Fifth, tones are self-contained with respect to effects on phonology, i.e. they may affect tones but will not affect consonants or vowels. Sixth, quite to the contrary, tones are affected by consonant types. Seventh, the interaction of tones with grammar is to be considered

compositional rather than integrated. Finally, tonal rules are similar to segmental rules of assimilation and dissimilation.

Given these prototypical features of tone systems, especially their non-demarcative function and their association with morphemes rather than words, we cannot expect the same prosodic processes of cliticization we found in stress systems. Reduction of stress and gradual integration into the word domain are of minor importance in systems lacking word demarcation by stress placement. In the following, we will discuss the tonal properties of clitics in tone languages. In following Hyman's (2001: 1368) broad definition of a tone language as "[a] language […] in which an indication of pitch enters into the lexical realization of at least some morphemes", we will also consider so-called pitch-accent systems, which also exhibit some properties of stress languages, and combined stress/tone systems, before we treat tone systems proper. The distribution of the various tonal systems and the number of possible tonal contrasts in the tone languages of our sample are given in Table 3.

Table 3: Tonal systems in the tone languages of our sample

	Tonal system	Tonal contrasts
Basque (Gernika)	Pitch-accent	Accented vs. unaccented
Nigerian Pidgin	Pitch-accent/stress/tone	High vs. low [+stress]: high > falling; low > rising; [-stress]: high, low, tone spreading
Mandarin Chinese	Stress/tone	High-level vs. high-rising vs. dipping/falling-rising vs. high-falling [+stress]: four way contrast [-stress]: neutral tone
Slave	Tone	High vs. low
Yoruba	Tone	High vs. mid vs. low
!Xóõ	Tone	High vs. mid-level vs. mid-falling vs. low

2.1.2.1. Pitch-accent systems

The Gernika dialect of Basque, as described by Hualde (1991: 144-159, 1999) and Hualde & Ortiz de Urbina (2003), exhibits properties reminiscent of languages such as Tokyo Japanese, which have been classified as restricted tone or pitch-accent systems. Parallels may be drawn from the fact that words may or may not be lexically specified

for a pitch drop, i.e. they come as accented or unaccented words, and that there is only one such pitch drop per word. On the one hand, pitch enters into the lexical realization of some words, which makes Gernika Basque a tone language. On the other hand, the tonal contrasts show the prototypically culminative distribution of primary stress in stress systems. These properties grant this system a mixed status with respect to Hyman's (2001) parametric typology summarized above. The facts about accentuation in this dialect of Basque can be described as follows. The general pitch pattern of Gernika involves of pitch rise on the second syllable of polysyllabic words. Thus a nominal word like the absolutive, indefinite noun *gun↗tzurrun* 'kidney', pronounced in isolation, will surface with a low tone on the first syllable and a level high pitch plateau on the second and third syllable. A number of suffixes are associated with a tone specification and trigger a pitch fall on the high pitch plateau. When the absolutive plural suffix /ak/ is added to the word for 'kidney', a pitch fall will be realized on the syllable preceding this suffix: *gun↗tzurru↘nek*. If there is more than one accented suffix, only the leftmost will trigger this pitch fall.[8] The prosody of pitch-accents on the sentence level is illustrated in (4).

(4) a. gure lagunêk esan **dau** Gernika Basque
our friend.ERG.SG say **AUX**
'our friend said it'

b. gure lagûnek esan dábe
our friend.ERG.PL say AUX
'our friends said it' (Hualde 1999: 964)

In both sentences, a pitch rise will start on the second syllable. In (4a.), the preverbal phrase will receive a pitch-accent on the final syllable, since there is no accented word in this phrase. If there is an accented word in the preverbal phrase, the pitch-accent will be realized on the accented syllable of the word. In (4b), the accented syllable is initiated by the preaccenting ergative plural suffix /ak/. Note the prosodic properties of the auxiliary forms in the two sentences. In (4b.), a peak is realized on the lexically accented auxiliary *dabe*, which otherwise behaves like a full word. In (4a.), however,

[8] Hualde (1991) analyzes this pattern by making use of a low tone specification of these suffixes in the lexicon and a rule of rightward tone spreading. In Hualde (1999), these morphemes are analyzed as preaccenting suffixes.

the auxiliary *dau* does not carry a peak and will be realized with a low tone that spreads from the pitch fall of the pitch-accent. With respect to the segmental rules of palatalization and devoicing, this element appears to be phonologically cliticized to the preceding verb form (see 2.2.1.1.1.). By comparing these two forms of the auxiliary, we may conclude that cliticization in this system is accompanied by deaccentuation in higher level prosodic domains. It should be noted that the majority of words in Gernika are unaccented so that the cliticized element cannot be considered deficient or special in this respect. In its tonal behavior, the cliticized auxiliary behaves exactly like the verb form *esan* in the examples above, which also surfaces with a low tone spreading from the pitch fall. However, not enough information on the tonal behavior of clitic elements is documented to enable a conclusive characterization of encliticization in Basque to be given.

2.1.2.2. Combined stress/tone systems

Nigerian Pidgin, as described by Faraclas (1984, 1989), combines properties of stress, pitch-accent and tonal prosodic systems. Since syllables of lexical entries are underlyingly specified for high tone, low tone or the lack of tone, it qualifies as a tone language in Hyman's (2001) sense. A few words are lexically distinguished by contrast in high or low tone, such as *sista* 'sister' (high tone) and *sìsta* 'nurse' (low tone). The surface form of these underlying tones is conditioned by the stress properties of the tone bearing syllable. In the context of stressed syllables, a high tone surfaces as a spreading falling tone, whereas a low tone surfaces as a spreading rising tone in this environment. Accordingly, the high toned and stressed verb /ˈgó/ 'go' will surface with a falling contour [gô]. The low toned and stressed /ˈtù/ 'too', on the other hand, will surface with a rising contour tone [tǔ]. In all other environments, the two tones will be realized as level tones. Stress is usually realized on the final tone-bearing syllable of a phrase stress group, which consists, at least, of a main verb, an adverbial or a non-subject noun phrase as its nucleus. The contour tones of the stressed syllables spread rightwards to any other syllable in the stress group. This rule of tonal sandhi can be illustrated with the tone properties of the high toned word *fada* 'father' in the stress group *Nà mà fada* 'It is my father.' The underlying representation specifies two low toned, a high toned and a toneless syllable, with stress associated with the high toned syllable: /nà mà ˈfáda/.

Two rules apply to this string before it surfaces as [nà.mà.fá.dà]. First, the stressed high tone becomes a falling contour tone. Second, the toneless final syllable takes on the falling tone of the stressed syllable as a low tone. Note that the prosodic behavior of the stress group resembles the pitch phrases over which pitch-accent is assigned in languages such as Tokyo Japanese or Basque. Clitics bear an unstressable low tone, as may be seen in the incompletive aspect auxiliary *dè* or the irrealis modality auxiliary *gò*. These forms are closely related to the locative/existential copula *de* and the verb *go* 'to go', both high toned and non-clitic. In the set of bound pronouns, which usually also bear an unstressable low tone, the third person marker *am* is unstressed and toneless, i.e. undergoing tone spreading. This behavior can be illustrated with the stress group *A folo-**am*** 'I followed her/him'. In its underlying form stress and tone are specified for the various syllables: /à ˈfólo-**am**/. Again, the stressed high tone becomes a falling tone and the unstressed, toneless syllables following the stressed syllable take on the falling tone as two low tones. Therefore, this string will surface as [à.fó.lò.**àm**]. To summarize, clitics in Nigerian Pidgin are all unstressed and come either with a low tone or are even toneless and undergo tone spreading. Comparing clitics with related non-clitic elements, we encounter stress reduction, but also the reduction of a high tone to a low tone as processes associated with cliticization.

Mandarin Chinese has a four way tonal contrast which enters into the composition of lexical entries.[9] Following Chao (1968: 25f.), the four tones can be described on a scale of five pitch levels: the 1st tone is characterized by a high-level 55 pitch, the 2nd tone is realized by a high-rising 35 contour, the 3rd dipping/falling-rising tone comprises a 214 pitch contour, the 4th high-falling tone, finally, comes with a 51 pitch contour. These tonal contrasts distinguish the otherwise identical four lexemes *yī* (tone 1) 'clothes', *yí* (tone 2) 'to suspect', *yǐ* (tone 3) 'chair' and *yì* (tone 4) 'meaning' (Li & Thompson 1981: 8). When toned syllables are juxtaposed, they undergo a number of tonal sandhi rules: when a tone 3 syllable is followed by a syllable with any tone other than tone 3, it changes to a low tone with the pitch contour 21; when a tone 3 syllable is followed by another tone 3 syllable, it changes to tone 2 with the pitch contour 35; finally, when a tone 2 syllable is preceded by either a tone 1 or a tone 2 syllable and is followed by a syllable with any of the four tones, it changes to tone 1

[9] For an autosegmental analysis of Chinese tonal phonology see Yip (1980).

with a 55 pitch level. More relevant for the issue of cliticization in Chinese is the fourth tonal sandhi rule of neutral tone. In the default case, i.e. when not contrastive or weak stressed, all syllables surface with normal stress, subject only to slight phonetic deviations. When a syllable has weak stress or is unstressed, the tonal contrasts are reduced and the syllable will receive a tone according to the following pattern: after a tone 1 syllable, unstressed syllables will surface as a half-low tone, after a tone 2 syllable as a middle tone, after a tone 3 syllable as a half-high tone, and after a tone 4 syllable they will be realized as a low tone. Accordingly, the genitive suffix *de*, which is unstressed and appears in the neutral tone, will be realized with half-low tone when it follows the tone 1 pronoun *ta* in the affixed word *ta-de* 'he-Gen = his' (cf. Chao 1968: 26ff., 35f.; Li & Thompson 1981: 8f.; and Lin 2001: 48ff. for discussion). All Mandarin Chinese particles are unstressed and undergo the same rule of neutral tone. For example, the locative particle *shang* 'on, up' will surface with a half-low tone when it appears as an enclitic on the 1st tone host *tuī* 'person' in (5).

(5) tuī **shang** qu le de rén — Mandarin Chinese
push **up** go PERF DE(a) person
'person pushed up' — (Lin 2001: 50)

Note that the locative particle can be related to a lexical word *shàng*, which may function as a verb 'to go (up)' or an adverb 'above'. In contrast to its clitic counterpart, this word carries stress and comes with a specification for the 4th tone with a 51 pitch contour. To summarize, Mandarin Chinese clitics are all unstressed and therefore subject to the tonal sandhi rule of neutral tone. With respect to stress and tone properties, these elements resemble genuine suffixes. Comparing clitics with related non-clitic elements, we encounter stress reduction, but also the neutralization of tonal contrasts as processes associated with cliticization.[10]

2.1.2.3. Tone systems

The tonal systems discussed so far exhibit some properties of stress systems, such as the culminative distribution of tone specifications in Basque/Gernika and Nigerian Pidgin or the metrical structure of stressed and unstressed syllables that is imposed on the right

[10] See also Ansaldo & Lim (2004) for phonological effects of grammaticalization in Mandarin, Cantonese and Hokkien.

edge of a word in Mandarin Chinese. The following tone languages exhibit different numbers of contrastive pitch levels but do not share any properties with stress phonologies.

Slave dialects all exhibit a two way contrast between the register tones high and low. Phonetically, every syllable appears with one of these tones. Their distinctive function can be illustrated with the minimal pair *jíh* (high tone) 'hook' and *jih* (low tone) 'mitts'. Additionally, affixes, such as the first person plural subject prefix *íd-* (high tone) or the customary aspect prefix *na-* (low tone), bear lexical tone. A number of grammatical categories are marked by the addition of tones alone. For instance, inalienable possession is marked by a high tone on the final vowel in *jíyetú* 'wine (poss.)' (Rice 1989a: 103ff.). Of the various tonal processes in Slave, two have been described in some detail in the literature: Tone Spread and Low Tone Insertion (cf. Rice 1987b, 1989b).

With respect to the first process, high tones on stems with at least two syllables spread leftward in Fort Nelson Slave. This will result in the association of the lexically specified high tone with both syllables of a disyllabic word. Evidence for this process comes from dialectal variation: whereas the Fort Liard Slave word *setthí* 'my hand' carries a high tone on its final syllable, the corresponding word in Fort Nelson Slave *sétthí* 'my hand' has high tone on both syllables.

With respect to the second rule, high tones in phrase-final position are replaced by a low tone. Accordingly, if the word *sétthí* 'my hand' appears in phrase-final position, its second vowel will constitute the final syllable of the intonational phrase and will undergo Low Tone Insertion. It will therefore surface as *sétthi*. As for the enclitic TAM markers, lexically they may equally well carry a high tone, as with *egų́h* 'past', or a low tone, for instance in *oli* 'future' (1989c: 106). For those which are disyllabic and carry a high tone on their last syllable, the high tone will regularly spread one syllable to the left in Fort Nelson Slave. This is evidenced in the past enclitic, which is realized as *égų́h*. For the application of Low Tone Insertion, these elements count as phrase-final elements. This means that their verbal hosts will not undergo Low Tone Insertion and that they will themselves be subject to this tonal rule, as they constitute the final high toned syllable of the intonational phrase. Therefore, the past enclitic will surface as *égų̀h* in this position. As for postpositions that obligatorily procliticize to the verb when

they govern a pronominal complement and appear as free forms otherwise, bound or free status does not impose any restrictions on the realization of their tone. The benefactive postposition *-ghá*, for instance, surfaces with its lexical high tone when it is free, as in *denǫ* ***ghá*** *ts'a nį?ǫ* 'refl.mother for hat 3.gave = (s)he gave his/her mother a hat', as well as when it is bound, as in *ts'a se**ghá**nį?ǫ* 'hat 3.gave.1sg. = (s)he gave me a hat'. In summary, Slave clitics show no special behavior when compared with other morphemes in terms of their tonal properties. Like other morphemes, they may either be high or low toned and regularly undergo tonal processes like Tone Spread and Low Tone Insertion. Unlike the tonal languages having some resemblance to stress systems, we do not encounter reduction of tonal contrasts but regular application of tonal processes which do not distinguish words from clitics.

In Yoruba, the three pitch levels, high, mid and low, function as distinctive tones in the lexemes *ọkọ́* (high tone) 'hoe', *ọkọ* (mid tone) 'husband' and *ọkọ̀* (low tone) 'boat' (Delanọ 1965: 2, Ashiwaju 1968: 15). Except for the minor tonotactic restriction that high tone in word-initial position only occurs in consonant initial words, tones are distributed freely in lexical representations and are not subject to any restrictions on word melody. In syntactic phrases, these tones are subject to a number of tonal processes in which mid toned syllables behave as if they were toneless. When an object follows a verb, for instance, these two words will be phonologically fused by the deletion of either the final vowel of the verb or the initial vowel of the object. Whereas high and low tones associated with the deleted vowel are retained in this process, mid tones disappear. Accordingly, when the high toned verb *wa* 'look (for)' is contracted with the low-high noun *ẹkọ* 'education', the /a/ of the verb gets deleted and the contracted form *wẹkọ* 'look for education' will carry a high-low-high tone pattern, retaining the high tone of the deleted vowel. When the high toned verb *mu* 'take' is combined with the low-high noun *iwe* 'book', the /i/ of the noun gets deleted and the contracted form *muwe* 'take a book' will carry a high-low-high tone pattern retaining the low tone of the deleted vowel. However, when the high toned verb *wa* 'look (for) is combined with the mid-high noun *ile* 'house', the /i/ of the noun gets deleted but the contracted form *wale* 'look for a house' will carry a high-high tone pattern in which the mid tone associated with the deleted vowel is also deleted. Note that the surface form derived from these rules exhibits a sequence of two identical high tones. With host-clitic

combinations, however, such sequences of identical tones are prohibited, constituting a prototypical Obligatory Contour Principle (OCP) effect. As for the object enclitics, they are specified for high tone, and surface with this tone after low or mid toned hosts, for instance in *ó̩ kọ̀* ***mí*** 'he/she/it divorced me', where the 1st person singular enclitic *mí* is preceded by a low toned verb and in *ó̩ pa* ***mí*** 'he/she/it killed me', where this enclitic is preceded by a mid toned verb. When such an enclitic is attached to a high toned verb, however, it would cause an OCP violation which is systematically avoided in this domain. The first option to avoid a sequence of two identical tones in this domain is to reduce the high tone of the clitic to a mid tone, as found in *ó̩ kọ́* ***mi*** 'he/she/it taught me'.[11] The second option lies in the insertion of an epenthetic mid tone vowel at the clitic boundary. This can be illustrated with the example *ó̩ kọ́ ọ* ***yín*** 'he/she/it taught you-all', where the high toned verb and the high toned 2nd person plural enclitic *yín* are separated by the mid toned epenthetic vowel *ọ* to avoid the sequence of two identical tones. Similar processes also apply to other enclitics, such as the low toned emphatic and exclamatory/vocative particles, the subject pronouns, and the reduced possessive pronouns. Proclitics, such as the proclitic 3rd person singular pronoun *ó̩*, however, are not subject to such OCP effects. Recall that in ***ó̩*** *kọ́ mi* 'he/she/it taught me', the high toned subject proclitic *ó* 'he/she/it' combines with a high toned verb, producing a sequence of two identical high tones which is not repaired (Akinlabi & Liberman 2000). To summarize, clitics in Yoruba are lexically specified for high, mid or low tone. Whereas proclitics retain their tones in syntactic phrases, enclitics are subject to rules of tonal sandhi that repair OCP violations. The tone of enclitics may thereby be altered to mid tone, i.e. their lexical tone will be deleted, or mid toned epenthetic vowels may be inserted at the clitic boundary.

!Xóõ Bushman exhibits a system of four distinctive tones comprising the pitches high, mid-level, mid-falling and low. The following lexemes are distinguished by the tones only: *!áo* (high) 'holding (pl.)', *!āo* (mid-level) 'remain', and *!ào* (low) 'hip'. The distinctive function of the mid-falling tone can be inferred from the minimal pair *sâː* (mid-falling) versus *sāː* (mid-level) 'come to you'. With respect to two phrasal rules of tonal sandhi, the lexemes may be categorized as belonging to two distinct classes. When

[11] Following Akinlabi & Liberman's (2000) analysis of mid tone as the lack of tone, the process discussed should be treated as tone deletion.

the high toned Tone Class 1 lexeme *!núle* ‘area’ functions as the head of the phrase *!núle //qhae* ‘another area’, it will trigger a slightly falling mid-tone on the modifier *//qhae* ‘another’. However, when the high toned Tone Class 2 lexeme *!nabe* ‘dispute’ functions as the head of the tone group *!nabe //qhae* ‘another dispute’, it will cause a steeply falling low pitch on the modifier *//qhae* ‘another’. Members of the two Tone Classes therefore initiate different sandhi rules for Post-Head syllables. The second rule of tonal sandhi makes reference to the element appearing in Pre-Head position in the tone group. With the high toned Tone Class 1 lexeme *//áẽ* ‘scorpion’ as the head of the tone group */oe //áẽ* ‘grab the scorpion’, the pre-head element */oe* ‘grab’ will be realized with middle pitch. However, the high toned Tone Class 2 lexeme *piisi* ‘horse’, appearing as the head of the tone group */oe piisi* ‘fear the horse’, allows the pre-head element */oe* ‘grab’ to surface in its lexical high tone. The facts about these rules in the different possible configurations can be summarized as follows: with Tone Class 1 heads, all lexical tones are neutralized to a phonetic middle pitch in pre- and post-head position; with Tone Class 2 heads, high, mid and low tones are allowed in pre-head position, whereas all post-head elements appear with low falling pitch. Note that some mid-level tones and all mid-falling tones in pre-head position of Tone Class 2 lexemes will be altered to either a high or a low tone, reducing the general four way tonal contrast to a three way tonal contrast in this position. As for mono-moraic grammatical particles, which are the most feasible candidates for clitic status,[12] they seem to follow the same pattern of tonal sandhi. For example, the preposition *ka* ‘to’ and the copulative particle *ka* will surface with their high and low tone, respectively, if they precede a high toned Tone Class 2 head in sentences like *saa* ***ka*** */qhuũ* ‘go to the white man’ and *//hoa* ***ka*** */qhuũ* ‘not be a white man = … is not a white man’. Preceding a Tone Class 1 head, they should surface with a mid pitch, just like any other element would (Traill 1985: 28f., 44ff.). On the basis of the available descriptions, there is no reason to assume that clitic-like grammatical particles in !Xóõ have a special status in tonal phonology. Like other morphemes, they may come with a specification for high or low tone, with which they surface in Tone Class 2 pre-head position, and are subject to the leveling of tonal

[12] There is no explicit classification of grammatical particles in !Xóõ as clitics in Traill (1985). However, a number of phonological and distributional properties make them pattern with other clitic elements discussed in the present study, e.g. they are systematically lighter than bi-moraic lexical words, show phonotactic restrictions with respect to their onset consonants and seem to be distributed on the phrasal level.

contrasts in Tone Class 1 pre-head position. Comparing grammatical particles with presumably related lexical words, we can infer some possible paths for the change in tone of these elements. When the high toned verb *≠ʔábV* 'have' is grammaticalized into a conjunction *≠ʔV́* 'and', the high tone is retained on the grammatical particle. The high toned possessive particle */V* is arguably related to the verb */îi* 'be'. Here we encounter a change in tone such that the mid-falling tone of the verb turns into a high tone on the grammatical particle. Note that mid-falling tones in pre-head position of Tone Class 2 heads generally change to either a high or a low tone. The tone change documented in this grammaticalization could therefore be considered a result of the general tonal sandhi rules that affect the morpheme in this position.

2.1.2.4. Summary

In summary, the prosodic behavior of clitics in tone languages resembles the properties of clitic elements in stress systems only when the tone system shares some properties with stress systems. The contrast between stressed and unstressed words in the latter type is paralleled by the contrast of accented vs. unaccented words in pitch-accent systems. However, in these systems, a lack of accent is not necessarily a property of function words or clitics, but may be the default for the majority of words, as observed in Basque. A lack of stress in mixed tone-stress systems is accompanied by a neutralization of possible tonal contrasts. In Nigerian Pidgin, the possible two-way contrast of high and low tone is reduced to low tone in unstressed words. In Mandarin Chinese, unstressed words show a pattern of tonal sandhi that, in effect, neutralizes tonal contrasts. On the other hand, in languages which only make use of tone in their prosodic phonology, clitics are specified for one of the available contrastive tones as documented for Slave, Yoruba, and !Xóõ. Here, the tones of clitic elements are subject to general tonal processes of tonal sandhi, such as tone spreading and OCP repairs. With respect to tonal phonology, there is thus little evidence of a special status for clitics.[13] The various tonal properties and rules of tonal sandhi applying to pro- and enclitics in the tone languages of our sample are summarized in Table 4.

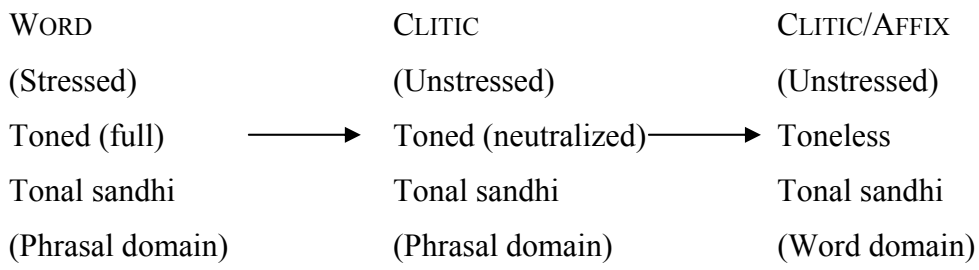
[13] However, recall the case of the OCP effects in Yoruba which are restricted to host-enclitic combinations.

Table 4: Prosodic behavior of clitics in the tone languages of our sample

	Proclitic	Enclitic
Basque (Gernika)	[Not reported]	Unaccented, deaccentuation
Nigerian Pidgin	Unstressed/unstressable, low tone	Unstressed/unstressable, low tone or toneless, tone spreading
Mandarin Chinese	[Not reported]	Unstressed, tonal sandhi (neutral tone)
Slave	High or low tone	High or low tone, tone spreading, low tone insertion
Yoruba	High, mid or low tone, no OCP effects	High, mid or low tone, OCP effects
!Xóõ	Leveling in pre-Head position, high, mid or low tone	Leveling in post-Head position, low-falling

From a grammaticalization perspective, several prosodic clines are possible for cliticization in tone languages. The prosodic process of stress reduction may be at work in tone languages that share some properties with stress systems, for instance in Basque, Nigerian Pidgin and Mandarin Chinese. In the latter cases, stress reduction is accompanied by the neutralization of tonal contrasts on the cliticized element. In Nigerian Pidgin, the reduction of tonal contrasts changes the tone specification of high toned elements to low tone and finally toneless. In Mandarin Chinese, rules of tonal sandhi reduce possible tonal contrasts of clitic elements to neutral tone. Gradual prosodic integration, as inferred from the synchronic data on clitics in stress phonologies, is not a general process of cliticization in tone languages, since they prototypically do not use tones to demarcate word boundaries. In most cases, the rules of tonal sandhi applying to cliticized elements, such as tone spreading and low tone insertion in Slave or pre-Head leveling in !Xóõ, are not restricted to a specific domain initiated by the host and its clitic. In one case, namely Yoruba, enclitics show a closer affinity with their host than proclitics do. Here, tonal sandhi rules which repair OCP violations are restricted to host-enclitic combinations and do not apply to proclitic-host combinations. The various prosodic clines for cliticization in tone languages inferred from the synchronic and diachronic data are summarized in Figure 2.

Figure 2: A prosodic cline for tone phonologies



The tonal changes clitics undergo in tonal sandhi may ultimately affect not only their surface forms but also their underlying tone specifications. Such a case is reported for the grammaticalization of the verb */îi* 'be' in !Xóõ, where the mid-falling tone of the verb changed to a high tone in the possessive particle */V*, presumably due to its participation in phrasal tonal processes. Therefore, in tone languages we can distinguish between stress reduction, tone neutralization, prosodic integration into low level domains for the sake of tonal sandhi, and tone change as prosodic processes of cliticization.

2.1.3. Intonational phonology

One language in our sample, West Greenlandic, can neither be characterized as a stress language nor as a tone language in the way we defined these prosodic systems above. The only noteworthy prosodic patterns are found in phrasal/sentential intonation contours. For declarative sentences, the general intonation pattern consists of a high-low-high contour over the last three morae of the utterance. For yes/no questions a high-low contour is realized on the last two morae of the utterance.[14] Irrespective of the morphological composition of the word on which these contours are realized, the intonation peak will appear on the antepenultimate mora in declaratives and on the penultimate mora in interrogatives (Rischel 1974: 79ff., Fortescue 1984: 340ff.). The two intonation patterns are illustrated with the examples in (6a.) for declarative and (6b.) for yes/no questions.

[14] This general pattern for interrogative sentence may be obscured by the lengthening of the final vowel which is accompanied by a final rise on the lengthened vowel. Due to this process, the intonation contour in yes/no questions may also surface as high-low-high (see Rischel 1974: 81f. and Fortescue 1984: 341f. for details).

(6) a. aasa-kkut ippirna-qar-puq — West Greenlandic
summer-pros. insect-have-3sg.indic.
'In the summer there are insects.'

b. aasa-kkut ippirna-qar-pa
summer-pros. insect-have-3sg.inter.
'Are there insects in the summer?' (Fortescue 1984: 341)

As for enclitics, there are various ways in which these elements may relate to the intonation contour and peak. The examples given in (7) and (8) illustrate the gradual integration of enclitics into the domain of the intonation contour.

(7) a. Aata-mik ati-qar-puq **aat** — West Greenlandic
Aata-instr. name-has-3s.indic. **req.conf.**
'His name is Aata, isn't it?'

b. isir-nia-rin=**aat**
come.in-try-2s.imp.=**req.conf.**
'Come in, won't you?' (Fortescue 1984: 9)

In (7a.), the confirmation-eliciting particle *aat* lies outside the domain of the declarative intonation contour and forms its own intonational phrase within which the interrogative high-low contour is realized. Note that there are two intonation peaks in this sentence. In this configuration, the particle does not act as an enclitic but as a word on its own. With imperative and optative verb-forms, however, *aat* is obligatorily encliticized, as illustrated in (7b.). Here, it forms an intonation unit with the preceding word, which takes the interrogative high-low contour, and the whole complex receives one intonation peak on the penultimate mora.

(8) a. aallar-pa=**guuq** — West Greenlandic
leave-3s.inter.=**quote**
'Did he_i say that he_j left?' (Fortescue 1984: 6)

b. aallar-pa=**guuq** West Greenlandic
leave-3s.inter.=**quote**
'Did he_i say that he_j left?' (Fortescue 1984: 6)

The enclitic quotative marker *guuq* forms one intonational phrase with its host word in both examples in (8). However, with respect to the intonation peak, the two variants differ. In (8a.), the intonation nucleus of the interrogative contour falls on the penultimate syllable of the host word and not of the host-clitic combination. With respect to the placement of the intonation nucleus, the enclitic quotative particle lies outside the domain of the intonational phrase. Therefore, it appears with a low intonation plateau.[15] Note, however, that this element does not initiate an intonational phrase on its own, since no intonation contour is realized on it as opposed to *aat* in (7a.). In (8b.), on the other hand, the enclitic *guuq* is fully integrated into the intonational phrase it forms with its host: the combination receives only one intonation nucleus which is realized on the last two morae of the combination, i.e. on the enclitic. To summarize, encliticization in West Greenlandic is associated with the gradual integration into the intonational phrase. After losing the status of initiating an intonational phrase, cliticized elements will fall within the intonational phrase they form with their host.[16] When doing so, they will first be invisible for the placement of the phrase final intonation contour and the intonation peak. In a second step, these elements will also count as belonging to this domain with respect to the placement of the intonation contour and peak, i.e. they will carry this intonation contour. Noteworthy, the processes constituting this cline resemble the processes of stress reduction and prosodic integration in the stress languages discussed in 2.1.1.

For completeness' sake, it should be mentioned that the Tamil interrogative/emphasis clitic *aa* exhibits special behavior with respect to intonational phonology. So far, cliticization in Tamil has been described with reference to the weak

[15] Kleinschmidt (1968 [1851]: 59f.) interprets this pattern in terms of word stress, such that the cliticized element lies outside the domain for word stress placement and does not 'move' the word accent.
[16] The enclitic =*guuq* may have arisen from the combination of the verbalizing affix *-(ng)u-* and a 3sg indicative inflection (Fortescue 2003: 301). If this etymology is correct and the enclitic originates from a bound morpheme rather than from a free word, the interpretation of the prosodic facts is less straightforward. In principle, it could also be possible that the element shows clitic-like behavior in prosodic phonology because it is undergoing prosodic disintegration.

initial word stress, but the interrogative clitic is obligatorily realized with a high-falling intonation contour as exemplified in (9c).

(9) a. avan vantaan ↘ Tamil
he come-past-3sm
'He came.'

b. avan vantaan ↗
he come-past-3sm
'Did he come?'

c. avan vantaan=**aa** ↗↘
he come-past-3sm=**ip**
'Did he come?' (Asher 1982: 4)

The basic declarative sentence intonation is characterized by a global pitch fall, as illustrated in (9a.). Such a declarative sentence can also be used as a yes/no question if a global pitch rise is realized at the end of the sentence, as exemplified in (9b.). When the interrogative clitic *aa* is attached to the main verb to form a yes/no question, however, a high-low intonation contour is realized on this clitic at the end of the sentence. In this respect, the clitic particle genuinely contributes to the intonational phonology of the utterance.[17]

2.1.4. Prosodic clines in cliticization

The data compiled in this section show rather heterogeneous behavior of clitic elements, both within prosodic phonology of the stress, tone and intonation types and across these prosodic types. Essentially, cliticization is associated with reduction of stress and the gradual integration into the domain for word stress placement in languages that show properties of typical stress phonologies, including those which combine properties of tone and stress systems. In the latter case, cliticization is associated with stress reduction and the reduction of tonal contrasts. In tone languages proper, clitic elements regularly

[17] This phenomenon is comparable to the behavior of the H* focus clitics in Bengali, as analyzed by Lahiri & Fitzpatrick-Cole (1999).

participate in the tonal phonology of the language, i.e. they will carry a tone specification and undergo rules of tonal sandhi. In some cases, higher level tonal sandhi will change the tone specification of the cliticized element. Prosodic integration into low level domain can impose further restrictions on possible surface tones on clitics, e.g. due to OCP effects. Finally, in pure intonation phonologies, cliticization is associated with the loss of the ability to carry phrasal intonation peaks and the gradual integration into the phrasal domain of intonation contours. The various prosodic clines for stress, tone and intonation phonologies are summarized in Table 5.

Table 5: Prosodic clines in cliticization

Stress	Stress reduction: primary stress > secondary stress > unstressed Integration into word domain: unstressable > stressable
Tone	Tone neutralization: full range of contrasts > reduced range of contrasts Integration into word domain: e.g. no OCP > OCP Tone change
Intonation	Loss of intonation peak Integration into intonation phrase

2.2. Clitics in segmental phonology

When a word cliticizes to another word, this change in evolutionary status may be accompanied by a change in the segmental composition of the element in question. First of all, the loss of a word boundary and the resulting bound status of a morpheme may initiate segmental processes such as assimilation, dissimilation, deletion and epenthesis that adjust the morpheme boundary to general phonotactic constraints. Other segmental rules may operate over whole syllables of the cliticized element or the host-clitic combination and may affect consonants or vowels. In this section, we will summarize the various segmental rules associated with cliticization in the languages of our sample. We will start by looking at the segmental processes that apply to consonants and vowels at the morpheme boundary in various configurations. Such processes will be treated under the cover term *junctural phenomena*. We will then proceed to processes that affect consonants and vowels across syllables in cliticized elements and host-clitic combinations. Such processes will be treated under the cover term *syllabic phenomena*.

Where possible, we will try to relate these rules to other domains in order to comment on the status of clitics with respect to the classical distinction between Internal and External sandhi, i.e. the degree of integration into the phonological word domain initiated by host.

2.2.1. Junctural phenomena

Junctural segments are consonants and vowels which appear in adjacency at the morpheme boundary between the host word and the cliticized element. With respect to segmental rules affecting segments at the host-clitic boundary, we can distinguish rules which apply to junctural consonants and junctural vowels. In both cases, rules may apply to the junctural segment of the clitic or the host. In principle, four options for the segmental treatment of junctural segments can be distinguished: structure preservation, assimilation, weakening and strengthening.

2.2.1.1. Junctural consonants

Cliticization of consonant-final proclitics and consonant-initial enclitics can lead to a consonant cluster at the morpheme boundary, if these elements are attached to a consonant-initial or consonant-final host. Consonant-final proclitics and consonant-initial enclitics may also attach to hosts beginning with, or ending in, a vowel. In these cases, cliticization leads to consonant-vowel sequences at the morpheme boundary. In what follows, we will first look at processes that apply to junctural consonants in consonant clusters and then at processes applying to junctural consonants in consonant-vowel sequences.

2.2.1.1.1. Consonant clusters

If cliticization leads to a consonant cluster at the morpheme boundary, both the consonant of the host and the consonant of the clitic may be affected by segmental rules. With respect to segmental rules applying to the junctural consonant of the host, the first option we find in the data is the blocking of word-bounded processes in cliticization. In effect, this blocking of rules leads to a preservation of the segmental composition of the element in question. First, the presence of a clitic may block the deletion of a word-final

consonant, as reported for the diachrony of Maltese. Here, consonantal reflexes of Old Arabic /ʾ/ and /ɣ/, referred to by the term *għajn* and represented with <għ> in the writing system, are restricted to host-clitic combinations with the enclitic pronouns *ha* '3sg.fem' and *hom* '3pl'. In contrast to *sema* 'he heard', where the word-final Old Arabic /ʾ/ has been lost, the host-clitic combination *semah=**ha*** 'he heard her' has retained /h/ as a consonantal reflex of the Old Arabic consonant (Borg 1997: 261). This suggests that encliticization of these pronouns blocks the deletion of the word-final /ʾ/. Therefore, the whole combination can be interpreted as a phonological word domain for the application of this rule. The same phenomenon is observed in a synchronic rule of word-final consonant deletion in Catalan which affects /r/. For example, the final /r/ of the infinitive *voler* 'to want' will be deleted in its surface form [bulɛ́]. If this infinitive is followed by a pronominal enclitic, however, /r/ is retained, cf. *voler=**ho*** [bulɛ́r**u**] 'to want it' and *voler=**te*** [bulɛ́r**tə**] 'to want you'. With respect to this rule, the host-clitic combination therefore forms one phonological word. Since the /r/ in the last two words is not word-final, it will not be deleted (Hualde 1992: 406). Note that the same analysis can account for the lack of /r/ deletion in prepositions such as *per* 'for'. Since this element is proclitic to a host word in *per a la mà* [**pəɾ**ələmá] 'for the hand', /r/ does not appear in word-final position and is therefore not deleted (Wheeler 1979: 34).[18] In the same manner, the presence of an enclitic blocks the application of final consonant cluster simplification. Final homorganic clusters of nasal and plosive consonants are simplified by deletion of the plosive, for instance final /nt/ will be realized as [n]. However, if this cluster is followed by an enclitic, it does not count as word-final and therefore the cluster /nt/ is retained: *anant=**hi*** 'going there' (Wheeler 1979: 281, Hualde 1992: 402).

Secondly, and closely related to the blocking of deletion rules, the presence of a clitic may block assimilation rules that apply to word-final segments. An example for this option comes from Udihe, where a word-final /i/ gets deleted in word-final position in rapid speech. Even after its deletion, a reflex of this vowel is found in the palatalization of the preceding consonant. Accordingly, when the final /i/ of *gagda-ni* 'another-3sg' undergoes deletion, the nasal will take on palatalization as a secondary

[18] For the parallel case of *un* 'a', which refuses to undergo final /n/-deletion when proclitic, see Hualde (1992: 405) and Wheeler (1979: 271).

articulation: *gagda-n*^{j}. In the presence of a clitic, such as *dA* 'additive focus', the palatalization rule is blocked because of the assimilative influence of the non-palatalized /d/ within the clitic. Therefore, *belie-ni-**de*** (fairy-3sg=**FOC**) 'this fairy' will surface with a non-palatalized /n/ after /i/ deletion: *belie-n=**de***. Note that with respect to /i/ deletion, the clitic remains outside the phonological word domain; with respect to the palatalization rule, however, it seems to lie inside the phonological word domain (Nikolaeva & Tolskaya 2001: 49).

A third, far more common, way of treating consonant clusters at the morpheme juncture of host-clitic combinations is not the blocking but the application of segmental rules on the junctural host consonant, for instance assimilation. In Koyra Chiini, the nasal consonant /n/ assimilates across word and morpheme boundaries to the place features of a following noncoronal stop /p, b, k, g/. Therefore, when the enclitic postposition *ga* 'on' is attached to a host ending in /n/, this nasal consonant will assimilate to /ŋ/, e.g. *ay din=**ga*** [ajdiŋ**ga**] 'I picked it up'. The tap *r* in Koyra Chiini tends to assimilate totally to a following alveolar /t, d, s, n/. This rule of total assimilation also applies to host-clitic boundaries, such as the combination of *gar* 'find' and the enclitic object marker *ni* '2sg'. In the consonant cluster /rn/, which results from the encliticization of the object marker, /r/ assimilates totally to /n/ such that the form will be realized as [ga**n:i**]. Also, /l/ assimilates totally to a following /r/ across such clitic boundaries. Therefore, the combination of *kul* 'all' and enclitic *ra* 'locative' will surface as [ku**r:a**] (Heath 1999: 29f.). The junctural consonant of the host may also undergo lenition, an option which is found in Chukchi. Here, two postpositions, namely *qaca* 'near' and *reen* 'together with', trigger the consonant alternation /k/ → [ɣ] / _$C_{\text{-back}}$, which applies within the word domain. For instance, when *reen* 'with' is encliticized to the host *ətl*^{ʔ}*a-k* (mother-LOC), the final consonant /k/ of the host undergoes lenition to /ɣ/: *ətl*^{ʔ}*a-ɣ=**reen*** 'with mother' (Dunn 1999: 77). A similar case could be made for the deictic particle *ŋan*, which triggers the nasalization rule /t/ → [n] _$C_{\text{+nasal}}$. When it combines with *cit* 'first', the host-final consonant /t/ will be nasalized to [n], yielding the host-clitic combination *cin=**ŋan*** 'first (deict)' (Dunn 1999: 44, 293). With respect to these segmental rules, the host-clitic combinations behave as single phonological words.

A last option for the phonological treatment of junctural host consonants in consonant clusters is the deletion of the consonant. Finnish, for example, has a truncation rule which is only triggered by the enclitic possessive markers. When these elements are attached to a host ending in a suffix with a final consonant, the suffix-final consonant is deleted. For example, the stem *lintu* 'bird' is marked for plural by suffixing *-t*: *lintu-t* 'birds'. However, when the enclitic possessive marker *ni* '1sg' is attached to this base, the final /t/ of the host is deleted: *lintu-**Ø-ni*** 'my birds' (Nevis 1984: 177).

Apart from these processes that apply to the junctural consonant of the host, the junctural consonant of the clitic may also undergo segmental rules, such as assimilation. Basque has a palatalization rule which affects /d/ in the groups /ild/ and /ind/. In these contexts, the plosive will be realized as [ɟ]. Accordingly, when the clitic auxiliaries *da* and *dau* are encliticized to the preceding word, the initial consonant will be palatalized, e.g. *hil **da*** [iʎ**ɟa**] 'has died' and *egin **dau*** [ejɲ**ɟaw**] 'has done it', respectively. Note that this rule applies to both suffix-initial and clitic-initial consonants, but not to word-initial /d/. We can infer from this distribution that the clitics are integrated into the phonological word domain with respect to this segmental rule (Hualde & Ortiz de Urbina 2003: 37f.). When the pronoun *ay* in Koyra Chiini procliticizes to a host with an initial /tʃ, j, ñ/, its final semivowel will totally assimilate to this consonant, e.g. /**ay**=ñaa/ [**aɲ**ːaːˈ] 'my mother' (Heath 1999: 30). In Maltese, the proclitic definite article *l* assimilates to the host-initial coronal consonants /tʃ, d, n, r, s, t, ʃ, z, ts/ with the exception of /dʒ/. For example, in combination with the noun *tarġa* 'step', the consonant will assimilate to the consonant /t/, yielding ***it-**tarġa* 'the step'. This rule is also documented for the prepositions *lil* 'to', *minn* 'from' and *għal* 'for', which assimilate to the following definite article, which in turn assimilates to the coronal consonant of the noun, cf. ***lit-**tifel* 'to the boy'. When *lil* functions as a direct object marker, however, the assimilation occurs only optionally in fast speech. It should be noted that a comparable rule of consonant assimilation also applies to the second person prefix *t-*, which assimilates to the verb stem-initial consonants /tʃ, d, dʒ, s, ʃ, z, ts/, e.g. *is-sir* 'you become'. The only difference between these two rules lies in the set of consonants which trigger regressive assimilation (cf. Sutcliffe 1936: 8, 18f.; Comrie 1980; Borg & Azzopardi-Alexander 1997: 137, 277, 328). When the Maltese enclitic *na*

'1pl.' is attached to hosts with a final /l/, this host-final consonant optionally assimilates to the initial consonant of the clitic, i.e. *kil=**na*** ~ *kin=**na*** 'we ate' and *hadil=**na*** ~ *hadin=**na*** 'he took from us' (Borg 1997: 256).[19] Note that in Koyra Chiini and Maltese, the resulting sequence of two identical consonants is retained as a geminate.

In a number of languages in our sample, consonant clusters at the morpheme boundary between host and clitics are resolved by the deletion of the junctural clitic consonant. In one rather idiosyncratic case in West Greenlandic, the initial /g/ of the quotative enclitic *guuq* is subject to the following consonant alternations: /g/ → [r] after a uvular, /g/ → [ŋ] after /p/ or /t/. For instance, when the particle is encliticized to *aap* 'yes', two assimilation rules apply. First, being preceded by /p/, /g/ will change to [ŋ]: /aap=**ŋuuq**/. Second, /p/ will assimilate to the following nasal consonant, thus the combination will be realized as [aan=**ŋuuq**] 'yes, he said' (Fortescue 1984: 349). When /g/ assimilates to a preceding uvular, the illicit resulting /qr/ cluster is simplified by the deletion of the first consonant in the cluster. Therefore, in the combination /qanuq=**guuq**/ (how=quote), /g/ will be realized as [r] after the uvular /q/. The form derived by this rule /qanuq=**ruuq**/ contains the illicit consonant cluster /qr/, which is simplified by the deletion of the first consonant in the surface form [qanu=**ruuq**] (Kleinschmidt 1968 [1851]: 5f., 59). Where a stop is followed by a heterosyllabic consonant in morphological formations in Basque, the stop is deleted and, if a voiced stop follows, this second stop is devoiced. This process applies to stem-suffix boundaries, to clitic boundaries and in the context of closely-bound syntactic concatenation. For instance, when the enclitic auxiliary *da* is attached to the conjunction *bait* 'since', the initial /d/ of the clitic is devoiced and the consonant cluster is simplified to a single [t]: *bai=**ta*** 'since he/she/it is' (Hualde & Ortiz de Urbina 2003: 40). When the clitic conjunction *ta* 'and' in Basque attaches to a host ending in a nasal or lateral, the initial /t/ will undergo voicing and surface as [d] (Hualde & Ortiz de Urbina 2003: 43). When Catalan proclitics ending in /s/, such as the proclitic article *les*, combine with hosts beginning in either /s/ or /r̄/ the resulting consonant cluster is simplified to /s/ or /r̄/, respectively. Accordingly, the forms ***les*** *sardines* 'the sardines' and ***les*** *reines* 'the queens' will be realized as [**ləs**ərðínəs] and [**lər̄**éjnəs] (Hualde 1992: 400ff.).

[19] This process is paralleled by the assimilation rules for proclitic /l/ and prefixed /t/, exemplified above.

Another mechanism to break up consonant clusters at the morpheme boundary is the insertion of epenthetic vowels. When the Maltese definite article *l* procliticizes to a following consonant-initial noun, the prosthetic vowel *i* is inserted. This rule of vowel epenthesis follows the general rule that sees such vowels inserted in front of words beginning with a geminate consonant or one of the consonants /l, m, n, għ, r/ followed by a consonant or semi-consonant. Accordingly, the proclitic-host combination ***it-****tibdíl* 'the mutation' will surface with this prosthetic vowel in the same way as the prefixed word *it-tallab* 'you beg' will. For nouns starting with a consonant cluster initiated by the voiceless fricatives /s/ and /ʃ/, the epenthetic vowel is inserted between the article and the noun, e.g. ***l-****isptar* 'the hospital'. This process is also reported for the proclitic particle *x* 'what' in the same phonetic context, e.g. ***xi****=smajt?* 'what did you hear?'. Note that the prosthetic *i* is not inserted with vowel-initial hosts or when the definite article combines with a preceding vowel-final word (Sutcliffe 1936: 16, 18; Borg & Azzopardi-Alexander 1997: 334f.). A number of object clitics in Catalan are only composed of a consonant or consonant cluster in their underlying form. These forms surface when they procliticize to a vowel-initial host such as in ***m'****odia* '(s)he hates me', where the first person singular marker /m/ is procliticized to a vowel-initial verb. In front of consonant-initial hosts, however, an epenthetic [ə] is inserted before the clitic. This process is evidenced in the host-clitic combination ***em*** *porta* '(s)he takes me', with the first person singular clitic, where the illicit initial consonant cluster /mp/ is avoided by the additional segment. This process also applies when these markers appear as enclitics. In this case, the epenthetic [ə] is inserted after the clitic consonant or between two vowelless clitics, e.g. *porta****=me=ls*** 'take them (masc.) to me' (Hualde 1992: 407ff.). When the Georgian conjoining particle enclitic *c(a)* 'too, also, both...and' attaches to a consonant-final host, an epenthetic /a/ is inserted at the morpheme boundary, e.g. *mankana****=c*** (car.NOM=too) 'the car, too' (Hewitt 1995: 88). The Chukchi emphatic enclitic consists of a bilabial consonant /m/ and vowel glottalisation which is realized on the preceding vowel (see below). When this enclitic is attached to a consonant-final host, an epenthetic vowel /ə/ is inserted to break up the resulting consonant cluster, e.g. /remkəlˀən=ˀ**m**/ is realized as *remkəlˀən=****ˀəm*** 'guest (EMPH)' (Dunn 1999: 76).

2.2.1.1.2. Consonant-vowel sequences

Consonant-final proclitics and consonant-initial enclitics may also attach to hosts beginning with or ending in a vowel. The resulting CV and VC sequences at the morpheme boundary may also be subject to segmental rules. As with the consonantal rules described above, the presence of the clitic may block the application of segmental rules operating on the junctural vowel of the host. Finnish, for example, has a number of segmental rules on word-final vowels. First, word-final /e/ is raised to [i], e.g. /lume/ [lumi] 'snow'. Second, word-final /ee/ is shortened to /e/, e.g. /hernee/ [herne] 'pea'. Third, a word-final vowel is deleted, e.g. /vanhuute/ [vanhuus] 'old age'. However, when an enclitic, such as one of the possessive markers, is attached to such a word, the application of these rules is blocked, cf. *lume=**ni*** 'my snow', *hernee=**nsä*** 'his pea' and *vanhuute=**ni*** 'my old age'. With respect to these rules, clitics form a phonological word with their host and block segmental rules to apply to the host final vowel. However, with respect to the rule of consonant gradation, these enclitics remain outside the word domain. When the agreement suffix *-mme* is attached to the stem *lentä*, the consonant of the suffix will close the preceding syllable and it will cause gradation of the sequence /nt/ in the stem to /nn/: *lenna**-mme*** 'we fly'. When the homophonous clitic possessive marker is attached to the host *lintu* 'bird', this rule of consonant gradation does not apply, cf. *lintu=**mme*** 'our bird' (Nevis 1984: 175f.).

Another possibility is the assimilation of the consonant in these sequences. When the clitic conjunction *ta* 'and' in Basque attaches to a host ending in /i/, the resulting sequence /it/ will be subject to a rule of palatalization which converts /t/ into [c]: /ni=**ta** śu/ [ni**ce**śu] 'you and I' (Hualde 1991: 60f.).[20] When the proclitic preposition *amb* 'with' in Catalan is attached to a vowel-initial host, the final plosive will surface as voiced. Note that final plosives of words in this phonological context will surface with a devoiced plosive, and, further, that this final /b/ also only surfaces in host-clitic combinations. When *amb* is followed by a pause, i.e. when it is not proclitic, /b/ will not surface. This may be an instance of the general rule of word-final cluster simplification, in which homorganic clusters of nasals and plosives, such as /mp/, are simplified by the deletion of the plosive (see above, Hualde 1992: 394, 402).

[20] Note that the clitic vowel also undergoes low vowel assimilation, see 2.2.2.2.

When proclitics with a VC structure attach to vowel-initial hosts or when CV enclitics attach to vowel-final hosts, the clitic consonant at the morpheme boundary will appear in intervocalic position. This is the most powerful constellation to trigger segmental rules on the junctural consonants. In particular, this context may cause a number of intervocalic weakening processes, which are captured by the universal strength hierarchy in (10) adapted from Hooper (1976: 206) and Hyman (1975: 164ff.).

(10) Universal Strength Hierarchy
voiceless > voiceless continuant > voiced continuant > nasal > liquid > glide > Ø
stop voiced stop

The changes that may apply to intervocalic consonantal segments are captured in this cline. A first process of consonantal weakening in intervocalic position applies to voiceless stops in Tamil. Here, intervocalic /k/ is laxened to the voiceless continuants [h] or [ʂ] or may be deleted in this phonological context. This rule also applies to the enclitic locative postposition *kiʈʈe* 'near', in which /k/ laxens to [h] or [ʂ] and is finally deleted if it is attached to a vowel-final host, e.g. *avanga=**hiʈʈe*** > [avəŋgɨʈʈɛ] 'with, near them' (Schiffman 1999: 11). Tamil also has a regular rule of consonant weakening, in which voiceless /t/ is realized as [ð] in intervocalic position and as [d̪] after nasals within the phonological word. In the first case we encounter the decline of a voiceless stop to a voiced continuant. This rule also applies to the initial /t/ of the enclitic emphatic particle *taan*, such that it will surface as [ð] when it is attached to a vowel-final host and as [d̪] when it is attached to a host with a final nasal consonant (Schiffman 1999: 10, 193, Arokianathan 1981: 103f.).

Voiced stops may be weakened to voiced continuants. In Basque, the voiced obstruents /b, d, g/ are realized as stops only after a pause, a nasal and, in the case of /d/, after a lateral. In all other contexts, especially in intervocalic position, they are realized as a continuant and may even be further reduced. Take for instance the clitic numeral *bat* 'one' in Gernika-Basque, whose initial consonant surfaces as [b] after a nasal and as [β] in intervocalic position: [laɣum=**bet**] 'one friend' and [aśto=**βat**] 'one donkey' (Hualde & Ortiz de Urbina 2003: 44, Hualde 1991: 56). Presumably, a similar mechanism may account for the alternations of initial voiced stops of clitic particles in

Nigerian Pidgin. Initial consonants of clitic auxiliaries like /d, g/ are subject to a number of segmental processes by which they are weakened to voiced continuants or liquids, or are even deleted, i.e. approximation, frication, tapping and deletion. For instance, the incompletive aspect marker *dè* in *A* ***dè*** *go* 'I am going', may be realized with an initial alveolar stop /d/, an approximant /j/, a tap /ɾ/, or may even be deleted completely in rapid speech. Note the intervocalic position of the consonant in the example given (Faraclas 1989: 540). Finally, consonants may be deleted in intervocalic position. In Maltese, /h/ in the enclitic pronouns *h* '3sg.masc.', *ha* '3sg.fem.' and *hom* '3pl.' is deleted in intervocalic position, i.e. when the enclitic pronouns are attached to vowel-final hosts. When the laryngeal consonant is deleted the resulting hiatus is resolved by a rule of glide formation which converts long /i:/ to /iy/ and long /u:/ to /uw/. For example, before the underlying form /yištru:=**hom**/ 'they buy them' surfaces, /h/ will be deleted, since it appears in intervocalic position. In order to resolve the resulting hiatus /u:o/, glide formation applies to yield the surface form *yištruw**om*** (Borg 1997: 275). Glides, however, may in turn be subject to consonantal weakening and may be deleted. For example, when the Yoruba 3rd person plural subject pronoun *wọ́n* encliticizes to a preceding vowel-final pragmatic particle, its initial glide /w/ appears in intervocalic position. In this context, the glide is normally lost, and a rule of vowel assimilation applies (see 2.2.1.2.1.). For instance, the combination *ngbọ́* ***wọ́n*** *wá* 'confirm, did they come' will surface without the intervocalic glide at the morpheme boundary between the confirmation particle *ngbọ́* and the enclitic subject object: *ngbọ́n* ***ọ́n*** *wá* (Akinlabi & Liberman 2000: 43). In the same manner, the enclitic possessive pronouns *Vrẹ* '2sg' and *Vrẹ̀* '3sg' are subject to a consonantal weakening rule which deletes intervocalic /r/ (Akinlabi 1993). In Koyra Chiini, we find another example of intervocalic glide deletion. Here, the glide /w/ in the enclitic demonstrative *woo* 'this' is deleted in allegro speech contractions with vowel-final host. After the glide has been deleted, the two now adjacent vowels will contract (see 2.2.1.2.1.) (Heath 1999: 35, 61).

The counterpart of weakening captured by progression from left to right on the strength hierarchy in (10) is strengthening captured by progression from right to left on this cline. The most well-known instance of consonant strengthening in intervocalic position is gemination. This process is documented in the context of cliticization for two languages of our sample. When the West Greenlandic enclitic particle *taaq* 'also' is

attached to a host word ending in /i/, the initial /t/ of the enclitic is turned into the fricative /s/. From the following example we can also infer that this consonant will be geminated in this intervocalic position: *Nuum-mi=**ssaaq*** (Nuuk-loc=**also**) 'also in N.' (Fortescue 1984: 113). When the proclitic object marker *lil* in Maltese is attached to a vowel-initial host, the clitic-final consonant /l/ will consequently appear in intervocalic position. In this context, the consonant will undergo automatic gemination as in ***lil** ommi* /**lill-**ommi/ 'to my mother' (Borg 1997: 256).

2.2.1.1.3. Summary

The various processes of structure preservation, assimilation, weakening and strengthening observed with junctural consonants in consonant clusters and consonant-vowel sequences are summarized in Table 6.

Table 6: Segmental processes on junctural consonants in the languages of our sample

	Consonant clusters	Consonant-vowel sequences
Structure preservation	Blocking of C assimilation Blocking of C deletion	Blocking of V raising Blocking of V shortening Blocking of V deletion
Assimilation	C assimilation (place, etc.)	C assimilation (palatalization, voicing)
Weakening	Cluster simplification (C deletion)	Intervocalic C weakening Intervocalic C deletion
Strengthening	V epenthesis	Intervocalic C gemination

2.2.1.2. Junctural vowels

Cliticization of vowel-final proclitics and vowel-initial enclitics can lead to vowel clusters at the morpheme boundary, if these elements are attached to vowel-initial or vowel-final hosts. Vowel-final proclitics and vowel-initial enclitics may also attach to hosts beginning with or ending in a consonant. In these cases, cliticization leads to consonant-vowel sequences at the morpheme boundary. In what follows, we will first look at processes that apply to junctural vowels in vowels clusters and then at processes applying to junctural vowels in consonant-vowel sequences.

2.2.1.2.1. Vowel clusters

When vowel-final proclitics attach to vowel-initial hosts and vowel-initial enclitics attach to vowel-final hosts a vowel cluster results. This hiatus situation may or may not violate phonotactic constraints on syllable structure. A number of repair strategies are documented for clitic boundaries of the languages in our sample. Apart from structure preservation, i.e. the lack of repair rules, we can distinguish assimilation rules, weakening and deletion rules as well as epenthesis. In Slave, VV sequences at clitic boundaries are not subject to segmental rules that break up the hiatus. This language has a rule of vowel deletion in which the first vowel in a vowel sequence is deleted when both vowels belong to suffixes. The deletion rule applies to suffix sequences with the possessive marker *-é* and the diminutive marker *-ah*. For example, by suffixing *-é* to the stem *tu* 'water' the possessed form *-tué* is derived. When a diminutive is formed on the basis of this form by suffixing *-ah*, the vowel of the first suffix /e/ is deleted: *-tú-Ø-ah* 'pond'. With vowel-initial enclitics like the negative particle *íle* or the future clitic *oli*, however, this rule fails to apply. When the verb *hejin* '(s)he sings' is combined with these two enclitics, the surface form contains all underlying vowels, and the initial vowel in the vowel sequence at the clitic-clitic boundary is not deleted: *hejin=**oli=íle*** '(s)he will not sing'. To summarize, this deletion rule does not affect stem vowels in vowel sequences and does not apply across word boundaries or clitic boundaries, but it does apply across suffix-suffix boundaries (Rice 1989c: 108ff.).

Vowel assimilation is attested in two languages of our sample. When a vowel sequence results from the encliticization of a vowel-initial clitic to a vowel-final host in Koyra Chiini, one of the vowels will assimilate to its neighbor and the two vowels will be contracted to a single long vowel. For example, when the imperfective marker *o* encliticizes to the 2nd person singular pronoun *ni*, the host vowel assimilates to /o/ and the two short vowels are contracted to one long [oː]: /ni **o**/ → /no **o**/ → [n**oː**] (Heath 1999: 24, 31). Note that this vowel assimilation is not accompanied by deletion or shortening of a vowel. A similar situation is found in Yoruba. Here, subject pronouns can either appear as proclitics to a verb or as enclitics to preceding pragmatic particles. In the latter case, vowel-initial enclitics like *a* '1pl' and *o* '2sg' trigger vowel assimilation when they attach to vowel-final hosts. Accordingly, a sequence like *ngbọ́ **a** wá* 'confirm, did we come?' will be realized as *ngbá **a** wá*, where the final vowel of the

confirmation particle assimilates to /a/. With the high toned 3rd person subject clitic *ó*, however, the final vowel of the host gets deleted. Therefore, the combination *ngbọ́* ***ó*** *wá* 'confirm, did he come?' will surface as *ngbó wá*, with the vowel of the host deleted (Akinlabi & Liberman 2000: 42f.).

A rather common strategy to avoid hiatus at clitic boundaries is a weakening process, which converts one of the junctural vowels into a consonant, usually a glide. When the Tariana emphatic enclitic *a* is attached to a host ending in /i/, the host-final /i/ is converted to a glide /y/. The examples *nawiki=**a*** [nawíky=**a**] (person=**EMPH**) 'really a person' and *da:pi-aɾi* [dá:py-aɾi] 'the river of Cipóvine' illustrate that this process applies to clitic boundaries as well as to affix boundaries (Aikhenvald 2002: 50). When the approximative enclitic *ihà* is attached to a vowel-final host, the resulting hiatus is optionally resolved by a rule of glide formation which turns the /i/ of the enclitic into a /y/, as in *kadíte=**ihá*** ~ *kadíte=**yhá*** (black+NCL:ANIM=**APPROX**) 'blackish'. Note that when this morpheme is used as a suffix, this rule does not apply. However, a rule of vowel fusion in which /a/ and /i/ collide to /i/ operates on the affix boundary, cf. /kada-iha-ite/ which surfaces as *kadihite* 'blackish' (Aikhenvald 2003a: 52). The proclitic conjunction *u* 'and' in Maltese procliticizes phonologically to a following host word. When this host word contains the definite article realized with the prosthetic vowel /i/, a hiatus situation results, e.g. in ***u*** *it-tifla* 'and the girl'. In this case, the hiatus is resolved by a rule of glide formation which turns /u/ to /w/. Accordingly, the example given will be pronounced as [**w**ɪˈtːɪflɐ] (Borg & Azzopardi-Alexander 1997: 276).

The ultimate step in the weakening of one of the adjacent vowels is its deletion. For instance, when the Tamil enclitic interrogative/emphasis marker *aa* is attached to a host word such as *vandaaru* 'came', a rule that deletes word-final /u/ will apply before clitic attachment. Therefore, the resulting surface form *vandaar=**aa*** does not show a hiatus (Schiffman 1999: 150). For the purposes of this rule, the enclitic does not belong to the phonological word domain. However, note that glide insertion, as described below, seems to be a far more common mechanism to resolve hiatus in Tamil. In a small subset of cases, hiatus situations in West Greenlandic are optionally resolved by a rule of vowel coalescence where underlying long /aa/ and short /a/ are realized as one long /aa/. For example, when the confirmation-eliciting enclitic particle *aat* is attached to a host with final /a/ as in *aallar-niar-ta=**at*** (eave-try-1p.opt.=**req.-conf.**) 'Let's go then',

the vowel cluster containing a long /aa/ and a short /a/ is realized as one long /aa/ (Fortescue 1984: 9, 354). In these languages, the junctural vowel of the host is affected by the vowel deletion. However, such rules may also delete the junctural vowel of the clitic. When the proclitic negative particle *ma* in Maltese procliticizes to a following vowel-initial host, the resulting hiatus is resolved by vowel coalescence in which the vowel of the proclitic is deleted, e.g. ***m'aħniex*** **NEG**=PRO.1.Pl.**-NEG** 'not us' (Borg & Azzopardi-Alexander 1997: 88f.). When the proclitic article *te* 'the' in Maori is attached to a vowel-initial element, its vowel /e/ will be deleted. For instance, if *te* combines with the genitive marker *aa* in constructions like /**te**+aa Hone/ (**the**+gen John) 'John's', vowel coalescence will apply and the vowel cluster /eaa/ will be simplified to /aa/ yielding ***t**aa Hone* (Bauer 1993: 507). In Kayardild, there are two vowel-initial enclitics which lose their junctural vowel when they combine with a vowel-final host, namely *(i)da* 'same, still, yet, both, even' and *(a)ka* 'emphatic focus'. Compare the vowel-initial variants *thathung=**ida*** (together=**SAME**) 'both' and *thalardin=**ak*** (old.man=**FOC**) 'old man!'[21] with the variants *wululbu-ya=**da*** (bait-LOC=**SAME**) 'still at the bait' and *ri-ya=**ka*** (east-NOM=**FOC**) 'east!' on vowel-final hosts. In these cases, the hiatus created by the encliticization of these elements is resolved by vowel coalescence in which the enclitic vowel is deleted (Evans 1995a: 389ff.). When the clitic conjunction *(e)ta* 'and' in Basque attaches to a vowel-final host, the resulting hiatus is repaired by the deletion of the clitic-initial vowel. Accordingly, it will surface as [ta] in *koldo=**ta** peru* 'Koldo and Peru' (Hualde 1991: 57).

Another common strategy for repairing illicit vowel sequences is the insertion of epenthetic segments, which can be interpreted as a strengthening process. In Basque, vowel sequences consisting of a high vowel and some other vowel at stem-affix or clitic boundaries are broken up by the insertion of a consonant. In the case of the cliticized demonstrative *hau*, this epenthetic consonant can either be /b/ or /ɟ/: [buu=**bau̯**] 'this head' and [mendi**ɟau̯**] 'this mountain' (Hualde 1991: 49). When a vowel-initial enclitic such as *aasiit* 'again as usual' is attached to a vowel-final host in West Greenlandic, an epenthetic consonant /j/ is inserted, e.g. *urnippaa=**jaasiit*** 'he came up to him as usual' (Fortescue 1984: 354; Rischel 1974: 1974). Tamil has a highly productive morphophonological rule which inserts a glide between two adjacent vowels at

[21] Note that the final vowel of *(a)ka* is affected by breath group final prosodic truncation, see 2.2.2.3.

morpheme- or word-boundaries. When the first vowel is one of the front vowels /i, iː, e, eː/, an epenthetic /y/ will be inserted; when the first vowel is one of the back or open vowels /u, uː, o, oː, a, aː/, an epenthetic /v/ will be inserted. The application of this rule can be illustrated with the vowel-initial interrogative/emphasis enclitic *aa*. In the host-clitic combination *ʧi=**yaa*** 'tea (int./emph.)' it is preceded by a front vowel, therefore an epenthetic /y/ is inserted at the morpheme boundary. In the combination *puu=**vaa*** 'flower (int./emph.)' the enclitic is preceded by a back vowel and, according to the rule outlined above, an epenthetic /v/ is inserted (Asher 1982: 240f., Schiffman 1999: 21). When a vowel-initial clitic is attached to a vowel-final host in Nigerian Pidgin, an epenthetic consonant may be inserted at the morpheme boundary. Sometimes this consonant is /y/; with preceding back vowels it may be /w/ or /r/. Accordingly, the host-clitic combination *folo* 'follow' plus *am* '3sg' in *A folo=**am** go* 'I went with him/her' may be realized as [fó.ló.**wám**], [fó.ló.**rám**] or as [fó.ló.**ám**] (Faraclas 1989: 553). Possibly related to hiatus-avoiding strategies is an idiosyncratic allomorphy of pronominal enclitics in Maltese. When the enclitics *=i* '1sg.' and *=u* '3sg.masc.' are attached to a vowel- or semivowel-final host, the resulting hiatus is resolved by the surfacing of their idiosyncratic consonant-initial allomorphs /ja/ and /h/, respectively (Borg & Azzopardi-Alexander 1997: 275).

2.2.1.2.2. Consonant-vowel sequences

VC and CV sequences at the clitic boundary also appear when vowel-final proclitics attach to consonant-initial hosts or when vowel-initial enclitics attach to consonant-final hosts. In principle, this constellation triggers the same mechanisms of structure preservation, assimilation, weakening and strengthening discussed in the section 2.2.1.1.2. Parallel to the evidence compiled for consonant-initial enclitics above, vowel-initial enclitics may block the deletion of a word-final consonant in the host. This is described for vowel-initial enclitics in Tamil. For example, with the 3rd person plural rational pronoun *avaɲka(l)*, the final lateral /l/ will be deleted in word-final position, yielding the surface form *avaɲka*. If a vowel-initial suffix or enclitic is attached, however, the underlying lateral is realized as the onset of the last syllable. Compare *avaɲka-e* 'they (acc.)' with the suffixed accusative marker *-e* and *avaɲka=**um*** 'they,

too' with the focus enclitic *um* (Asher 1982: 239). With respect to this rule, the host-clitic combinations count as much as phonological words as do the stem-suffix combinations. Note that this rule also regularly applies to the final lateral in the politeness enclitic *(u)ŋka(l)*. In Nigerian Pidgin, /r/ is deleted in word-final position. When a word like *hyar* 'hear' is uttered in isolation, it will surface as [hyá], without the final consonant. However, if the 3rd person object clitic *am* is attached to this word, the host will surface with its final consonant /r/: *hyar=**am*** [hyá.**ràm**] 'hear it'. With respect to this rule, the host-clitic combination therefore constitutes one phonological word (Faraclas 1989: 539). The presence of a vowel-initial clitic may also block other segmental processes that would affect the host-final consonant in coda position. Slave has a rule of nasalization which turns underlying Vn sequences into nasalized vowels, if the nasal consonant is in the coda of a syllable. For example, an underlying form like /ten/ 'ice', which contains a Vn sequence with the nasal consonant in the coda, will surface with a nasal vowel: *tẹ*. However, if a vowel-initial suffix or enclitic is attached to such a stem, the nasal consonant will be syllabified as an onset and therefore nasalization fails to apply. This can be illustrated with the form *-tené* 'ice (possessed)', in which the possessive marker *-é* is suffixed to the stem /ten/. Vowel-initial enclitics behave exactly like vowel-initial suffixes with respect to this nasalization rule. On the one hand, a verb form like /hejin/ '(s)he sings' will undergo nasalization and will surface with a nasal final vowel: *hejį*. When the vowel-initial negative marker *ílẹ* is encliticized to this verb, the nasal consonant is syllabified as an onset and nasalization fails to apply: *hejin**ílẹ*** '(s)he does not sing'. Closely related to the behavior of vowel-initial suffixes and enclitics with respect to nasalization is their behavior with respect to consonant neutralization. Coda consonants like /h, d, l, z, dl/ are neutralized to [h] in Slave. When a vowel-initial bound morpheme is attached to a base ending in such a consonant, this consonant is syllabified as an onset and neutralization again fails to apply. Compare *ts'ah* 'hat', with a neutralized coda consonant, with *-ts'adé* 'hat (possessive)', in which the presence of the possessive suffix *-é* blocks neutralization of /d/. This is paralleled with pairs like *duhtlah* 'I will go', with the neutralized coda consonant, and *duhtlad**ẹ́hsịi*** 'I will probably go', with the enclitic probability marker *ẹ́hsịi* (Rice 1989c: 114ff.). In all these cases, re-syllabification of the consonant

preceding the clitic as an onset lays the ground for the blocking of these segmental rules.

The host-final consonant in such a combination may also undergo weakening in the sense outlined above. For instance, West Greenlandic exhibits a highly productive rule of enclitic sandhi by which host-final plosive consonants are nasalized in front of vowel-initial enclitics. In this morphophonological context, /p/ is realized as [m], /t/ as [n], /k/ as [ŋ] and /q/ as [N]. For example, when the proper name *Suulut* 'Søren' is combined with the enclitic demonstrative pronoun *una* the host-final plosive /t/ will surface as [n]: *Suulun=**una*** 'it is Søren!' (Rischel 1974: 155f.; Fortescue 1984: 333, 348). Except for quasi-compounds, for which this rule is also attested, this process seems to be highly specialized for enclitic junctures. Note that host-final /q/ may also alternate with /r/ in the context of consonant-initial enclitics like *li* 'but' (cf. Kleinschmidt 1968 [1851]: 58f., Fortescue 1984: 348).

Consonantal strengthening in the form of gemination is also documented for host-initial consonants preceded by a vowel-final enclitic. The Maltese future particle *se* is procliticized to the following imperfect verb form. In the case of the first person plural, this imperfect verb form will have the prefix *n-*. If this consonant is followed by a vowel, the nasal consonant will be geminated. For example, in ***se** naraw* 'we will see', where the consonant /n/ appears in intervocalic position at the clitic boundary, the nasal is optionally lengthened by some speakers, resulting in [**sɛ**nːɐˈrɐw] (Borg & Azzopardi-Alexander 1997: 223).

Two rather marked options in these constellations are attested in Mandarin Chinese and Georgian. Mandarin Chinese has a rule whereby a following single-vowel syllable /a/ copies the last consonantal segment of the preceding syllable as its onset. For example, when the enclitic interjective particle *a* is attached to *hǎo* [xaw] 'good', it will copy the final glide of the host as its onset. The combination is realized as [xaw.**wa**] 'good!' (Lin 2001: 36f.). When the enclitic copula *a* 'is' is attached to a consonant-final host in Georgian, it surfaces with a long vowel *aa* as in *sad=**aa*** 'where is'. This could be interpreted as an instance of vowel epenthesis, where an epenthetic vowel /a/ is inserted at the morpheme boundary (Harris 1981: 12f.).

2.2.1.2.3. Summary

The various processes of structure preservation, assimilation, weakening and strengthening observed with junctural vowels in vowel clusters and consonant-vowel sequences are summarized in Table 7.

Table 7: Segmental processes on junctural vowels in the languages of our sample

	Vowel clusters	Consonant-vowel sequences
Structure preservation	No vowel coalescence	Blocking of C deletion Blocking of C nasalization Blocking of C nasalization
Assimilation	V assimilation	[Not reported]
Weakening	Glide formation Vowel coalescence	Intervocalic C weakening
Strengthening	C epenthesis	Intervocalic C gemination C epenthesis V epenthesis

2.2.2. Syllabic phenomena

In the preceding section we discussed the various segmental rules that apply to junctural consonants and vowels. However, there are a number of processes that operate on whole syllables of clitics, hosts, or host-clitic combinations. Note that in the case of syllabic processes, the segments affected by the rule need not be adjacent. This section will survey the various rules that apply to consonants and vowels in such syllables. Again, the various options attested at the syllabic level can be divided into structure preservation, assimilation, weakening and strengthening.

2.2.2.1. Consonants

Consonants in clitics may undergo assimilation to other segments within the same syllable. One example for such an assimilation rule is to be found in the initial consonant of the enclitic 3rd person plural marker *gi* in Koyra Chiini, which is palatalized to /j/ due to the presence of the following high vowel (Heath 1999: 31). Clitics may also be subject to certain processes which adjust their segmental composition to phonotactic constraints. !Xóõ has such a constraint for CV sequences, which demands the segments to agree with respect to the feature [+back]. With

cordially determined forms of grammatical particles such as *ki* (Class 1) and *ke* (Class 3), this constraint affects the consonants in assimilating them to the following [-back] feature of the vowels. Accordingly, [ti] and [te] are also possible surface forms of these combinations (Traill 1985: 90).

Tariana provides some interesting cases where segmental processes operate on several syllables in the context of cliticization. First, this language has a rule of aspiration floating which only applies to enclitic boundaries. The rule prohibits aspirated consonants in adjacent syllables at this boundary. For instance, the underlying form /dí-pha=**khà**/ (3sgnf-fall=**away**) 'he fell in the opposite direction' may either surface as *dí-pa=**khà*** or as *dí-pha=**kà*** but not as **dí-pha=**khà***.[22] This process does not apply across suffix boundaries, for instance in *pana-phé-kha* (leaf-CL:LEAF.LIKE-CL:CURVED) 'a curved feather', which has two adjacent syllables with aspirated consonants, and operates on half a dozen enclitics which have an aspirated consonant in their underlying form (Aikhenvald 2002: 49). Closely related to this process is a rule of h-metathesis which applies to sequences of two syllables within a phonological word in which one contains an aspirated consonant and the other contains an unaspirated voiceless stop. In this context, the aspirated consonant may loose its aspiration and /h/ will be inserted as the coda consonant of this syllable. For instance, when the sequence of the two enclitics *=tha=ka* 'frustrative=recent past visual' undergoes this rule, /h/ will effectively be metathesized yielding the surface form *=tah=ka* (Aikhenvald 2003a: 43). Finally, consonantal aspiration in a clitic may be completely lost. This happens to enclitics beginning with /dh/, such as the Aktionsart enclitic *dhalà* 'touch the surface, unsticking or scratching it' which may also be realized as *dala*, cf. *di=**dhala*** ~ *di=**dala*** (3sgnf=**unstick**) 'he unstuck' (Aikhenvald 2003a: 43). Aspirated voiced stops and aspirated nasals may lose their aspiration in non-word-initial position. For instance, the aspirated nasal /mh/ in the enclitic *mhà* 'present non-visual' may be pronounced unaspirated in the host-clitic combination *di-nu=**mha*** [di-nu=**ma**] (3sgnf-come=**PRES.NONVIS**) 'he is coming' (Aikhenvald 2003a: 43).

[22] Note the similarity to the rule of dissimilation known as Grassmann's Law.

2.2.2.2. Vowels

Far more common syllabic rules affect the vowels in the syllables of clitics, hosts, or host-clitic combinations. Such processes include assimilation/vowel harmony, weakening/vowel reduction and strengthening/vowel lengthening. It should be noted that another, and by no means uncommon, possibility is the lack of such rules. One process, which does not fall within the three general types described here, is found in Chukchi. The emphatic enclitic in this language consists of a bilabial nasal consonant /m/ and vowel glottalisation on the host-final vowel or the epenthetic vowel /ə/. For example, when this element is encliticized to the word *cewaro* 'grey reindeer' the host-clitic combination will be pronounced as *cewar^{ʔ}**om*** 'grey reindeer (EMPH)' with glottalisation on the host-final vowel /o/. With consonant-final hosts, an epenthetic /ə/ is inserted at the morpheme boundary which also takes on glottalisation, e.g. *remkəl^{ʔ}ən^{ʔ}**əm*** 'guest (EMPH)' (Dunn 1999: 76).

In a number of languages, the vowels in clitic syllables harmonize with a host vowel. Basque exhibits a rule of low vowel assimilation in which a low vowel is raised to /e/ after a high vowel. This rule also applies to phonological clitics in the Gernika dialect. Compare the following two instances of the clitic numeral *bat* 'one' in Gernika-Basque: [aśto=**βat**]'one donkey' and [laɣum=**bet**] 'one friend'. In the second example, the vowel of phonological clitic is raised to /e/, since it follows a syllable with the high vowel /u/ (Hualde 1991: 56). The vowel of the second person enclitic /Vk/ in Maltese is subject to the general rule of roundness assimilation. This element may surface as one of the three allomorphs /ok/ after stems with /o/, such as *omm**-ok*** 'your mother', /ak/ after historically stem-final /'/ as in *tiy**-ak*** 'your' or as /ek/ in all other contexts, for instance in *ra:s**-ek*** 'your head'. For the first allomorph /ok/, a harmony rule copies the roundness feature of the stem vowel to derive the surface form. Note that this rule may also operate on vowels only present in underlying forms. For instance, the underlying form *yɪ:hod**=Vk*** contains the round vowel /o/ whose rounding feature can spread to the enclitic, yielding *yɪ:hod**=ok***. However, this form is again input to a syncope rule which deletes the round vowel of the stem. The surface form *yɪ:hd**=ok*** therefore lacks the stem vowel /o/ (Borg 1997: 276). Udihe provides an example of a language in which vowel harmony is sensitive to height and roundness features. In this

system, vowels pattern as non-round low, non-round mid and round mid. The enclitics *dA* 'additive focus', *kA ~ kAi* 'contrastive focus', *nA* 'contrastive focus', *lA* 'contrastive focus/new topic', *gdA* 'contrastive focus/limitative', *zA* 'hortative', *sA* 'focus', *gA* 'focus/hortative' and *tA* 'restrictive focus' therefore come in three surface forms with vowels harmonizing with the vowel of the host. For instance, *dA* will surface a) with a non-round low vowel if the host contains a vowel with these features, as in *aka=**da*** 'and the back', b) with a non-round mid vowel if preceded by a non-round mid vowel, as in *tege=**de*** 'and the gown' and c) with a round mid vowel after a round mid vowel host as in *moxo=**do*** 'and the cup' (Nikolaeva & Tolskaya 2001: 87). In Finnish, vowels harmonize with respect to the features front vs. back. Across morpheme boundaries, the specification of the vowels in the suffixes and enclitics are determined by the last non-neutral vowel of the base. This means that the interrogative clitic *kO* will surface either with a front vowel after a front vowel host as in *Pertti=**kö*** 'Pertti?' or with a back vowel after a back vowel host as in *on=**ko*** 'Is?' (Nevis 1986: 9f.; Sulkala & Karjalainen 1992: 378). In Nigerian Pidgin, proclitic auxiliaries, like the incompletive marker *dè*, either assimilate to the quality of the following vowel or are centralized to [ə]. For instance, the vowel of the aspect marker *dè* in *A **dè** wo̲k* 'I am working' can be realized either as a harmonizing [ɔ] or as a centralized [ə] (Faraclas 1989: 545). Vowel assimilation triggered by both vowels and consonants is found in Amele. The plural possessed morpheme /el/ undergoes regular vowel assimilation in which /el/ is converted to [il] after the [-high] vowels /e, a/ and to [ul] after /h, ʔ, g/.[23] Accordingly, the clitic will surface as [ul] following the host-final /g/ in *jo as-ag=**ul*** (house grandparent-3s.Poss=**Pl**) 'the boss of the houses' (Roberts 1996: 8, 48f.). Vowel harmony can also operate within a polysyllabic clitic. In Tariana enclitics, which appear in word-final position and bear secondary stress on the last syllable, the pre-tonic vowel is assimilated to the stressed vowel, e.g. *nakù* 'topical non-subject' becomes *nukù* and *pidenà* 'remote past inferred' becomes *pidanà*. Note that the form with the assimilated pre-tonic vowel is the only variant used by younger speakers (Aikhenvald 2003a: 45). In some languages, such as Chukchi and Yoruba, clitics fall outside the domain for vowel harmony.

[23] Note that the output forms of the first rule will contain the diphthongs /ei/ and /ai/, respectively.

Weakening is another type of syllabic process which applies to vowels in clitics. This type consists of various degrees of vowel reduction and, finally, vowel deletion. In the case of the Maltese first person plural enclitic *na*, the presence of the clitic blocks pre-tonic vowel deletion in open syllables. For instance, when the morpheme *na* functions as a subject agreement suffix in the combination /hareğ-na/ 'we went out', the pre-tonic vowel /a/ will be deleted in the first open syllable of the word: *hriğ-na*. When this morpheme functions as an object enclitic, however, the application of this deletion rule is blocked. Accordingly, /hareğ=**na**/ 'he took us out' will surface, retaining the vowel in the first open syllable *harig̃=**na*** (Borg 1997: 279). Vowel reduction can affect the quantity of a vowel or the quality of a vowel. Comparing the Tariana Aktionsart enclitic *kàwhi* 'do early in the morning' with its non-clitic verbal counterpart *ka:whi* 'wake up; be early in the morning' which can also be used as an adverb, we encounter the possibility of a long vowel being shortened in the process of encliticization, in this case /a:/ is shortened to /a/. Note that in this process the primary stress on the long vowel seems to be reduced to secondary stress (cf. the examples in Aikhenvald 2003a: 346). Reduction of vowel quality comes in a number of flavors. When the Koyra Chiini plural morpheme *yo* appears in an enclitic postpositional phrase, its vowel /o/ is unrounded to *ye* ~ *ya*. This process seems to be triggered by the preceding consonant, which causes relaxation of the secondary labial articulation, and by the lack of phonetic stress, which may enhance vowel reduction (Heath 1999: 44). Amele has a rule of vowel laxening, which affects the word-final tense vowel /a/ in unstressed open syllables. For example, in a word like *maha* 'ground', with stress on the initial syllable, /a/ will be realized as [ə]: [ˈmæhə]. Now when an enclitic, such as *na* 'locative', is attached to such a word, the final vowel of the host will not count as final anymore. Instead, the vowel of the clitic will be treated as a final vowel and will undergo laxening: *maha=**na*** [mæˈhæ**nə**] 'on the ground'. With respect to this rule, host-clitic combinations in Amele act as one phonological word (Roberts 1996: 7). Another example of vowel laxening in unstressed syllables comes from Koyra Chiini, where the vowel of the first person singular pronoun *ay* [aj] is laxened to *ey* [ɛj] when it appears as an unstressed enclitic to the verb, e.g. *a kar=**ey*** 'she hit me' (Heath 1999: 20). In Kayardild, vowels undergo centralization when they appear in unstressed syllables. Accordingly, the second /a/ of the word *balanangku*, being unstressed, will reduce to

[ɐ]: [ˈbalɐˌnaŋkω]. Vowels in enclitics are subject to the same rule of vowel reduction, i.e. when these elements are not secondary stressed (see 2.1.1.1.) their vowels will centralize. For instance, in the clitic cluster *dangka=**tha=ka*** (person=**THA=FOC**) the first enclitic *tha*, which functions as a syllabic filler, will receive secondary stress, while the last enclitic *(a)ka* 'focus' will remain unstressed. In this phonological context, the final /a/ of *(a)ka* will regularly reduce to [ɐ] (Evans 1995a: 59, 597; p.c.). Vowel centralization in clitics is also reported for Nigerian Pidgin (Faraclas 1989: 557) and Mandarin Chinese (Chao 1968: 36).[24] In Catalan, the seven phonemic vowels which constitute the vowel inventory of the language reduce to three in unstressed syllables: /u, o, ɔ/ reduce to [u], /e, ɛ, a/ reduce to [ə] and /i/ reduces to [i]. The rule of vowel reduction also applies to unstressed proclitics such as the preposition *amb* 'with', which surfaces with a reduced vowel [ə] in combinations like ***amb** ordre* [**əmb**ór̄ðrə] 'with order' (Hualde 19992: 394). On top of that, certain unstressed proclitics like for example *de* 'of' lose their [ə] when followed by a vowel-initial host. This may be an example of the general rule of schwa deletion, which deletes schwas across word-boundaries when in contact with another vowel, e.g. *serà espanyol* [səráØspəɲó] 'he will be Spanish' (Hualde 1992: 407, Wheeler 1979: 287ff.). The same rules of vowel reduction described above also apply to unstressed enclitics. Accordingly, the pronominal enclitics *nos* 'us' and *en* 'partitive' will be realized with the reduced vowels [u] and [ə], respectively, when they constitute unstressed syllables in host-clitic combinations like *donár=**nos=en*** [dunár**nuzən**] 'to give us some' (Wheeler 1979: 34). Finally, the ultimate reduction of vowels is their deletion. Note that this deletion is not triggered by the junctural position of the vowel. As with all cases of vowel reduction discussed in this paragraph, the fact that the syllable is unstressed triggers the application of the rule. Tariana has a rule of pre-tonic and post-tonic vowel reduction by which /e, i, a/ are centralized to [ə]. Since this rule also applies to vowels immediately preceding secondary stressed syllables, this process is also observed in polysyllabic enclitics. For example, the clausal enclitics *makhà* 'recent past non-visual' and *tahkà* 'frustrative+recent past visual' are realized as [məkhà] and [təhkà], respectively, with

[24] See also Matisoff (1991: 387f.) on vowel reduction in clitic-like elements in the Southeast Asian language Lahu.

the pre-tonic vowels reduced to [ə] (Aikhenvald 2003a: 39). In other cases, this pre-tonic vowel reduction is only reported for rapid speech, e.g. in the aspect enclitic *yenà ~ yənà* ‘little by little’ (Aikhenvald 2000: 27f.). In enclitics with initial secondary stress, such as *mayã* ‘just about, almost’, this rule also affects the post-tonic vowel in rapid speech. Here, /a/ is centralized to [ə], and the enclitic will be pronounced as *mayə̃* (Aikhenvald 2000: 24, Aikhenvald 2003b: 12). In some cases, such as the verbal clitic *sità* ‘accomplished’, the pre-tonic, unstressed vowel is deleted, yielding the variant *sta*. However, the loss of the deleted vowel is compensated by the insertion of an epenthetic [ə] at the enclitic boundary: *əsta* (Aikhenvald 2003a: 35).

It is also possible to strengthen the clitic vowel by lengthening it. In Maltese, short vowels which appear in stressed syllables after stress shift are lengthened. For instance, when the enclitic *ha* ‘3sf.fem.’ constitutes the final syllable of a phonological word, it will remain unstressed and its vowel will surface as /a/: *ftaħt=**ha*** ‘I opened it’. However, when it constitutes the penultimate syllable of a word and receives primary stress, its vowel will be lengthened and will show up in its stressed allophone /ie/: *ftaħt=**ħie=lek*** ‘I opened it for you’ (Borg & Azzopardi-Alexander 1997: 358ff.). As we saw above, Maori proclitics are fully integrated into the domain for stress placement and may be stressed according to the general stress placement rules. Since length of the vocalic element is one of the most constant correlates of primary stress, vowels of stressed clitics will be lengthened. We already saw two such examples, with the proclitics *ka* ‘inceptive’ and *te* ‘the’ in the combinations ***kaa**hore* ‘no’ and ***tee**nei* ‘this’ (Bauer 1993: 507). When a proclitic and an enclitic combine in Tariana to form a clitic-only word, the proclitic element will receive primary stress. If the resulting form consists of two syllables only, the stressed vowel of the proclitic will be lengthened. Accordingly, when the proclitic connector *ne* ‘then’ fuses with the enclitic *mha* ‘present non-visual’, the combination [**né:=mhà**] carries primary stressed on the proclitic and the stressed vowel is phonetically lengthened (Aikhenvald 2002: 69). In Koyra Chiini, a morpheme-initial vowel is phonetically lengthened after a CVC syllable. This process also applies to initial vowels in enclitic postpositional phrases, such as *a se* ‘to her’ in sentences like *ay har=**aːse*** (1sg say=**3sg Dat**) ‘I said to her’ (Heath 1999: 40f.).

However, clitics may also fail to undergo regular vowel-lengthening rules in a language. When the last word of a yes-no question is monosyllabic in Georgian, the rise

of the intonation contour is accompanied by the lengthening of the final vowel, i.e. the vowel of the monosyllabic word. Compare the examples in (11).

(11) a. k'art'opils prckvniis? ↗ Georgian
potato he.peel
'Is he peeling the potatoes?'

b. ak=ac? / *ak=**aac**? ↗ ↗
here=too
'Here too?' (Harris 2002: 235)

In (11a.), the vowel of the monosyllabic word *prckvnis* 'he peels' carries the rise of the yes-no intonation contour and its vowel is accordingly lengthened. In (11b.), however, the last monosyllabic word constitutes the conjunctive enclitic *(c)a* 'too'. In this case, Monosyllabic Lengthening does not apply and the vowel remains short (Harris 2002 235).[25] Therefore, for the sake of this rule, the enclitic forms one word with its hosts. Since this combination consists of two syllables, it ceases to be affected by this rule that affects monosyllabic words.

2.2.2.3. Syllables

In a number of cases, syllabic phenomena are not restricted to consonant or vowels in clitic syllables but operate on whole syllables or even higher prosodic levels. Tariana has a rule of nasalization for which the domain is the phonological word and, in informal rapid speech, the phonological phrase. If such a domain contains a nasal vowel or a nasal consonant, all vowels except *ɨ* and the consonants /d/, /l/, /ɾ/ and /y/ will be nasalized. For example, the phrase *di-nu=**niki** yeda-se* (3sgnf-come=**COMPL** downstream-LOC) 'he came completely downstream' may be realized as [ni-nu=**niki** nẽdẽã-sẽ] where the enclitic *niki* 'totally, completely' is fully integrated to the domain of this process (Aikhenvald 2003a: 42). This rule also operates on clitics which contain the nasalization triggering segments mentioned above, cf. sequencing enclitic *kayamì*

[25] This behavior is paralleled by the enclitic particle *ve* 'again' and the enclitic copula *a* 'is' which also fail to undergo Monosyllabic Lengthening. See Harris (2002: 235) for discussion.

‘after: different subject’ in which either the consonant /y/ or the pre-nasal vowel /a/ are nasalized in *kañamì* and *kayãmì*, respectively (Aikhenvald 2003a: 517).

In the encliticization of the Tariana verb *whyume* ‘be over, be last’, which has been grammaticalized as a sequencing enclitic ‘after, because: same subject’, this word underwent phonological reduction and metathesis in the first syllable. First, the initial glide /w/ is deleted, yielding the form *hyume*. Second, this form undergoes h-metathesis and is realized as *yuhme* (for the h-metathesis rule in Tariana see 2.2.2.1.) (Aikhenvald 2000: 21).

In some cases, syllabic phenomena result in the deletion of whole syllables. The proclitic object marker *lil* is often reduced to *’(i)l*. In this reduction, the initial consonant and the vowel of the cliticized element are deleted (Borg & Azzopardi-Alexander 1997: 137). Tariana enclitics ending in the sequence /ana/ optionally undergo segmental phonological reduction in rapid speech, in which this sequence is reduced to /ã/. This process seems to combine deletion of the final unstressed vowel with nasalization. For instance, the Aktionsart enclitic *khana* ‘away’ may be reduced to *khã* in rapid speech (Aikhenvald 2000: 20). Also, the unstressed syllable /pi/ can be deleted in the enclitics *pidanà* ‘remote past reported’, *pidakà* ‘recent past reported’ and *pidà* ‘present reported’, yielding *dana*, *daka* and *da*, respectively. This process is only reported for the rapid speech of younger speakers (Aikhenvald 2003a: 52).

Kayardild exhibits a rule of vowel deletion, which truncates the final /a/ of an intonational phrase/breath group (Evans 1995a: 63, 1995b: 751). The application of this rule is illustrated by the example in (12).

(12) marri-ja ri-ya=**ka** marri-ja ri-ya=**k**! Kayardild
listen-IMP east-NOM=**FOC** listen-IMP east-NOM=**FOC**
‘Listen to the EAST, listen to the EAST!’ (Evans 1995a: 392)

The utterance in (12), being composed of two clauses, forms one intonational phrase. The final /a/ of this intonational phrase, which belongs to the focus enclitic *(a)ka*, is regularly deleted in this phonological context. The first instance of *(a)ka* does not undergo prosodic truncation of its final /a/, as it does not constitute the final /a/ of an intonational phrase. Presumably related to this rule of prosodic truncation is the allomorphy encountered with the third person nominative pronoun *niya*. For

phrase-final, postverbal position, this pronoun developed a reduced variant *ni* which shows some clitic properties (Evans 1995a: 93, 201). Note that due to the distribution of this element it is highly likely to constitute the final syllable of an intonational phrase. In this case, the rule of prosodic truncation would regularly delete the final /a/ of the pronoun yielding a reduced form *niy*. Additionally, to arrive at the actual form *ni* the sequence /iy/ needs to be simplified to /i/. However, this explanation for the development remains rather speculative since there are no diachronic data or analyses available.

2.2.2.4. Summary

The various processes of structure preservation, assimilation, weakening and strengthening observed with consonants, vowels and syllables at the syllabic level are summarized in Table 8.

Table 8: Syllabic processes in cliticization

	Consonants	Vowels	Syllables
Structure preservation	[None]	Blocking of V deletion Blocking of V lengthening	[None]
Assimilation	CV assimilation (Dissimilation)	Vowel harmony	Nasalization (Dissimilation)
Weakening	[Not reported]	Vowel reduction Vowel deletion	Syllable Deletion
Strengthening	[Not reported]	Vowel lengthening	[Not reported]

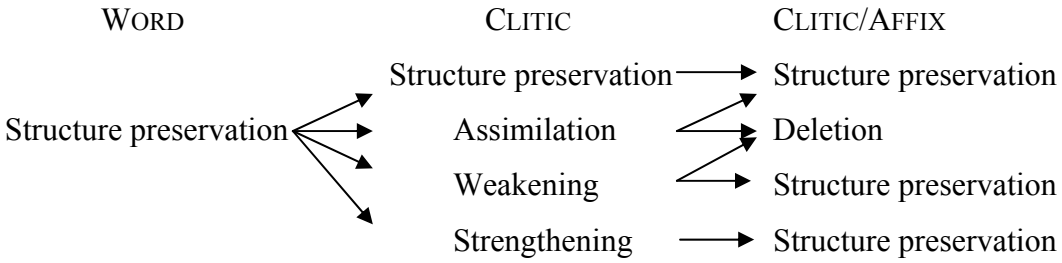
2.2.3. Segmental clines in cliticization

The data compiled in this section allow us to distinguish four types of segmental effects of cliticization. First, by the blocking of phonological processes in the host-clitic combination, or by the sheer absence of such processes, the segmental structure of both host and clitic may be preserved. Second, the clitic element may be subject to, or trigger, assimilation rules which adapt the cliticized element to its phonological context. Third, the weakening process may affect junctural consonants and vowels, or other consonants and vowels in the syllables of clitics. This weakening can ultimately lead to the deletion of the segment in question. Fourth, the segmental composition of host-clitic

combination may also be strengthened by the lengthening of segments or the insertion of segments.

In a restricted set of cases, the synchronic variation with respect to segmental rules in words, clitics and affixes allows the establishment of gradual segmental clines for cliticization as illustrated in Figure 3.

Figure 3: Segmental clines in cliticization



Firstly, when a word cliticizes and a clitic is affixed, it may be that no segmental rules at all apply. In this case, ongoing grammaticalization is not accompanied by a change in the segmental composition of the element in question. In Tariana, the majority of verbs and adverbs which are cliticized as Aktionsart enclitics preserve their segmental composition in grammaticalization; as was seen in the case of the free adverb *thepí* and the Aktionsart enclitic *thepì* 'in(to) water', discussed in 2.1.1.2. In Nigerian Pidgin, where the 3rd person object pronoun *am* is encliticized to the verb and has to be considered highly grammaticalized towards affix status, the segmental composition of the element is fully retained even in ongoing affixation, cf. 1.2.3.3.

Secondly, the segmental composition of a cliticized word may change due to assimilation rules that apply to bound morphemes only. We encountered such a case with the Basque Palatalization rule, which affects clitic-initial and affix-initial /d/, but not word-initial /d/, cf. 2.2.1.1.1. This suggests that assimilation will alter the form of the cliticized element; when such an element is affixed, however, there is no further change and the structure will be preserved. Such behavior is also documented for assimilation across consonant clusters of junctural consonants, where in Koyra Chiini and Maltese the resulting geminate consonant is kept after cliticization, cf. 2.2.1.1.1. However, in some languages, West Greenlandic for example, assimilation across such

clusters is followed by rules of cluster simplification in which one of the adjacent consonants is deleted, cf. 2.2.1.1.1.

Thirdly, cliticization may be accompanied by weakening, for example vowel reduction in languages like Catalan. A final step of syllabic vowel reduction can be found in vowel deletion, as exemplified in Maltese, cf. 2.2.2.2. A similar case of weakening with subsequent deletion is evidenced with the Tariana approximative enclitic *ihà*. As an enclitic, its initial vowel is weakened to a glide after vowel-final hosts. When it acts as an affix, however, the initial vowel is deleted in vowel coalescence, cf. 2.2.1.2.1. However, this last step of deletion is not obligatory when a clitic grammaticalizes towards affix status. The weakened element may also retain its segmental composition when undergoing affixation.

Finally, when a word cliticizes, the segmental composition of the morpheme boundary may be strengthened by the insertion of epenthetic segments, for example the Tamil glide insertions in hiatus situations, cf. 2.2.1.2.1. Also, syllables of cliticized elements can be strengthened by vowel lengthening as observed in Maltese, cf. 2.2.2.2. In such cases, further grammaticalization towards affix status is not necessarily associated with further segmental changes. It should be noted that in all options discussed so far, the output form may be subjected to further segmental changes. In principle, a fully grammaticalized affix can again be subject to structure preservation, assimilation, weakening and strengthening. For instance, when a vowel cluster at a morpheme boundary is resolved by consonant epenthesis, the resulting VCV constellation could again trigger processes of intervocalic consonant weakening.

2.3. Summary

Now that we have studied the cross-linguistic diversity of prosodic and segmental processes in cliticization in some detail, we are in a position to comment on the phonology of cliticization. Essentially, the synchronic data discussed in this section allow us to establish diachronic pathways in prosodic and segmental phonology that may accompany cliticization.

In prosody, cliticization may be accompanied by different processes in the various prosodic types. In stress phonologies, reduction of stress from primary to secondary to the loss of stress and the gradual integration into the domain for stress placement accompany the progress from word to clitic. In tone phonologies, tonal sandhi restricts the realization of tonal contrasts on clitic elements. Such processes may ultimately lead to a change in the underlying tone specification of cliticized elements over time. Prosodic integration of cliticized elements into low-level domains may lead to the application of special tonal processes such as OCP effects. In intonation phonologies, cliticization is associated with the loss of intonation peaks and the gradual integration into phrasal domains for the placement of intonation contours and peaks.

In segmental phonology, words may be subject to several processes when they cliticize and grammaticalize towards affix status. First of all, the morpheme boundary that results from the concatenation of host and clitic may be affected by processes of structure preservation, assimilation, weakening or strengthening. Consonant and vowel clusters at the morpheme boundary can thus be retained, and/or trigger assimilation rules or rules of cluster simplification and epenthesis. Syllables of cliticized elements may be retained, assimilated in vowel harmony, reduced in vowel reduction and deletion, or strengthened by vowel lengthening. The succession of these processes can be summarized in several segmental clines for cliticization. Whereas the segmental composition may be retained during the whole process, assimilation, weakening and strengthening can also alter the surface form of the cliticized element. When such elements undergo further integration into phonological word domains, processes of assimilation and weakening may be followed by subsequent deletion rules. However, in the migration into word domains, the segmental composition of the cliticized elements may also be retained in this last phase of phonological integration.

Since the prosodic and segmental clines in cliticization have been inferred from synchronic and cross-linguistic data, it is far from clear to what extent all languages will progress through the whole cline in morphologization. So far, we have not discussed possible restrictions on the progression on the phonological clines. A further question that immediately arises from the observations summarized in this chapter is that of possible correlations between prosodic processes of cliticization and segmental ones. In our survey, we only saw two cases in which prosodic and segmental processes are

immediately dependent on another. In a number of languages, vowel reduction in cliticization is associated by the stress reduction in the cliticized element and vowel lengthening is paralleled by the presence of stress in the cliticized element. In one case, an epenthesis rule repairs an OCP violation at the host-clitic boundary and is thus directly related to the prosodic integration of clitics into low-level domains for the sake of tonal sandhi.

In the following chapters, we will try to develop a typological perspective on the various prosodic and segmental effects of cliticization encountered in the languages of our sample. The basic idea behind our approach is that the phonological processes associated with cliticization within a language are constrained by the overall phonological organization of the language in question. We will adhere to the rhythm-based typology of stress-based, syllable-based and mora-based phonologies, which gives us the possibility of taking a systematic perspective on prosodic, phonotactic, and morphophonological properties of individual languages. In Chapter 3, we will outline this rhythm-based typology of language and will apply its methodology to the languages of our sample. After having situated the languages within this typology, we will try to establish correlations between the rhythmic properties of a language and possible phonological processes in cliticization in Chapter 4. We will see that rhythm constrains the progress of cliticized elements on the prosodic and segmental clines outlined in this chapter.

3. A rhythm-based typology of language

In the preceding chapters we documented clitic inventories in the languages of our cross-linguistic sample, and established processes in prosodic and segmental phonology that accompany cliticization and ongoing grammaticalization. From a typological perspective, the question to what extent these processes correlate in a systematic way within and across languages still needs to be answered. In order to address this question, this chapter will introduce a rhythm-based typology of language which aims at describing phonological systems in terms of interdependent properties in prosodic and segmental phonology. The constellations allowed for by this typology culminate in the three major prototypes of stress-based, syllable-based and mora-based phonologies. Chapter 4 will flesh out this typology with respect to possible phonological effects of cliticization in the various phonological climates. The ultimate goal behind relating the logically independent phenomena of cliticization and linguistic rhythm lies in establishing empirical correlations between the two aspects of linguistic structure and in predicting possible phonological effects of cliticization in languages of different rhythmic types.

In this chapter, we will first summarize major findings of previous work on linguistic rhythm (3.1.). Starting from the idea that linguistic rhythm results from the isochrony of morae, syllables or feet, we will review phonetic and psycholinguistic research which culminate in the deconstruction of rhythm as a result of isochrony. We will proceed by introducing a phonological understanding of linguistic rhythm which relies on differences in the phonological make-up of languages. Secondly, the parameters discussed in the literature for such a rhythm-based typology of language will be introduced (3.2.). The rhythmic organization of languages can be characterized by a number of prosodic, phonotactic and morphophonological properties, which will be discussed in some detail. Finally, we will test the hypothesis that languages show systematic co-variation across such parameters coherent with the idea of rhythmic types. Therefore, we will locate the languages of our sample within this rhythm-based typology (3.3.). Their values for the respective prosodic, phonotactic and

morphophonological parameters will be deduced and a cline from mora-/syllable-based rhythm to stress-based rhythm will be established.

3.1. Previous work on linguistic rhythm

This section will give a short overview of the major findings of work on linguistic rhythm during the last hundred years. The definition of the three major rhythmic types of mora-, syllable- and stress-timed languages in terms of isochrony will first be summarized. Secondly, the lack of phonetic evidence for this typology, which led to a general skepticism towards this classification, will be illustrated by the results of representative phonetic studies on the topic. However, attention will also be given to a number of psycholinguistic studies in speech perception, language acquisition and language processing, which provide support for the rhythm-based typology of language and give rise to phonological theories of rhythm, for instance in Metrical Phonology. Finally, we will introduce the recent understanding of linguistic rhythm as being due to a constellation of certain phonological properties in a language.

3.1.1. Linguistic rhythm as isochrony

The first formulation of a distinction between stress-timed and syllable-timed languages in modern times is usually attributed to Pike (1945).[1] For the purposes of his analysis of American English intonation he defines a single rush of syllables uninterrupted by a pause as a *rhythm unit*. Such a rhythm unit may be composed of a single word like [intonation], phrases like [the car] and whole sentences like [he said he would]. Each of these simple rhythm units contains one primary intonation contour with one strong stress forming the intonation peak, e.g. [the uni'versity]. In his view, the timing of such rhythm units constitutes an important characteristic of the phonological structure of English. The timing of such rhythm units in sentences can be illustrated on the basis of the following example.

[1] However, compare the distinction between 'machine-gun rhythm' and 'Morse code rhythm' in Lloyd James (1940). For the ancient predecessors and an exhaustive summary of pre-modern thought on rhythm see Dufter (2003: 3ff.).

(1) [ˈWhich is the] [ˈtrain for] [ˈCrewe], [ˈplease]? English
(Abercrombie 1967: 98)[2]

The sentence in (1) is made up of four rhythm units indicated by the bracketing. Each of these units constitutes a trochaic foot with an initial stressed syllable.[3] These feet follow another in a rhythmic succession in which the time interval between the prominent syllables tends to be isochronous. In order to maintain this rhythmic principle of evenly timed stresses with rhythm units consisting of different numbers of syllables, the syllables are "crushed" into shorter time limits where necessary. For example, the first foot in (1) contains three syllables, whereas the second contains two and the last two feet contain one syllable each. The first two feet can only be isochronous to the last two, if the length of the syllables is shortened in the second and even more so in the longer first foot. Another option lies in the lengthening of the last two feet. These processes are usually considered to complement each other in their effect on unstressed and stressed syllables. Whereas unstressed syllables tend to reduce, stressed syllables tend to lengthen in order to enhance *stress-timed* rhythm.[4]

In contrast to the stress-timed rhythm of English, Pike mentions the option of languages relating rhythm more closely to the syllable instead of stress. In this case, syllables tend to occur in even, isochronous time intervals. Abercrombie (1967: 98) illustrates this rhythmic type with the French sentence given in (2).

(2) C'est ab*so*lu*ment* ridi*cule* French
(Abercrombie 1967: 98)

According to Abercrombie, the italicized syllables in (2) will be realized with stress. In contrast to the timing in the English rhythm units in (1), the stressed syllables do not come in isochronous time intervals. Since all syllables tend to be equal in length, the time interval between the first and second stressed syllables, intervened by one syllable,

[2] See also Abercrombie (1964) for a typology of feet in English and the role of enclitics.
[3] The phonological phrasing of English utterances as trochaic feet has already been discussed in the traditional literature on English and Germanic (see among others Sweet 1904: 57, Sievers 1893: 18ff. and Saran 1907).
[4] Cutler (1980) found that production errors such as syllable omissions in spoken English also result in closer approximation to isochronous feet. There seems also to be an interdependence of vowel quality, vowel quantity and the locus of stress within the stressed syllable in stress-timed languages (Fox & Lehiste 1987).

will be shorter than the time interval between the second and third stressed syllables, which are intervened by two syllables. The rhythmic organization of languages like Spanish and French, therefore, do not impose any restrictions on the length of syllables within a foot, and vowels do not usually undergo abbreviations and vowel obscuration. For this second rhythmic type, Pike (1945: 34ff.) coined the term *syllable-timed*.

A third rhythmic type which is often neglected in the literature on linguistic rhythm is the so-called *mora-timed* rhythm of languages like Japanese.[5] To illustrate the principles of durational organization in such languages, we will summarize Bloch's (1950: 90ff.) discussion of the "staccato rhythm" of Colloquial Japanese. The auditory impression of this rhythm is based on the succession of "fractions", or in more modern terms *morae*, of about the same length (see also Martin 1975: 17). The various types of morae in Japanese are listed in the examples in (3).

(3)				
	C˙$_{[-voice]}$	[**s˙**-te-ru]	'throw away'	Japanese
	N˙	[hõ-**ŋ˙**]	'book'	
	V	[**o**-mu-u]	'thinks'	
	C$\underset{\circ}{\text{V}}$	[**sɯ̥**-su-mu]	'advances'	
	CV	[**to**-ko-ro]	'place'	
	CCV	[**kʏa**-ku]	'guest'	(Bloch 1950: 91)

As for long vowels, they are equal in duration to two of the morae listed above. For example, [ki˙-ta] 'heard' is as long as a word composed of three fractions like [to-ko-ro] 'place'. Given the fact that all these morae are realized with equal length, the duration of a phrase depends on the number of morae within this phrase. The phrase [yo-ko-ha-ma-no-mi-na-to-de] 'in the Yokohama harbor' contains nine morae and will therefore be three times as long as the phrase [to-ko-ro] 'place', which only contains three morae.

Whereas the classical classification based on Pike's work remains tentative and closely related to his analysis of American English, other authors demand a more central role of speech rhythm in language typology. Abercrombie (1967: 96ff.) attributes these differences to the syllable- and stress-producing processes which together make up the

[5] The term 'mora-counting' or 'mora-timed' goes back to the Prague School. Trubetzkoy (1939: 174f.), for example, distinguished between 'syllable-counting' and 'mora-counting' languages when discussing the nature of quantity oppositions (see also Trubetzkoy 1968: 35). It is noteworthy that the concept of 'stress-counting' languages is not included in his discussion, whereas the concept of 'mora-counting' languages is usually lacking in the classic literature on linguistic rhythm.

pulmonic air-stream mechanism. Syllable-timed rhythm is the result of an isochronous succession of chest-pulses, whereas stress-timed rhythm is determined by an isochronous succession of stress-pulses. Therefore, speech rhythm is only one aspect of a more general rhythm of movement. Abercrombie's (1967: 97) extreme position that "every language in the world is spoken with one kind of rhythm or with the other" has provoked a lot of discussion in the literature on rhythm and initiated a strong empirical interest in the phonetic reality of isochrony distinctions.

3.1.2. Deconstructing isochrony

The characterizations of Pike and Abercrombie make at least two straightforward predictions which can be tested by phonetic measurements. First, in languages spoken with stress-timing, syllable length should show considerable variation, whereas in languages spoken with syllable-timing, syllable length should be equal. Secondly, stress pulses should be evenly spaced in stress-timed languages and unevenly spaced in syllable-timed languages. These two hypotheses have been tested by Roach (1982) with data from Abercrombie's six exemplar languages: French, Telugu and Yoruba for the syllable-timed type and English, Russian and Arabic for the stress-timed type. For the measurements, intensity meter traces were made from tape-recordings of one speaker of each language. A sample of two minutes of each speaker's speech form the basis of the results summarized here. With respect to syllable length variability, the results of the measurements in Table 1 do not support the first hypothesis formulated above.

Table 1: Standard deviation of the syllable durations (measured in milliseconds) for the six languages in Roach's (1982: 74) sample

French	75.5	English	86
Telugu	66	Russian	77
Yoruba	81	Arabic	76

The results contradict the first hypothesis both within the two rhythmic types and across representatives of the two groups. First, the hypothesis predicts that French, Telugu and Yoruba should form a group in which syllable duration is comparably equal. However, the measurements of these three languages show heterogeneous standard deviations of syllable durations ranging from 66 milliseconds to 81 milliseconds. English, Russian

and Arabic, on the other hand, should form a group in which syllable duration is more variable compared to the first group. Here, the measurements range from 76 milliseconds to 86 milliseconds. Neither the putative syllable-timed nor the supposed stress-timed languages form a homogenous group. Second, members of these groups may show standard deviations which group them across this classification. Russian and Arabic clearly pattern with French with respect to this phonetic property, whereas English is closer to Yoruba than to the other stress-timed languages Russian and Arabic.

In order to test the second hypothesis of uneven versus even spacing of stress pulses, the inter-stress differences expressed in percentages were measured. Calculating the variance of the percentage deviations in the data leads to the following table.

Table 2: Variance of the percentage deviation in inter-stress intervals for the six languages in Roach's (1982: 77) sample

French	617	English	1267
Telugu	870	Russian	917
Yoruba	726	Arabic	874

In contrast to the results of the syllable duration measurements summarized above, the six languages of the sample fall into two groups with respect to the variance of inter-stress intervals. However, contrary to the prediction of the hypothesis, the so-called stress-timed languages differ from the syllable-languages in showing more variance in inter-stress intervals. A second way to test the second hypothesis is to calculate inter-stress intervals in proportion to the syllables they contain. In syllable-timed languages, such intervals should tend to be longer in proportion to the number of syllables they contain. The Pearson correlation coefficient for the association between percentage deviation and the number of syllables per inter-stress interval is given in Table 3.

Table 3: Pearson correlation coefficient for the association between percentage deviation and the number of syllables per inter-stress interval for the six languages in Roach's (1982: 78) sample

French	.41	English	.53
Telugu	.61	Russian	.61
Yoruba	.62	Arabic	.57

Again, the languages of the sample do not pattern as two groups with respect to this correlation and in some cases show parallel values across the classification, e.g. Telugu and Russian both have the value .61. To summarize, the phonetic measurements give no support for a categorial distinction between stress-timed and syllable-timed languages.

Although contradictory in some respects to Roach's (1982) results, the measurements of inter-stress intervals in English, Thai, Spanish, Italian and Greek, as conducted by Dauer (1983), also cast doubt on the idea of a typological contrast in stress isochrony. The results show that the mean duration of inter-stress intervals is proportional to the number of syllables in the interval in all languages examined, irrespective of their rhythmic type. Also, the recurrence of stresses is no more regular in English than in the other languages. Dauer (1983: 54) interprets these results as evidencing a universal property of the temporal organization in language, in which inter-stress intervals form the basic unit for the rhythmic task of speech production.

As for mora-timed languages, the durational properties of Japanese have been extensively studied from a phonetic perspective. The phonetic measurements presented by Han (1962a) confirm the analysis of vowel length, consonant length and syllabic nasals in terms of isochronous morae, cf. (3).[6] In her data, long vowels are twice as long as corresponding short vowels. For example, the bi-moraic word /i.i/ 'is good' is twice as long as the mono-moraic word /i/ 'stomach'. In pairs like /bo.ta.i/ 'mother's body' and /bo.o.ta.i/ 'bow tie', the extra-length of the second mora [o] matches the duration of the preceding mora [bo] consisting of a consonant and a short vowel. The duration of voiceless long consonants such as [kː] in /ha.kː.ka/ 'mint' is, with 20 centiseconds, roughly the same as in the neighboring morae [ha] and [ka]. This time interval is also evidenced in syllabic nasals such as [ŋː] in /ku.ŋː.i/ 'rank'. In this word, each mora lasts roughly 20 centiseconds, adding up to approximately 62 centiseconds for the whole word. Similar positive evidence for the moraic status of CV̥ sequences is presented in Han (1962b). In Japanese, the vowels /i, u/ are devoiced when they appear between two voiceless consonants or between a voiceless consonant and a pause. In such cases, the time dimension of the unvoiced vowel is taken up by the preceding consonant.

[6] Han (1962a: 71) refers to this basic unit of duration in Japanese as 'onsetsu'. However, her definition and discussion of this unit, especially in being different from the 'syllable' in other languages, in exhibiting approximately the same length and in being responsible for the staccato quality of Japanese, bring it close to our more recent understanding of the term 'mora' (see also Martin 1975: 17).

Accordingly, when the second vowel of the copula /de.su/ is devoiced, the consonant [s] will be realized twice as long as a corresponding [s] in another position. For instance the sentence /sa.se.ta.so.o de.su/ 'I heard that he caused someone to do so' will be realized as [sa.se.ta.so.o de.s:], with the [s] of the copula being twice as long as the two preceding [s] sounds. The mora [s:] therefore appears to be isochronous to other CV morae in the utterance, as predicted by the typology of isochronous morae in (3). Another piece of supporting evidence comes from the measurements of word durations by Homma (1981: 278f.). These reveal that the average word duration in Japanese is dependent on the number of morae in the word. The duration ratio of bi-moraic and tri-moraic words is accordingly 2:3. As promising as these results seemed to be, they were unable to be reproduced in later studies. Beckman (1982) tested the prediction of the mora hypothesis and the results of Han's earlier studies and found no convincing evidence supporting the moraic status of devoiced vowels, long consonants or for compensation within CV syllables (see also Hoequist 1983 and Nagano-Madsen 1992 for phonetic studies on the mora in Japanese).

The results of the studies summarized above clearly show the overall lack of phonetic evidence for the rhythm-based typology proposed by Pike (1945) and his followers. This pessimistic perspective prevails even if one acknowledges the possible flaws that result from the problems in determining what to measure in the speech signal (Roach 1982) and from the fact that even within a language like English, principles of stress-timed and syllable-timed rhythm are evidenced in different speech registers and phonological rules (cf. Pike 1945: 35; Dasher & Bolinger 1982; Bolinger 1986). Among the group of researchers working on the topic, several strategies have been utilized to cope with the overall negative outcome of the enterprise (cf. Bertinetto 1989: 101ff.). Some researchers are inclined to give up the hypothesis altogether while others propose new labels, reformulating the basic problem in terms other than that of isochrony. Presumably, more promising results can be achieved as soon as the problems of phonetic measurements and of the distinctions themselves can be formulated more precisely in the course of ongoing progress in research on this topic (cf. Ramus, Nespor & Mehler 1999).

On the other hand, a number of experimental findings in psycholinguistics underpin the psychological reality of the distinctions between different rhythmic types.

As Lehiste (1977) and Donovan & Darwin (1979) noted, isochrony can also be viewed as a perceptual phenomenon. Evidence in favor of this view comes from the perception of rhythm in infants (Ramus, Nespor & Mehler 1999), naïve speakers and phoneticians (Miller 1984) and even in native speakers of closely related, though rhythmically different, Romance languages (Dufter & Reich 2003). In this sense, the distinctions are real in that languages "sound" mora-, syllable- or stress-timed (Beckman 1982, Roach 1982). There is also evidence that the knowledge of linguistic rhythm guides language acquisition. Cutler & Mehler (1993) hypothesize that children are born with a bias towards attention to periodic sounds, i.e. mora, syllables, and feet, which equips them to use linguistic rhythm as a means to segment continuous speech signals into word units.[7] In adults, linguistic rhythm is also an important factor in word recognition. Speakers of stress-based languages, such as English seem to rely on stress pulses for the identification of word boundaries, whereas speakers of syllable-based and mora-based language, such as French and Japanese, make use of the rhythmic units of the syllable and the mora, respectively (Cutler 1999: 51ff.).

The apparent contradiction between the results in phonetics and the results in psycholinguistics certainly call for an explanation. One such explanation within the Generative paradigm is given by Selkirk (1984). In her argumentation, "[i]n measuring for isochrony, one is measuring only the performance of the score [i.e. the metrical grid, R.S.], and not the abstract patterning that makes it up" (Selkirk 1984: 39). Whereas performance obscures the underlying rhythm of a language, the perception of rhythm is said to be guided by linguistic competence in form of abstract metrical representations. The differences between so called stress-timed and syllable-timed languages are represented by different metrical grid alignments (see Liberman & Prince 1977; Hayes 1980, 1984, 1995 and Kager 1999: 142ff. for the formalism of Metrical Phonology). Compare the examples from English and Italian in (4).

(4) English vs. Italian

x x	x x x x
x x x x x	x x x x
a. The manager's here	b. il popolo

(Selkirk 1984: 40)

[7] See Nespor, Guasti & Christophe (1996) on the role of rhythm in the acquisition of word order.

Whereas each syllable in the Italian example (4b.) is aligned to a *basic beat*, only the primary stressed syllables, which "coincide with a pulse" (Selkirk 1984: 40) are aligned to a basic beat in English. Here, three syllables are not aligned with a basic beat but form *demibeats*. A hallmark of Metrical Phonology is the formal treatment of the so-called Rhythm Rule that repairs illicit sequences of stressed syllables which emerge in the formation of phrases.[8] When the English word *thirteen*, with main stress on the second syllable, is combined with the word *men* to form a noun phrase, the derivation results in a stress clash (two adjacent stresses). The application of the Rhythm Rule is illustrated in (5), using the formal conventions of Metrical Phonology.

(5)

	x	x	English
	x x	x x	
	x x x	x x x	
	a. thirteen men	b. thirteen men	(Liberman & Prince 1977: 316)

In (5a.), the stressed syllable of *thirteen* and the stressed syllable of *men* are in immediate adjacency and produce a stress clash. In (5b.), this stress clash is repaired by shifting the final stress of the word *thirteen* to the initial syllable. Note that the output of the Rhythm Rule exhibits an even alternation of strong and weak syllables, i.e. trochaic feet. With respect to the classical distinction between stress-timed and syllable-timed languages, stress clashes seem to be relevant for both rhythmic types, such that there is a strong force to repair the illicit sequence of adjacent stressed syllables and to create sequences of alternating strong and weak syllables. However, languages of the two rhythmic types differ in defining the notion "adjacency of stressed syllables." Whereas two stressed syllables separated by one unstressed syllable count as adjacent in stress-timed languages, such as English, they do not qualify as adjacent in syllable-timed languages like Italian. Another difference lies in the processes which repair stress clashes. Since stressed syllables in stress-timed languages are inherently longer than unstressed syllables, stress clashes can also be repaired by the lengthening of the stressed vowel, which inserts an additional beat into the metrical grid.

[8] Insights of Metrical Phonology help us to understand phonological processes in a number of ways. For instance, stress, high vowel deletion, Sievers' Law, poetic meter, and open syllable lengthening in Germanic can elegantly be handled with reference to foot structure (see Dresher & Lahiri 1991 and Lahiri & Dresher 1999). However, in general, work in Metrical Phonology hardly ever comments on issues raised by the study of rhythmic types in ways other than summarized below. See also Dufter (2003: 58ff.) for an overview.

Syllable-timed languages, which do not exhibit such an asymmetry of stressed and unstressed syllables with respect to duration, do not employ this strategy to eliminate clashes (Nespor & Vogel 1989). In this line of thought, Nespor (1990) denies the reality of a parameter 'stress-timing versus syllable-timing', and proposes that languages formerly attributed to the rhythmic types only differ with respect to metrical grid alignment and phonological processes such as the Rhythm Rule or Beat Insertion (Lengthening) which operate on stress clashes and stress lapses (sequences of more than two unstressed syllables).[9]

Although the achievements of Metrical Phonology cannot be questioned, the perspective on a rhythm-based typology of language taken within the paradigm leaves a number of issues open. From a typological perspective, the question arises of which phonological processes may be utilized in which languages to resolve stress clashes and stress lapses. The claimed systematic difference with respect to the application of Beat Insertion in stress- and syllable-based languages needs to be tested against more data, especially as all supporting evidence comes from European languages. The alternation of stressed and unstressed syllables which is said to be a driving force in the realization and perception of rhythm cannot be considered universal. As we already saw in 2.1., a number of prosodic systems, such as certain tone and intonation phonologies, do without prosodic prominence in the form of stress or metrical structure (see also Dufter 2003: 92ff. for a critique). Also, it is far from clear how the formal treatment of rhythm in stress- and syllable-timed languages can be extended to mora-timed languages.

Ultimately, the observed differences in languages of the various rhythmic types are related to phonological properties of the languages in question. Nespor & Vogel (1989: 112) explain the fact that two stressed syllables with one intervening unstressed syllable count as adjacent in English by the phonological behavior of unstressed vowels in stress-timed languages. In such languages, unstressed vowels are reduced in quality and quantity and therefore only minimally separate the two flanking stressed syllables. Since unstressed vowels remain full in syllable-timed languages, an unstressed syllable has enough substance to separate two flanking stressed syllables in such languages. Therefore, two stressed syllables with one intervening unstressed syllable qualify as non-adjacent in syllable-timed languages. Another phonological property of

[9] See also Arvaniti (1994) for an overview of research in the same vein and positive evidence from Greek.

stress-timed languages which contributes to stress clash resolution is the phonetic realization of stress. If duration is a phonetic correlate of stress, lengthening can eliminate illicit adjacent stressed syllables. The research paradigm in the study of linguistic rhythm to which we will adhere takes such properties in the phonologies of stress-, syllable- and mora-timed languages as its starting point. In the following section, we will lay out the assumptions and hypotheses that characterize this approach to linguistic rhythm.

3.1.3. The phonology of linguistic rhythm

The phonological basis of the typological distinctions between mora-timed, stress-timed and syllable-timed languages was discerned in the late 1970s and early 1980s by a number of researchers such as Bertinetto (1977), Beckman (1982), Dasher & Bolinger (1982), Roach (1982) and Dauer (1983). Facing the seemingly paradoxical finding of the impressionistic and perceptually intuitive classification of rhythmic types and the lack of supporting evidence in their experimental data, all of them sought a solution in specific phonological phenomena of the languages in question. The phonological properties most often discussed in this context are vowel reduction in unstressed syllables in stress-timed languages and simple syllable structure in syllable-timed language, which enhance a rhythmic perception of the respective languages. For mora-timed languages, simple syllable structure and the lack of length variation due to lexical stress have been mentioned as a source for the staccato rhythm of Japanese (Beckman 1982: 134). Precisely how many and which phonological properties are to be held responsible for the rhythmic organization of a language is, however, still open for discussion. Whereas Roach (1982) restricts his discussion to vowel reduction and syllable structure, Dauer (1983) also considers the phonetic realization of stress as a defining parameter of the typology. Bertinetto (1977), who was the first to take a phonological stand towards isochrony, lists four parameters: i) presence vs. absence of vowel reduction, ii) complex vs. simple syllable structure, iii) different effect of tempo accelerations, and iv) elastic vs. rigid position of lexical stress (see also Bertinetto 1981: 168ff., 1989: 108; Bertinetto & Fowler 1989: 71f.). In a later contribution of Dauer (1987), length distinctions and other prosodic features in tonal and intonational

phonology have been introduced, enlarging possible parameters of the typology (for a complete survey see Auer & Uhmann 1988, Auer 1993, Auer 2001 and section 3.2.).

It should be noted that at least one of the parameters introduced so far, namely syllable structure, has been positively tested in phonetic measurements and perceptual experiments. Ramus, Nespor & Mehler (1999) introduced a method which exclusively relies on the simple segmentation of speech into consonants and vowels.[10] The duration of vocalic and consonantal intervals in a language corpus consisting of the eight languages English, Dutch, Polish, French, Spanish, Italian, Catalan and Japanese has been measured, with three variables being derived from these measurements: i) the proportion of vocalic intervals within each sentence, noted as *%V*, ii) the standard deviation of the duration of vocalic intervals within each sentence, noted as Δ*V*, and iii) the standard deviation of the duration of consonantal intervals within each sentence, noted as Δ*C*. The results of the measurements for these three variables are given in Table 4.

Table 4: Proportion of vocalic intervals, standard deviation of vocalic intervals and standard deviation of consonantal intervals in Ramus et al.'s (1999: 272) sample

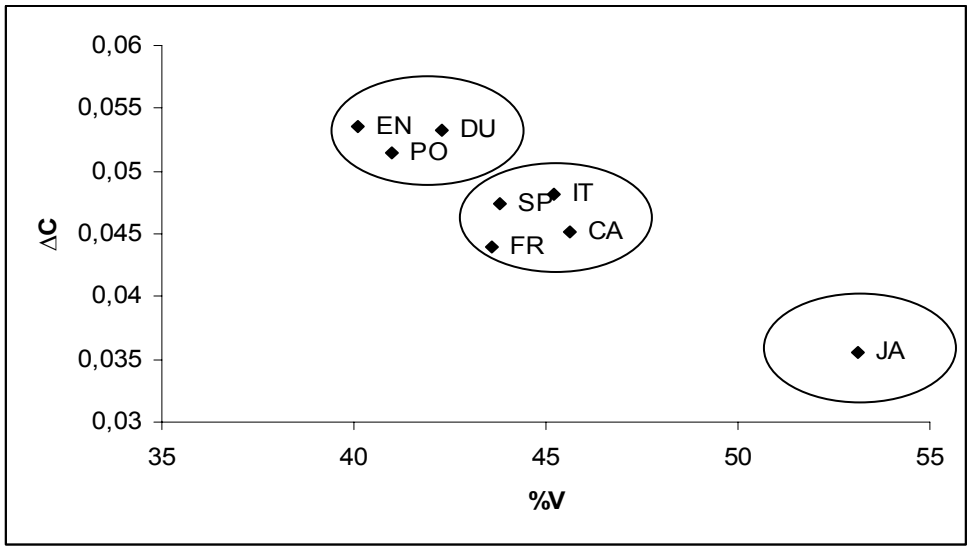
Language	%V (SD)	ΔV (SD) (× 100)	ΔC (SD) (× 100)
English	40.1 (5.4)	4.64 (1.25)	5.35 (1.63)
Polish	41.0 (3.4)	2.51 (0.67)	5.14 (1.18)
Dutch	42.3 (4.2)	4.23 (0.93)	5.33 (1.5)
French	43.6 (4.5)	3.78 (1.21)	4.39 (0.74)
Spanish	43.8 (4.0)	3.32 (1.0)	4.74 (0.85)
Italian	45.2 (3.9)	4.00 (1.05)	4.81 (0.89)
Catalan	45.6 (5.4)	3.68 (1.44)	4.52 (0.86)
Japanese	53.1 (3.4)	4.02 (0.58)	3.56 (0.74)

The results in Table 4 are ordered depending on %V. With respect to this value, the eight languages appear on a gradual cline which reflects the intuitive, former classification into rhythmic categories with English being the most stress-timed, through to the Romance languages, being syllable-timed, and finally Japanese, being mora-timed. The values for ΔC divide the eight languages up into three groups: English, Polish and Dutch versus French, Spanish, Italian and Catalan versus Japanese. Again, the measurements reflect previous rhythmic classifications. It is only ΔV which does not

[10] Compared to previous research which concentrated on phonological domains such as the foot, the syllable and the mora, the structure assumed by the authors is remarkably flat.

give results in line with the predictions of a rhythm-based typology. The authors attribute this to phonological factors such as vowel reduction, contrastive vowel length, vowel lengthening in specific contexts and the presence of long vowels which influence the variability of vocalic intervals. Figure 1 gives the projection of the data on the (%V, ΔC) plane.

Figure 1: Distribution of languages over the (%V, ΔC) plane in Ramus et al.'s (1999: 273) sample (error bars removed, circles added to the figure)



The three rhythm classes as represented in this diagram are significantly different from each other.[11] The authors computed an ANOVA by introducing the 'rhythm class' factor with Polish, English and Dutch as stress-timed, Japanese as mora-timed and the rest as syllable-timed. This statistical test gave a significant effect of rhythm class ($P < 0.001$) for %V and ΔC. A post-hoc Tukey test also showed that each class differs significantly from the two others in %V (each comparison $P < 0.001$) and ΔC ($P \leq 0.001$). For ΔV, no significant rhythm class effect was found (Ramus, Nespor & Mehler 1999: 272-273).

These results can be interpreted as being directly related to the phonotactics of the respective languages. First, the more syllable types a language permits, the greater variability in the number of consonants and in their overall duration in the syllable it

[11] Further evidence for the tripartite distinction of syllable duration is given in Hoequist (1983). In Japanese, this duration is influenced by morae, in English, by stress feet and in Spanish, no language specific characteristics could be found. Note that the difference between stress-timed and mora-timed languages is the clearest in both studies.

will show. This will result in an increase the ΔC value for this language. This also implies a greater consonant/vowel ratio on average, which manifests itself in a lower %V. Note that languages with high ΔC and low %V values permit many syllable types (around 15 for English, Dutch and Polish), whereas languages with a low ΔC and a high %V only permit a restricted set of syllable types (Japanese allows four syllable types). Counter to the former phonetic measurements, this paradigm gives robust phonetic evidence for the rhythm-based types postulated in the literature. However, it does so by dispensing with the idea that the duration of prosodic domains, such as the mora, the syllable or the foot, are responsible for the linguistic rhythmic of a language. The experimental results support the idea that the perceived rhythm of a language is a result of its phonological organization, in this case its phonotactic make-up. Future research will presumably find more reliable parameters in the speech signal to back up the rhythmic typology and the relevance of certain phonological properties for the rhythmic perception of a language.

The most recent rhythm-based typology of language is proposed by Dufter (2003). Widening the perspective by including insights from Metrical Phonology, he proposes a four way distinction on the basis of the two phonological parameters, time duration and prominence. In his conception, *mora-based rhythm*, as reported for Japanese, Finnish and West Greenlandic, is associated with distinctive length contrasts within the word domain; *phrase-based rhythm*, for instance in French and Korean, with distinctive length contrasts in the domain of the sentence. The *prominence-based rhythm* of English, German or Russian is characterized by the distinctive function of prominence within the word or sentence domain. Finally, languages such as Italian and Spanish which lack contrasts in length and prominence are grouped in the class of *alternating rhythm*. For our purposes, the introduction of the phonological parameters of phonemic length and the role of prominence as defining characteristics of linguistic rhythm will be of major importance.

In the following section, we will follow the understanding of a rhythm-based typology which relies on phonological parameters in prosody, phonotactics and morphophonology. To avoid confusion with the somewhat dubious phonetic definitions of the various rhythmic types, we will henceforth refer to the three basic types as

mora-*based*, syllable-*based* and stress-*based* phonologies instead of the traditional terms mora-*timed*, syllable-*timed* and stress-*timed* language.

3.2. Parameters for a typological study of rhythm

In the preceding section, a number of properties of so-called mora-, syllable- and stress-based languages were introduced. In essence, these can be divided into three groups of parameters: prosodic, phonotactic and morphophonological. We will discuss relevant parameters within these groups and possible correlations among them, as they have been proposed in the literature. Prosodic parameters encompass the realization and placement of stress as well as its segmental effects and tone. Within phonotactics, syllable complexity, length contrasts and the nature of syllable division are mentioned as varying systematically across the various rhythmic types. Linguistic rhythm could also constrain morphophonological processes of assimilation, cluster resolution and vowel harmony. The question of whether rhythm also has an impact on the morpho-syntactic organization of language, as proposed by some authors, will only be discussed in the context of cliticization in this study. In contrast to previous discussions of relevant parameters such as, for instance, vowel reduction, which focused on the presence or absence of such a phenomenon, we will try as much as possible to take a diachronic and typological perspective and to establish reasonable clines connecting the end poles of the various parameters.

3.2.1. Prosody

In prosodic phonology,[12] four parameters have been proposed in the literature to distinguish mora-, syllable- and stress-based phonologies: phonetic correlates of stress, segmental effects of stress, stress placement and tone. We will discuss these parameters and their phonetic and diachronic motivations in turn.

[12] The term *prosody* is understood here as a cover term for suprasegmental features such as stress, tone, intonation, etc. See Lehiste (1970: 1) for the various definitions of the term.

3.2.1.1. Phonetic correlates of stress

As the name already suggests, stress as defined in 2.1. is a central property of stress-based phonologies. In the definition of a prototypic stress system given there, one culminative primary stress is realized within the domain of the phonological word. Usually, it demarcates the word boundary by imposing a metrical structure at one of the word's margins (see Hyman 2001 for a discussion of prototypical features of stress systems). Of particular interest for the prosodic parameter of stress in a rhythm-based typology is the phonetic realization of stress (Auer 1993: 9; Auer 2001: 1395). Prototypically, phonetic correlates of stress include pitch movement, duration and intensity/loudness. However, languages employing stress may differ with respect to these phonetic correlates of stress. A principle distinction can be drawn between *stress accent* and *non-stress accent* (Beckman 1986). In languages of the latter type, such as Japanese, accentual prominence is manifested by F0 alone, whereas duration and amplitude are not important cues. In stress accent systems such as English, on the other hand, material other than pitch is used to realize accent, in particular duration[13] and amplitude. Note that Beckman's exemplar languages, English and Japanese, constitute prototypical instances of stress-based and mora-based phonologies, respectively.

3.2.1.2. Segmental effects of stress

Another prosodic parameter relevant for a rhythm-based typology relies on the non-contained effect of stress on phonology in prototypical stress systems. In such phonologies, the presence or absence of stress can affect rules of segmental or tonal phonology. In particular, vowel reduction in unstressed syllables has received considerable attention in the literature on rhythmic types (Auer 1993: 6; Auer 2001: 1396).[14] A more exhaustive overview of such segmental effects of stress is presented by Bybee et al. (1998), who studied vowel reduction in unstressed syllables, vowel lengthening in stressed syllables and consonantal changes conditioned by stress, across a cross-linguistic sample of sixty-eight languages. Only a few consonantal changes have been reported in the languages of Bybee et al.'s sample. The authors distinguish three major categories of consonant mutation triggered by stress, namely changes in voice

[13] This is not to say that there is a one-to-one correspondence of stress and phonemic length in English. However, stressed vowels will be phonetically longer than their unstressed counterparts.
[14] See also Lehiste (1970: 139ff.) for an overview.

onset timing (aspiration in stressed syllables and voicing in unstressed syllables), lengthening of stops after stress, and general weakening of consonants in unstressed syllables (Bybee et al. 1998: 288ff.). Their major findings are captured by the two implicational universals given in (6) and (7).

(6) **Implicational universal I**:
The presence of vowel lengthening in stressed syllables implies the presence of vowel reduction in unstressed syllables (Bybee et al. 1998: 286).

(7) **Implicational universal II**:
The presence of consonant changes conditioned by stress in a language implies the presence of vowel reduction in unstressed syllables (Bybee et al. 1998: 288).

Vowel reduction appears to be the most widespread segmental effect of stress, but is far from being the only one. From a diachronic perspective, a possible cline in which vowel reduction precedes vowel lengthening and consonantal changes can be inferred from the two implicational universals above. In this line of thought, the innovation of duration as a phonetic correlate of stress arguably triggers the evolution of segmental effects of stress. Note that the presence or absence of pitch-accent in mora-based languages like Japanese has no effect on the duration of vowels within such syllables (Homma 1981: 278).

3.2.1.3. Stress placement

Apart from a purely demarcative function, stress may also be utilized to encode grammatical meaning or to mark lexical distinction (Auer 1993: 10; Auer 2001: 1395). Another aspect of stress often referred to in the literature is the unpredictable or even free placement of stress in stress-based phonologies. “Unpredictable” in this context means that stress placement does not follow purely phonological rules, such that all initial or final syllables will be stressed in a language. Instead, the morphological composition may condition special stress placement rules which deviate from the default stress placement. In the Bybee et al. (1998) scenario, unpredictable stress placement results from the reduction and complete loss of unstressed syllables. Accordingly, only languages which have already developed a high degree of segmental effects of stress will exhibit this phenomenon. In the following discussion we will leave

out this aspect, as the languages in our sample show hardly any traces of unpredictable stress. [15]

A diachronic scenario for the evolution of stress systems which makes reference to the phonetic realization of stress, segmental effects of stress and stress placement has been proposed by Hyman (1977) and later taken up by Bybee et al. (1998). In this scenario, stress originates from the reinterpretation of phrasal intonation patterns as accents on words. The innovation of duration as a phonetic correlate of prosodic dominance may cause the phonology of a language to develop segmental effects of stress, first vowel reduction in unstressed syllables, then lengthening of stressed vowels and consonantal changes triggered by stress. Finally, the loss of unstressed syllables may lead to changes in the placement of stress. For instance, if a language has penultimate stress and tends to reduce unstressed syllables, the word-final syllable may be lost in diachronic change. After the unstressed syllable has been deleted, stress will appear on the now final syllable of the word. Note that this account presupposes a positive correlation of weakly-realized stress and the lack of segmental effects thereof, on the one hand, and a positive correlation of strong stress and segmental effects thereof on the other hand. With respect to a rhythm-based typology of language, stress-based phonologies will constitute the final stage of this development, exhibiting phonetically strong stress, segmental effects of stress and idiosyncratic stress placement. Languages of the mora- and syllable-based types will go to the other extreme in showing phonetically weak stress, no segmental effects of stress and regular stress placement.

3.2.1.4. Tone

The rhythm-based typology makes several predictions with respect to tone (Auer 1993: 7, 55f.; Auer 2001: 1397). In contrast to stress, tones show distributional freedom such that multiple identical or non-identical tones may occur in the same word (Hyman 2001). Such a prototypical tone system can be considered *unrestricted*, because every

[15] The term "unpredictable" might seem a bit of an unfortunate choice. In principle, any stress placement can be predicted by a certain set of rules. Such rules may be of varying complexity even if they are to be stated in purely phonological terms. Compare stress placement in Finnish (initial) with stress placement in Maori (one of the last four morae, depending on phonological weight). Morphological conditioning may be another obstacle for simple stress placement rules which make reference to a word margin. However, even in such cases, stress placement may be entirely predictable when one considers the phonological and morphological composition of a word.

syllable may contain a distinctive tone.[16] Since tonal contrasts are optimally realized on full vowels, the realization of tonal contrasts and vowel reduction should be complementary. Such unrestricted tone systems should therefore only be possible in mora- or syllable-based languages that have not phonologized segmental effects of stress. In *restricted* tone systems, tonal contrasts may only be realized on a subset of syllables within a word. As Schadeberg (1973) and Voorhoeve (1973) noted for the Bantu languages Kinga and Safwa, respectively, the appearance of high tone may be restricted to one syllable per word. The realization of tonal contrasts in the Scandinavian languages is closely related to the realization of stress. The so-called accent 2 in North Germanic, for instance, occurs only in trochaic feet (see Lahiri, Wetterlin & Jönsson-Steiner 2005 for a recent analysis). Such an asymmetry of stressed and unstressed syllables is paralleled by the asymmetry of the segmental composition of such syllables in stress-based phonologies, i.e. full vowels/stressed and reduced vowels/unstressed. Note the resemblance to stress feet in the distribution of tonal contrasts. Since the distribution of tones in such languages is dependent on the metrical structure of the foot, such a tone system could be considered stress-based. In prosodic systems that combine properties of tone and stress systems, we can therefore expect a correlation of stress, tonal contrast and full vowels on the one hand, and of lack of stress, tone neutralization and reduced vowels on the other hand.

A strong conceptual bond between tones and syllables or morae stems from more recent discussions on the underlying representation of contour tones and the prosodic unit which functions as the tone-bearing unit (Hyman 2001: 1368, Yip 2002: 27ff.).[17] If such a contour tone is spread over two syllables, one could represent this fact by assuming two level tones on each syllable which surface as a contour tone in the output. In this case, the syllable would be the tone-bearing unit and the tonal system could be characterized as syllable-based. However, contour tones may also be realized on a single syllable. In such cases, the syllable has to be heavy, i.e. it has to contain a long vowel or a coda consonant. This is reported for Hausa, where falling tones only appear on heavy syllables. In these cases, the contour tone could be represented as two level tones which are associated with the two morae of the syllable. Here, the mora

[16] For the distinction *restricted* versus *unrestricted* tone language see van der Hulst & Smith (1988).
[17] See also Leben (1973) and Goldsmith (1976) for an autosegmental analysis of tones and their alignment to morae and syllables.

would be the tone-bearing unit and the tonal system could be characterized as mora-based (see also Blevins 1995: 208 for syllables or morae as tone-bearing units). In some cases, the need for a bi-moraic basis of contour tones could also lead to vowel lengthening, providing an additional mora in the surface form. In some languages, tones are also realized on segments like long nasals. This fact could be interpreted as further evidence for the mora as the tone-bearing unit. Remember that long nasal consonants and unvoiced fricatives constitute types of moraic elements in the mora-based system of Japanese, as summarized in (3).

3.2.1.5 Summary

In the context of a rhythm-based typology of language four prosodic parameters have been proposed, each allowing for cross-linguistic and diachronic variation. These parameters and their expected values for the three major types are illustrated in Table 5.

Table 5: Proposed prosodic parameters for a typological study of rhythm

		Mora-based	Syllable-based	Stress-based
i)	Accent	Non-stress accent (pitch)		Stress accent (pitch, duration, amplitude)
ii)	Stress effects	(None)		Vowel reduction Vowel lengthening Consonant changes
iii)	Stress placement	(None)	Fixed, predictable	Free, unpredictable
iv)	Tone distribution	Unrestricted		Restricted
	Tone-bearing unit	Mora	Syllable	Foot

3.2.2. Phonotactics

With respect to phonotactics, syllable complexity, length contrasts in vowels and consonants, and the nature of syllable divisions have been discussed as relevant parameters in the literature on linguistic rhythm. To what extent different values on these parameters can be indicative of a certain rhythmic organization will be summarized in the following paragraphs.

3.2.2.1. Syllable complexity

The dominance of simple CV syllable structure has been treated as a defining property of syllable-based and mora-based languages (Auer 1993: 7f.; Auer 2001: 1396; see also summary in 3.1.3.). Since coda consonants are extremely rare or even absent in such systems, intervocalic consonant clusters hardly ever appear. In stress-based languages, on the other hand, the presence of both complex syllable structure and consonant clusters in onset and coda position has been noted. In order to establish a possible diachronic cline for syllable complexity we will first look at the cross-linguistic variation in syllable types. We will then introduce data from language acquisition suggesting possible routes for the development of complex onset and coda clusters. The cross-linguistic variation in syllable types is illustrated in Table 6, adapted from Blevins' (1995) sample.

Table 6: Cross-linguistic variation in syllable types (Blevins 1995: 217)[18]

	V	CV	CVC	VC	CCV	CCVC	CVCC	VCC	CCVCC	CVCCC
Hua	-	+	-	-	-	-	-	-	-	-
Cayuvava	+	+	-	-	-	-	-	-	-	-
Cairene	-	+	+	-	-	-	-	-	-	-
Mazateco	+	+	-	-	+	-	-	-	-	-
Mokilese	+	+	+	+	-	-	-	-	-	-
Sedang	-	+	+	-	+	+	-	-	-	-
Klamath	-	+	+	-	-	-	+	-	-	+
Spanish	+	+	+	+	+	+	-	-	-	-
Finnish	+	+	+	+	-	-	+	+	-	-
Totonac	-	+	+	-	+	+	+	-	+	+
English	+	+	+	+	+	+	+	+	+	+

The first apparent generalization is that all languages have the most unmarked and simplest syllable structure CV. Second, if a language allows a cluster of *n* onset consonants, it will also allow a cluster of *n*-1 onset consonants. Third, if a language allows a cluster of *n* coda consonants, it will also allow a cluster of *n*-1 coda consonants. Fourth, if a language does not allow syllables consisting solely of V, then it does not

[18] V is used as a cover term for various possible nuclear elements such as short and long vowel or vowel sequences.

allow any V-initial syllables. As for syllable nuclei, the following cross-linguistic variation is documented in Blevins' sample.

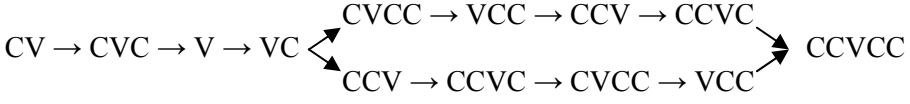
Table 7: Parametric variation in nuclear sequences (Blevins 1995: 217)

	V	V:	V::	V:::	VV	VVV	VVVV
Cayuvava	+	-	-	-	-	-	-
Yokuts	+	+	-		-	-	-
El Paraíso Mixe	+	+	+	-	-	-	-
Spanish	+	-	-	-	+	-	-
Witoto	+	-	-	-	+	+	-
Finnish	+	+	-	-	+	-	-
Estonian	+	+	+	-	+	+	-

Again, a number of generalizations can be made on the basis of this cross-linguistic data. First, if a language allows tautosyllabic sequences of *n* vowels, it also allows sequences of *n*-1 vowels. No language allows more than three vowels within a single syllable. Second, the presence of superlong vowels implies the presence of long and short vowels, the presence of long vowels implies the presence of short vowels. No language has more than a three-way contrast in vowel length.

The synchronic cross-linguistic patterns are highly suggestive of a gradual cline of increasing onset or consonant complexity and of a gradual increase of nucleus complexity. However, data from first language acquisition in Dutch, a language with complex onset and coda clusters, allows a closer look at the actual development of syllable complexity. In what follows, we will summarize the discussion in Levelt, Schiller & Levelt (1999/2000), which is informed by work on the acquisition of syllable structure (Fikkert 1994) and on the cross-linguistic distribution of syllable types (Blevins 1995). Figure 2 summarizes the various steps in the development of syllable complexity.

Figure 2: Steps in the development of syllable types (Levelt et al. 1999/2000)



In the course of the development sketched above, the universal and optimal CV syllable is acquired first. In a second step, coda consonants are acquired, yielding the syllable structure CVC. This gradual increase in syllable complexity is followed by a decrease in

onset complexity when the onsetless syllable types V and VC are acquired. From this point on the scale, there are two possible routes for further development. First, complex coda cluster may be developed in CVCC syllables and the onsetless counterpart VCC before complex onset cluster in CCV and CCVC syllables appear. Second, complex onset clusters may be developed in CCV and CCVC syllables before complex coda in CVCC and VCC syllables appear. Both paths lead to the most complex syllable types CCVCC. Note that this acquistional development mirrors Blevins' (1995) cross-linguistic findings (Levelt & Vijver 1998).

From a diachronic point of view, certain preference laws for syllable structure constrain the evolution of complex consonant clusters or complex nuclei (Vennemann 1988). As for consonant clusters, they may result from stress-triggered reductions of unstressed syllables, which ultimately lead to the loss of vowels in such syllables. This is evidenced in the diachronic development of Germanic **harbista-* to Old High German *her.bis.to* to Middle High German *her.best* to German *herbst* 'autumn', where the unstressed vowels /i/ and /a/ have been reduced and finally deleted over the course of time, and a consonant cluster comprised of four consonants has arisen (Auer 2001: 1396). In addition, other rules of syncope and apocope can lead to consonant clusters (Vennemann 1988: 2). As for nucleus complexity, the lengthening of stressed vowels with subsequent diphthongization may lead to long vowels and vowel sequences in syllable nuclei. Another possible diachronic process which leads to vowel sequences can be found in the weakening and eventual deletion of intervocalic consonants.

With respect to linguistic rhythm, the prototypical stress-based language English allows all syllable structures given in Table 6. Onsets in English syllables may consist of consonant clusters of up to two segments,[19] and codas may consist of up to three consonants. With respect to nucleus complexity, the asymmetry of stressed and unstressed syllables in such languages may impose restrictions on the appearance of vowel length contrasts and diphthongs in unstressed syllables. The prototypical syllable-based language Spanish also allows bi-consonantal onsets but is far more restrictive with respect to consonant clusters in syllable codas. In this position, only one consonant is permitted. With respect to nucleus complexity, Spanish has no vowel length contrast and accordingly only exhibits short vowels in syllable nuclei and permits

[19] Onset clusters of three segments, for instance in ***spr****ing*, are lacking in Blevins' (1995) characterization of English onset consonant clusters.

vowel sequences of up to two vowels. Closest to the optimal syllable structure of syllable-based languages come Hua and Cayuvava, both allowing a maximum of one onset consonant, and no coda consonants, thus being characterized by low syllable complexity. With respect to nucleus complexity only single short vowels are allowed in Cayuvava. The oft-cited prototypical mora-based language, Japanese, also comes close to this optimal CV structure in allowing maximally two onset consonants, i.e. a consonant and a semi-vowel, and no coda consonants at all (Bloch 1950: 118f.).

When languages allow consonant clusters, a major difference has been hypothesized for the degree of sonority within such clusters in stress- and syllable-based languages (Auer 1993: 53f.). It is generally assumed that the order of consonants in a consonant cluster follows a certain pattern which is referred to as the Sonority Hierarchy or the Sonority Scale. In (8), this scale is given in the order of increasing sonority (Gussenhoven & Jacobs 1998: 152).[20]

(8) Obstruents > Nasals > Liquids ([l, r] etc.) > Glides ([w, j] etc.) > Vowels

In an optimal onset cluster, the order of the consonants follows the order of increasing sonority given in (8). For instance, an onset cluster like /kw/ in English /kwest/ *quest* obeys the sonority principle such that a stop consonant is followed by a glide. In an optimal coda cluster, the order of the consonants follows the order of decreasing sonority, i.e. the reverse order of that given in (8). The coda cluster /st/ in English /kwest/ *quest* again obeys this principle, such that a stop is preceded by a more sonorant fricative. With respect to the rhythm-based typology of language, consonant clusters disobeying the sonority principle are usually associated with stress-based languages like English. In a word like *sports*, for instance, both the onset and the coda cluster disobey the sonority principle. In the onset /sp/, a fricative is followed by a less sonorant stop. The coda cluster obeys the sonority principle in so far as the stop /t/ is preceded by a more sonorant liquid. However, it also disobeys this principle because the stop /t/ is followed by a more sonorant consonant, namely the fricative /s/. In languages of mora- or syllable-based rhythm, on the other hand, such violations of the sonority principle in consonant clusters are not expected.

[20] Note the similarity to the Universal Strength Hierarchy given in (10) in Chapter 2 and the references given there.

3.2.2.2 Length contrasts

Although syllable-based and mora-based phonologies share a number of properties with respect to syllable complexity, the latter are characterized by an additionally phonotactic property. Japanese, for instance, has contrastive length in consonants, e.g. *ita* 'existed' vs. *itta* 'went', and vowels, e.g. *sedai* 'generation' vs. *seedai* 'splendid' (Han 1962a: 69f.). In languages with mora-based phonology, such length contrasts appear independent of stress and constitute a defining characteristic of this rhythmic type. As mentioned above, in stress-based systems there is a tendency to allow such length contrasts in stressed, but not in unstressed syllables (Auer 1993: 6f.; Auer 2001: 1397).[21]

3.2.2.3. Syllable division

A final phonotactic parameter which has been discussed in the literature on linguistic rhythm is the nature of syllable division in languages of the various types (Auer 1993: 8f., Auer 2001: 1397). Due to the higher number of phonemic contrasts in stressed syllables and the reduction of unstressed syllables in stress-based phonologies, stressed syllables tend to show a higher degree of complexity. Such syllables can also attract some of the consonants of adjacent syllables. In such cases, syllabification can be ambiguous and variable, in that the resulting consonant clusters are broken up at different points. Intervocalic single consonants may function both as codas and onsets at the same time. In mora- and syllable-timed languages, only intervocalic geminates are unambiguously syllabified as codas and onsets at the same time.

3.2.2.4. Summary

In summary, prototypical mora-, syllable- and stress-based phonologies are associated with the values indicated in Table 4 on the parameters syllable complexity, length contrasts and syllable division.

[21] However, even dialects of a single language can exhibit a considerable degree of variation with respect to length contrasts. See, for instance, Kohler (1995: 113) and Kraehenmann (2003) for the distribution of geminates in dialects of German.

Table 8: Proposed phonotactic parameters for a typological study of rhythm

		Mora-based	Syllable-based	Stress-based
v)	Syllable complexity Sonority	Low Obeyed		High Disobeyed
vi)	Length contrasts	In all syllables		Not in unstressed syllables
vii)	Syllable division	Unambiguous		Ambiguous

3.2.3. Morphophonology

Apart from the generally accepted parameters in prosody and phonotactics, a couple of morphophonological properties have been suggested for the study of linguistic rhythm. Of particular interest for our purposes are assimilations, cluster resolution and vowel harmony.

3.2.3.1. Assimilations

If a language allows complex consonant clusters, a number of assimilation phenomena may operate across these segments. Since such clusters are far more common and complex in stress-based phonologies, more assimilations may be expected in such languages. Languages of the other two rhythmic prototypes, on the other hand, rarely exhibit such consonant clusters and, accordingly are less likely to have such assimilations (Auer 1993: 8; Auer 2001: 1397). However, it should be noted that, apart from CC sequences, other combinations might as well provide a context for certain assimilation rules. VV sequences, for instance, may provide an environment for vowel assimilation, while VCV sequences may trigger rules of intervocalic consonant weakening or assimilation. Note that the frequency of such phenomena is also dependent on the phonotactic make-up of a language, such that languages allowing complex syllable nuclei are more likely to show vowel assimilation and languages with strict CV phonotactics provide more contexts for intervocalic processes.

3.2.3.2. Cluster resolution

Phonotactic restrictions on consonant and vowel clusters may trigger processes of epenthesis and cluster simplification which apply to illicit junctures resulting from the

concatenation of morphemes. Consonant clusters may be resolved by the insertion of epenthetic vowels or by the deletion of one of the adjacent consonants in cluster simplification. In hiatus situations, an overall CV structure is preserved by consonantal epenthesis which breaks up the illicit vowel sequence or by vowel coalescence where a complex syllable nucleus is simplified to a simple one by the deletion of one of the adjacent vowels. Note that these processes are conditioned by different degrees of syllable complexity. In mora- or syllable-based languages, complex syllable onsets, codas or nuclei are avoided and the preferred CV syllable structure surfaces (Auer 2001: 1396). Since stress-based languages are characterized by a high degree of syllable complexity, repair strategies for consonant and vowels clusters are expected to be infrequent or even lacking in morphophonology.

3.2.3.3. Vowel harmony

Another observation with respect to morphophonological rules comes from vowel harmony processes (Auer 1993: 9; Auer 2001: 1397f.). In these processes, vowel features spread over entire word domains, with the effect that all vowels of a complex word-form harmonize with respect to these features. In order to harmonize with preceding or following vowels, the place features of vowels need to be retrievable in their surface forms. Logically, this excludes the co-occurrence of vowel harmony and vowel reduction, since the latter process neutralizes the place features of the unstressed vowels. This incompatibility suggests that vowel harmony should only occur in mora- or syllable-based languages, and not in stress-based languages which reduce unstressed vowels.

In this study, we will not consider claims which are concerned with the domains for the application of morphophonological processes. For instance, it has been claimed that syllable-based languages will show no word-related processes and that there will be no distinction between internal and external Sandhi rules (Auer 1993: 9). We will comment on this more complicated issue in the final chapter where we will discuss the relevance of the concept *Clitic Group* in Prosodic Phonology.

3.2.3.4. Summary

The morphophonological parameters relevant for our purposes are given in Table 9, again with an indication of the expected values for mora-, syllable- and stress-based phonologies.

Table 9: Proposed morphophonological parameters for a typological study of rhythm

		Mora-based	Syllable-based	Stress-based
viii)	Assimilations	Few		Frequent
ix)	Cluster resolution	Yes		No
x)	Vowel harmony	Possible		No

3.2.4. Morpho-syntactic parameters

A number of researchers who adhere to the basic typological distinction between syllable- and stress-timed languages also proposed a number of morpho-syntactic parameters for this typology (Donegan & Stampe 1983; Gil 1986, Auer 2001). This classification relies on the general trochaic or iambic organization of language. Since stress-timed languages are generally trochaic, they are conceived as being prefixing, procliticizing, more analytic, overall flexive or isolating and VO. Syllable-timed languages, on the other hand, are generally iambic and said to be suffixing, encliticizing, more synthetic, agglutinative or polysynthetic and OV. Within the limitations of the present study, the majority of these parameters cannot be efficiently tested, since all of them call for precise definitions and accessible parameters for a typological study. Instead, we will concentrate on a very specific question with respect to cliticization, namely what possible segmental effects may be encountered in the languages of the different rhythmic types. Ultimately, the results of this research may enlighten our understanding of what kinds of morphological markers can be expected from a diachronic process of cliticization.

3.2.5. Summary

The following ten phonological parameters in prosody, phonotactics and morphophonology will be used to identify the position of the nineteen languages of our sample on the cline from mora- and syllable-based phonologies to stress-based ones. Table 10 summarizes the parameters and the expected values for the three rhythmic prototypes as they have been proposed in the literature summarized above.

Table 10: Phonological parameters proposed for a typological study of rhythm (cf. Auer 1993: 14)

		Mora-based	Syllable-based	Stress-based
i)	Accent	Non-stress accent (pitch)		Stress accent (pitch, duration, amplitude)
ii)	Stress effects	(None)		Vowel reduction Vowel lengthening Consonant changes
iii)	Stress placement	(None)	Fixed, predictable	Free, unpredictable
iv)	Tone distribution Tone-bearing unit	Unrestricted Mora	Syllable	Restricted Foot
v)	Syllable complexity Sonority	Low Obeyed		High Disobeyed
vi)	Length contrasts	In all syllables		Not in unstressed syllables
vii)	Syllable division	Unambiguous		Ambiguous
viii)	Assimilations	Few		Frequent
ix)	Cluster resolution	Yes		No
x)	Vowel harmony	Possible		No

3.3. The languages of the sample

Since the discussion of rhythmic types is usually focused on better known languages from the Germanic or Romance language families, the majority of the nineteen languages in our sample have not been thoroughly studied in this context. The mora-based phonology of Maori has been noted as a side issue in Holmes & Ainsworth's (1996) study on New Zealand English. Balasubramanian's (1972-73, 1975,

1980, 1981a, b) phonetic studies on the durational properties of Tamil initiated a discussion revolving around mora-based rhythm, since the results neither pointed at stress- nor at syllable-timing. Nagano-Madsen (1992) studies various aspect of the mora-based rhythm in Eskimo and Yoruba, the latter being Abercrombie's (1967) classic example of a syllable-timed language. The mixed status of Catalan in having stress-based vowel reduction and syllable-based phonotactics has been noted by Ramus et al. (1999). In Dufter's (2003) four way distinction, West Greenlandic and Finnish are classified as mora-based phonologies. In Hurch (1988) the rhythmic structure of Basque as a syllable-based language is examined on the basis of fourteen phonetic and phonological features. In a similar vein, we will establish the rhythmic organization of the nineteen languages in our sample by setting their respective values on the ten phonological parameters introduced in the preceding section.

The objective of the study of the various phonological parameters in the languages of our sample is twofold. First, we will use the cross-linguistic data to test the various hypotheses about the distribution of the phonological properties of rhythm and about possible correlations between the phonological parameters. Second, we will employ those parameters which prove to be reliable in evaluating linguistic rhythm as a means of determining the rhythmic profile of the languages in our sample.

3.3.1. Prosody

In prosody, phonetic correlates of stress, segmental effects of stress, stress placement, and tone have been proposed as diagnostic parameters for the typological study of linguistic rhythm. In this section we will set the values for the languages of our sample for each of these parameters, and will try to evaluate proposed correlations across these parameters.

3.3.1.1. Phonetic correlates of stress

The parameter of phonetic correlates of stress is not applicable to the intonation only prosody of West Greenlandic, the pure tone systems of !Xóõ, Slave, Yoruba, and the pitch-accent system of Basque. All these languages only employ pitch movement in their prosody (see 3.3.1.4. for the details of tone distribution and tone-bearing units).

The remaining fourteen languages of our sample make use of stress to varying degrees. With respect to the phonetic realization of stress, they fall into roughly three groups.

The first group comprises languages which are often said to have weak stress, namely Chukchi and Tamil. In these languages, stress is closely related to intonational phonology, such that intonation peaks in phrases and sentences are aligned to the prominent syllable. Therefore, pitch may be considered the only phonetic correlate of stress in these cases (Kämpfe & Volodin 1995: 8, Dunn 1999: 53f. for Chukchi; Asher 1982: 231 for Tamil). As for Finnish, the case is not completely clear. Although it seems to be uncontroversial that pitch is a phonetic correlate of stress (Sulkala & Karjalainen 1992: 382), duration has also been discussed in the phonetic literature on Finnish. On the one hand, stressed syllables seem to show an increased duration (Välimaa-Blum 1987: 104, Suomi & Ylitalo 2004). In comparison to a stress-based language like Swedish, on the other hand, the durational effect of stress on vowels is marginal and non-significant (Engstrand 1986: 13). Using pitch and, marginally, duration as phonetic correlates of stress, Finnish is on the verge of being a language of the second type.

This second type with respect to phonetic correlates of stress is represented by only one language in our sample: Georgian. Here, the prominent syllable is characterized solely by increased duration (*Längenakzent*) and is integrated into the pitch contour of intonational phonology (Tschenkéli 1958: LIX). Therefore, stress may be said to be realized by a combination of pitch and duration.

A prototypical member of the third and last group is Maltese. In this language, the phonetic correlates of stress include higher pitch and greater intensity of the stressed syllable. The realization of stress is also closely related to syllable weight, such that syllables with long vowels or closed syllables attract prominence. In most words, particularly those of Semitic origin, the penultimate syllable is both long and stressed. Stress shift in word derivation is also paralleled by lengthening of the stressed vowel, cf. the lengthening of /ɐ/ in the minimal pair /ˈbɐj.jɐt/ ‘he painted’ and /bɐj.ˈjɐːt/ ‘painter’. Therefore, duration can be seen as the primary correlate of stress and, as it is deeply rooted in the grammar, it may be attributed phonologized status (Borg & Azzopardi-Alexander 1997: 319ff.). This constellation of phonetic correlates of stress is also observed in Catalan (Hualde 1992: 385), Udihe (Baitchura 1989-1990; Nikolaeva

& Tolskaya 2001: 91), Tariana (Aikhenvald 2003: 37), Maori (Bauer 1996: 555f.), and Koyra Chiini (Heath 1999: 49). In the combined stress/tone systems of Nigerian Pidgin and Mandarin Chinese, stress is associated with certain patterns of pitch change (see 2.1.2.), extra length of the stressed syllable and increased loudness (Faraclas 1989: 556f.; Chao 1968: 35). Accordingly, these languages behave exactly as do the pure stress systems of the languages described above. Although not all relevant parameters of phonetic stress are described in the respective reference grammars consulted, Kayardild and Amele seem to pattern with the languages in this group (Evans 1995: 79; Roberts 1986: 357).

The distribution of phonetic correlates of stress in the languages of our sample is summarized in Table 11. This evidence has to be taken with a grain of salt, since most information on the phonetics of stress in descriptive grammars is based on auditory impression and rarely backed up by phonetic measurements.

Table 11: Phonetic correlates of stress in the languages of our sample[22]

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Pitch	+	+	+	+	+	+	+	+		+	+					+	+	+	+
Duration	+	+	+	?	+	+	-	-		+	?					+	+	+	?
Intensity	+	+	+	?	+	-	-	-		+	+					+	+	+	-

The evidence given in Table 11 could be read as positive evidence for the diachronic scenario for the evolution of stress proposed by Hyman (1977) and later taken up by Bybee et al. (1998). As outlined in 3.3.1., this scenario proceeds from the assumption that stress originates from the reinterpretation of phrasal intonation patterns as accents on words. A prosodic system which shows only phrasal intonation patterns is the pure intonation phonology of West Greenlandic, as described in 2.1.3. The high-low-high

[22] For cells marked with <?> in this and all following tables, the relevant information cannot be reliably extracted from the sources consulted. Shaded cells mark parameters which are not applicable. In this table, languages that do not make use of stress (West Greenlandic, !Xóõ, Basque, Slave and Yoruba) cannot be attributed with any phonetic correlates of stress.

contour which is realized over the last three morae of an utterance could be reinterpreted as an antepenultimate stress on the final word of the utterance by the language learner.[23] Such a reanalysis would change the intonation-only system into a word-stress system in which stress is phonetically realized by pitch only, i.e. intonation would change into non-stress accent. This second evolutionary stage of realizing stress by pitch movement only is represented by Chukchi and Tamil in the languages of our sample. In Finnish, we find gradual progression towards the third step in the evolution of stress. As the phonetic literature summarized above suggests, Finnish seems to introduce duration as a phonetic correlate of stress. When a language combines the two phonetic correlates pitch and duration, as Georgian does, the third evolutionary stage is reached. Finally, the phonetic realization is composed of pitch, duration and intensity in Maltese, Udihe, Tariana, Kayardild, Maori, Catalan, Amele, Koyra Chiini, Nigerian Pidgin and Mandarin Chinese. These languages have reached the final state of the evolution of word stress in exhibiting stress accent.

3.3.1.2. Segmental effects of stress

The second prosodic parameter for the study of linguistic rhythm, namely segmental effects of stress, can be further broken up into processes of vowel reduction in unstressed syllables and vowel lengthening in stressed syllables. As for consonant changes triggered by stress, we can distinguish between consonant reduction and deletion in unstressed syllables and consonant lengthening in stressed syllables.

Vowel reduction in unstressed syllables is not reported for Udihe, Maori, Georgian,[24] Tamil, West Greenlandic, !Xóõ, Basque, Slave, Yoruba and Finnish. The remaining nine languages show such processes to varying degrees. Chukchi has one rule of vowel reduction by which word-final /e/ and /a/ reduce to [ə]. This rule effectively has a rather restricted domain of application since it only applies to nouns marked for absolutive case. The vowels /i/ and /u/ are deleted in this word-final position. Since Chukchi places primary stress at the left word margin, the respective word-final syllables are potentially secondary stressed or unstressed. In both cases, it is hard to

[23] Interestingly, Kleinschmidt's (1968 [1851]: 7f.) analysis of West Greenlandic prosody interprets the intonation facts as a system of word stress.

[24] Although Georgian does not exhibit stress-triggered vowel reduction synchronically, the source of syncope can be found in stress-triggered vowel reduction at an older stage of the language (Hewitt 1995: 29).

decide whether these rules are triggered by the absence of stress or by phonotactic constraints (Kämpfe & Volodin 1995: 17, Dunn 1999: 53). In Amele, unstressed vowels undergo laxening in word-final position (Roberts 1996: 7). As was the case in Chukchi, vowel reduction has thus a highly restricted domain of application. In Tariana, the vowels /e, i, a/ are reduced to [ə] in pre- and post-tonic, unstressed position. As for /i/, this vowel is further reduced to Ø in rapid speech in this phonological context. This rule of pre-tonic vowel reduction also operates in syllables which immediately precede secondary stressed syllables. The post-tonic vowel sequence of /ua/ is realized as either /u/ or /o/, which could be interpreted as an instance of monophthongization in unstressed syllables. (Aikhenvald 2003: 35, 39f.). Compared to Chukchi and Amele, the domain for the application of rules of vowel reduction and deletion is not restricted to word-final position, as they apply in a less restricted way to vowels adjacent to stressed syllables. Nigerian Pidgin and Mandarin show even fewer restrictions on vowel reduction, such that rules of this sort apply to unstressed syllables in general, even if only marginally (Faraclas 1989: 557 and Chao 1968: 36). [25] In Kayardild, the vowel /a/ centralizes to [ɐ] in all unstressed syllables. The same tendency towards centralization with decreasing stress is also characteristic for the other vowels in the language (Evans 1995: 58f.). In Koyra Chiini, unstressed syllables may undergo one of a number of reduction processes: unstressed /a/ may be laxened to [ɛ], /o/ may be unrounded to [a, e], and stem-final CVV syllables are shortened to CV (Heath 1999: 20, 39, 44, 49). Catalan exhibits a clear distinction between vowels in stressed and unstressed syllables. The seven phonemic vowels /u, o, ɔ/, /e, ɛ, a/ and /i/ reduce to three vowels in unstressed syllables, namely [u], [ə], and [i]. Additionally, the reduced unstressed vowel [ə] undergoes deletion when in contact with another vowel (Hualde 1992: 376, 407). The deletion of unstressed vowels can be considered the most drastic process of vowel reduction. The same degree of vowel reduction in unstressed syllables is observed in Maltese, where vowel length contrasts are neutralized in unstressed positions; cf. the long stressed /a/ in *ferhá:n* ‘happy (sg.)’ and the short unstressed /a/ in *ferhani:n* ‘happy (pl.)’. Vowels in pretonic, unstressed open syllables are also subject to vowel deletion, as exemplified in 2.2.2.2. with the example *bi travu* ‘with a beam’ /pˈtrɐːvʊ/ (Borg

[25] See also Ansaldo & Lim (2004) for vowel reduction associated with grammaticalization in the isolating tone languages Mandarin, Cantonese and Hokkien.

1997: 266, 273; Borg & Azzopardi-Alexander 1997: 310). In summary, processes of vowel reduction which change the quality and quantity of vowels in unstressed syllable may be restricted in their application to only a subset of the vowels of a language or to a certain position, for instance word-final position or immediate adjacency to a stress syllable. The languages of our sample form a cline from the lack of vowel reduction in unstressed syllables, to systems of restricted vowel reduction, to systems where vowel reduction and deletion is the default for any unstressed syllable.[26]

Vowel lengthening in stressed syllables is documented for nine languages in the sample. This parameter is closely related to the property of having duration as a phonetic correlate of stress. In essence, all languages that use duration as a means to realize stress will have a positive value with respect to this feature. However, a number of languages also show phonologized rules applying to vowels in stressed syllables.

For Maori, we have already noted the close relationship between stress and vowel length. In 2.2.2.2. we also saw that vowels in clitic clusters undergo lengthening when stressed. Tariana also exhibits phonetic lengthening of the stressed syllable in clitic clusters. The optional diphthongization of /u:/ to /ui/ may also be related to stress (Aikhenvald 2003: 33). Maltese stress is closely related to vowel length and syllable weight. This language also exhibits vowel lengthening of stressed syllables after stress-shift in morphologically complex forms (Borg & Azzopardi-Alexander 1997: 319). As for long stressed vowels, in some varieties these are diphthongized; cf. Standard Maltese *zarbuːn* and Rabat (Gozo) *zarbewn* 'shoes' (Borg 1997: 248). Additionally, vowel allophony distinguishes between stressed and unstressed syllables: an unstressed /a/ changes to /ie/, an unstressed /e/ to /i/ and an unstressed /u/ to /o/, when receiving stress after stress shift (Borg 1997: 265, Sutcliffe 1936: 14f.). In Georgian, Udihe, Catalan, Koyra Chiini, Nigerian Pidgin, and Mandarin Chinese, duration is a phonetic correlate of stress, and stressed vowels will accordingly be lengthened with respect to their unstressed counterparts.[27] It is noteworthy that intonational phonology may also impose segmental effects on vowels. In Georgian, a sentence-final vowel pronounced in a rising yes-no question intonation is lengthened

[26] See also Crosswhite (2004) for an OT analysis of vowel reduction.

[27] Finnish has a rule by which the second vowel of an initially stressed word of the form CV.CV is lengthened to a half long vowel (Välimaa-Blum 1987). However, the question to what extent this process is to be interpreted as a segmental effect of stress or whether it is motivated by phonotactics is a controversial issue on which we cannot take a stand here.

(cf. Harris 2002: 235 on Monosyllabic Lengthening). In West Greenlandic, the general intonation contour high-low may be obscured by the lengthening of the final vowel with an accompanying final rise on the lengthened vowel (Rischel 1974: 81f. and Fortescue 1984: 341f.).

As for consonantal changes triggered by the presence or absence of stress, five languages in our sample show relevant processes. Reduction of consonants in unstressed syllables is documented for Mandarin Chinese, where unaspirated voiced stops of stressed syllables are unvoiced when they appear in unstressed syllables (Chao 1968: 36).[28] The ultimate reduction of consonants in unstressed syllables is their complete deletion. Finnish has such a rule, by which the consonants /t/ and /s/ are deleted when they precede an unstressed vowel (Keyser & Kiparsky 1984).

The lengthening of consonants in stressed syllables is documented for Catalan, Kayardild, Nigerian Pidgin and Maori. In Catalan, the voiced stops /b/ and /g/ are devoiced and/or geminated when they immediately follow a stressed vowel and immediately precede /l/. Compare the various pronunciations of *poble* [pɔ́plə], [pɔ́bblə], [pɔ́pplə] 'people, village' (Hualde 1992: 411). Consonants appearing in interstress position, i.e. in-between a primary and a secondary stressed vowel, are lengthened in Kayardild. Compare the short [l] in *kálathàrri* [kálɐt̪ɐ̀ri] 'didn't cut' with the long [lː] in *kálàth(a)* [kálːɐ̀t̪] 'cut' (Evans 1995: 81f.).[29] Such lengthening also affects sonorants in consonant clusters in stressed syllables in Nigerian Pidgin (Faraclas 1989: 548). Consonants in stressed syllables in Maori undergo a number of strengthening rules, namely aspiration and affrication of stops, stronger friction of fricatives, longer contact of /r/, closer approximation of /w/ and the lengthening of nasals (Bauer 1993: 556).

The distribution of segmental effects of stress on vowels and consonants in unstressed and stressed syllables across the nineteen languages of our sample is given in Table 12.

[28] See also Matisoff (1991: 387f.) on the deletion of certain consonants in unstressed syllables of clitic-like elements in the Southeast Asian language Lahu.

[29] This may be another example of stress clash resolution, in which the lengthened consonant separates the two flanking stressed syllables. Compare the discussion of the analysis of linguistic rhythm in Metrical Phonology in 3.1.2.

Table 12: Distribution of segmental effects of stress in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Vreduction	+	-	+	+	-	-	?	-		+	+					+	+	+	-
Vlengthening	+	+	+	?	+	+	-	-		+	?					+	+	+	-
Creduction	-	-	-	-	-	-	-	-		-	-					-	-	+	+
Clengthening	+	-	-	+	+	-	-	-		+	-					-	+	-	-

A short comparison of Bybee et al.'s (1998) results and the results obtained from our study may be in order. The first prediction made in Bybee et al.'s study, namely that duration as a phonetic correlate of stress will precede segmental effects on vowels, is borne out by our data. Vowel reduction is only attested in a subgroup of the languages employing duration as a means to realize stress. Although all of these languages will show an increase in duration of the stressed vowel, only a subset has phonologized special stressed-syllable allophony in their phonemic vowel inventory, rules of vowel lengthening and diphthongization. The picture is less clear with segmental effects on consonants. In five languages, Nigerian Pidgin, Mandarin Chinese, Kayardild and Catalan, this property is paralleled by vowel reduction and vowel lengthening. In Maori, however, we only encounter vowel lengthening and consonantal changes. In Finnish, finally, consonantal changes are the only segmental effects of stress. In the face of this data, the place of consonantal changes triggered by stress in the evolution of segmental effects of stress is far from clear.

3.3.1.3. Stress placement

In the majority of cases, stress fulfills a purely demarcative function in the stress languages of our sample. As illustrated in 2.1.1. stress is placed either at the left or at the right word margin and its placement is predictable by phonological rules that make reference to syllable weight. In three languages, stress also has lexical or grammatical functions.

In Tariana, stress placement depends partially on the accentual properties of morphemes. For instance, whereas the root *-ká* 'to see' is underlyingly stressed, the root *-ˊka* 'laugh' comes with a specification for stress on the pre-root vowel (Aikhenvald 2003: 38). In Catalan, the position of stress distinguishes lexemes in cases like *célebre* [sɛ́ləβrə] 'famous', *celebra* [səléβrə] 'he celebrates' and *celebrar* [sələβrá] 'to celebrate' (Hualde 1992: 385). In Amele, stress placement is in part dependent on the morphological composition of words. As for verbs, stress can be placed on the subject agreement suffix, the aspect/mood/negative marker or the verb stem. As discussed in 2.1.1., possessed nouns are obligatorily stressed on the possessive marker (Roberts 1986: 358f.).

Although we noted segmental effects of stress for the three languages exhibiting lexical or grammatical functions of stress, the evidence is too scarce to establish a positive correlation between these two parameters. In particular, languages such as Maltese which show massive segmental effects of stress do not necessary make such use of stress. For Amele we noted only slight segmental effects of stress, therefore we should be cautious in attributing the property of unpredictable stress placement in morphological complex forms to preceding vowel reduction and loss. *Stress placement*, therefore, seems an unreliable parameter for the evaluation of linguistic rhythm.

3.3.1.4. Tone

As illustrated in 2.1.2., six languages of our sample can be classified as tone languages on the basis of Hyman's (2001) definition. Unrestricted tone systems are represented by !Xóõ, Slave, and Yoruba, whereas restricted tone systems are represented by Basque, Nigerian Pidgin and Mandarin Chinese, where the distribution of tonal contrasts and rules of tonal Sandhi are influenced by stress.

Across the tone languages of our sample, we find differences with respect to tone-bearing units in a given language. The four lexical tones of !Xóõ, namely high, mid-level, mid-falling and low, can be realized on eight types of segmental bases. The realization of the mid-falling tone on the various segmental bases is illustrated in (9).

(9)	CV:	ta:	'a San'	!Xóõ Bushman
	CV_iV_j	tshoe	'inside'	
	CVCV	ǂabe	'a Mukgalagadi'	
	CVN	ʘum	'sleep (n.)'	
	$CV_i{}^{ʔ}V_i$	$sa^{ʔ}ã$	'seed'	
	$CV_i{}^{ʔ}V_j$	$ǁa^{ʔ}ũ$	'cold'	
	$CV^{ʔ}N$	$ǁnu^{ʔ}m$	'rolling'	
	$CV^{ʔ}CV$	$g!xa^{ʔ}d^{y}e$	'udder'	(Traill 1985: 35)

It is noteworthy that every possible base for the realization of the lexical tones consists of two morae, i.e. a long vowel, two short vowels, a closed syllable or two CV syllables. Based on such evidence, Traill (1985: 37) concludes that the mora is to be considered the tone-bearing unit in !Xóõ.

In Slave, there are two register tones, high and low, which are used to distinguish lexemes or as grammatical markers. Underlyingly, these tones are associated with a vowel. However, a number of processes such as tone preservation in vowel deletion and tone spreading may change the placement of the tones in surface forms. Since every vowel is realized with one of the two register tones, and since there are no constraints on the number of high or low tones within a word, Slave can be characterized as an *unrestricted* tone system. On the basis of the available description it is not easy to decide whether the mora or the syllable functions as the tone-bearing unit. Since the language does not have contour tones, there is little testing ground on which to decide this question. The close relationship of single vowels to single tones, however, is suggestive of an analysis in which the mora is the tone-bearing unit (Rice 1989a: 103ff.)

Yoruba has a three way contrast of lexical tones, high, mid, and low. Except for one tonotactic restriction,[30] the three tones occur freely in lexical representation, so that this tone system can be classified as unrestricted. As for the question of the tone-bearing unit, no explicit information could be obtained from the literature consulted (see also Nagano-Madsen 1992: 31 for discussion of the syllable in Yoruba). Contour tones resulting from the coalescence of two adjacent vowels are realized on a single short vowel. Therefore the underlying representation of tones cannot provide evidence for the tone-bearing unit in Yoruba (Akinlabi & Liberman 2000).

[30] The occurrence of high tone in word-initial position is restricted to consonant-initial words. However, in the genitive construction, these words reveal an underlying initial vowel (Akinlabi & Liberman 2000: 33).

The tone system of Nigerian Pidgin, on the other hand, can best be characterized as a restricted tone system. In this language, the distribution of the two lexical tones high and low is subject to a number of constraints. For instance, a group of words of English origin will typically have a high tone where the English source word would have its stressed syllable. Accordingly, such words will only allow one high toned syllable. Although tone is attributed to the syllable in Nigerian Pidgin, the rules of tonal Sandhi described in 2.1.2. operate on the domain of the trochaic foot. Remember that the tone of the stressed syllable will spread rightwards over the unstressed syllables in the foot (Faraclas 1984). The four lexical tones of Mandarin Chinese are also subject to a number of restrictions. All tones, including the rising, low-high and the rising contour tones, can be realized on a simple CV syllable with a short vowel. The syllable, therefore, seems to be the tone-bearing unit in Mandarin Chinese. We noted in 2.1.2. that the distribution of tonal contrasts is restricted to stressed syllables and that these contrasts are reduced to neutral tone in unstressed syllables. The rules of tonal Sandhi therefore, operate within a foot which shows an asymmetry of stressed/fully toned and unstressed/neutralized toned syllables (Yip 1980; Lin 2001: 44ff.; Ansaldo & Lim 2004: 359f.).

In the pitch-accent system of Gernika Basque, the distribution of accent, i.e. a drop in the pitch plateau, is highly restricted to accented words which have fixed accent on a given syllable (Hualde 1999: 947). Although not tonal, the mora-based prosody of West Greenlandic should also be discussed in the context of tone-bearing units. Remember that the pitch contours realized at the right margin of an utterance can be analyzed as a sequence of a high tone followed by a low tone and a final high tone. In this case, these tones which make the intonation contour are clearly associated with the last three morae and not the last three syllables (Rischel 1974: 79ff., Fortecue 1984: 340ff.).

Table 13 summarizes the distribution of tone systems, restricted tone systems and tone-bearing units in the languages of our sample. The distribution of unrestricted tone systems gives clear evidence for a major distinction across the rhythmic types. It can be seen that these systems are only found in languages that do not make use of stress and show no segmental effects of stress. As for restricted tone systems, there is clear evidence for foot structure restricting the realization of tones in Nigerian Pidgin

and Mandarin Chinese, languages which share some properties with stress phonologies. The relevance of tone-bearing units within a rhythm-based typology of language cannot satisfactorily be addressed on the basis of the scarce information in our data.

Table 13: Distribution of tone systems in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Unrestricted												+	-	+	+		-	-	
TBUmora												+	-	?	?		-	-	
TBUsyllable												-	+	-	?		+	+	
TBUfoot												-	-	-	-		+	+	

3.3.1.5 Summary

After the settings of the prosodic parameters for the typological study of linguistic rhythm have been fixed for the languages in our sample, we may now try to evaluate the proposed correlations across the parameters.

In our synchronic data, we find positive evidence for the hypothesis that the innovation of duration as a phonetic correlate of stress precedes the evolution of segmental effects of stress. Vowel reduction in unstressed syllables is only documented for a subset of languages which use duration as a phonetic correlate of stress. Phonologized rules of vowel lengthening occur only in languages with duration as a phonetic correlate of stress and, with the exception of Maori, only in languages with vowel reduction. Although consonant changes triggered by stress are documented in four languages with vowel reduction, they are also documented for two languages which only have vowel lengthening. As noted above, the place of stress-triggered consonant changes within this typology cannot be satisfactorily decided on. The same holds for the predictability of word stress and the lexical and grammatical functions of stress. As for the tone languages in the sample, in those in which tonal Sandhi operates within stress-based feet, segmental effects of stress are possible. This is found in Nigerian Pidgin and Mandarin Chinese, which both have vowel reduction, vowel

lengthening, and stress-triggered consonant changes. For unrestricted tone languages where tone is realized within the domains syllable and mora, none of the stress-related processes are observed.

3.3.2. Phonotactics

In the phonotactic structure of a language, syllable complexity, length contrasts, and the nature of syllable divisions may contribute to its rhythmic organization. In the following paragraphs we will describe the various settings for these parameters in the languages of our sample.

3.3.2.1. Syllable complexity

Syllable complexity can be further broken down into onset complexity, coda complexity, and nucleus complexity. With respect to onset complexity, the languages in our sample pattern in four groups. The most complex onset clusters are documented for Georgian, which allows up to seven onset consonants. Languages with onset consonant clusters of up to three consonants are Maltese, Nigerian Pidgin and Catalan. For the latter, onset clusters of three consonants are marginal and in free variation with consonant clusters of two consonants, cf. *embrions* [əm.brjóns] or [əm.bri.óns] 'embryos' (Hualde 1992: 383). Six languages in the sample allow onset consonant clusters of not more than two consonants: Tamil, !Xóõ, Basque, Mandarin Chinese, Chukchi, and Finnish. As for Chukchi, there is only one licit onset cluster in the language, consisting of a consonant and the glottal stop [ʔ] (Dunn 1999: 48). Finnish only allows such clusters marginally, in loan-words and slang (Sulkala & Karjalainen 1992: 376). Finally, the nine languages Udihe, Tariana, Kayardild, Maori, West Greenlandic, Amele, Slave, Yoruba and Koyra Chiini do not allow onset consonant clusters and opt for single consonant onsets. The distribution of onset consonant clusters in the languages of our sample is given in Table 14.

Table 14: Distribution of onset consonant clusters in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
CC	+	-	-	-	-	+	(+)	+	-	+	-	+	+	-	-	-	+	+	(+)
CCC	+	-	-	-	-	+	-	-	-	(+)	-	-	-	-	-	-	+	-	-
CCCC	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
CCCCC	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
CCCCCC	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
CCCCCCC	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-

As for consonant clusters in coda position, the languages in our sample form five groups. Georgian allows coda consonant clusters of up to four consonants, thus being the most complex language with respect to consonant clusters in coda position. Three languages, namely Maltese, Catalan, and Finnish, exhibit consonant clusters of up to three consonants. In Maltese, such clusters only arise after the encliticization/suffixation of the negative marker *-x* [ʃ] to bases already ending in a bi-consonantal coda (Borg & Azzopardi-Alexander 1997: 306f.). Finnish shows such clusters only marginally in loan-words and slang (Sulkala & Karjalainen 1992: 376). Five languages in the sample allow codas consisting of up to two consonants: Kayardild, Tamil, Basque, Koyra Chiini and Nigerian Pidgin. In the eight languages Udihe, Tariana, Chukchi, West Greenlandic, Amele, !Xóõ, Slave and Mandarin Chinese, only mono-consonantal codas are permitted. Maori and Yoruba, finally, do not have codas at all. The distribution of coda consonant clusters in the languages of our sample is illustrated in Table 15.

Table 15: Distribution of coda consonant clusters in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
C	+	+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	+	+	+
CC	+	-	-	+	-	+	-	+	-	+	-	-	+	-	-	+	+	-	+
CCC	(+)	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	(+)
CCCC	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-

In the context of consonant clusters, it has been claimed that stress-based languages and syllable-based languages will show a systematic difference with respect to the degree in which consonant clusters follow the sonority principle. Onset clusters optimally show increasing sonority, whereas codas optimally show decreasing sonority within such clusters. Languages of stress-based rhythm are said to disobey this principle, whereas syllable-based languages follow it. The behavior of consonant clusters in onset and coda position with respect to the sonority principle is given in Table 16.

Table 16: Distribution of sonority in consonant clusters in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Onset	-					-	-	+		+		-	+				+	+	+
Coda	+			+		-		+		+			+			+	+		-

Apart from sonority, the combination of consonants may be restricted by consonantal harmony, such that the consonants in the cluster harmonize with respect to features such as, for instance, voicing. This is documented for Maltese, Udihe and Georgian. When languages allow consonant clusters, the sonority principle may be obeyed in nine languages of our sample. Within these languages, phonotactics may treat onset clusters differently from coda clusters. For example, in Maltese, onset clusters usually consist of

a fricative followed by a stop which contradicts the sonority principle. Coda consonants, on the other hand, exhibit decreasing sonority (Azzopardi-Alexander 1997: 308f.). Since the sonority principle is obeyed in the majority of cases across the languages of our sample, it is dubious to what degree this phonotactic property will be useful in typologizing languages. Those languages whose phonotactics disobey the sonority principle in consonant clusters to the highest degree, namely Georgian, Chukchi and !Xóõ, otherwise show little resemblance in their phonological make-up. As a consequence, we will exclude this aspect of syllable complexity from evaluating linguistic rhythm in the following discussion.

After discussing onset and coda clusters as an aspect of syllable complexity, we can now turn to the complexity of syllable nuclei in the languages of our sample. The major diagnostic for nucleus complexity is the distribution of vowel clusters within syllables. This property, however, is especially hard to examine, since it relies on a number of analytic decisions made in language description. For instance, a long vowel may be analyzed as a double vowel, and a vowel sequence of two different vowels may be analyzed as a diphthong. Due to these uncertainties, the following data has to be read with a grain of salt. With respect to vowel clusters, the languages in our sample divide into three groups. Maori and Udihe allow up to three vowels in syllable nuclei. For Maori, vowel sequences of up to six vowels are reported. However, their status as syllable nuclei is far from clear (Bauer 1993: 544ff.). By far the most common option in the context of this parameter is to allow vowel clusters of up to two vowels, as evidenced in the fourteen languages Maltese, Tariana, West Greenlandic, Catalan, Amele, !Xóõ, Basque, Slave, Yoruba, Koyra Chiini, Nigerian Pidgin, Mandarin Chinese and Finnish. In Chukchi, such sequences are allowed as the output of a rule of intervocalic glide deletion (Dunn 1999: 42f.). Kayardild, Georgian and Tamil finally only allow syllable nuclei consisting of one vowel. The distribution of vowel clusters in the languages of our sample is presented in Table 17. Since there is little cross-linguistic variation with respect to this aspect of syllable complexity and since there are no apparent interdependencies with other parameters of linguistic rhythm, nuclei complexity cannot be considered a reliable phonotactic parameter in evaluating linguistic rhythm and will be excluded from the following discussion.

Table 17: Distribution of vowel clusters in the languages of our sample[31]

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
V	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
VV	+	+	+	-	+	-	+	-	+	+	+	+	+	+	+	+	+	+	+
VVV	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VVVV	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VVVVV	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VVVVVV	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Combining the information on onset and coda complexity given in Table 15 and Table and 16 we can infer possible syllable types in the languages of our sample. The simplest and unmarked syllable CV is reported for all the languages. Seventeen languages permit CVC syllables, with the exception of Maori and Yoruba, which both do not allow coda consonants at all. Onsetless syllables of the form V are possible in seventeen languages, with Kayardild and !Xóõ being the exceptions. VC syllables are reported for fourteen languages. Note that the cross-linguistic frequencies in the data reflect the first steps in the development of syllable types as illustrated in Figure 2 and repeated here under (10).

(10) CV (19) → CVC (17) → V (17) → VC (14)

Seven languages in our sample remain in the realms of these simple syllable structures: Maori and Yoruba, both having CV as a maximal syllable shell, and the five languages Udihe, Tariana, West Greenlandic, Amele, and Slave, which all do not exceed CVC syllable shells. For the remaining languages we can distinguish between onset prominent languages, which show more complexity in their onsets, and coda prominent languages, which exhibit more complexity in syllable codas. In Chukchi, !Xóõ, and Mandarin Chinese, the maximal syllable shell allows two onset consonants and one coda consonant. Maltese and Nigerian Pidgin allow three onset and two coda

[31] Although we tried as much as possible to consider only vowel sequences, it cannot be guaranteed in certain cases that no long vowels or diphthongs have also been included in this table.

consonants. Georgian, finally, allows up to six onset consonants and four coda consonants. Kayardild and Koyra Chiini allow only one onset and two coda consonants, whereas Finnish allows two onset and three coda consonants. Symmetrical syllable complexity is evidenced in the syllable complexity of Tamil and Basque, which allow two onset and coda consonants, and Catalan, allowing for three onset and coda consonants. The distribution of syllable types across the languages of our sample is summarized in Table 18.

Table 18: Syllable types in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
V	+	+	+	-	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+
VC	+	+	+	-	-	+	+	+	+	+	+	-	+	+	-	+	+	+	+
VCC	+	-	-	-	-	+	-	+	-	+	-	-	+	-	-	-	+	-	+
CV	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
CVC	+	+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	+	+	+
CVCC	+	-	-	+	-	+	-	+	-	+	-	-	+	-	-	+	+	-	+
CVCCC	(+)	-	-	-	-	+	-	-	-	(+)	-	-	-	-	-	-	-	-	(+)
CCV	+	-	-	-	-	+	(+)	+	-	+	-	+	+	-	-	-	+	+	(+)
CCVC	+	-	-	-	-	+	(+)	+	-	+	-	+	+	-	-	-	+	+	(+)
CCVCC	+	-	-	-	-	+	-	+	-	+	-	-	+	-	-	-	+	-	(+)
CCVCCC	(+)	-	-	-	-	+	-	-	-	(+)	-	-	-	-	-	-	-	-	(+)
CCCV	+	-	-	-	-	+	-	-	-	(+)	-	-	-	-	-	-	+	-	-
CCCVC	+	-	-	-	-	+	-	-	-	(+)	-	-	-	-	-	-	+	-	-
CCCVCC	+	-	-	-	-	+	-	-	-	(+)	-	-	-	-	-	-	+	-	-
CCCVCCC	(+)	-	-	-	-	+	-	-	-	(+)	-	-	-	-	-	-	-	-	-
CCCCCCC VCCCC	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-

3.3.2.2 Length contrasts

The distribution of length contrasts in the vowels and consonants of the languages in our sample is as follows. Ten languages make use of vowel length contrasts. In the four languages Maltese, Udihe, Tariana, and Maori, the occurrence of long vowels is closely related to the placement of stress. Of the remaining six languages with vowel length independent from stress, Tamil, West Greenlandic and Finnish also exhibit contrastive length in consonants. These three languages are generally considered to be mora-based in the literature on linguistic rhythm. Maltese, otherwise showing classical stress-based behavior, also has length contrasts in consonants. The overall distribution of length contrasts in vowels and consonants across the languages of our sample is given in Table 19.

Table 19: Length contrasts in vowels and consonants in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Vowels	(+)	(+)	(+)	+	(+)	-	-	+	+	-	-	-	-	-	+	+	-	-	+
Consonants	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	+

3.3.2.3. Syllable division

This phonotactic parameter turns out to be rather unrevealing in the context of a rhythm-based typology. In essence, syllabification follows the general phonotactic constraints on syllable structure and consonant clusters. In onset prominent languages such as Maltese, word-medial CCC clusters are broken up as C.CC sequences in syllabification. In coda prominent languages like Finnish, such clusters are broken up into CC.C sequences. Variable syllable division, which has been discussed as a characteristic of stress-based languages, is only documented for Georgian where the word medial CC cluster in *k'ac-ma* (man-narrative.case) is either syllabified as [k'ac.ma] or as [k'a.cma] (Harris 2002: 234). None of the languages of our sample show ambi-syllabic single consonants, which have been said to be a diagnostic for stress-based phonologies. As for geminate consonants, all languages which allow such

segments will syllabify them as codas of the preceding syllable and onsets of the following syllable. This is not only true for the mora-based languages Tamil, West Greenlandic and Finnish, but also for Maltese, an otherwise stress-based language. On the basis of such scarce evidence, *syllable division* cannot be considered a reliable parameter in the typological study of linguistic rhythm.

3.3.2.4. Summary

After the settings of the phonotactic parameters for the typological study of linguistic rhythm have been fixed for the languages in our sample, we may now try to evaluate the proposed correlations across the parameters.

With respect to syllable complexity, we found positive evidence for a gradual increase of onset and coda complexity along the lines of the proposed developmental path of syllable types. Languages which allow consonant clusters can be further subdivided into onset prominent languages, i.e. languages in which consonant clusters in onset position are potentially more complex, and coda prominent languages, i.e. languages in which consonant clusters in coda position are potentially more complex. These tendencies are paralleled by preferences in syllabification, which opts for onset clusters in the first group and coda clusters in the second group. Length distinctions in vowels and consonants unrelated to stress are only documented for three languages, which have been discussed as prototypical mora-based languages. Sonority in consonant clusters, nucleus complexity, variable syllable division and ambiguous syllable boundaries could not be successfully tested on the basis of our language sample. Such phonological properties may be considered peculiar to the better known exemplar languages discussed in the literature on linguistic rhythm, such as English and German.

3.3.3. Morphophonology

The processes of assimilation, cluster resolution and vowel harmony have been noted as possible morphophonological diagnostics of linguistic rhythm. In what follows, we will describe the various settings for these parameters for the nineteen languages of our sample.

3.3.3.1. Assimilations

Thirteen languages of our sample exhibit assimilations of adjacent consonants in consonant clusters. These processes include voicing assimilation, place of articulation assimilation and nasalization, among others. In languages with complex onset or coda clusters, like Maltese, such processes may apply within the syllable. Languages which only allow CVC structures as their maximal syllable shell show such assimilations only word-medially and at morpheme boundaries. However, such processes may also be absent in languages with syllable structures that may cause word-medial consonant clusters in affixation. In Tariana, Amele, !Xóõ and Mandarin Chinese, no such processes are reported. In Maori and Yoruba, the concatenation of codaless syllables will never yield consonant clusters and accordingly consonant assimilations do not occur. Assimilation rules applying to adjacent vowels in vowel clusters are reported for nine languages. In West Greenlandic, for example, the vowel cluster /a+i/ is converted to a long /aa/ by the assimilation of the second vowel in the cluster (Fortescue 1984: 344). Given the fact that all languages potentially allow such clusters in morphological formations, the rather restricted distribution of such assimilations is noteworthy. Eleven languages in our sample have processes affecting intervocalic consonants. Such processes include intervocalic weakening, for example the fricativization of Basque /b/ to [β] in this phonological context, and intervocalic consonant deletion, for instance the deletion of /w/ in Maori (Bauer 1996: 570).

Overall, the distribution of these processes across the languages in our sample, as illustrated in Table 20, remains rather inconclusive. For instance, the five languages which show all three types of assimilation, Udihe, Chukchi, Slave and Koyra Chiini, do not form a class with respect to the other rhythmic parameters discussed so far. The same could be said about Tariana and Amele, the only languages which exhibit none of the processes. Across the parameters, no meaningful correlation can be deduced. In order to successfully connect the presence of assimilation to the overall linguistic rhythm of a language, a detailed study on the frequency of such processes would be necessary. For instance, if consonant clusters are frequent in a stress-based language like Maltese, assimilation processes applying within these sequences should be more frequent when compared to a language where phonotactic constraints restrict the probability of consonant clusters in the first place. Such a study, however, demands a

body of data different from that obtained from grammatical descriptions in reference grammars.

Table 20: Assimilations in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
CC	+	+	-	+	-	+	+	+	+	+	-	-	+	+	-	+	+	-	+
VV	+	+	-	-	+	-	+	-	+	-	-	-	-	+	+	+	-	+	-
VCV	-	+	-	-	+	-	+	-	-	+	-	+	+	+	+	+	+	-	+

3.3.3.2. Cluster resolution

With respect to the treatment of consonant clusters resulting from morphological concatenation, seven languages of our sample break up a junctural consonant cluster by the insertion of an epenthetic vowel: Maltese, Udihe, Chukchi, Catalan, Amele, Basque and Nigerian Pidgin. In six of the languages of our sample, consonant clusters are simplified by the deletion of one of the cluster consonants: West Greenlandic, Basque, Catalan, Kayardild, Slave, and Koyra Chiini.

Hiatus situations arising in morphophonology are resolved by consonant epenthesis in seven languages of our sample. The insertion of intervocalic /w/ is only marginal in some idiolects of Udihe and optional in Maltese. In the other five languages, it is used as a regular process to avoid such vowel clusters. In Tamil, it is even one of the most widespread morphophonological rules. Eleven languages of our sample resolve hiatus by vowel coalescence, i.e. by the deletion of one of the adjacent vowels. In Amele, for instance, the hiatus /e+i/ is simplified to /i/ and the hiatus /o+i/ is changes to single /u/ (Roberts 1987: 372). In Tamil, vowel coalescence is restricted to sequences containing stem-final /u/ such as /u+i/ resulting from the suffixation of a morpheme with initial /i/ (Asher 1982: 238). West Greenlandic has an optional rule of vowel coalescence which simplifies /aa+a/ to /aa/ (Fortescue 1984: 351).

The overall distribution of vowel epenthesis and consonant deletion in the context of consonant clusters, and of consonant epenthesis and vowel deletion in the

context of vowel clusters, is given in Table 21 for the languages of our sample. The fact that languages may show all types of processes, as, for instance, Basque does, and the unsystematic distribution of the processes in general, sheds doubt on a principled complementary distribution across rhythmic types with respect to this parameter. We will comment on possible correlation with other parameters of the rhythm-based typology in 3.3.4.

Table 21: Resolution of consonant and vowel clusters in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Vowel epenthesis	+	+	-	-	-	-	+	-	-	+	+	-	+	-	-	-	+	-	-
Consonant deletion	-	-	-	+	-	-	-	-	+	+	-	-	+	+	-	-	-	-	-
Consonant epenthesis	+	+	-	-	-	-	-	+	+	-	-	-	+	+	-	-	+	-	-
Vowel deletion	-	-	+	+	+	-	+	+	+	-	+	+	+	+	+	-	-	-	-

3.3.3.3. Vowel harmony

Processes of vowel harmony have already been discussed in our survey of clitics in segmental phonology in Chapter 2.2.2. A number of languages exhibit vowel harmony processes which are restricted to adjacent syllables and thus apply to relatively small domains. In Maltese, for instance, such processes occur only marginally with short /ɔ/ (Borg & Azzopardi-Alexander 1997: 312ff.). Other languages with such restricted vowel harmony effects are Tariana, Kayardild, Tamil, Amele, !Xóõ, Basque, Yoruba, and Nigerian Pidgin. In other languages, such as Chukchi, where vowel harmony applies to the phonological word domain, clitics lie outside this domain. The overall distribution of vowel harmony in the languages of our sample is given in Table 22. Note

that those languages in which vowel harmony operates over the entire affixed word, namely Udihe, Chukchi, and Finnish, show no stress-triggered vowel reductions.

Table 22: Vowel harmony in the languages of our sample

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Vowel harmony	+	+	+	+	-	-	+	+	-	-	+	+	+	-	+	-	+	-	+

3.3.3.4. Summary

The morphophonological parameters of linguistic rhythm have proven to be rather unrevealing. As for consonant assimilations, the very existence of such processes can only be excluded for languages which have only maximal CV shells; in our sample this would be true for Maori and Yoruba. In these languages the phonotactic structure prohibits consonant clusters resulting from the concatenation of syllables. In all other languages, the presence of consonant assimilation cannot be positively correlated with any other rhythmic-related property. The results for the distribution of assimilation processes involving adjacent vowels did not show any noteworthy observations. Only their rather infrequent occurrence can be noted. It seems that such processes, including processes affecting intervocalic segments, could be more meaningfully accounted for by universals of assimilation rather than by the rhythmic properties of a given language. Tentatively complementary is the distribution of the hiatus resolution processes consonant epenthesis and vowel coalescence. If anything, these processes are constrained by preference laws in syllable structure, for instance the preference for simple syllable nuclei in the case of vowel coalescence and the preference for CV syllables in the case of consonant epenthesis. Vowel harmony is especially strong as a means of word demarcation in languages which have not developed segmental effects of stress in the form of vowel reduction.

3.3.4. Rhythm in the languages of our sample

We will end this chapter by summarizing the data collected in the preceding section, in order to evaluate the rhythm-based typology of language proposed in 3.2. and to situate the languages of our sample within such a typology. Table 23 combines the information collected for the prosodic, phonotactic and morphophonological parameters which have proved to be testable within in the context of the present study.

Table 23: The languages of our sample in a rhythm-based typology of language

	Maltese	Udihe	Tariana	Kayardild	Maori	Georgian	Chukchi	Tamil	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish
Accent	3	3	3	3	3	2	1	1	0	3	3	0	0	0	0	3	3	3	2
Stress effect	3	1	2	3	2	1	1	0	0	3	2	0	0	0	0	2	3	3	1
Tone	0	0	0	0	0	0	0	0	0	0	0	2	1	2	2	0	1	1	0
Syllable types	15	4	4	3	2	> 16	5	9	4	15	4	4	9	4	2	5	10	6	11
Length	2	1	1	1	1	0	0	2	2	0	0	0	0	0	1	1	0	0	2
Vowel harmony	1	2	1	1	0	0	2	1	0	0	1	1	1	0	1	0	1	0	2

Table 23 summarizes the respective values for the phonological parameters, as given in Table 11 to Table 22. For example, for the phonetic correlates of stress accent, the value 0 stands for the lack of stress, 1 stands for cases where there is only one phonetic correlate of stress. The value 2 is given to languages which employ two phonetic correlates of stress, 3 to languages which employ all possible correlates of stress. In this and all other rows, the positive values as given for the respective parameters in the preceding tables have been summed up.

A strong correlation exists between the *phonetic strength of stress* and *segmental effects of stress*. Languages with strong stress, i.e. stress realized by pitch, duration and intensity, allow segmental effects of stress to varying degrees. Table 24 summarizes this finding in a cline from tone/intonation to non-stress accent to stress accent. The tone

and intonation languages on the left-hand side show neither stress nor segmental effects of stress. Tamil, on the other hand, uses only pitch to realize stress and does not exhibit any segmental effects of stress. Catalan uses all three phonetic correlates of stress and exhibits all three types of segmental effects of stress. Note that the cross-linguistic variation across the languages of our sample patterns in a systematic way, such that the gradual increase in the strength of the phonetic realization of stress is paralleled by an increase in segmental effect of stress. We can conclude that segmental effects of stress imply the presence of phonetically strong accent. The languages on the left-hand side behave as mora- or syllable-based with respect to these properties, whereas those located on the right-hand side can be considered more stress-based. In essence, this can be interpreted as positive evidence for the hypothesis about the evolution of stress and segmental effects of stress as proposed by Hyman (1977) and Bybee et al. (1998). Remember that stress placement did not turn out to be a reliable parameter of linguistic rhythm.

Table 24: Correlation of phonetic correlates of stress and segmental effect of stress in the languages of our sample

	Yoruba	Slave	Basque	!Xóõ	W. Greenlandic	Tamil	Chukchi	Finnish	Georgian	Udihe	Koyra Chiini	Amele	Maori	Tariana	Mandarin Chinese	Nigerian Pidgin	Kayardild	Catalan	Maltese
Accent	0	0	0	0	0	1	1	2	2	3	3	3	3	3	3	3	3	3	3
Stress effect	0	0	0	0	0	0	1	1	1	1	2	2	2	2	3	3	3	3	3

With respect to the prosodic parameter of *tone*, there is no such clear correlation with the two parameters *phonetic correlates of stress* and *segmental effects of stress*. In principle, the realization of tonal contrasts is possible across the whole cline given in Table 24. However, there are certain differences with respect to the distribution of tone. In the unrestricted tone systems Yoruba, Slave and !Xóõ neither stress nor segmental effects of stress are possible. In such systems, the absence of vowel reduction guarantees full vowels in all syllables such that tonal contrasts can be realized on any

vowel. This is also true for the pitch-accent system of Basque and the intonation-only system of West Greenlandic. Nigerian Pidgin and Mandarin Chinese, which both have a combined stress/tone system, show strong phonetic stress and high degrees of segmental stress. In these systems, the distribution of tonal contrasts is restricted by stress-induced foot structure. We can conclude that mora- or syllable-based phonologies allow for unrestricted tone systems, whereas stress-based phonologies only allow for the restricted realization tonal contrasts within stress feet.

The degree of syllable complexity can be measured by the number of possible syllable types in the languages of our sample. A cline of increasing complexity is given in Table 25 adapted from Table 18.

Table 25: Syllable complexity in the languages of our sample

	Maori	Yoruba	Kayardild	Udihe	Tariana	W. Greenlandic	Amele	!Xóõ	Slave	Chukchi	Koyra Chiini	Mandarin Chinese	Tamil	Basque	Nigerian Pidgin	Finnish	Catalan	Maltese	Georgian
Syllable types	2	2	3	4	4	4	4	4	4	5	5	6	9	9	10	11	15	15	< 16

The expected correlation of the prosodic parameters discussed above with syllable complexity claims that languages with phonetically weak stress and no segmental effects of stress should exhibit low degrees of syllable complexity, while languages with phonetically strong stress and segmental effects of stress should exhibit high degrees of syllable complexity. This hypothesis is not completely borne out by the cross-linguistic data compiled in this study as summarized in Table 26.

Table 26: Correlation of phonetic correlates of stress, segmental effects of stress and syllable complexity in the languages of our sample

	Maori	Yoruba	Kayardild	Udihe	Tariana	W. Greenlandic	Amele	!Xóõ	Slave	Chukchi	Koyra Chiini	Mandarin Chinese	Tamil	Basque	Nigerian Pidgin	Finnish	Catalan	Maltese	Georgian
Accent	3	0	3	3	3	0	3	0	0	1	3	3	1	0	3	2	3	3	2
Stress effect	2	0	3	1	2	0	2	0	0	1	2	3	0	0	3	1	3	3	1
Syllable types	2	2	3	4	4	4	4	4	4	5	5	6	9	9	10	11	15	15	> 16

Taking the language with the lowest degree of syllable complexity, namely Maori, we see that such a language could easily also exhibit phonetically strong stress and segmental effects of stress. Looking at the other end of the cline, we encounter the converse case. Here, the language with the highest degree of syllable complexity, namely Georgian, at the same time has phonetically weak stress and hardly any segmental effect of stress.[32] With respect to the rhythmic categories of mora-, syllable- and stress-based phonologies, we can nevertheless try to identify rhythmic prototypes which show the expected correlation of the phonetic realization of stress, segmental effects of stress and syllable complexity. In this line of thought, Maltese and Catalan are prototypical representatives of stress-based rhythm, since they both show phonetically strong stress, high degrees of segmental effects of stress and high degrees of syllable complexity. On the other end of the scale we find a number of languages with phonetically weak or no stress, little or no segmental effects of stress and low degrees of syllable complexity. In this group, Yoruba is the clearest case, as it lacks stress altogether and allows for only two syllable types. The same holds true for the unrestricted tone languages Slave and !Xóõ and the intonation-only language West Greenlandic, which allow for only four syllable types. Within the group of stress languages, Chukchi has phonetically weak stress, little segmental effect of stress and, with five possible syllable types, a low degree of syllable complexity. The phonotactic

[32] In Georgian, this constellation could be a result of a number of phonological changes in the history of the language. In this diachronic scenario, it is likely that Georgian had phonetically strong stress and heavy segmental effects of stress in earlier stages of the language. Due to the complete loss of unstressed vowels, a number of complex consonant clusters arose (see Hewitt 1995: 29).

parameters of sonority within consonant clusters and of nucleus complexity did not provide reasonable means of typologizing languages.

Length contrasts, which have been discussed as a defining property of mora-based rhythm, show a rather erratic distribution across the languages of our sample. Phonemic length in vowel inventories has been documented for ten languages, co-occurring with almost any combination of the other phonological parameters of linguistic rhythm discussed so far. Such contrasts in vowels and, at the same time, in consonants are reported for otherwise prototypically stress-based languages like Maltese, but also for West Greenlandic, Tamil and Finnish. It seems therefore possible that length contrasts in vowels and consonants can appear in languages with any value for the parameters of phonetic correlates of stress, segmental effect of stress and syllable complexity. However, some languages behave as prototypical representatives of mora-based rhythm. The clearest case is West Greenlandic, a language which has no stress and no segmental effects of stress, a low degree of syllable complexity and length contrasts in vowels and consonants. The same could be said about Tamil, since it exhibits weak stress, no segmental effects of stress, a moderate degree of syllable complexity and phonemic length in vowels and consonants.

With respect to the morphophonological parameters of the rhythm-based typology of language introduced in 3.2., we already noted the erratic distribution of the various relevant processes over the languages in our sample. The only generalization which can be drawn on this level of analysis is that assimilations across consonant and vowel clusters are only possible in languages whose phonotactics allow such clusters. Accordingly, Maori and Yoruba, which both lack consonant clusters due to their simple CV phonotactics, do not exhibit assimilations. Languages such as Kayardild, Georgian and Tamil will not show assimilation processes across vowels, since their respective phonotactics do not permit vowel clusters. However, even in the presence of clusters, there is no need to assimilate across the individual segments of a cluster. Mandarin Chinese phonotactics allow consonant clusters; nevertheless there are no rules of consonant assimilation across such clusters. Similarly, Catalan, which exhibits vowel clusters, has no rules of vowel assimilation across such clusters. A similar case could be made with respect to cluster resolution. When the phonotactics of a language prohibit such clusters from resulting in morphophonological processes, there will be no cluster

resolution processes. When morphological concatenation results in clusters which are illicit in a given language, there seems to be no way of predicting which cluster resolution strategies will be employed by the phonology of a language. Even within a single language, cluster simplification and epenthesis could be employed in different contexts. For instance, some illicit consonant clusters in Basque are resolved by vowel epenthesis and others by cluster simplification. Given this evidence, it seems implausible that there is a principled connection between the rhythm profile of a language and the application of the morphophonological processes of assimilation and cluster resolution. Nevertheless, we will try to give a more detailed look on such processes in the context of cliticization in Chapter 4 of this study.

The morphophonological parameter *vowel harmony*, however, seems to be related to prosodic properties of linguistic rhythm. In Table 27, the degree of vowel harmony is compared with the values for the parameters *phonetic correlates of stress* and *segmental effects of stress*.

Table 27: Correlation of phonetic correlates of stress, segmental effects of stress and vowel harmony in the languages of our sample

	Yoruba	Slave	Basque	!Xóõ	W. Greenlandic	Tamil	Chukchi	Finnish	Georgian	Udihe	Koyra Chiini	Amele	Maori	Tariana	Mandarin Chinese	Nigerian Pidgin	Kayardild	Catalan	Maltese
Accent	0	0	0	0	0	1	1	2	2	3	3	3	3	3	3	3	3	3	3
Stress effect	0	0	0	0	0	0	1	1	1	1	2	2	2	2	3	3	3	3	3
Vowel harmony	1	0	1	1	0	1	2	2	0	2	0	1	0	1	0	1	1	0	1

We have already noted that vowel harmony *per se* appears in languages regardless of how stress is realized phonetically and of how many segmental effects of stress they have developed. Compare Yoruba, a language with no stress at all, with Maltese, a language with phonetically strong stress and the full range of possible segmental effects of stress. In both languages, we encounter vowel harmony effects across two adjacent

syllables. Vowel harmony processes which span over several syllables as a word demarcating process, however, are only attested for languages with low degrees of segmental effect of stress, namely Udihe, Chukchi, and Finnish. The phonological motivation for this correlation lies in the complementary distribution of vowel reduction as a segmental effect of stress and vowel harmony. Since vowel reduction neutralizes distinctive place features, these features can only spread over full vowels in the absence of vowel reduction. In this respect, the distribution of unrestricted tone and word demarcating vowel harmony imply the absence of vowel reduction.

To summarize, we can conclude that the phonetic realization of stress, segmental effects of stress, distribution of tone, syllable complexity, phonemic length and word-demarcating vowel harmony proved to be reliable parameters for the typological study of rhythm. Whereas the parameters phonetic correlates of stress and segmental effects of stress show a robust co-variation, the phonotactic parameter of syllable complexity only tentatively patterns with the two prosodic parameters, as does phonemic length. The presence of unrestricted distribution of tone or word-demarcating vowel harmony implies the absence of vowel reduction as a segmental effect of stress. In essence, the variation within the various parameters has to be conceived as a gradual cline. Accordingly, the languages in our sample do not fall neatly into three discrete categories of mora-, syllable- and stress-based rhythm. This favors the conception of linguistic rhythm as a continuum with various intermediate stages between rhythmic prototypes. Focal points on this cline would be languages which exhibit all the relevant properties as rhythmic prototypes. West Greenlandic, for instance, would be a prototypical representative of mora-based rhythm. The phonology of this language is characterized by the lack of stress and segmental effects thereof, by simple syllable structure and by length contrasts in consonants and vowels. A prototypical representative of syllable-based rhythm would be a language like Chukchi, which shows phonetically weak stress, little segmental effect of stress, simple syllable structure and the lack of length contrasts in vowels and consonants. Finally, Maltese shows prototypical stress-based behavior in having phonetically strong stress with the full range of segmental effects of stress and complex syllable structure.

3.4. Summary

We began this chapter by summarizing previous work on linguistic rhythm which focused on isochrony of phonological domains like the mora, the syllable and the foot. Due to disappointing results from phonetic studies on isochrony, the isochrony hypothesis has largely being abandoned and has been replaced by a number of competing research paradigms in the study of linguistic rhythm. We introduced and defended a rhythm-based typology of language which relies on the co-variation of phonological properties in prosody, phonotactics and morphophonology. After having discussed claims in the literature with respect to these parameters, we tested ten of the parameters on the basis of the nineteen languages in our sample. The variation across six parameters has proved to be systematic and symptomatic for different types of rhythmic organization. With the help of these parameters we proposed an interpretation of the rhythm-based typology of language as a continuum ranging from prototypical mora-based to prototypical syllable-based to prototypical stress-based languages. This concept of linguistic rhythm allows for a number of intermediate stages which are documented in the languages of our sample. After having discussed the various phonological effects of cliticization in Chapter 2, and after having situated the languages of our sample within a rhythm-based typology, we are now in a position to establish positive correlations between the rhythmic properties of a language and possible phonological processes in cliticization in the following chapter.

4. Linguistic rhythm and the phonology of cliticization

So far, we focused our attention on the cross-linguistic diversity of the phenomenon of cliticization. On the basis of the considerable cross-linguistic variation in the phonological behavior of clitics, we established prosodic and segmental clines in cliticization. Leaving the domain of cliticization for a while, we established a rhythm-based typology of language which relies on six prosodic, phonotactic and morphophonological parameters. In this chapter, we will attempt to flesh out the hypothesis that the overall rhythmic organization of a language constrains the possibilities in the phonological behavior of clitics. We will start by reconsidering the syllabic processes applying to consonants, vowels and whole syllable (4.1.). The distribution of syllabic processes on vowels in cliticization will be correlated with the phonetic correlates of stress and the degrees of segmental effects in a given language. In a second step, we will discuss junctural phenomena documented for host-clitic combinations in the light of the phonotactic structure of the respective languages (4.2.). The degree to which the junctural processes at the host-clitic boundary follow from the overall syllable complexity of a language will be tested. In particular, we will focus on the treatment of junctural consonants and vowel clusters and the treatment of intervocalic consonants at the clitic boundary. In the final section of this chapter, we will establish a typology for segmental effects of cliticization in mora-, syllable- and stress-based phonologies (4.3.), discussing illustrative examples from prototypical representatives of mora-based and stress-based rhythm, before we summarize our findings and evaluate the hypothesis proposed.

4.1. Prosody and syllabic processes in cliticization

A number of segmental rules in cliticization apply to whole syllables of the host-clitic combination. In 2.2.2., we documented such processes which affect consonants, vowels and whole syllables of clitics and which can be described within the taxonomy of structure preservation, assimilation, weakening and strengthening. We will start by

recapitulating the relevant processes which apply to consonants and whole syllables. Within the rhythm-based typology of language introduced in this study, no rhythm-related parameter can make clear predictions with respect to the cross-linguistic distribution of these processes. We will proceed to syllabic processes which apply to vowels in cliticized elements, essentially vowel preservation, vowel reduction, vowel harmony, and vowel lengthening, whose distribution over the languages of our sample can be correlated with the rhythm-related parameters of the phonetic strength of stress and segmental effects of stress. Summarizing our findings, we will formulate predictions with respect to syllabic segmental effects of cliticization in the different rhythmic types.

4.1.1. Syllabic processes on consonants and processes affecting whole syllables

As we saw in 2.2.2.1., consonants of clitic elements may be assimilated to other segments within the syllable. We saw two such cases in Koyra Chiini and !Xóõ, where onset consonants assimilate to subsequent vowels. In Koyra Chiini, /g/ is palatalized to /j/ in the presence of a following high vowel, for example in the 3rd person plural enclitic *gi* (Heath 1999:31). The onset consonant of the clitic grammatical particles *ki* and *ke* in !Xóõ are subject to [±back] harmony, such that /k/ will assimilate to the front consonant /t/ in the presence of the following front vowels (Traill 1985: 90). In Tariana, several processes related to consonant aspiration, such as aspiration floating and loss of aspiration, apply across syllables at the host-clitic boundary or within clitic clusters. In this language, we also encountered a rule of nasalization which spans over phonological words or phonological phrases in fast speech. This rule also operates on clitics which happen to be within the affected domains (Aikhenvald 2003a: 42). Whole syllables of cliticized elements may even be deleted in fast speech, an option which is documented for the Maltese proclitic object marker *lil* which reduces to *'(i)l* and for Tariana enclitics beginning with /pi/, namely *pidanà ~ danà* 'remote past reported', *pidakà ~ dakà* 'recent past reported' and *pidà ~ dà* 'present reported' (Aikhenvald 2003a: 52). Finally, Kayardild exhibits a rule of prosodic truncation which deletes the vowel of the final syllable within an intonation group. This rule may also apply to phrase-final clitics (Evans 1995a: 392).

As for the various rules which affect consonants in cliticized elements, none of them seem to be conceptually related to any phonological parameter of linguistic rhythm we successfully tested in 3.3., namely phonetic strength of stress, segmental effects of stress, syllable complexity, length contrasts and vowel harmony. Due to this, and due to the low number of occurrences of such processes in the languages of our sample, no correlations of the occurrence of segmental rules of this type and parameters of linguistic rhythm can be established. At this stage, the rhythm-based typology of language cannot make predictions with respect to the occurrence of these processes in languages of different rhythmic types.[1]

4.1.2. Syllabic processes on vowels, strength of stress and segmental effects of stress

Every language in our sample has clitic-like elements which form a syllable and contain a vowel. In principle, therefore, we can expect syllabic processes operating on vowels within clitics to appear in every language. However, the occurrences of structure preservation, assimilation, weakening and strengthening show a systematic distribution coherent with the rhythm-based typology of language developed in 3.3. In this section, we will start by summarizing the distribution of the various syllabic processes affecting vowels in clitics (see 2.2.2.2.) and will then proceed to a correlation of these processes with the rhythm-related parameters of phonetic strength of stress and segmental effects of stress (see 3.3.1.), before we finally formulate a prediction with respect to syllabic segmental effects in cliticization in the different rhythmic types.

Structure preservation, in the context of syllabic processes affecting vowels in cliticized elements, manifests itself in vowel preservation. In such cases, no segmental rule applies to the vowel of the cliticized element. This phenomenon is documented for the vast majority of languages, sixteen in sum, excluding only Catalan, Nigerian Pidgin and Mandarin Chinese. To give just one of many possible examples, both vowels of the Tariana adverbial *thepí* 'into water' remain unchanged when it is encliticized to the verbal host *du-hwá* (3sgf-fall) 'she fell', yielding *du-hwá=**thepì*** 'she fell into water' (Aikhenvald 2002: 64).

[1] See 4.1.2. for possible generalizations with respect to the fast speech reductions in Maltese and Tariana.

In the context of syllabic phenomena in cliticization, vowel harmony is a form of assimilation which applies to vowels in adjacent syllables within a host-clitic combination. Such rules of vowel harmony in the context of cliticization are reported for Maltese, Udihe, Tariana, Amele, Basque, Nigerian Pidgin and Finnish. In Maltese, the vowel of the second person enclitic /Vk/ assimilates to the vowel of the host with respect to roundness features. Thus it will surface as [ok] in the host-clitic combination *omm-**ok*** 'your mother' (Borg 1997: 276). Udihe enclitics, such as the additive focus enclitic *dA*, come in three allomorphs, with their vowels harmonizing with respect to height and roundness features, cf. *aka=**da*** 'and the back', *tege=**de*** 'and the gown' and *moxo=**do*** 'and the cup' (Nikolaeva & Tolskaya 2001: 87). In some Tariana enclitics, the pre-tonic vowel is assimilated to the stressed vowel. The 'topical non-subject' marker *nakù*, for instance, becomes *nukù* (Aikhenvald 2003a: 45). The Amele plural possessed morpheme /el/ undergoes regular vowel assimilation in which /el/ is converted to [il] after the [-high] vowels /e, a/ and to [ul] after /h, ʔ, g/], as in *jo as-ag=**ul*** (house grandparent-3s.Poss=**Pl**) 'the boss of the houses' (Roberts 1996: 8, 48f.). Basque exhibits a rule of low vowel assimilation in which a low vowel is raised to /e/ after a high vowel. This rule also applies to the clitic numeral *bat* 'one' in Gernika-Basque, compare [aśto=**βat**]'one donkey' and [laɣum=**bet**] 'one friend' (Hualde 1991: 56). In Nigerian Pidgin, proclitic auxiliaries, like the incompletive marker *dè*, assimilate to the quality of the following vowel, if they are not centralized to [ə]. For instance, the vowel of the aspect marker *dè* in *A **dè** wo̲k* 'I am working' can be realized either as a harmonizing [ɔ] or as a centralized [ə] (Faraclas 1989: 545). Finnish vowel harmony makes reference to the features [front] and [back]. The interrogative clitic *kO* will surface either with a front vowel after a front vowel host, as in *Pertti=**kö*** 'Pertti?' or with a back vowel after a back vowel host, as in *on=**ko*** 'Is?' (Nevis 1986: 9f.; Sulkala & Karjalainen 1992: 378).

Syllabic processes which apply to the vowels of cliticized elements may constitute cases of weakening, such as vowel reduction and vowel deletion. Such processes are reported for Maltese, Tariana, Kayardild, Catalan, Amele, Koyra Chiini, Nigerian Pidgin and Mandarin Chinese. In Maltese, the unstressed vowels in the proclitic prepositions *fi* 'in' and *bi* 'with' are deleted; ***bi** travu* 'with a beam' /**p**ˈtrɐːvʊ/ would be a relevant example for the application of this rule with the latter preposition

(Borg 1997: 273, Borg & Azzopardi-Alexander 1997: 310). Weakening is reported for Tariana in a number of processes. Comparing the Tariana Aktionsart enclitic *kàwhi* 'do early in the morning' with its non-clitic verbal counterpart *ka:whi* 'wake up; be early in the morning' we concluded that vowel shortening is a concomitant of stress reduction (cf. the examples in Aikhenvald 2003a: 346). Tariana also has a rule of pre-tonic and post-tonic vowel reduction by which /e, i, a/ are centralized to [ə], as in the clausal enclitics *makhà* 'recent past non-visual' and *tahkà* 'frustrative+recent past visual', which are realized as [məkhà] and [təhkà], respectively (Aikhenvald 2003a: 39). In some cases, the pre-tonic unstressed vowel is even deleted, as with the verbal clitic *sità* 'accomplished', yielding the variant *sta* (Aikhenvald 2003a: 35). In Kayardild, vowels of clitics undergo centralization when they appear in unstressed position, cf. *dangka=**th**[ɐ]=**ka*** (person=**THA=FOC**) (Evans 1995a: 59, 597; p.c.). Catalan vowel reduction reduces the seven phonemic vowels to [u], [ə] and [i] in unstressed syllables, see for instance the clitic preposition *amb* 'with' in the combination ***amb** ordre* [**əmb**ór̄ðrə] 'with order' (Hualde 19992: 394). Unstressed proclitics, for example *de* 'of', additionally lose their [ə] when followed by a vowel-initial host (Hualde 1992: 407, Wheeler 1979: 287ff.). The vowel of clitics which form an unstressed open syllable in Amele are laxened, cf. *maha=**na*** [mæˈhæ**nə**] 'on the ground' (Roberts 1996: 7). In Koyra Chiini, the vowel of the first person singular pronoun *ay* [aj] is laxened to *ey* [ɛj] when it appears as an unstressed enclitic to the verb, e.g. *a kar=**ey*** 'she hit me' (Heath 1999: 20). Vowel centralization in clitics is also, even if marginally, reported for Nigerian Pidgin (Faraclas 1989: 557) and Mandarin Chinese (Chao 1968: 36).

Vowels in cliticized elements can be strengthened by syllabic processes of vowel lengthening. We saw such cases in Maltese, Tariana, Maori and Koyra Chiini. In Maltese, short vowels which appear in stressed syllables after stress shift are lengthened. For instance, the enclitic *ha* '3sf.fem.' is lengthened when it constitutes the penultimate, stressed syllable of a word, as in: *ftaħt=**ħie**=lek* 'I opened it for you' (Borg & Azzopardi-Alexander 1997: 358ff.). Maori proclitics may be stressed according to the general stress placement rules, in which case their vowel is lengthened; compare *te* 'the' in the combination ***tee**nei* 'this' (Bauer 1993: 507). When a proclitic and an enclitic combine in Tariana to form a clitic-only word, the proclitic element will

receive primary stress and its vowel will be phonetically lengthened, as in [**né:**=mhà] (then=present non-visual) (Aikhenvald 2002: 69). In Koyra Chiini, a morpheme-initial vowel is phonetically lengthened after a CVC syllable. This process also applies to initial vowels in enclitic postpositional phrases, such as *a se* 'to her' in sentences like *ay har*=***aːse*** (1sg say=**3sg Dat**) 'I said to her' (Heath 1999: 40f.).

Table 1 summarizes our findings with respect to syllabic processes on vowels in cliticized elements and provides information on phonetic correlates of stress and segmental effects of stress; see Chapter 3.3.4., Table 23.

Table 1: Syllabic processes on vowels, phonetic strength of stress and segmental effects of stress in the languages of our sample

	Yoruba	Slave	Basque	!Xóõ	W. Greenlandic	Tamil	Chukchi	Finnish	Georgian	Udihe	Koyra Chiini	Amele	Maori	Tariana	Mandarin Chinese	Nigerian Pidgin	Kayardild	Catalan	Maltese
Accent	0	0	0	0	0	1	1	2	2	3	3	3	3	3	3	3	3	3	3
Stress effect	0	0	0	0	0	0	1	1	1	1	2	2	2	2	3	3	3	3	3
Vowel preservation	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	+	-	+
Vowel harmony	-	-	+	-	-	-	-	+	-	+	-	+	-	+	-	+	-	-	+
Vowel reduction	-	-	-	-	-	-	-	-	-	-	+	+	-	+	+	+	+	+	+
Vowel lengthening	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	+

The majority of rules which describe the segmental processes operating on vowels within cliticized elements make reference to the absence or presence of stress. This observation leads us to compare the distribution of syllabic processes on vowels accompanying cliticization with the rhythmic parameters of phonetic correlates of stress and the degree of segmental effect of stress, two parameters which have proved to be highly reliable in evaluating degrees of linguistic rhythm and which turned out to show a systematic co-variation. Table 1 presents the languages in the order of gradually increasing degrees of phonetic strength of stress and increasing degrees of segmental effects of stress, as developed in 3.3.4, Table 24.

For languages lacking stress, or exhibiting weak stress, i.e. stress realized only by pitch, vowels of cliticized elements are generally preserved. This is true for Yoruba, Slave, Basque, !Xóõ, West Greenlandic, Tamil and Chukchi. Basque, which represents a pitch-accent system, retains vowels in the majority of cases, but also has a rule of vowel harmony which applies to such elements. Finnish, Georgian, and Udihe, which employ pitch and duration as phonetic correlates of stress and only show little segmental effect of stress, behave very much like the members of the first group in preserving or harmonizing vowels in cliticized elements. For the third group of languages, in which stress is realized by pitch, duration and intensity and which show higher degrees of segmental effects, the picture looks quite different. In such languages, the segmental processes applying to vowels in cliticized elements are triggered by the absence or presence of stress. Almost every language of this group shows vowel reduction in the context of cliticization, Maori being the exception. Rules of vowel reduction may apply to the vowel of the cliticized element when it appears as an unstressed syllable within the host-clitic combination. Interestingly, the cases where whole syllables of clitics are deleted in fast speech are reported for languages of this group, namely Maltese and Tariana. In 2.1.1., we noted that clitics may also be stressable within the stress domain they form with their host. In this context, the vowel of the cliticized element will be lengthened, if duration is a phonetic correlate of stress and/or is phonologized in the context of stressed syllables. Relevant examples for this phenomenon come from Koyra Chiini, Maori, Tariana and Maltese. Occasionally, we also find vowel harmony phenomena in cliticization in the languages of this group. Vowel harmony effects are restricted to adjacent syllables in all of these languages and do not span entire word domains. In languages which allow vowel harmony processes and vowel reduction, such as Amele, Tariana, Nigerian Pidgin and Maltese, the two processes are in complementary distribution.[2] In a number of languages in this group, vowels of clitic elements may also be preserved in cliticization. This can be the case when the cliticized element retains secondary stress and is thus not subject to rules which apply to stressed vowels, like vowel lengthening, or unstressed vowels, like vowel reduction. In systems where vowel reduction has a rather restricted domain of

[2] These findings are compatible with the general distribution of vowel harmony as discussed in 3.3.4., see in particular Table 27.

application, for instance word-final syllables, the clitic can fail to appear in such a position and is therefore not affected by the rules of vowel harmony.

The data presented in Table 1 allow for straightforward generalizations with respect to the distribution of syllabic processes on vowels in languages of the different rhythmic types. Languages which exhibit no or only phonetically weak stress and no segmental effects of stress and which count as mora- and syllable-based with respect to these prosodic parameters of linguistic rhythm, will show a high degree of vowel preservation and vowel harmony in the context of syllabic processes in cliticization. Languages with phonetically strong stress and segmental effects of stress, which count as stress-based with respect to these prosodic parameters of linguistic rhythm, will show little vowel preservation, occasional vowel harmony, frequent vowel reduction and, in some cases, vowel lengthening in cliticization.

4.1.3. Summary

In this section we reminded ourselves of the various syllabic processes which apply to consonants and vowels in the clitics of our sample and tried to correlate them with reliable parameters of linguistic rhythm. For syllabic processes applying to consonants in cliticized elements, too few processes in too few languages are documented in our sample. Since there is no conceptual connection with any phonological parameter of linguistic rhythm, we could not attribute the occurrence of such processes to a specific rhythmic type. However, with respect to syllabic processes affecting vowels in clitics, namely vowel preservation, vowel harmony, vowel reduction/deletion and vowel lengthening, we could establish a positive correlation with two prosodic parameters of linguistic rhythm, namely phonetic correlates of stress and segmental effects of stress.

The generalizations which can be drawn from our observations of the occurrence of the various syllabic processes in mora-/syllable-based and stress-based languages are summarized in Table 2.

Table 2: Syllabic effects of cliticization in mora-/syllable-based and stress-based rhythm

	Mora-/Syllable-based	Stress-based
Structure preservation	Vowel preservation	Restricted vowel preservation
Assimilation	Vowel harmony	Restricted vowel harmony
Weakening	Not reported	Vowel reduction/deletion
Strengthening	Not reported	Vowel lengthening

Languages with mora-based and syllable-based rhythm are characterized by the lack of stress in pure tone, pitch-accent or intonation-only systems or by the phonetically weak realization of stress by pitch movement only. In this phonological climate, stress has no or little segmental effect on vowels and consonants in stressed and unstressed syllables. The syllabic effects of cliticization in such phonologies are notably few. Usually, vowels in cliticized elements are retained unchanged, even if the clitic constitutes an unstressed syllable in the host-clitic combination. The only syllabic process which is possible here is vowel harmony, which may even span entire word domains. Neither vowel reduction nor vowel strengthening are reported for these languages. However, it is important to remember that tonal phonology can also trigger rules of vowel epenthesis, which strengthen the host-clitic combination by the insertion of an additional segment, cf. the Yoruba case discussed in 2.1.2.3.

Stress-based languages, on the other hand, are characterized by phonetically strong stress, realized by pitch, duration and intensity. The stronger the phonetic realization of stress is in a language, the higher the degrees of segmental effects of stress which the language exhibits will be. Processes such as vowel reduction in unstressed syllables and vowel lengthening in stressed syllables are deeply rooted in the phonologies of these languages. The syllabic effects of cliticization are manifold in this phonological climate. Cliticization, which includes stress reduction in these languages, will be accompanied by the reduction and deletion of the unstressed vowels in clitic elements. When clitics are integrated into the domain for stress assignment and happen to be stressed, their vowels will also be lengthened. Vowel reduction and vowel lengthening, which both are absent in mora- and syllable-based rhythm, are therefore salient concomitants of cliticization in stressed-based rhythm. When clitics fail to

undergo these processes, for instance because the rules of vowel reduction and vowel lengthening apply to more restricted domains, their vowels will be retained or may even enter vowel harmony processes with restricted domains of application. These last options are, however, rather infrequent in our data.

4.2. Phonotactics and junctural processes in cliticization

With respect to junctural processes, we encountered processes that apply to consonant clusters which result from the encliticization of consonant-initial clitics to consonant-final hosts or from the procliticization of consonant-final clitics to consonant-initial hosts. A second group of processes comprises segmental rules which apply to vowel clusters which emerge from the encliticization of vowel-initial clitics to vowel-final hosts or from the procliticization of vowel-final clitics to vowel-initial hosts. Processes that apply to intervocalic consonants at the clitic boundary form the third group. We will recapitulate the various strategies of structure preservation, assimilation, weakening and strengthening documented in the various contexts (compare Chapter 2.2.1.) and will try to correlate the appearance of specific strategies in a given language with phonotactic properties such as syllable complexity and length distinctions, which constitute important ingredients of the rhythmic organization of language (compare Chapter 3.3.2.). The major finding that rhythm-based phonology cannot make clear predictions with respect to the occurrence of junctural processes in cliticization will be summarized in the final section.

4.2.1. Junctural consonant clusters and syllable complexity

Not all languages in our sample exhibit consonant clusters at clitic boundaries. In Tariana, Kayardild, Maori, !Xóõ and Yoruba, no consonant clusters at the clitic boundary are reported. In Udihe, Tamil, Slave and Nigerian Pidgin, such clusters seem to be very infrequent. For those languages which exhibit consonant clusters at clitic boundaries, such clusters may be subject to processes of structure preservation, assimilation, weakening and strengthening.

When cliticization gives rise to consonants cluster, they are preserved in a number of languages, namely Maltese, Georgian, Chukchi, Tamil, West Greenlandic, Catalan, Amele, Basque, Koyra Chiini, Nigerian Pidgin, Mandarin Chinese and Finnish. In 2.2.1.1., we saw how the deletion of word-final consonants is blocked by the presence of a clitic in Maltese and Catalan. In the Maltese host-clitic combination *semah=**ha*** 'he heard her' and in the Catalan host-clitic combination *voler=**te*** 'to want you' we find word-medial consonant clusters which are not repaired by any segmental rule. A similar cluster surfaces after vowel deletion and the blocking of palatalization in the host-clitic combination *belie-ni=**de*** 'this fairy' in Udihe, which surfaces as *belien=**de***. Such consonant clusters do not only result when segmental rules are blocked, they may also result from the concatenation of host and clitic when no rules of cluster resolution apply. The most salient languages in which even more complex consonant clusters are retained at the clitic boundary are Maltese and Georgian. As noted above, the blocking of consonant deletion rules in Maltese may lead to bi-consonantal clusters at the clitic boundary. In *ktibt=**lek** ittra* 'I wrote you a letter', the encliticization of the indirect object pronoun *lek* '2sg' even results in a consonant cluster composed of three consonants (Borg & Azzopardi-Alexander 1997: 254). Complex consonant clusters may also surface after the application of other segmental rules, such as pre-tonic vowel deletion. For example, the proclitic preposition *bi* 'with' is subject to this rule in the prepositional phrase ***bi** travu* 'with a beam' which surfaces as /**p**ˈtrɐːvʊ/ (Borg & Azzopardi-Alexander 1997: 310). Note that the surface form shows a consonant cluster with three word-initial consonants. The encliticization of the negative marker *=x* to a verb ending in a consonant cluster provides the only context for a cluster of three coda consonants. Georgian also preserves complex consonant clusters that result from cliticization. One such case is found in the encliticization of the clitic postposition *ši* 'in' to the host *saxl* 'house' which yields the host-clitic combination *saxl=**ši*** 'in the house', with a consonant cluster of three consonants (Harris 2002: 239).

In languages where cliticization leads to the emergence of consonant clusters at the clitic boundary, the adjacent segments may also be subject to rules of assimilations. Such segmental rules of assimilation are reported for Maltese, Chukchi, Basque and Finnish. The proclitic definite article in Maltese, for example, assimilates to the following consonant of the host, e.g. ***it-**tarġa* 'the step'. In Chukchi, rules of lenition

apply to adjacent consonants at the clitic boundary, as evidenced in the consonant alternation /k/ → [ɣ] / _C$_{\text{-back}}$ in *ɘtl^{ʔ}a-**ɣ=reen*** ‘with mother’ (Dunn 1999: 77). Basque has a palatalization rule which changes /d/ to [ɟ] in the groups /ild/ and /ind/, as in the clitic group *egin **dau*** [ejɲ**ɟaw**] ‘has done it’ (Hualde & Ortiz de Urbina 2003: 37f.). We encountered a number of assimilation rules in Koyra Chiini, for instance when the nasal consonant /n/ assimilates to /ŋ/ in *ay din**=ga*** [ajdiŋ**ga**] ‘I picked it up’ (Heath 1999: 29f.).

In the context of consonant clusters at the clitic boundary, cluster simplification, whereby one of the adjacent consonant is deleted, is a process of weakening. Such cluster simplification rules at the clitic boundary are documented for four languages of our sample: West Greenlandic, Catalan, Basque and Finnish. West Greenlandic shows cluster simplification in cases such as /qanuq=**guuq**/ ‘how (quot.)’, which is rendered to /qanuq=**ruuq**/ by assimilation, and finally surfaces as [qanu=**ruuq**], with one of the adjacent segments deleted (Kleinschmidt 1968 [1851]: 5f., 59). Catalan forms such as ***les*** *sardines* ‘the sardines’, with a proclitic article, will be realized as [**ləs**ərðínəs], where the cluster of two identical /s/ sounds is simplified to one (Hualde 1992: 400ff.). In Basque, the cluster /td/ is simplified to [t] in the host-clitic combination *bai**=ta*** ‘since he/she/it is’ (Hualde & Ortiz de Urbina 2003: 40). Another example for cluster simplification comes from Finnish, where /lintu-t=**ni**/ ‘my birds’ is realized as *lintu**ni***, with the host final consonant deleted.

Cluster simplification is one strategy of cluster resolution; the insertion of epenthetic vowels to break up the cluster is another strategy to resolve consonant clusters. Since an additional segment is introduced to the surface form, we can refer to such processes as strengthening processes. Four languages of our sample show vowel epenthesis in consonant clusters at the clitic boundary, namely Maltese, Georgian, Chukchi and Catalan. In Maltese, the cluster /ʃs/ is broken up by the insertion of epenthetic *i*, in the clitic-host combination ***xi**=smajt?* ‘what did you hear?’. The epenthetic vowel /a/ is inserted when the Georgian conjoining clitic *c(a)* ‘too, also, both…and’ attaches to consonant final hosts, as in *mankana**=c*** (car.NOM=**too**) ‘the car, too’ (Hewitt 1995: 88). Catalan inserts an epenthetic schwa in clitic clusters, such as *porta**=me=ls*** ‘take them (masc.) to me’ (Hualde 1992: 407ff.). When the Chukchi emphatic enclitic is attached to a consonant-final host, an epenthetic vowel /ə/ is

inserted to break up the resulting consonant cluster, e.g. /remkəlʔən=**ʔm**/ is realized as *remkəlʔən=**ʔəm*** ‘guest (EMPH)’ (Dunn 1999: 76).

Table 3 summarizes the observations made in the preceding paragraphs with respect to the treatment of consonant clusters at clitic boundaries in the languages of our sample. Additionally, it provides information about the degree of syllable complexity found in the respective languages; see Chapter 3.3.4., Table 23.

Table 3: Junctural processes affecting consonants and syllable complexity in the languages of our sample

	Maori	Yoruba	Kayardild	Udihe	Tariana	W. Greenlandic	Amele	!Xóõ	Slave	Chukchi	Koyra Chiini	Mandarin Chinese	Tamil	Basque	Nigerian Pidgin	Finnish	Catalan	Maltese	Georgian
Syllable types	2	2	3	4	4	4	4	4	4	5	5	6	9	9	10	11	15	15	> 16
Consonant clusters	-	-	-	+	-	+	+	-	+	+	+	+	+	+	+	+	+	+	+
Structure preservation	-	-	-	+	-	+	+	-	+	+	+	+	+	+	+	+	+	+	+
Assimilation	-	-	-	-	-	+	-	-	-	+	+	-	-	+	-	-	-	+	-
Cluster simplification	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	+	+	-	-
Epenthesis	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	+	+

The degree of syllable complexity seems to be conceptually related to a number of junctural rules discussed so far. A common understanding of cluster simplification and vowel epenthesis, for example, is its function in repairing illicit consonant clusters and in altering surface forms to consist approximately of CV sequences only. Cluster assimilations, on the other hand, are only possible when a language allows two or more adjacent consonant in clusters. The degree of syllable complexity we measured in the number of syllable types includes information on onset and coda consonant clusters and seems therefore to be relevant for the treatment of junctural consonants in cliticization. Table 3 presents the languages of our sample in the order of gradually increasing syllable complexity, cf. 3.3.4, Table 25.

First of all, the very appearance of such clusters is constrained by the overall phonotactic structure of a language. When a language maximally allows CV syllables, the concatenation of hosts and clitics will never give rise to consonant clusters. This holds true for Maori and Yoruba, which both only allow V and CV syllables and accordingly do not exhibit consonant clusters at clitic boundaries. A prerequisite for the emergence of such consonant clusters at the clitic boundary is phonotactics which allow CVC syllables. With the exception of Maori and Yoruba, all languages of our sample allow such syllables, which means that, in principle, all of them may show junctural consonant clusters. Nevertheless, languages like Tariana, Kayardild and !Xóõ presumably do not exhibit junctural consonant clusters at host-clitic boundaries. With respect to structure preservation, all languages may retain consonant clusters which emerge in cliticization. This is true for languages with low degrees of syllable complexity, for instance Amele with 4 possible syllable types, and for languages with high degrees of syllable complexity, such as Maltese with 15 syllable types and Georgian with more than 16 syllable types. As for assimilation across consonant clusters at clitic boundaries, only five languages of our sample are reported to exhibit such rules. Chukchi, which is one of them, has a rather low degree of syllable complexity, in that it allows up to 5 syllable types. Maltese, another language of this group, allows up to 15 syllable types and thus shows a high degree of syllable complexity. Cluster simplification is documented for four languages with varying degrees of syllable complexity. A representative with a low degree of syllable complexity is West Greenlandic with 4 syllable types, while Catalan is representative for languages with high degrees of syllable complexity, with 15 syllable types. Epenthesis at clitic boundaries is documented for the three languages with the highest degree of syllable complexity, namely Maltese, Georgian and Catalan, but also for Chukchi with a low degree of syllable complexity.

On the basis of this weak evidence, we cannot formulate positive correlations of the treatment of junctural consonant clusters at the clitic boundary and syllable complexity. The most robust, but presumably also the most trivial, finding in this context concerns the distribution of junctural consonant clusters across the languages of our sample. Such clusters can only emerge if a language allows syllable structures more complex than CV. When the degree of syllable complexity in the language is high

enough to allow the emergence of such clusters, they will usually also be retained and the structure of the host-clitic combination will be preserved. In a subset of these languages, the consonant cluster resulting from cliticization will be subject to further assimilation rules. The occurrence of such rules is, however, not constrained by syllable complexity. As for cluster simplification, such processes are reported for languages with all degrees of syllable complexity. In the West Greenlandic case, the consonant cluster /qr/ happens to be one of the illicit consonant clusters in the language, licit consonant clusters are not simplified at the clitic boundary. In Catalan, a cluster of two identical /s/ sounds is simplified, and in Basque, a cluster of the two sounds /td/ is simplified. In both cases, the segments in question resemble each other considerably in sharing a number of or even all distinctive features. There seems to be no way to attribute these peculiarities to the overall degree of syllable complexity in a language. As for the cases where consonant clusters at clitic boundaries are broken up by vowel epenthesis, it seems more likely that the segmental composition of the clitics in question has to be held responsible for the application of such rules and not the phonotactic make-up of a language. In all of the cases we discussed, namely Maltese *x*, Georgian *c*, Chukchi *m* and Catalan *m*, the clitics are subminimal in consisting of one consonant only.

The generalizations we can draw from these observations are as follows. The higher the degree of syllable structure in a language, the likelier is the occurrence of consonant clusters at clitic boundaries. If the phonotactics of a language allow for such clusters, structure preservation and assimilations across the cluster are possible. In such languages, rules of cluster simplification apply only to idiosyncratically illicit consonant clusters and rules of epenthesis apply only to subminimal clitics. Since a high degree of syllable complexity is a prototypical property of stress-based phonologies, we can attribute the observations made above to this rhythmic type. Languages with low degrees of syllable complexity, on the other hand, are less likely to show junctural consonant clusters and processes applying to them. Since a low degree of syllable complexity is characteristic for mora-/syllable-based phonologies, we can attribute this behavior to representatives of this rhythmic type.

4.2.2. Vowel clusters, nucleus complexity and vowel-initial syllables

Vowel clusters at clitic boundaries emerge when vowel-final proclitics attach to vowel-initial hosts and when vowel-initial enclitics attach to vowel-final hosts. Such hiatus situations are documented for 12 languages in our sample: Maltese, Tariana, Kayardild, Maori, Georgian, Tamil, West Greenlandic, Basque, Slave, Yoruba, Koyra Chiini and Nigerian Pidgin. As was the case with consonant clusters, languages may treat such vowel clusters with rules of structure preservation, assimilation, weakening or strengthening.

Languages which retain vowel clusters that result from cliticization are Tariana, Maori, Georgian and Slave. The vowel cluster which results when the Tariana approximative marker *ihà* is encliticized to a vowel-final host, as in *kadíte=**ihà*** (black+NCL:ANIM=**APPROX**) 'blackish (relative to other black thing)', may be retained in the surface form [kadíte=**ihà**] or may be resolved by glide formation in [kadíte=**yhà**] (Aikhenvald 2003a: 52). In Maori, the vowel cluster that emerges when the proclitic preposition *ki* 'to' attaches to a vowel-initial host is preserved, e.g. ***ki**=a='raatou* (**to**=pers=IIIpl) 'to them'. In other cases, procliticization of this element leads to vowel sequences of up to four vowels, for instance in ***ki**='a:=ia* (**to**=pers=IIIsg) 'to her' (Bauer 1993: 508). In Georgian, the vowel cluster which results from the encliticization of the copula *a* to a vowel-final host is retained, for example in *gela ekimi=**a*** 'Gela is a doctor' (Harris 1981: 13). In Slave, vowel clusters within clitic clusters are preserved, e.g. *hejin=**oli=íle*** '(s)he will not sing', whereas vowel clusters in suffix clusters are resolved by vowel coalescence (Rice 1989c: 108ff.). In both cases, the segmental composition of host and clitic are retained, therefore we can characterize this behavior as structure preservation.

When cliticization leads to junctural vowel clusters which are retained, these vowel sequences may be subject to assimilation rules. Such behavior is reported for Yoruba and Koyra Chiini. Remember that a sequence like *ngbọ́=**a** wá* 'confirm, did we come?' in Yoruba will be realized as *ngbá=**a** wá*, where the final vowel of the host assimilates to the /a/ of the clitic (Akinlabi & Liberman 2000: 42f.). When the imperfective marker *o* encliticizes to the 2nd person singular pronoun *ni* in Koyra Chiini,

the host vowel assimilates to /o/ and the two short vowels are contracted to one long [oː]: /ni=**o**/ → /no o/ → [noː] (Heath 1999: 24, 31).

Adjacent vowels at the host-clitic boundary may also be subject to weakening processes. In 2.2.1.2.1., we discussed cases where one of the adjacent vowels is weakened to a consonant, i.e. a glide as observed in Tariana and Maltese, and cases where one of the adjacent vowels is deleted in vowel coalescence. For the present purposes, we will restrict our attention to the latter type of weakening which is reported for Maltese, Kayardild, Maori, Tamil, West Greenlandic, Basque and Yoruba. When the proclitic negative particle *ma* in Maltese procliticizes to a following vowel-initial host, the resulting vowel cluster is resolved by vowel coalescence in which the vowel of the proclitic is deleted, e.g. ***m**'aħniex* (**NEG**=PRO.1.Pl.-NEG) 'not us' (Borg & Azzopardi-Alexander 1997: 88f.). In Kayardild, two vowel-initial enclitics lose their junctural vowel when they combine with a vowel-final host, namely *(i)da* 'same, still, yet, both, even' in *wululbu-ya=**da*** (bait-LOC=**SAME**) 'still at the bait' and *(a)ka* 'emphatic focus' in *ri-ya=**ka*** (east-NOM=**FOC**) 'east!' (Evans 1995a: 389ff.). Although Maori usually retains vowels clusters which emerge in cliticization, vowel coalescence applies to the construction /**te**+aa Hone/ (**the**+gen John) 'John's' which surfaces as *taa Hone*, with the vowel of the proclitic definite article deleted (Bauer 1993: 507). In Tamil, a rule which deletes word-final /u/ prohibits a vowel cluster in the host-clitic combination /vandaaru=**aa**/ 'did he come?', which surfaces as *vandaar=**aa*** (Schiffman 1999: 150). West Greenlandic optionally resolves vowel clusters by a rule of vowel coalescence where underlying long /aa/ and short /a/ are realized as one long /aa/, for instance in *aallar-niar-ta=**(a)at*** (eave-try-1p.opt.=**req.-conf.**) 'Let's go then' (Fortescue 1984: 9, 354). When the clitic conjunction *(e)ta* 'and' in Basque attaches to a vowel-final host, the resulting hiatus is repaired by the deletion of the clitic-initial vowel. Accordingly, it will surface as [ta] in *koldo=**ta** peru* 'Koldo and Peru' (Hualde 1991: 57). Apart from the assimilation rules across vowel clusters we encountered in Yoruba, this language also resolves hiatus by the deletion of one of the adjacent vowels. The combination *ngbọ́ **ó** wá* 'confirm, did he come?', for instance, will surface as *ngb**ó** wá*, with the vowel of the host deleted (Akinlabi & Liberman 2000: 42f.).

The last option for the treatment of junctural vowel clusters emerging in cliticization is the insertion of an epenthetic consonant to break up the cluster. Since

such processes increase the number of segments in the output form, we consider these to be cases of strengthening. Such processes are documented for Tamil, West Greenlandic, Basque and Nigerian Pidgin. In Tamil, two adjacent vowels at suffix-, clitic- and word-boundaries are broken up by the insertion of an epenthetic /y/, if the first vowel in the cluster is a front vowel, or an epenthetic /v/, if the first vowel in the cluster is a back vowel (Asher 1982: 240f., Schiffman 1999: 21). The vowel cluster that results from the encliticization of vowel-initial *aasiit* 'again as usual' to a vowel-final host in West Greenlandic is resolved by the insertion of /j/, as observed in the host-clitic combination *urnippaa=**jaasiit*** 'he came up to him as usual' (Fortescue 1984: 354; Rischel 1974: 1974). In the case of the Basque demonstrative *hau*, the epenthetic consonant which breaks up the junctural vowel cluster can either be /b/ or /ɟ/: [buu=**bau̯**] 'this head' and [mendi=**ɟau̯**] 'this mountain' (Hualde 1991: 49). In Nigerian Pidgin, one of the epenthetic consonants /y/, /w/ or /r/ is inserted to resolve consonant clusters at the host-clitic boundary, compare the realizations of *A folo=**am** go* 'I went with him/her' as [fó.ló.**wám**] or [fó.ló.**rám**] (Faraclas 1989: 553).

Table 4 summarizes our short recapitulation of the treatment of junctural vowel clusters in cliticization in the languages of our sample, and provides information about the phonotactic properties of nucleus complexity and the presence of vowel-initial syllable types in the respective languages; see Chapter 3.3.2., Table 17 and 18.

Table 4: Junctural processes affecting vowels, nucleus complexity and vowel-initial syllables in the languages of our sample

	Kayardild	Georgian	Tamil	Maltese	Tariana	Chukchi	W. Greenlandic	Catalan	Amele	!Xóõ	Basque	Slave	Yoruba	Koyra Chiini	Nigerian Pidgin	Mandarin Chinese	Finnish	Udihe	Maori
Nucleus complexity	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	6
Vowel-initial syllables	-	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+
Hiatus situations	+	+	+	+	+	-	+	-	-	-	+	+	+	+	+	-	-	-	+
Structure preservation	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	+
Assimilation	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-
Vowel coalescence	+	-	+	+	-	-	+	-	-	-	+	-	+	-	-	-	-	-	+
Epenthesis	-	-	+	-	-	-	+	-	-	-	+	-	-	-	+	-	-	-	-

The values for syllable complexity, which we calculated on the basis of possible syllable types in the languages of our sample, are of minor importance here, since they explicitly exclude information on syllable complexity in the form of vowel clusters. Therefore, we will consider the degree of syllable complexity as discussed the context of the phonological treatment of vowel clusters at the syllable boundary. The parameter is relevant in the present context since the possibility of syllabifying verb clusters as syllable nuclei should in principle exclude the application of vowel cluster resolution processes. The presence of vowel-initial syllables is relevant in this context since the concatenation of such syllables to CV syllables provides the basis for the emergence of vowel clusters in cliticization. Table 4 presents the languages of our sample in the order of gradually increasing nucleus complexity, cf. 3.3.2.1., Table 17.

The data presented in Table 4 reveals a rather erratic distribution of junctural vowel clusters and segmental rules affecting them across languages of varying degree of nucleus complexity. Facing the fact that at least two languages in our sample do not exhibit vowel-initial syllables, namely Kayardild and !Xóõ, we would like to predict that these languages would also lack hiatus situations in cliticization. Kayardild, however, has two vowel-initial enclitics which initiate a hiatus situation when they

attach to vowel-final hosts. Udihe, on the other hand, is a language with high nucleus complexity and which also allows vowel-initial syllables, but since it fails to have vowel-initial enclitics, no hiatus situation can arise in cliticization. Maori and Yoruba, which provide numerous examples for hiatus situations resulting in cliticization, notably have the lowest degrees of syllable complexity in the languages of our sample, both only allowing (C)V syllables. As for structure preservation, vowel clusters are retained in four languages: Tariana, Maori, Georgian, and Slave. The complexity of the resulting vowel cluster is constrained by the overall degree of nucleus complexity in a language. For Tariana and Slave, bi-vocalic sequences are the maximum, whereas Maori allows for even more complex vowel clusters in cliticization and elsewhere. The vowel sequences that emerge in Georgian cliticization are presumably syllabified as two simple syllable nuclei, since the language does not allow complex syllable nuclei. Only two languages in our sample show assimilation across vowel clusters. In both cases, Yoruba and Koyra Chiini, the complexity of the vowel sequence does not exceed the degree of nucleus complexity of the language in general. Vowel coalescence simplifies the vowel clusters which result from cliticization. In Kayardild, which does not tolerate complex syllable nuclei and which does not allow vowel-initial syllables, the phonotactics force the resolution of hiatus situations, in this case through vowel coalescence. In the other six languages for which this process is documented, however, no phonotactic restriction on nucleus complexity of vowel-initial syllables constrains the resolution of hiatus situations. As for consonant epenthesis as a strategy to resolve hiatus, three out of the four languages which show this process, in principle, allow for complex nuclei and vowel-initial syllables: West Greenlandic, Basque and Nigerian Pidgin. Tamil phonotactics impose a higher pressure on vowel cluster resolution, since they do not allow for complex nuclei.

The preceding report gives no reliable basis for correlations of phonotactic parameters of linguistic rhythm and the phonological treatment of vowel clusters at clitic boundaries. In 3.3.2., we already noticed that nucleus complexity is of little help in evaluating linguistic rhythm, because we found too little cross-linguistic variation within this parameter. In the context of the present discussion, we may note that the degree of nucleus complexity of language imposes restrictions on the complexity of vowel clusters emerging in cliticization. The only thing which could be inferred from

our observations is that the lower the degree of syllable complexity in a language, the likelier the occurrence, preservation and assimilation of vowel clusters at clitic boundaries is. This would be true for the languages with the lowest degree of syllable complexity within our language sample: Maori and Yoruba. Since these languages behave like mora-/syllable-timed languages with respect to this phonotactic parameter of rhythm, we may attribute the emergence, preservation and assimilation of vowel clusters in cliticization to this rhythmic type. Overall, we have to admit that the rhythm-based typology proposed in this study has little to say on this topic.

4.2.3. Intervocalic consonants, syllable complexity and length contrasts

Intervocalic consonants at host-clitic boundaries may result from the procliticization of consonant-final clitics to vowel-initial hosts and the encliticization of consonant-initial clitics the vowel-final hosts (see 2.2.1.1.2.), or from the procliticization of vowel-final clitics to consonant-initial hosts and the encliticization of vowel-initial clitics to consonant-final hosts (see 2.2.1.2.2.). Due to the high number of constellations which can lead to intervocalic consonants at the clitic boundary, all languages in our sample exhibit such junctural VCV sequences.

The most natural treatment of such host-clitic boundaries is the preservation of their structure. All languages retain at least some of the intervocalic consonants which emerge in cliticization. In other cases, these contexts block segmental rules that would apply in the absence of the clitic. In Tamil, the deletion of word-final /l̩/ is blocked by the presence of a vowel-initial enclitic, such as the focus enclitic *um* 'they, too' in *avaŋkal̩=**um*** (Asher 1982: 239). Intervocalic position of nasal consonants blocks the nasalization of the vowel preceding the nasal consonant in Slave, e.g. in *hejin=**íle*** '(s)he does not sing'. Here, a number of neutralization rules are also blocked in this phonological context (Rice 1989c: 114ff.). In Nigerian Pidgin, /r/ is deleted in word-final position. However, if the 3rd person object clitic *am* is attached to a word ending in /r/, the host will surface with its final consonant: *hyar=**am*** [hyá.r**àm**] 'hear it' (Faraclas 1989: 539). In Finnish, rules of vowel raising, vowel shortening and vowel deletion are blocked by the presence of a clitic, therefore the structure of such junctural VCV sequence is preserved (Nevis 1984: 175f.).

Assimilation is a marginal phenomenon in this context. In our data, we only encountered one example from Basque, where the initial consonant of *ta* 'and' palatalizes when the conjunction attaches to a host ending in /i/, see /ni=**ta** śu/ [ni**ce**śu] 'you and I' (Hualde 1991: 60f.).

As we noted in 2.2.1.1.2., intervocalic position provides a prototypical context for a number of consonantal weakening rules. In Maltese, this intervocalic consonantal weakening is manifested in the deletion of /h/ in host-clitic combinations involving the enclitic pronouns *h* '3sg.masc.', *ha* '3sg.fem.' and *hom* '3pl.' (Borg 1997: 275). Intervocalic /k/ in Tamil is laxened to the voiceless continuants [h] or [s̱] or may be deleted, compare *avanga=**kitte*** and *avanga=**hitte*** 'with, near them' (Schiffman 1999: 11). Also, as voiceless /t/ is realized as [ð] in intervocalic position, the enclitic emphatic particle *taan* will surface with an initial [ð] when it is attached to a vowel-final host (Schiffman 1999: 10, 193, Arokianathan 1981: 103f.). Enclitic Sandhi in West Greenlandic nasalizes host-final plosive consonants in front of vowel-initial enclitics. In this morphophonological context, /p/ is realized as [m], /t/ as [n], /k/ as [ŋ] and /q/ as [N], see for example *Suulun=**una*** 'it is Søren!' (Rischel 1974: 155f.; Fortescue 1984: 333). In Basque, the voiced obstruents /b, d, g/ are realized as continuants in intervocalic position. Take for instance the clitic numeral *bat* 'one' in Gernika-Basque, whose initial consonant surfaces as [b] after a nasal and as [β] in intervocalic position: [laɣum=**bet**] 'one friend' and [aśto=**βat**] 'one donkey' (Hualde & Ortiz de Urbina 2003: 44, Hualde 1991: 56). The initial glide of the Yoruba 3rd person plural subject pronoun *wọ́n* is deleted when it encliticizes to a preceding vowel-final pragmatic particle and a rule of vowel assimilation applies, see *ngbọ́n= **ọ́n** wá* (Akinlabi & Liberman 2000: 43). In Koyra Chiini, a similar rule of intervocalic glide deletion applies to the demonstrative *woo* 'this' when it is encliticized to a vowel-final host (Heath 1999: 35, 61). Finally, Nigerian Pidgin provides some examples where initial consonants of clitic elements are subject to segmental processes weakening, such as approximation, frication, tapping and deletion, in intervocalic position. For instance, the incompletive aspect marker *dè* in *A **dè** go* 'I am going', may be realized with an initial alveolar stop /d/, an approximant /j/, a tap /ɾ/, or may even be deleted completely in rapid speech (Faraclas 1989: 540).

Strengthening of intervocalic consonants at clitic boundaries is documented in the form of gemination for two languages of our sample, namely Maltese and West Greenlandic. When the proclitic object marker *lil* in Maltese is attached to a vowel-initial host, the clitic-final consonant /l/ appears in intervocalic position and is geminated, e.g. ***lil*** *ommi* /**lill-**ommi/ 'to my mother' (Borg 1997: 256). This rule of intervocalic strengthening also applies to the host-clitic combination ***se*** *naraw* 'we will see', with the future particle *se*. Here, the consonant /n/ appears in intervocalic position at the clitic boundary and is geminated, resulting in [**sɛ**nːɐˈrɐw] (Borg & Azzopardi-Alexander 1997: 223). When the West Greenlandic enclitic particle *taaq* 'also' is attached to a host word ending in /i/, the initial /t/ of the enclitic is turned into the fricative /s/. This consonant is further geminated in this intervocalic position, e.g. *Nuum-mi*=***ssaaq*** (Nuuk-loc=**also**) 'also in N.' (Fortescue 1984: 113).

Table 5 summarizes our observations with respect to intervocalic consonants at clitic boundaries and recapitulates the information on syllable complexity and length contrasts in the languages of our sample, compare Chapter 3.3.4., Table 23.

Table 5: Junctural processes affecting intervocalic consonants, syllable complexity and length contrasts in the languages of our sample

	Maori	Yoruba	Kayardild	Udihe	Tariana	W. Greenlandic	Amele	!Xóõ	Slave	Chukchi	Koyra Chiini	Mandarin Chinese	Tamil	Basque	Nigerian Pidgin	Finnish	Catalan	Maltese	Georgian
Syllable complexity	2	2	3	4	4	4	4	4	4	5	5	6	9	9	10	11	15	15	> 16
Length contrasts	1	1	1	1	1	2	0	0	0	0	1	0	2	0	0	2	0	2	0
Intervocalic consonants	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Structure preservation	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Assimilation	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Weakening	-	+	-	-	-	+	-	-	-	+	+	-	-	+	+	-	-	+	-
Gemination	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-

Since the emergence of VCV sequences relies on the concatenation of two (C)V syllables or a VC and a V syllable, the presence of complex consonant clusters, and therefore high degrees of syllable complexity, may be an obstacle for the distribution of such sequences. As for length distinctions, we encountered a number of gemination rules which apply to intervocalic consonants at the clitic boundary. The question which arises is whether the occurrence of gemination in cliticization is restricted to such languages which have phonemic length distinction on consonants or whether this process can occur in any language. Following this consideration, we will try to correlate the occurrence of junctural rules affecting intervocalic consonants with the rhythmic parameters of syllable complexity and length contrasts. Table 5 presents the languages of our sample in the order of gradually increasing syllable complexity, cf. 3.3.4, Table 25.

Every language in our sample exhibits intervocalic consonants at clitic boundaries, ranging from those with the simplest syllable structure, such as Maori and Yoruba, to those with the most complex syllable structure, such as Maltese and Georgian. In all of these languages, intervocalic consonants at the clitic boundary are retained in the majority of cases. Assimilation in this phonological context is a marginal phenomenon, since it is only documented for one language in our sample, Basque. With respect to consonantal weakening, such processes apply to VCV sequences at clitic boundaries in languages with all possible degrees of syllable complexity, ranging from Yoruba with two syllable types to Maltese with 15 syllable types. As for strengthening, gemination of intervocalic consonants only applies in languages which have phonemic length contrasts integrated into their phonological system, as observed in Maltese and West Greenlandic. Finnish, which presumably does not have a synchronic rule of gemination in cliticization, exhibits clitics with initial geminates, as for example the possessive marker *mme* ‘1pl’. Tamil, the fourth language in our sample which exhibits phonemic length contrasts in consonants, geminates intervocalic consonants in other morpho-syntactic contexts; cf. the example given in 2.1.1.1.

Although intervocalic consonants at clitic boundaries are possible in every language, the degree of syllable complexity can restrict the actual frequency with which such junctures occur. Languages which allow complex onset and coda consonant clusters lessen the probability of the co-occurrence of two adjacent CV syllables. We

would therefore suspect that intervocalic consonants are much more frequent in languages with simple CV syllable structure, thus making more room for possible segmental rules of weakening and strengthening. Again, we can only tentatively formulate generalizations with respect to the phonological treatment of intervocalic consonants in the different rhythmic types. Languages with simple syllable structure, which count as mora-/syllable-based with respect to this phonotactic parameter, are more likely to show intervocalic consonants at clitic boundaries and segmental rules applying to them. Mora-based languages exhibit stress-independent phonemic length contrasts. Since gemination of intervocalic consonants presupposes the existence of phonemic length in consonants, we may attribute the gemination of intervocalic consonants, and thereby junctural strengthening at host-clitic boundaries, to languages with mora-based rhythm. Languages with complex syllable structure, which count as stress-based with respect to this phonotactic parameter, are less likely to show intervocalic consonants at clitic boundaries and segmental rules applying to them.

4.2.4. Summary

In this section we tried to correlate segmental rules applying to consonant clusters, vowel clusters and intervocalic consonants at clitic boundaries with phonotactic properties of linguistic rhythm, such as syllable complexity, nucleus complexity and length contrasts. Since our data provides no positive evidence for any such correlation, we can only formulate generalizations which are based on our observations, but which need more careful reexamination.

In mora- and syllable-based languages, which have low degrees of syllable complexity, consonant clusters and segmental processes applying to them at clitic boundaries are less likely to occur. Their simple phonotactics, however, increases the likelihood that vowel clusters at the host-clitic juncture will occur. In such contexts, we can expect junctural structure preservation and assimilation. The emergence of intervocalic consonants again presupposes the simple syllable structure of this linguistic rhythm. Gemination of consonants in such a phonological context at the clitic boundary is more likely to happen in languages with phonemic length contrasts, i.e. mora-based languages. In stress-based languages, which have high degrees of syllable complexity,

the emergence of consonant clusters at the clitic boundary is more likely than in mora- or syllable-based languages. Since complex clusters are allowed for by the phonotactics, the junctural consonant clusters will be preserved or will be subject to rules of assimilation. In languages of this rhythmic type, the frequent occurrence of complex syllables will restrict the distribution of vowel clusters and intervocalic consonants and accordingly also the application of segmental rules to junctural vowel clusters and intervocalic consonants.

In Chapter 3.3.3., we tested hypotheses that have been already formulated in the literature on linguistic rhythm with respect to morphophonological rules of assimilation, cluster resolution and vowel harmony. Neither assimilation nor cluster resolution show a systematic distribution coherent with the idea of different rhythmic types. A more detailed examination of such processes in cliticization as well could not provide any positive evidence for the claim that linguistic rhythm determines the morphophonology of assimilation and cluster resolution in a language. Syllable complexity, which is a reliable phonotactic parameter of linguistic rhythm, however, restricts the occurrence of certain phonological contexts, such as consonant clusters, vowel clusters and intervocalic consonants. In order to comment on this issue more substantially, a set of data different from the one used in this study needs to be examined. For questions revolving around syllable complexity and morphophonology the actual frequency of distribution of certain syllable types may be more revealing than the abstract phonotactic restrictions on syllable structure imposed by grammar. Since linguistic rhythm allows us to make so few predictions with respect to rules of assimilation, cluster simplification and epenthesis, such processes should be studied with deeper insight in another paradigm of phonological research.

4.3. Towards a typology

After having tested possible correlations between segmental rules in cliticization and prosodic and phonotactic parameters of linguistic rhythm, we are now in a position to formulate a typology of segmental effects of cliticization. This typology makes a basic distinction between cliticization in stress-based phonologies and cliticization in

mora-/syllable-based phonologies.[3] In what follows, we will first outline the phonological characteristics of stress-based rhythm and our predictions with respect to segmental effects of cliticization in languages of this rhythm. To substantiate our claims, we will discuss one illustrative example from Maltese, a prototypical representative of stress-based rhythm. We will then discuss the prosodic and phonotactic properties of mora- and syllable-based rhythm and our predictions with respect to segmental effects of cliticization in languages of this rhythm. We will underpin our predictions with an example from Tamil, a prototypical mora-timed language. Finally, the claims made in this section will be summarized in a proposal for a typology of segmental effects of cliticization.

4.3.1. Segmental effects of cliticization in stress-based rhythm

Prototypical stress-based rhythm can be characterized by a constellation of prosodic and phonotactic properties. Languages of this rhythmic type are stress systems, and in some cases allow tone systems which are constrained by foot structure. The phonetic realization of stress in such languages will combine pitch, duration and intensity. The phonetic strength of stress is paralleled by a high degree of segmental effect of stress. The asymmetry between stressed and unstressed syllables results from the application of different sets of rules in these contexts. Stressed syllables are lengthened by rules of vowel lengthening and rules of consonant strengthening, e.g. aspiration. Unstressed syllables, on the other hand, are shortened by rules of vowel reduction and consonant weakening, e.g. voicing. In phonotactics, these languages tend to show high degrees of syllable complexity, which means that they allow complex onset and coda consonants of varying degrees. The distribution of length contrasts in such languages is usually constrained by the distribution of stress. For example, stressed syllables will tend to contain long vowels, and long consonants can appear only as onsets of stressed syllables. The strength of the stress and the high degree of vowel reduction impose restrictions on possible domains for vowel harmony and tone realizations. Vowel harmony as a word demarcating process is not possible in this climate as reduced vowels loose their place specifications and therefore cannot harmonize with neighboring

[3] See also Reich (2002) for a detailed study on the interplay of linguistic rhythm and cliticization in Bazillion Portuguese.

vowels with respect to such features. Tonal contrasts can only be realized on full vowels; for this reason, tone distinctions will be neutralized in unstressed syllables in stress-based rhythm.

In the context of cliticization, we can formulate the following predictions with respect to prosodic and segmental effects of cliticization in stress-based rhythm. In 2.1.1.3., we established a prosodic cline of cliticization which is comprised of the sub-processes of stress reduction and prosodic integration. In languages with segmental effect of stress as outlined above, the reduction of stress will be accompanied by vowel reduction and vowel deletion in the unstressed syllables of cliticized elements. In combined stress/tone systems, cliticization may additionally include tone neutralization. In these cases, the reduction of stress, the neutralization of tone and the reduction of the unstressed vowels go hand in hand. Apart from segmental effects of stress, consonants which belong to such unstressed syllables in clitics can be expected to be weakened. When clitics become stressable within the domain for stress placement in the course of ongoing prosodic integration, the stressed syllable of the clitic will undergo rules of vowel lengthening and consonant strengthening which are typical for these languages. Very marginally, vowels of cliticized elements may also be preserved or harmonized to preceding syllables. However, such processes are more typical for cliticization mora- or syllable-based phonologies. The complex syllable structure of stress-based phonologies increases the likelihood that consonant clusters will emerge at the clitic boundary and that segmental rules will apply to the junctural segments. To the same extent that syllable complexity increases junctural consonant clusters, it restricts the occurrence of vowel clusters and intervocalic consonants at the clitic boundary, and, accordingly, the application of segmental rules to such segments.

As we mentioned in 3.3.4., Maltese is the language in our sample which comes closest to the prototype of stress-based rhythm. Its phonology is characterized by phonetically strong stress, realized by pitch, duration and intensity. Segmental effects of stress in Maltese show the whole range of possible rules: vowel deletion in unstressed syllables, lengthening of stressed syllables and, at least diachronically, gemination after stressed vowels. With respect to syllable complexity, the phonotactics allow up to 15 syllable types, with onset clusters consisting of up to three consonants and coda clusters with two and marginally three members. Whereas there is a clear interdependence

between stress and the distribution of long vowels, geminates, however, do not show the restricted distribution expected for a stress-based language. Following from the incompatibility of vowel reduction and vowel harmony, the latter process has a highly marginal status in the language.

In this phonological climate of stress-based rhythm, we encounter the grammaticalization of the noun **xaj* 'thing' to a marker of verbal negation *-x* as illustrated in (1) (Sutcliffe 1936: 211).[4]

(1) ħrig=tu=**x** mill-forn kmieni wisq? Maltese
took.out.2.Sg.=3.Masc.Sg.**=NEG** from.the=oven early too-much
"Did you take it out of the oven too soon?"
(Borg & Azzopardi-Alexander 1997: 4)

Comparing the surface forms of **xaj* 'thing' and the negative marker *-x*, we can infer a number of phonological processes which applied in the course of ongoing grammaticalization. The lexical status of the source word as a noun implies that it originally initiated a stress domain. This primary stress has been reduced and finally lost. Accompanying stress reduction, the unstressed vowel of the cliticized element has been reduced and finally deleted. With respect to the initial *x* of *xaj*, we note that it has been retained as the only segment of the morpheme. Interestingly, the encliticization of this element provides the only environment for tri-consonantal consonant clusters in the language; see the forms *ma kiltx* 'I didn't eat', *ma tlaqtx* 'I didn't leave' and *ma strahtx* 'I didn't rest' (Borg & Azzopardi-Alexander 1997: 307). In this sense, cliticization includes the clustering of junctural consonants, increasing the typically high degree of syllable complexity in a stress-based language. In summary, the segmental effects of cliticization in this case include junctural structure preservation and syllabic weakening in the form the rhythm-based typology would predict.

[4] This case has also been reported for Tunisian Arabic in a recent discussion on the ALT mailing list on the grammaticalization of negatives and interrogatives (Ahmed Brahim, March 18, 2005). See also Heine & Kuteva (2002: 295) on grammaticalization paths for the lexeme THING.

4.3.2. Segmental effects of cliticization in mora-/syllable-based rhythm

Prototypical mora-/syllable-based rhythm can be characterized by a constellation of prosodic and phonotactic properties which systematically differs from the one discussed for stress-based rhythm in the preceding section. Languages of these rhythmic types employ either pure, unrestricted tone stress, pitch-accent or intonation-only systems. If stress plays a role in the prosody of such languages, the phonetic realization of stress only relies on pitch movement. The lack of phonetic strength of stress is paralleled by the lack of segmental effect of stress. Ultimately, stressed and unstressed syllables in these rhythmic types do not show a systematic asymmetry with respect to the quality and quantity of vowels and consonants. Unlike stress-based phonotactics, languages of mora- and syllable-based rhythm exhibit low degrees of syllable complexity, which means that they do not allow complex onset and coda consonants. The distribution of length contrasts is a phonotactic parameter by which languages of mora-based rhythm and languages of syllable-based rhythm can be distinguished. In the former group, length contrasts in vowels and consonants have phonemic status, in the latter, length contrasts should be lacking. Since none of the languages reduces unstressed vowels, vowel harmony is possible in every language, even as a means of demarcating words.

In the context of cliticization, we can formulate the following predictions with respect to prosodic and segmental effects of cliticization in this linguistic rhythm. When an element cliticizes in such a language, it may undergo the prosodic processes of stress reduction, tone neutralization and prosodic integration. In contrast to the behavior of de-stressed elements in stress-based languages, the lack of stress and the neutralization of tone are not accompanied by vowel reduction. In the same vein, prosodic integration which can lead to the stressability of the cliticized element will not be paralleled by vowel lengthening. The lack of such processes of vowel reduction and vowel lengthening lays the ground for vowel preservation and vowel harmony which are highly characteristic for cliticization in mora- and syllable-based languages. The simple syllable structure of these languages decreases the likelihood that consonant clusters will emerge at the clitic boundary and that segmental rules will apply to the junctural segments. At the same time, the simple syllable structure with mainly (C)V syllables provides a rich basis for the emergence of vowel clusters and intervocalic consonants at

the clitic boundary, and for processes applying in these contexts. For mora-based languages, with also exhibit consonant length, we saw that the gemination of junctural intervocalic consonants is another option for the segmental effects of cliticization.

Tamil is a language in our sample which comes close to the prototype of mora-based rhythm. It has only weakly realized stress, which interacts with intonational phonology. Due to the weak phonetic realization in pitch movement, Tamil exhibits no segmental effects of stress. Accordingly, unstressed syllables will not reduce their vowels or weaken their consonants and stressed syllables will not lengthen their vowels and strengthen their consonants. It can be characterized by a moderate degree of syllable complexity, allowing up to 9 syllable types with up to two onset and coda consonants. The phonemic length distinctions in vowels and consonants occur independently of stress and restricted vowel harmony is documented for smaller domains.

In this phonological climate of mora-based rhythm, we encounter the grammaticalization of *iruntu*, the past participle form of the verb *iru* 'to be', into the case marker *runtu*, itself fused with the case marker *kiʈʈe* to express ablative as illustrated in (2) (Asher 1982: 103, 111).

(2) naan inta pustakatte murukaŋ=**kiʈʈe=runtu** eraval vaaŋkaneen Tamil
I this book-acc Murugan=**loc=abl** loan obtain-past-1s
'I borrowed this book from Murugan.' (Asher 1982: 111)

In contrast to the grammaticalization of **xaj* in Maltese, the development of **iruntu* to *runtu* shows little accompanying segmental effect. Since stress is usually realized on the initial syllable of a word in Tamil, we may assume that both *kiʈʈe* and *runtu* will surface with unstressed syllables. However, contrary to what we would expect for stress-based languages, the vowels of the cliticized, unstressed clitic are preserved. The only rule associated with this process applies to the vowel cluster /ei/, which results at the clitic boundary, when the two forms are concatenated. Tamil only allows syllable nuclei consisting of single short or long vowels. Accordingly, /ei/ is an illicit syllable nucleus in the language. Of the two available strategies for hiatus resolution, vowel coalescence applies in this case, which deletes the second of the adjacent vowels, i.e. the initial vowel of the clitic. The preference for the application of this rule over the more frequent strategy of epenthetic glide insertion, for instance in *poo*=***yirukkaraan*** (go=perf-pres-

3sm) ‘he’s gone’, cannot be explained in the context of a rhythm-based typology of language. In summary, the segmental effects of cliticization in this case include junctural weakening, i.e. vowel coalescence, and syllabic structure preservation, as predicted by the rhythm-based typology.

4.3.3. Summary

In this section, we formulated predictions with respect to segmental effects of cliticization in languages of mora-, syllable- and stress-based rhythm. Our claims are based on the attempt to correlate junctural and syllabic processes in cliticization with rhythm-related parameters in prosody and phonotactics. For languages which are prototypical representatives of the different rhythmic types, we can predict a typology of segmental effects in cliticization as summarized in Table 6.

Table 6: Segmental effects of cliticization in mora-, syllable- and stress-based rhythm

<table>
<tr><td>Mora-based rhythm</td><td>Syllable-based rhythm</td><td>Stress-based rhythm</td></tr>
<tr><td colspan="2">Stress reduction, tone neutralization
Vowel preservation/vowel harmony</td><td>Stress reduction, tone neutralization
Vowel reduction/deletion,
consonant weakening</td></tr>
<tr><td colspan="2">Prosodic integration
Vowel preservation/vowel harmony</td><td>Prosodic integration/stressing
Vowel lengthening,
consonant strengthening</td></tr>
<tr><td colspan="2">Junctural consonant clusters and associated processes unlikely</td><td>Junctural consonant clusters and associated processes likely</td></tr>
<tr><td colspan="2">Junctural vowel clusters, intervocalic consonants and associated processes likely</td><td>Junctural vowel clusters,
intervocalic consonants and
associated processes unlikely</td></tr>
<tr><td>Gemination of intervocalic consonants at clitic boundaries</td><td colspan="2">No gemination of intervocalic
consonants at the clitic boundary</td></tr>
</table>

The major differences between cliticization in the various rhythmic types lie in the treatment of unstressed and stressed clitics in stress reduction and prosodic integration. Whereas mora- and syllable-based languages lack syllabic reduction of clitics due to phonetically weak stress and no segmental effects of stress, stress-based languages substantially reduce clitics at the syllabic level due to phonetically strong stress and high degrees of segmental effects of stress, including the reduction of unstressed

syllables. When ongoing prosodic integration leads to the stressing of a clitic within the stress domain it forms with its host word, mora- and syllable-based languages retain the segmental composition of the clitic, whereas stress-based languages lengthen the clitic following the general trend in the language to lengthen stressed syllables. Phonotactics of simple syllable structure constrain the occurrence of consonant clusters and associated processes in mora- and syllable-based languages, and increase the probability of junctural vowel clusters and intervocalic consonants with associated processes. In the mora-based languages, length contrasts in consonants enable the phonology to geminate intervocalic consonants. The complex syllable structure of stress-based languages, on the other hand, increases the probability of consonant clusters and associated processes, and constrains the occurrence of junctural vowel clusters, intervocalic consonants and segmental rules applying to them.

4.4. Summary

In this chapter, we recapitulated the various segmental processes which, in principle, can apply in cliticization. For each group of processes, we determined a conceptually related parameter of linguistic rhythm and tried to establish correlations of the segmental effects of cliticization and the rhythmic properties in a language.

As for syllabic phenomena, processes applying to consonants in clitic elements are very scarce in our data and cannot successfully be related or correlated with any parameter of linguistic rhythm. For syllabic processes on vowels, however, we could formulate and verify a strong correlation between vowel reduction and lengthening and the phonetic strength of stress and segmental effects of stress, i.e. stress-based rhythm. Whereas languages with mora- and syllable-based phonologies retain the vowels in cliticized elements due to their phonetically weak stress and the lack of segmental effects of stress, stress reduction is accompanied by vowel reduction and deletion in stress-based phonologies. In such languages, vowels of clitics may also undergo processes of vowel lengthening characteristic for stressed syllables when they become stressed in the domain they form with their host in ongoing prosodic integration. Vowel harmony stands in complementary distribution to vowel reduction, since the latter

process neutralizes place features which need to be retrievable in the spreading of features in vowel harmony. Accordingly, vowels of clitics may either harmonize to vowels in adjacent syllables or reduce as vowels in unstressed syllables. In principle, vowel harmony processes are possible in languages of any rhythm, such processes which span over a number of syllables and serve to demarcate a word domain, however, are only documented for mora- and syllable-based languages.

For the interdependence of phonotactic structure and the phonological treatment of junctural consonant and vowel clusters as well as intervocalic consonants, the results are less straightforward. Junctural consonant clusters are more likely to occur in languages with complex syllable structure, as prototypical for stress-based phonologies, and incompatible with simple (C)V syllable structure of mora-based and syllable-based languages. How and if these clusters are resolved, however, cannot be predicted with reference to any parameter of linguistic rhythm. The distribution of junctural vowel clusters increases in languages with simple (C)V syllable structure of mora-based and syllable-based languages. The frequency of consonant clusters in stress-based phonologies restricts the emergence of such vowel sequences at the clitic boundary. Intervocalic consonants are also more likely to occur in mora-based and syllable-based languages and less likely to occur in stress-based languages. Which phonological rules apply to junctural vowel clusters and intervocalic consonants at the clitic boundary cannot be predicted by linguistic rhythm in the vast majority of cases. The occurrence of gemination of intervocalic consonants at clitic boundaries is only possible in languages with phonemic length contrasts in consonants, i.e. mora-based languages.

Generalizing the observations made on the basis of our cross-linguistic sample, we can predict segmental effects of cliticization for prototypical mora-, syllable- and stress-based phonologies. Stress reduction and tone neutralization in mora-, and syllable-based languages are not accompanied by vowel reduction, but rather by vowel preservation or vowel harmony. Ongoing prosodic integration, which leads to the stressability of clitics, is not paralleled by vowel lengthening in these languages. Complex junctural consonant clusters and associated processes are less likely to occur, whereas junctural vowel clusters, intervocalic consonants at the clitic boundary and processes applying to these contexts are expected to be more frequent. In mora-based languages, gemination of intervocalic consonants at clitic boundaries is another likely

option. In stress-based phonologies, on the other hand, stress reduction, tone neutralization and vowel reduction are interdependent. Ongoing prosodic integration, which results in the stressability of clitics, is paralleled by vowel lengthening in such languages. Complex junctural consonant clusters are frequent and form the basis for segmental rules applying to such clusters. Vowel clusters and intervocalic consonants at the clitic boundary are less likely to occur, as are processes associated with these contexts.

The prediction for the segmental effects of cliticization which have been formulated in this chapter have been illustrated by the discussion of cliticization phenomena in Maltese, a prototypical representative of stress-based rhythm, and Tamil, a prototypical representative of mora-based rhythm. The question of to what extent these predictions are born out in actual diachronic cliticization processes needs to be further verified on the basis of detailed case studies in cliticization. After acknowledging the cross-linguistic variation in the phonology of cliticization, establishing a rhythm-based typology of languages and formulating a typology of segmental effects of cliticization in the respective rhythmic types, we may now conclude our cross-linguistic study on clitics by commenting on a number of issues raised by the findings of this study.

5. Conclusions

The present study presented cross-linguistic data on the phonology of cliticization, introduced and defended a rhythm-based typology of language, and formulated a typology of phonological effects of cliticization for languages belonging to different rhythmic types. In this conclusion, we will situate our findings in the context of current research in the typology of clitics, the phonology of clitics, linguistic rhythm and grammaticalization.

Contrary to the implicit assumptions made in some studies on clitics, clitic-hood cannot be described by a set of invariable properties. The methodology used in this study tries to abstract from language-universal particulars of clitics and to deduce more general characteristics of such elements. In our discussion, the case of the Latin *-que* has been the point of departure. For this clitic, pre-stressing and placement in second position are characteristics in prosodic phonology and syntax, respectively. However, abstracting away from this, we described these properties as instances of more general principles of phonological dependency and syntactic distribution. Having established this general characterization of clitics as elements which are phonologically bound, like affixes, but which follow syntactic rules of distribution, like words, we are in a position to seek symptoms of phonological dependency and syntactic specialization in other languages. It turned out that a number of phonological, morphological and syntactic parameters can be employed to decide on the degree of cliticity of a given element in a given language. It is noteworthy that for all the parameters we applied in isolating clitics in the languages of our sample, there is considerable cross-linguistic variation. In this study, we could only discuss the parameters in prosody and segmental phonology in some detail, but hopefully, future research will take up the job of working out the typological dimensions in the morphology and syntax of clitics.

Phonological dependency can be manifested in a number of processes in prosodic and segmental phonology. The most general characterization of clitics as unstressed words potentially restricts the perspective on possible prosodic properties by presupposing the universality of a certain prosodic system, namely stress. In such systems, phonological bonding can be characterized by the prosodic processes of stress

reduction and prosodic integration. The latter process may even result in the stressability of clitics within the stress domain they form with their host. The various steps evidenced in this development already constitute a wide range of variation, within and across languages. Widening the perspective to languages with tone or intonation systems, a different taxonomy needs to be established to describe the phonological behavior of clitics. Since prosodic systems differ across languages, the phonology of cliticization is inclined to vary. The same holds true for segmental concomitants of phonological dependency. Neither assimilation nor reduction are, as is sometimes claimed, universal ingredients of cliticization, instead, the application of segmental rules is determined by the overall phonological make-up of a language, which is subject to cross-linguistic variation, for instance in linguistic rhythm. Unfortunately, much research on the phonology of clitics has restricted its attention to cliticization phenomena in better known European languages. The typological differences which have been surveyed in this study will hopefully inspire more cross-linguistic research on the topic. It could emerge that the relevance of a number of theoretical issues in the study of clitics will be reevaluated in the course of such research. To single out just one theoretical issue in the study of clitics, the status of the *Clitic Group* in Prosodic Phonology has received considerable attention in recent phonological literature (Nespor & Vogel 1986; Hayes 1989; Zec 1988, 1993; Booij 1988, 1995, 1996; Selkirk 1995). Although we cannot do justice to the advanced discussion of this problem, we can at least notice how rarely clitics form special domains with their hosts which are different from other phonological domains. In prosody, the extrametrical status of clitics as unstressed, unstressable syllables would be a potential constellation which calls for a phonological domain in-between the prosodic word and the phonological phrase. We encountered such behavior in procliticization in Georgian, Catalan, Maltese and Tariana, and in encliticization in Udihe and Catalan. Acknowledging the diversity of the data surveyed for this study, evidence of this sort seems to be rather scarce cross-linguistically. In our cliticization scenario, this behavior will ultimately be only one evolutionary step of prosodic integration which accompanies progression on the word-to-affix cline, and will presumably be subject to change. In segmental phonology, the only genuine case of a rule applying to host-clitic combinations in our sample is enclitic Sandhi in West Greenlandic, by which host-final plosive consonants are

nasalized in front of vowel-initial enclitics. In this morphophonological context, /p/ is realized as [m], /t/ as [n], /k/ as [ŋ] and /q/ as [N] (Rischel 1974: 155f.; Fortescue 1984: 333, 348). In the majority of cases, clitics are subject to segmental rules that also apply to other morphophonological contexts. From a typological perspective, one would wish that such observations will inform theoretical discussions on the existence of a special phonological domain 'clitic group' and claims about its universality.

With respect to linguistic rhythm, there is a consensus across different research paradigms that language is organized according to rhythmic principles. Although it turns out to be a non-trivial task to trace rhythm in the speech signal, at least in terms of the isochrony of morae, syllables and feet, psycholinguistic evidence from perception clearly supports intuitive distinctions with respect to the rhythmic organization of languages. On top of this, rhythm has also an impact on meter in poetry (Lehiste 1987; Dresher 1994) and guides conversational interaction by providing means to synchronize turn-taking (Couper-Kuhlen 1993; Auer, Couper-Kuhlen & Müller 1999). Disagreement predominates when it comes to analyze the assumed rhythmic differences across languages. The idea of isochrony has been abandoned by the majority of researchers working on rhythm. The alterative offered by Metrical Phonology, namely taking the alternation of prominent and non-prominent syllables as the primitive of linguistic rhythm, faces severe problems when cross-linguistic diversity in prosodic systems is considered. The whole concept of prominence, as evidenced in stress phonologies, can be absent in languages which only make use of intonation, such as West Greenlandic, or tone, such as Slave. If we accept that these languages also exhibit rhythm, Metrical Phonology has little to offer any attempt to analyze it. In this vein, Dufter's (2003) typology is the logical synthesis of these two lines of thought. Here, the alternation of prominence and duration in the form of length distinctions are the defining parameters of linguistic rhythm. The approach of the present study follows from the understanding of rhythm as a constellation of phonological properties. Of the various properties which have been proposed in the literature, six show systematic cross-linguistic variation coherent with the idea of linguistic rhythm. Four of these can be conceived of as direct indicators of rhythmic organization: phonetic strength of stress, segmental effects of stress, syllable complexity and length contrasts. All of them allow for considerable variation, a fact which has been interpreted as symptoms of gradual evolutionary clines.

In this line of thought, linguistic rhythmic does not come in three distinct classes, but as a continuum, presumably ranging from mora-based to syllable-based to stress-based rhythm. The first two parameters in particular show systematic co-variation, with a tendency to correlate with the degree of syllable complexity, too. Length contrasts form the backbone of mora-based rhythm, but are symptomatic for this rhythmic type only in the presence of other properties. The distribution of tones and word-demarcating vowel harmony processes also show a cross-linguistic distribution coherent with the rhythm-based typology of language. The possibility of such phenomena secondarily follows from the absence of segmental effect of stress, since the realization of both tones and harmonizing vowels requires full, non-reduced vowels. Overall, the paradigm of breaking down linguistic rhythm to a number of prosodic, phonotactic and morphophonological parameters proved successful in evaluating the rhythm of the languages of our sample. However, a lot of information crucial for establishing rhythmic types cannot be extracted from descriptive grammars, the primary source for our study. In particular, information on the phonetic strength of stress and the degree of vowel reduction and vowel lengthening is hardly ever backed up by phonetic measurements. With respect to phonotactics, a key question in determining the degree of syllable complexity is the actual frequency of the syllable types allowed for by phonotactics. For instance, even a language which in principle allows complex syllables may opt for simple CV syllables wherever possible and may enhance this syllable-based effect by appropriate morphophonological rules, see for example the case of Nigerian Pidgin as described by Faraclas (1989). Although the methodology for the phonological study of linguistic rhythm still needs improvement, the results of this study promise a profitable outcome of the enterprise, which may also culminate in a better understanding of diachronic change of linguistic rhythm.

On the basis of the evidence from cliticization discussed in this study, the role of phonology in grammaticalization needs serious reconsideration. In the classic literature on grammaticalization, it has been claimed that erosion is an intrinsic phonetic process in grammaticalization, see Lehmann ([1982] 1995) and Heine & Reh (1984). Other authors made even stronger claims, arguing that erosion is a defining property of grammaticalization (Haspelmath 1998). In a similar vein, the formulation of the *Parallel Reduction Hypothesis*, which restates traditional linguist's work, claims that

semantic bleaching will always be accompanied by phonological reduction (Bybee, Perkins & Pagliuca 1994). Even strong critics of grammaticalization theory, such as Newmeyer (2001), in principle adhere to this idea. The functional motivation which has been hypothesized for the salience of erosion in grammaticalization is ease of production, which primarily affects grammatical elements of high frequency (see Bybee & Hopper (eds.) 2001). Contrary to these commonly shared assumptions, the typological distinctions in segmental effects of cliticization in languages of different rhythmic types paint a rather different picture. With respect to junctural phenomena, i.e. phonological rules applying to segments at the clitic boundary, we encountered four options: structure preservation, assimilation, weakening and strengthening. The data suggests that erosion, or weakening in our terminology, is far from being the unmarked option. Although we could not attribute the application of the different strategies to the overall linguistic rhythm of a language, the finding that cliticization, and thereby grammaticalization, can happily do without junctural erosion should be clear. Presumably, processes which apply to this context fall under the traditional understanding of sound change in diachronic linguistics (see Joseph 2004 who expresses a strong skepticism of erosion as a symptom of grammaticalization and also Bybee 2005: 189 who acknowledges cross-linguistic difference with respect to reduction in grammaticalization). This observation is also valid for syllabic phenomena in cliticization. Here, we concluded that syllabic erosion, i.e. the gradual reduction and deletion of vowels, is characteristic of a certain rhythmic type, namely that of stress-based rhythm. It is noteworthy that in this rhythm, ongoing cliticization may also be accompanied by strengthening, the contrary process of erosion. In other rhythmic climates, the segmental composition of cliticized elements is preserved or assimilated but not reduced. The data suggests that grammaticalization will be accompanied by erosion in languages of stress-based rhythm only, which casts doubt on the intrinsic status of erosion in grammaticalization. If this conclusion is correct, we also need to refine our understanding of the functional motivations of segmental effects of cliticization. Phonetic reduction is only one strategy to ease production. In principle, articulatory energy has to be economically distributed in speech production. For stress-based languages, a large amount of articulatory energy is spent in the production of stressed syllables. To compensate for this loss of energy, less energy can be spent on

the production of unstressed syllables, which likens their reduction. In languages of mora- or syllable-based rhythm, however, articulatory energy is economically distributed across all rhythmic units of an utterance. Since these overall phonetic principles work in all domains of a language, it should come as no surprise that grammaticalized elements in languages of different rhythms are subject to different phonological processes.

Our findings are complemented by a number of observations made in the context of detailed studies of grammaticalization phenomena in single languages. The first to question the universality of erosion was, to the best of my knowledge, Wilhelm von Humboldt. Informed by his work on American Indian languages, he noted that in the cliticization of pronouns which results in paradigms of pronominal affixes, the cliticized element completely retains its segmental composition in not undergoing processes of assimilation or erosion.

> "Die, wenn auch nur lose an einander gereihten Elemente fliessen meistentheils auch in Ein Wort zusammen, und sammeln sich unter einen Accent. Aber einestheils geschieht dies nicht immer, und anderntheils treten dabei andere, die formale Natur mehr oder weniger störende Nebenumstände ein. Die Elemente der Formen sind trennbar und verschiebbar; jedes behält seinen vollkommenen Laut, ohne Abkürzung oder Veränderung; sie sind in der Sprache sonst selbständig vorhanden, oder dienen auch zu anderen grammatischen Verbindungen, z. B. Pronominal-Affixa als Besitzpronomina bei dem Nomen, als Personen bei dem Verbum; […]" (Humboldt [1822/23] 1843: 290).

In more recent works on grammaticalization, it has been noted again and again that grammaticalization needs not to be paralleled by phonological erosion. Languages of certain linguistic areas, such as East and mainland South East Asia, systematically show little or no erosion in grammaticalization (see Bisang 2004, but see also Ansaldo & Lim 2004 for symptoms of erosion in Sinitic). For certain grammaticalization processes, phonological erosion does not accompany morpho-syntactic and functional processes of grammaticalization. For instance, Wiemer (2002, 2004) noted the absence of phonetic erosion in a detailed study of the evolution of passive constructions in Northern Slavic and Baltic languages. Within a single language, erosion can be restricted to certain grammaticalization clines only. In the syllable-based language Turkish, for example, the conditional marker *ise* is grammaticalized as a topic marker and as a conjunction. Cliticization, which is accompanied by junctural erosion of *i* to *y* to *Ø*, only applies in

the latter case. The grammaticalization of *ise* as a topic marker is paralleled by neither cliticization nor by reduction (Kabak & Schiering 2004). Even in languages with high erosive power, such as stress-based German, grammaticalization is accompanied by different degrees of erosion. Take for instance the grammaticalization of the Old High German demonstrative *thëmo* into the definite article *dem* in Standard German. Here, the final, unstressed vowel has been reduced and deleted in the course of time. When this element grammaticalizes further into an agreement suffix marking gender and number on prepositions in non-deictic contexts, as observed in Ruhrdeutsch (Schiering 2005), the form is further reduced to *-m*, loosing its syllabic status. Such split behavior in the application of erosion in grammaticalization constitute intriguing examples of the process of *divergence* (see among others Hopper & Traugott 1993: 116). On the other hand, our observation that grammaticalization may also be accompanied by phonological strengthening has been documented for grammaticalization in Japanese, a prototypical representative of mora-based rhythm. Due to the morphological extension of a morphophonological process of epenthesis, the development from the transitivizer *...s.u* to the causativizer *-(s)as.u* results in the accretion of phonological material which turns a monosyllabic marker into an disyllabic one (Narrog 2004: 374).

Returning to the concept of the linguistic cycle and its assumptions with respect to the evolution of morphology, the cross-linguistic evidence from cliticization casts doubt on such a universal scenario of language change. If the phonological concomitants of language change differ across languages, it seems implausible to postulate universality for concepts such as erosion. Quite to the contrary, the evolution of morphology in different phonological climates is constrained by different principles. In stress-based phonologies, morphologization will be accompanied by high degrees of syllabic reduction. In the prototypical representative of the rhythmic type, Maltese, we encountered a case where the word *xaj* 'thing', which constitutes a whole syllable, is reduced to a mono-consonantal suffix *x* 'neg' in the course of grammaticalization. In Tamil, a prototypical representative of mora-based rhythm, on the other hand, we encountered cases where morphologization results in disyllabic suffixes. In 4.3.2., we illustrated this with the example *iruntu*, the past participle form of the verb 'to be', which grammaticalized into the bound postposition *=runtu* 'ablative'. However, there are a number of cases which point in the same direction: the bound benefactive

postposition *aaka* goes back to *aaku*, the infinitive of the verb 'become', and the bound instrumental postposition *koŋʧu* goes back to *koŋʧu*, the past participle of the verb *kol* 'to take'. In all these cases, the evolution of case morphology is not accompanied by erosion, creating a paradigm of morphological markers of considerable phonological length. Since the language does not show any disposition for reduction in its phonological system, it seems unlikely that these elements will undergo erosion in the future. For West Greenlandic, another prototypical mora-based language, certain disyllabic evidentiality affixes have a traceable history of up to 3000 years in which they did not erode, again questioning the concept of erosion as a universal force in language change (see Fortescue 2003: 300). On the basis of such evidence and general cross-linguistic trends captured in our typology of segmental effects of cliticization, we can make at least one prediction with respect to the co-variation of phonology and morphology (see also Plank 1998 for an overview of claims about such co-variation). Cliticization in stress-based languages, with its high degrees of erosion, will ultimately lead to subminimal exponents of grammatical categories. In mora- and syllable-based languages, with their low degrees of erosion, cliticization will lead to disyllabic exponents of grammatical categories. In essence, grammaticalization in the different phonological climates results in different morphological structures, which may contribute to the manifestation of an overall morphological type. To substantiate this hypothesis, however, further research needs to be done into the characteristics of morphological types (see Plank 1999) and the various properties of the exponents arising in grammaticalization.

The present study contributed to three research paradigms which have long histories. The study of clitics goes back to the early Greek grammarians; the study of rhythm has its predecessors in pre-modern times and the study of grammaticalization dates back to at least the 19th century. However, the more recent interest in all these topics generated new research paradigms with shorter histories. The new interest in the study of cliticization may be attributed to Zwicky's (1977) seminal paper on clitics. As we noted, the cross-linguistic basis for theorizing about this phenomenon is still underdeveloped and needs improvement. The present research hopes to initiate a wider consideration of the typological variation in phonological, morphological and syntactic aspects of cliticization. The current interest in the study of linguistic rhythm may be

traced back to the 1940s with Pike's work. In this line of research, insights were gained which, on the one hand, eliminated certain assumptions about rhythm in terms of isochrony and which, on the other hand, opened the door for phonological interpretations of rhythms. The methodology applied in this study allows us to evaluate the rhythmic properties of a language and to establish rhythmic prototypes. However, we also encounter serious shortcomings in this methodology: information necessary to evaluate linguistic rhythm is not always given in descriptive grammars and needs to be elicited in more detailed phonetic and phonological studies. In this respect, the methodology of studying phonological aspects of linguistic rhythm still needs further refinement. Finally, with respect to grammaticalization, which became popular in the 1980s, a number of assumptions proved implausible. Erosion, which has been hypothesized to be a universal concomitant of grammaticalization, is only typical for grammaticalization in a certain phonological type. On the basis of such evidence, more thorough tests of the often assumed correlations between phonetic, morpho-syntactic and functional processes in grammaticalization need to be conducted on the basis of cross-linguistic data. It is only when we put the claims made in the grammaticalization literature to the test that we will be in a position to decide on the status of this research paradigm as providing a credible theory.

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Deutsche Zusammenfassung

Morphologische Systeme unterliegen wie andere Komponenten der Grammatik historischem Wandel. Unter den verschieden diachronen Prozessen in der Genese von morphologischen Markierungen hat vor allem die Klitisierung eine besondere Aufmerksamkeit genossen. Im Rahmen der Grammatikalisierungsforschung stellt der grammatische Status eines Klitikon ein Zwischenstadium in der Entwicklung von freistehenden Wörtern zu gebundenen Affixen dar. Die Idee, dass diese diachrone Entwicklung mit der phonetischen Reduktion des grammatikalisierten Morphems einhergeht, lässt sich dabei mindestens bis in das neunzehnte Jahrhundert zurückverfolgen. Die vorliegende Arbeit möchte die bisherige Forschung vor allem in Bezug auf die Phonologie der Klitisierung um eine sprachvergleichende Perspektive erweitern. Der wesentliche Beitrag besteht einerseits in einer Systematisierung der diversen phonologischen Eigenschaften von Klitika und andererseits in dem Versuch, bestimmte phonologische Aspekte der Klitisierung im Rahmen einer rhythmusbasierten Sprachtypologie vorherzusagen. Die bisher vorausgesetzte Korrelation von Klitisierung und phonetischer Erosion stellt sich hierbei als Charakteristikum des akzentbasierten Sprachtyps heraus.

Die Datengrundlage dieser Arbeit besteht aus einer Datenbank mit 355 klitischen Elementen aus neunzehn Sprachen und wird im ersten Kapitel detailliert vorgestellt. Bei der Auswahl der Sprachen wurde jeweils ein Vertreter der neunzehn von Ruhlen (1991) vorgeschlagenen Sprachphyla bestimmt. Auf der Grundlage von phonologischen, morphologischen und syntaktischen Eigenschaften wurden klitische Elemente in den betreffenden Sprachen isoliert. Dabei folgen wir einer weiten Definition eines Klitikons als einem Element, das auf der einen Seite phonologisch gebunden ist, wie ein Affix, aber auf der anderen Seite syntaktischen Distributionsregeln folgt, wie ein Wort. Anhand dieser Methodologie konnten klitische Elemente aus den Klassen der Partikeln, Adpositionen, Pronomina, Verben, Artikeln und einige schlecht zuzuordnende Elemente benannt werden. Jedes dieser Elemente lässt sich auf einem der zahlreichen in der Literatur vorgeschlagenen Grammatikalisierungspfade verorten, wie zum Bespiel klitische Pronomen, die das

Zwischenstadium bei der Morphologisierung von Kongruenzaffixen aus Pronomina darstellen. Anhand der unterschiedlichen Eigenschaften der phonologischen, morphologischen und syntaktischen Parameter lässt sich schließlich auch ein Klisekontinuum von Allegroformen über einfache Klise zu spezieller Klise und phrasaler Affigierung etablieren, das die diversen Zwischenstufen der Grammatikalisierung erfasst und die Variation innerhalb der verschiedenen klitischen Elemente systematisiert.

Kapitel 2 beschreibt die Mannigfaltigkeit phonologischer Gebundenheit von klitischen Elementen in den Sprachen unseres Samples. Hierbei lassen sich die Parameter der prosodischen Phonologie und der segmentalen Phonologie unterscheiden. In verschiedenen prosodischen Systemen manifestiert sich phonologische Dependenz dabei unterschiedlich. In Akzentsystemen geht Klitisierung mit allmählicher Akzentreduzierung und prosodischer Integration in die Akzentdomäne einher, die das Klitikon mit seinem Stützwort bildet. In Tonsystemen können die Tonspezifikationen klitischer Elemente neutralisiert werden und sich im Laufe der diachronen Entwicklung verändern. In Einzelfällen stellt sich prosodische Integration ein, bei der klitische Gruppen bestimmten tonalen Sandhiprozessen unterliegen, die auf Wortdomänen beschränkt sind, z.B. OCP-Effekte. In Intonationssystemen verlieren Klitika die Fähigkeit einen eigenen Intonationsgipfel zu tragen und werden allmählich in eine benachbarte Intonationsphrase integriert. In der segmentalen Phonologie zeichnet sich phonologische Gebundenheit durch Regeln aus, die entweder Segmente an der Morphemgrenze zwischen Stützwort und Klitikon betreffen, oder über mehrere Silben der klitischen Gruppe operieren. In jedem dieser Fälle lassen sich die vier Grundtypen *Strukturerhaltung*, *Assimilation*, *Schwächung* und *Stärkung* in den Sprachen des Samples beobachten. Im Rahmen der Prozesse, welche die Junktur betreffen, lassen sich segmentale Regeln in solche unterscheiden, die Konsonanten, und in andere, die Vokale betreffen. Klitisierung kann dazu führen, dass Konsonantenhäufung an der Morphemgrenze eintritt. Zunächst einmal kann die Konsonantenhäufung an der Junktur unverändert bewahrt werden. Die zweite Möglichkeit besteht in der Assimilation einer der benachbarten Konsonanten. In manchen Fällen wird jedoch die Verbindung von mehreren Konsonanten reduziert, indem einer der benachbarten Konsonanten getilgt wird. Eine weitere, letzte Strategie besteht in der Auflösung der Konsonantenhäufung

durch die Einfügung eines epenthetischen Vokals. Für Konsonanten in intervokalischer Position an der Morphemgrenze lassen sich dieselben Prinzipien unterschieden. Entweder wird der Konsonant bewahrt, oder er wird an einen benachbarten Vokal assimiliert. In manchen Fällen wird der intervokalische Konstant gemäß der universalen Hierarchie der Konsonantenstärke geschwächt oder gestärkt, z.B. durch Geminierung. Parallel verhält es sich mit Vokalhäufungen, die z.B. durch die Proklitisierung eines auf Vokal endenden Klitikons an ein auf Vokal beginnendes Stützwort entsteht. Prinzipiell kann dieser Hiatus unverändert beibehalten werden. In manchen Fällen unterliegen die benachbarten Vokale Assimilationsregeln. Durch die Tilgung eines der benachbarten Vokale kann zudem auch die segmentale Komposition der klitischen Gruppe reduziert werden. Durch Einfügung eines epenthetischen Vokals kann schließlich auch die Oberflächenrealisation der Kombination von Klitikon und Stützwort gestärkt werden.

Im Rahmen der silbischen Prozesse sind nur wenige Regeln dokumentiert, die über Konsonanten in mehreren Silben der klitischen Gruppe operieren. Im Bereich der silbischen Effekte der Klitisierung, die Vokale betreffen, spalten sich die beobachteten Prozesse jedoch wieder in *Strukturerhaltung*, *Assimilation*, *Schwächung* und *Stärkung* auf. Wird der Vokal des klitisierten Elements unverändert beibehalten, können wir von Strukturerhaltung sprechen. Assimilation in dieser Domäne manifestiert sich in Form von Vokalharmonie. Die Reduktion und Tilgung eines Vokals innerhalb eines klitischen Elements lässt sich als silbische Schwächung interpretieren, die Dehnung eines klitischen Vokals als silbische Stärkung. Die verschiedenen Formen der segmentalen Effekte der Klitisierung können einander im Verlauf graduellen Grammatikalisierung vom Wort zum Affix folgen. Während Strukturerhaltung alle Stufen der Klitisierung begleiten kann, kann der Assimilation eines klitisierten Elements Strukturerhaltung oder Tilgung folgen. Auch die Schwächung eines klitisierten Elements kann schließlich in der Tilgung klitischen Materials enden. Allerdings ist dies nicht obligatorisch, in manchen Fällen wird die geschwächte Form des Klitikons bei der Morphologisierung auch bewahrt. Die phonologisch gestärkte Form eines Klitikons wird schließlich auch bei fortschreitender Grammatikalisierung beibehalten.

Um zu bestimmen, in wie weit die oben zusammengefassten phonologischen Prozesse der Klitisierung einer systematischen, vorhersagbaren Verteilung folgen, wird in Kapitel 3 eine rhythmusbasierte Sprachtypologie eingeführt und verteidigt. Frühere

Konzepte von Sprachrhythmus gingen hauptsächlich von der Isochronie von rhythmischen Einheiten wie Moren, Silben und Füßen aus. Obwohl psycholinguistische Forschungsergebnisse die Relevanz der Rhythmizität von Sprache bestätigen, lässt sich die Isochroniehypothese phonetisch nicht nachweisen. Als Konsequenz auf diese widersprüchlichen Ergebnisse bewerten verschiedene Forschungsparadigmen die Rhythmizität einer Sprache anhand phonologischer Eigenschaften in Prosodie, Phonotaktik und Morphophonologie. Zehn der vorgeschlagenen phonologischen Parameter für die Rhythmusbewertung werden in dieser Arbeit vorgestellt und getestet. Sechs von diesen zehn Parametern zeigen eine Verteilung über die Sprachen des Samples, die im Einklang mit der Sprachklassifikation von moren-, silben-, und akzentbasierten Sprachen zu bringen ist. Hierbei sind die phonetische Stärke des Akzents, segmentale Effekte des Akzents, komplexe Silbenstruktur und Längenkontraste primäre Indikatoren des Sprachrhythmus. Prototypischer akzentbasierter Rhythmus zeichnet sich durch phonetisch starken Akzent, segmentale Effekte des Akzents, komplexe Silbenstruktur und das Fehlen von akzentunabhängigen Längenkontrasten aus. Prototypischer silbenbasierter Rhythmus hingegen ist gekennzeichnet durch phonetisch schwachen Akzent, das Fehlen von segmentalen Effekten des Akzents und einfacher Silbenstruktur. Das Unterscheidungsmerkmal zum morenbasierten Rhythmus, das diese Eigenschaften des silbenbasierten Rhythmus teilt, besteht im Fehlen von Längenkontrasten, die den morenbasierten Rhythmus auszeichnen. Die enorme Variation, die für alle Parameter der Rhythmustypologie dokumentiert ist, wird als Symptom eines evolutionären Kontinuums von morenbasierten zu silbenbasierten zu akzentbasierten Rhythmus interpretiert. Sekundär folgen die Realisierung von Tönen und die Distribution von wortbegrenzenden Prozessen der Vokalharmonie von dem Fehlen der Vokalreduktion als segmentalen Effekt des Akzents in moren- und silbenbasierten Rhythmus.

Kapitel 4 tritt den Versuch an, die Erkenntnisse über die verschiedenen prosodischen und segmentalen Prozesse der Klitisierung mit Aspekten der Rhythmustypologie zu korrelieren. Die eindeutigsten Befunde erhalten wir dabei bei der Korrelation von prosodischen Parametern der Rhythmustypologie und silbischen Prozessen der Klitisierung. Während moren- und silbenbasierte Sprachen die Vokale klitisierter Elemente unverändert beibehalten und in Form von Vokalharmonie

assimilieren, reduzieren und tilgen sie keine Vokale in klitisierten Elementen und dehnen die entsprechenden Vokale auch nicht. Dieses Verhalten geht einher mit dem Fehlen oder der phonetisch schwachen Ausprägung des Akzents und dem Fehlen von segmentalen Effekten des Akzents. Akzentbasierte Systeme, die durch phonetisch starken Akzent und segmentale Effekte des Akzents gekennzeichnet sind, zeigen nur marginal Strukturerhaltung und Vokalharmonie in diesem Bereich. Als charakteristisch ist jedoch das Vorkommen von Vokalreduktion und Vokaldehnung im Kontext der Klitisierung zu bewerten. Weniger eindeutig lässt sich das Vorkommen von junkturalen Prozessen anhand der Silbenkomplexität einer Sprache vorhersagen. In moren- und silbenbasierten Sprachen kommen Konsonantenhäufungen zwar seltener und intervokalische Konsonanten und Vokalhäufung an der Morphemgrenze zwischen Stützwort und Klitikon aufgrund der einfachen Silbenstruktur öfter vor, jedoch lassen sich die jeweiligen Prozesse, die in diesem Kontext greifen, nicht auf rhythmische Prinzipien zurückführen. Ebenso kommen Konsonantenhäufungen in akzentbasierten Sprachen mit komplexer Silbenstruktur eher und intervokalische Konsonanten und Vokalhäufungen an der Morphemgrenze seltener vor, aber auch hier lässt sich anhand der Rhythmustypologie nicht vorhersagen, welche phonologischen Prozesse in diesen Kontexten greifen werden. Die Typologie, die auf der Grundlage dieser Beobachtungen vorgeschlagen wird, macht unterschiedliche Voraussagen in Bezug auf phonologische Effekte der Klitisierung in moren-, silben- und akzentbasierten Sprachen. In moren- und silbenbasierten Sprachen geht Akzentreduktion und Tonneutralisierung mit Vokalerhaltung und Vokalharmonie einher. Diese beiden Prinzipien der Strukturerhaltung und Assimilation greifen auch bei fortschreitenden prosodischer Integration noch. Konsonantenhäufungen an der Morphemgrenze sind in diesem rhythmischen Typ selten, während Vokalhäufungen und intervokalische Konsonanten zahlreicher vorkommen. Für letztere Kontexte sind auch entsprechende phonologische Prozesse häufiger zu beobachten. Die beiden rhythmischen Typen unterscheiden sich lediglich in Bezug auf den Kontext der intervokalischen Konsonanten an der Morphemgrenze. Bei den morenbasierten Sprachen ist hier Geminierung des betreffenden Konsonanten zu beobachten, ein Prozess, der bei Sprachen der anderen Rhythmustypen eher selten zu beobachten ist. Akzentbasierte Systeme zeichnen sich dadurch aus, dass Akzentreduktion und Tonneutralisierung von Vokalreduktion,

Vokaltilgung und Konsonantenschwächung begleitet werden. Fortschreitende prosodische Integration kann schließlich zur Betonbarkeit des klitischen Elements führen, was in diesem Sprachtyp mit Vokaldehnung und Konsonantenstärkung einhergehen kann. Häufig sind in diesem rhythmischen Typ Konsonantenhäufungen und phonologische Prozesse, die in diesem Kontext greifen, an der Morphemgrenze zu beobachten, seltener sind Vokalhäufungen und intervokalische Konsonanten nebst den begleitenden phonologischen Prozessen in diesem Kontext.

Auf der Basis der in dieser Arbeit angestellten Untersuchungen lassen sich einige Schlussfolgerungen in Bezug auf die typologische Erforschung von Klitika, die Phonologie der Klitisierung, Rhythmustypologie, Annahmen der diachronen Typologie und der Grammatikalisierungsforschung ziehen. Der sprachvergleichende Ansatz, den diese Arbeit verfolgt, kann einige typologische Unterschiede in den phonologischen Eigenschaften von Klitika bestimmen. Auf der Basis dieser Beobachtungen ist es unwahrscheinlich, dass sich universale Eigenschaften klitischer Elemente in den Sprachen der Welt bestimmen lassen. Zukünftige Forschung in diesem Rahmen muss sich vielmehr der Herausforderung stellen, die typologischen Dimensionen des Phänomens Klitisierung in Phonologie, Morphologie und Syntax einzubeziehen. Dies gilt besonders für die Diskussion um den theoretischen Status klitischer Gruppen in der generativ ausgerichteten Phonologie, deren Diskussion weitgehend auf Daten aus europäischen Sprachen beruht. Der Beitrag dieser Arbeit für die Rhythmustypologie besteht in der Überprüfung einiger in der Literatur vorgeschlagener Korrelationen von phonologischen Eigenschaften innerhalb rhythmischer Typen. Auch wenn die hier angewandte Methodologie auf klare Grenzen stößt, lassen sich auf der Basis der sprachvergleichenden Evidenz, die in dieser Arbeit zusammengestellt wurde, sechs Parameter für die Rhythmusbewertung aufstellen. Die Variation innerhalb dieser Parameter deutet dabei auf ein evolutionäres Kontinuum und nicht auf drei diskrete Rhythmustypen. Die rhythmusbasierte Typologie phonologischer Effekte der Klitisierung stellt schließlich Grundannahmen der Grammatikalisierungsforschung in Frage. Phonetische Erosion, die bisher als charakteristisch oder gar symptomatisch für Grammatikalisierungsprozesse angesehen wurde, begleitet Klitisierung nur in einem bestimmten Sprachtyp und kann deshalb als nicht universal angesehen werden. Ganz im Gegenteil führt die Morphologisierung in den verschiedenen rhythmischen Typen zu

grammatischen Markierungen von verschiedener phonologischer Gestalt. Während die stark in der Phonologie verankerten Reduktionstendenzen akzentbasierter Sprachen zu subminimalen Markierungen führen, kann das Fehlen solcher Reduktion in moren- und silbenbasierten Sprachen in der Morphologisierung zweisilbiger Affixe enden. Diese Beobachtungen fordern die Überprüfung allgemein akzeptierter Vorstellungen über Grammatikalisierung und möglicherweise eine Revision derselben in der Formulierung einer typologisch fundierten Grammatikalisierungstheorie.