ASSIMILATION AS SPREADING IN KOLAMI[1]

Ke Zou

University of Southern California

In this paper I discuss three types of assimilation in Kolami, a Dravidian language spoken by the Kolams in central India. I argue that an adequate account for the Kolami assimilations needs the theory of non-linear phonology, in which assimilation is expressed by spreading rules, which expand the domain of a feature or a class of features from trigger to target segments. I will show how such spreading rules interact with Kolami morphological structures and phonology rule typology to determine the morphological and phonological forms of the Kolami words in question.

1. DATA

The data given in this paper come from Emeneau (1955), who lists (1955:6) the following segment inventory for Kolami:

(1) Vowels: i, i:, e, e:, a, a:, o, o:, u, u:

Consonants:

	Bilabial	Labio-dental	Dental/ Alveolar	Retroflex	Palatal	Velar
Stops	p b		t d	ṭ ḍ		k g
Affricate					č ǰ	
Fricative		v	s z		y	
Nasal	m		n			ŋ
Liquid			l r			

The three types of Kolami assimilation are listed below:

(2) i) **voicing assimilation**
ii) **retroflex assimilation**
iii) **vowel assimilation**

[1] I am grateful to Heather Goad, Alicja Gorecka, Peter Petrucci, Debbie Schlindwein and Jean-Roger Vergnaud for their valuable and detailed comments. Naturally, all errors are my own.

Voicing assimilation applies regressively to a morpheme-final obstruent when it is followed by a hetero-morphemic obstruent with the opposite voice feature, i.e. the morpheme-final consonant agrees with its following morpheme-initial consonant in voicing:

(3)	Stem		Derived Form	
a.	**dig**	'descend'	**dikten**	'he descended'
b.	**tik**	'die'	**tigdan**	'he will die'
c.	**raz**	'say, speak'	**rastam**	'you spoke'
d.	**kis**	'fire'	**kiz gis**	'no fire at all'
e.	**surund**	'honeycomb'	**surunt potte**	'honeybee'
f.	**ke:t**	'winnowing basket'	**ke:d gis**	'no winnowing basket at all'
g.	**kaṭ**	'build'	**kaḍdun**	'I used to build'
h.	**muḍ**	'talk'	**muṭṭ**	'talked'
i.	**oḍ**	'wash'	**oṭṭ**	'washed'
j.	**paḍ**	'become'	**paṭṭ**	'became'

Since [b], [c] and [j] do not occur in a morpheme-final position (Emeneau 1955:15), voicing assimilation is irrelevant for these three consonants. And there are no attested data showing voicing assimilation of a morpheme-final [p]. As we know from (1), [f] does not exist in the Kolami consonant inventory, so morpheme-final [v] is not subject to voicing assimilation, e.g. **ruv** 'throw' ---> **ruvtan** 'I threw'; **tiv** 'pull' ---> **tivtam** 'you pulled'.

Unlike voicing assimilation, retroflex assimilation applies progressively to a morpheme-initial consonant from the preceding hetero-morphemic voiced retroflex consonant. Take (3h), (3i) and (3j) for example. Retroflex assimilation applies to the past suffix **t** to yield **ṭ**, which then forms a geminate with the stem-final **ṭ**, which is, in turn, derived from an underlying **ḍ** by voicing assimilation.

In Kolami three-consonant clusters are rather exceptional in character, and there are no three-consonant clusters containing two successive identical consonants. For example, when the past suffix **-t** is attached to a verb stem ending in two identical consonants, a degemination rule will apply to delete one of the two identical consonants. An interesting fact emerging from such a situation is that voicing assimilation still affects the stem-final consonant, whereas retroflex assimilation to the past suffix **-t** is blocked:

(4)

Verb Stem		Past Form	
ad̤d	'thirst for'	aṭṭ	*aṭṭ 'thirsted for'
id̤d	'tell'	iṭṭ	*iṭṭ 'told'

To make things more puzzling, the retroflex feature sometimes appears on the past suffix -t when it follows a stem-final liquid, which gets deleted later. This strikingly contrasts with other cases in which no retroflexion appears on the past suffix -t following a stem-final liquid, and no deletion of the stem-final liquid occurs either:

(5)

	Verb Stem		Past Form	
a)	ku:l	'run from tap'	ku:ṭ	'ran from tap'
	su:l	'get up'	su:ṭ	'got up'
	tu:l	'run'	tu:ṭ	'ran'
	ti:r	'be finished'	ti:ṭ	'was finished'
	u:r	'wind on'	u:ṭ	'winded on'
	vi:r	'sell'	vi:ṭ	'sold'
b)	o:l	'see'	o:lt	'saw'
	ve:l	'ask'	ve:lt	'asked'
	a:r	'become dry'	a:rt	'became dry'
	za:r	'leak from pot'	za:rt	'leaked from pot'
	u:r	'(house) leak'	u:rt	'(house) leaked'

Besides the degemination mentioned above, a three-consonant cluster formed by two non-identical stem-final consonants and a consonant suffix should be broken up by inserting a vowel between the two stem-final consonants:

(6) Vowel Epenthesis: $\emptyset$ ---> V / C_i ___ C_j + C

The inserted vowel always undergoes vowel assimilation to conform to the preceding stem vowel in quality, as shown by the following examples:

(7)

Verb Stem		Past Form	
ayk	'sweep away'	ayakt	'swept away'
erk	'light (fire)'	erekt	'lit (fire)'
kink	'break'	kinikt	'broke'
kork	'bite'	korokt	'bit'
puḍk	'touch'	puḍukt	'touched'
daṭp	'drive (horse)'	daṭapt	'drove (horse)'
ḍolp	'pull down'	ḍolopt	'pulled down'
ku:lp	'puncture'	ku:lupt	'punctured'
merp	'lighten'	merept	'lightened'
ti:rp	'finish'	ti:ript	'finished'

kars	'see (dream)'	**karast**	'saw (dream)'
pirs	'slide'	**pirist**	'slid'
part	'cut up'	**paratt**	'cut up'
urt	'make to drink'	**urutt**	'made to drink'

2. ANALYSES OF ASSIMILATION

2.1. Arguments against a Linear Analysis

In order to account for the three types of Kolami assimilation, we may adopt either a linear analysis or a nonlinear analysis. However, I argue that an adequate account of Kolami assimilation needs the theory of nonlinear phonology, in which assimilation is expressed by spreading rules (cf. Hayes 1986b). Before offering a non-linear analysis, let us see whether a corresponding linear analysis works or not. A linear analysis of the three types of Kolami assimilation can be represented by the following three rules:

(8) a. Voicing Assimilation:

$$\begin{bmatrix}\alpha\,\text{voice}\\ -\,\text{son.}\end{bmatrix} \longrightarrow [-\alpha\,\text{voice}] \;/\; \underline{\quad} + \begin{bmatrix}-\alpha\,\text{voice}\\ -\,\text{son.}\end{bmatrix}$$

b. Retroflex Assimilation:

$$\begin{bmatrix}+\,\text{ant.}\\ +\,\text{cor.}\\ +\,\text{distr.}\end{bmatrix} \longrightarrow \begin{bmatrix}-\,\text{ant.}\\ -\,\text{distr.}\end{bmatrix} \;/\; \begin{bmatrix}-\,\text{ant.}\\ +\,\text{cor.}\\ -\,\text{distr.}\\ +\,\text{voice}\end{bmatrix} + \underline{\quad}$$

c. Vowel Assimilation:

$$\emptyset \longrightarrow \begin{bmatrix}\text{V}\\ \alpha\,\text{high}\\ \beta\,\text{low}\\ \gamma\,\text{back}\\ \delta\,\text{round}\end{bmatrix} \;/\; \begin{bmatrix}\text{V}\\ \alpha\,\text{high}\\ \beta\,\text{low}\\ \gamma\,\text{back}\\ \delta\,\text{round}\end{bmatrix} \; C_i \;\underline{\quad}\; C_j + C$$

There are two general arguments against such a linear approach (see among others, Odden 1988). The first argument refers to formal simplicity of rules. In (8a), (8b) and (8c), the assimilating feature(s) (i.e. [-α voice] in (8a); [-ant., -distr.] in (8b); [α high, β low, γ back, δ round] in (8c)) has or have to be mentioned twice: once in the structural description, once in the structural change. This not only makes (8a), (8b) and (8c) more costly to formulate, but also leads to the wrong prediction that (8c) is more marked than (8a) since the former requires the specification of more features

than the latter. The second argument refers to rule naturalness (as opposed to rule arbitrariness) and power. Although (8a), (8b) and (8c) are natural with respect to the feature(s) of trigger segments and the assimilated feature(s) of target segments, such a linear analysis provides no distinction between these rules and the following arbitrary rules which can also be generated by the linear theory of phonology:

(9) a. [+ con.] --> [- voice] / ____ [+ cont.]
b. [+ cont.] --> [α nasal] / [α cor.] ____
c. [+ high] --> [αback,βlow] / [βround,αlow] __

However, the rules in (8) are natural, whereas the rules in (9) are unattested. But there is no straightforward explanation for this distinction (in rule naturalness) in the theory of linear phonology. This undoubtedly endows linear phonology with excessive descriptive power and makes it unconstrained. This is because its ability to include rules like (9) in grammar does not give us any reason to expect specific relations to hold between features or feature values of trigger and target segments.

More specific arguments against the linear analysis address its lack of sufficient power to account for the whole set of data given above. That is to say, the linear analysis is also too restrictive, as shown by the following: i) the linear analysis does not tell us why retroflex assimilation is effective in (3h), (3i) and (3j), but is blocked in the case of degemination, as shown in (4);[2] ii) there is no account in the linear analysis for the occurrence of retroflex feature on the past suffix -t, as shown in (5a). Moreover, the linear analysis gives us only a description rather than an explanation for the difference between degemination and vowel insertion with respect to the simplification of three-consonant clusters.

---

[2] This problem may be solved in the linear analysis by adding an ad hoc condition to Rule (8b), i.e. to place a vowel before the trigger segment:

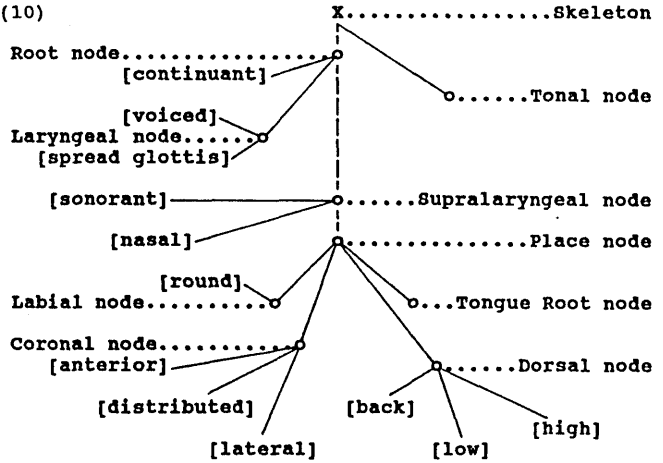
$$\begin{bmatrix}+\text{ ant.}\\+\text{ cor.}\\+\text{ distr.}\end{bmatrix} \text{ --> } \begin{bmatrix}-\text{ ant.}\\-\text{ distr.}\end{bmatrix} \text{ / V } \begin{bmatrix}-\text{ ant.}\\+\text{ cor.}\\-\text{distr.}\\+\text{ voice}\end{bmatrix} + \text{ ____}$$

Therefore, the linear analysis faces a serious paradox in the sense that the mechanism used is too powerful and too restrictive at the same time. The inadequacies of the linear approach force us to reject it and to develop an alternative approach which can offer an account for Kolami assimilation in a more adequate fashion.

2.2. A Non-linear Analysis and its Motivation

Before offering a non-linear analysis of Kolami assimilation, I would like to present the theoretical assumptions on which my analysis is based. First, I assume the hierarchical organization of segment features proposed by Archangeli and Pulleyblank (1989:193), as shown by the following representation:

(10)



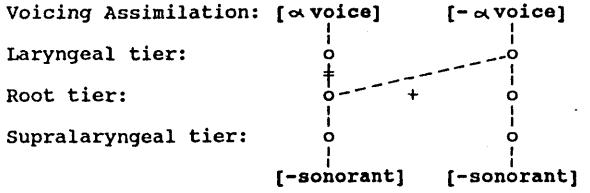
Second, I assume the Universal Well-formedness Condition proposed by Goldsmith (1976) with respect to associations between tiers:

(11) Association lines cannot cross.

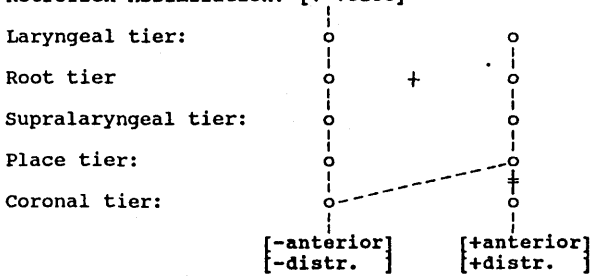
Given the hierarchical organization of segment features and the Universal Well-formedness Condition, I now present a non-linear analysis of Kolami assimilation. Compared with the linear theory of phonology, a non-linear theory offers a different conception of

assimilation rules, which expand the domain of feature(s) by spreading an element on one tier to a new position on its adjacent tier, often resulting in the deletion of displaced feature(s) in the process (cf. Clements 1985; Hayes 1986b; Steriade 1987; Odden 1988). Under this conception, the voicing and retroflex assimilation rules in Kolami can be formulated as follows:

(12) Voicing Assimilation:



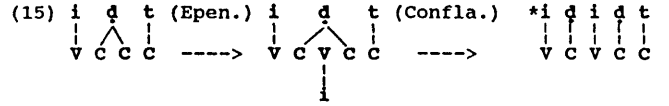
(13) Retroflex Assimilation:



To formulate the vowel assimilation rule in a non-linear fashion, I assume that vowels and consonants share the same class tiers or plane if they belong to the same morpheme, following an idea suggested by Steriade (1986). One strong argument for this assumption in Kolami comes from the difference between the two ways of breaking up three-consonant clusters, i.e. degemination vs. vowel insertion. This difference has no explanation under the linear analysis, but is explained by the integrity of geminates (Hayes 1986b), if tauto-morphemic vowels and consonants share the same class tiers or plane, i.e. vowel epenthesis into geminates will be blocked by the violation of the Universal Well-formedness Condition given in (11):

(14) a. * i i d t b. * i d i t

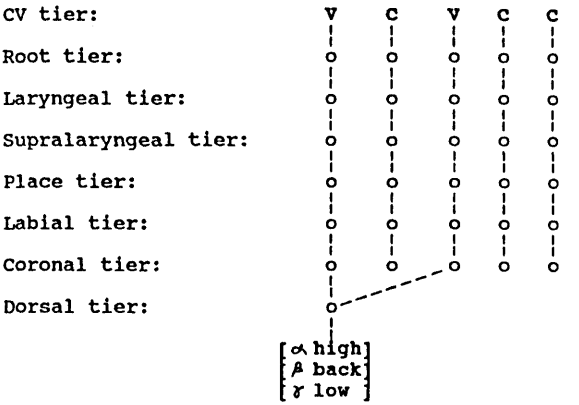
However, if vowel and consonant features occupied disjoint sets of tiers within one morpheme, the constraint on the integrity of geminates would be circumvented. This is because an epenthetic vowel might appear on a separate plane or a set of vowel tiers between the two C-slots linked to a geminate consonant, without violating the universal ban on crossing association lines. After Tier Conflation (McCarthy 1986), the epenthetic vowel would appear phonetically between the halves of a geminate:



Therefore, the difference between degemination and vowel insertion would remain unexplained.

However, assuming the same set of tiers for tautomorphemic vowels and consonants does not mean that they should share the same articulator nodes (e.g. the coronal node may only dominate consonant features, cf. (10)), unless they are characterized by the same articulator nodes or the same terminal features (Clements 1985; Steride 1987). So the non-linear vowel assimilation rule, which is fed by the output of the Epenthesis Rule given in (6), can be formulated as follows:

(16) Vowel Assimilation:



The spreading of the dorsal node across a consonant in (16) is legitimate under the assumption that the dorsal features of consonants are underlyingly unspecified or absent. So the intervening consonant is **transparent** with respect to the spreading of the dorsal node, and no crossing of the association lines will occur (cf. Clements 1985; Steriade 1987). This analysis is motivated by the fact that consonants in Kolami can be distinguished from each other without reference to the dorsal node. Either we can leave their dorsal node unfilled or fill it by redundancy rules later in the phonological process.[3] Following the same idea, we can assume that the vowel feature **[round]** in Kolami is also underlyingly unspecified, and it becomes specified later by the redundancy rules, since Kolami vowels can be distinguished from each other without reference to the labial node.

Compared with the linear analysis of assimilation as feature changing, the non-linear analysis of assimilation as feature spreading is more adequate and motivated for the following reasons. First, the non-linear analysis is very constrained and draws a distinction between the natural rules in (8) and the arbitrary rules in (9), i.e. the former can be translated into the spreading rules in (12), (13) and (16), whereas the latter have no translation in non-linear phonology. Second, the non-linear analysis is less redundant because the assimilating feature(s) is/are mentioned only once in the structural description. The structural change is simply expressed by an association line from a trigger segment node to its adjacent target segment node. Thus, vowel assimilation will not be more marked than voicing assimilation since they both involve a single node spreading, i.e. the laryngeal node for voicing assimilation and the dorsal node for vowel assimilation.

The most crucial argument for the non-linear analysis lies in its ability to explain some phenomena which get no account under the linear analysis. First, as mentioned above, the linear analysis provides no explanation for the two ways of resolving three-consonant clusters. But under the non-linear analysis, their difference is captured by the integrity of geminates, i.e. epenthesis into geminates will be blocked by the

---

[3] If we adopt Steriade's hierarchical model (1987), the specification of dorsal features for consonants becomes unnecessary because an independent **Velar tier** is proposed to cover the velar features of consonants.

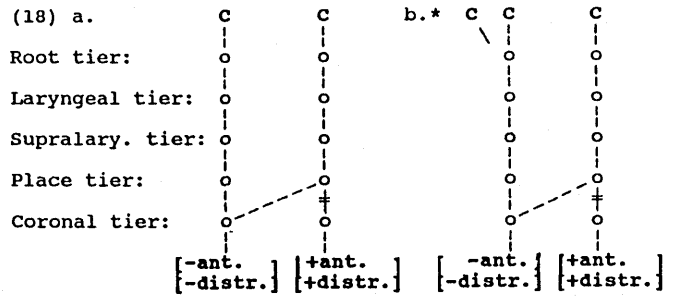
universal ban on crossing association lines, as shown in (14). Second, the non-linear analysis also offers an account for the non-application of retroflex assimilation in the case like (4), if such an assimilation is ordered before degemination. That is to say, based on the assumption that retroflexion spreads only from a single retroflex consonant rather than from a geminate one (cf. Hayes' Linking Constraint (1986a)), the past suffix -t in (4) will not be affected when the rule applies. After degemination takes place, the retroflex assimilation rule is not able to apply again to the suffix -t even though the condition is met at this time. This is due to the effect of the Principle of Strict Cyclicity in the sense that the same rule cannot apply twice at the same cycle or morphological level (cf. Kean 1974; Kiparsky 1982):

(17)	'thirsted for'	'told'
Verb stem plus past suffix:	aḍḍ + t	iḍḍ + t
Retroflex assimilation:	(the rule does not apply because the retroflex feature spreads only from a single retroflex consonant)	
Degemination:	aḍt	iḍt
Voicing assimilation:	aṭt	iṭt

The assumption that the retroflexion only spreads from a single retroflex consonant follows from the Linking Constraint proposed by Hayes (1986a:331), though the opposite facts are observed in some languages (Hayes 1986a; Schein & Steriade 1986).[4] So the retroflex assimilation rule should be rewritten as (18a), and (18b) should be ruled out:

---

[4] According to Schein and Steriade (1986:712-716), geminates are not restricted from participating in rules that do not result in their changes at the segmental level, as shown by Tigrinya Rounding, Turkish Velar Palatalization and Romance Affrication. However, retroflex assimilation in Kolami is subject to geminate blocking, as evidenced by the data to be shown later.



Moreover, the non-linear analysis can explain the occurrence of the retroflex feature on the past suffix -t when it follows a stem-final liquid, which gets deleted later, as shown in (5a). This phenomenon is mysterious under a linear analysis and no arbitrary feature changing rule can account for the data in both (5a) and (5b). According to Emeneau (1955:7), the liquids in Kolami can acquire the retroflex feature when they follow a retroflex consonant. Given this property of Kolami liquids, I assume that in the underlying representations of the verb stems in (5a), both [l] and [r] follow a retroflex consonant. Following Kiparsky's (1982) theory of lexical phonology, we can say that the retroflexion has spread to [l] and [r] from the preceding retroflex consonant in the stem, prior to the spreading of retroflexion in the later word-formation process.[5] I further assume that after retroflex assimilation applies in the stem of (5a), the phonemic melody of the preceding retroflex consonant is deleted by a lexically restricted rule of deletion, which triggers compensatory lengthening by spreading the root node of the preceding stem vowel to the root node of the empty C-slot left by the deletion. When the past suffix -t is added to such stems, retroflex assimilation further applies to the output of this word-formation process by spreading the retroflex feature from [ɻ] to the suffix -t. Since there are no ɻt or ɾt clusters in the phonetic representation of Kolami (Emeneau 1955:13), a surface filter will be activated to force the deletion of ɻ in ɻt and ɾ in ɾt,

[5] The retroflex assimilation applying within the verb stem is a little different from the one applying across a morpheme boundary:, i.e. the former does not require the trigger segment to have the [+ voice] feature, whereas the latter does.

resulting in the correct past forms of these verbs. The derivations of ku:ṭ and ti:ṭ in (5a) illustrate the analysis given above:

(19)	'run from tap'	'be finished'
Underlying form of verb stem:	kuḍl	tiḍr
Retroflex assimilation:	kuḍḷ	tiḍṛ
Deletion & Compensatory Lengthening:	ku:ḷ	ti:ṛ
Past tense affixation:	ku:ḷt	ti:ṛt
Retroflex assimilation:	ku:ḷṭ	ti:ṛṭ
Surface filter:	ku:ṭ	ti:ṭ

Now the problem facing the non-linear analysis is how to account for the data in (5b), in which no retroflex feature appears on the past suffix -t and no deletion of the stem-final liquid occurs either. In order to account for these data in (5b), I assume that the vowels in these verb stems are underlyingly long, whereas the vowels in the verb stems in (5a) are lengthened by compensatory lengthening. Thus, no retroflex consonant can occur before the liquid in the verb stems in (5b). There is independent evidence for the existence of two types of long vowels in Kolami, as shown below:

(20)	Verb Stem	Past Form
a)	u:r '(house) leak'	u:rt '(house) leaked'
b)	u:r 'wind on'	u:ṭ 'winded on'

Although the stems u:r '(house) leak' and u:r 'wind on' share the same form, their past forms are distinct from each other. The former has the past form u:rt '(house) leaked' while the latter has the past form u:ṭ 'winded on'. If the underlying representations of the two verb stems were identical, there would be no explanation for their different past forms. Only under the assumption that there are two types of long vowels in Kolami: underlying and derived, can their different past forms be adequately explained.

3. THEORETICAL IMPLICATIONS

In this section, I would like to discuss two theoretical implications that the analysis of the Kolami assimilation phenomena raises for the theory of non-linear phonology. The first implication relates to the question of tier separation between consonants and vowels. My analysis presents an argument for the Overlapping Tier Hypothesis proposed by Steriade (1987), unless vowels and consonants constitute separate morphemes (e.g. in Arabic, vowels and consonants belong to different morphemes, so they may appear on separate tiers. See McCarthy (1982) for detailed discussion of this case). This argument comes from the difference between the two means of simplifying three-consonant clusters in Kolami, i.e. degemination vs. vowel insertion. If we assume that vowels and consonants within a morpheme occupied disjoint sets of tiers or separate planes, the constraint on the integrity of geminates would be circumvented by specifying, on a separate set of vowel tiers, the features of the V-slot inserted between the two C-slots linked to a geminate consonant. But if tauto-morphemic vowels and consonants share the same set of tiers or if their tiers overlap, then the epenthesis into geminates will be blocked by the constraint which prohibits association lines from crossing. This then leads to an adequate explanation for the difference between degemination and vowel insertion.

The second implication of the presented analysis relates to the Linking Constraint proposed by Hayes (1986a:331), i.e. association lines in structural descriptions are interpreted as exhaustive. Schein and Steriade (1986:712-716) propose that geminates are never restricted from participating in rules which do not result in their changes at the segmental level. Their proposal is supported by Tigrinya Rounding, Turkish Velar Palatalization and Romance Affrication rules. However, these facts do not necessarily suggest that the non-exhaustive interpretation of association lines is universal for the trigger segments which are not affected by the rules. The blocking of retroflex assimilation in (4) provides evidence for the Linking Constraint with respect to the association lines matching in the rule and the input to the rule. Another piece of evidence for matching association lines comes from the fact that the Kolami consonant cluster that has undergone partial assimilation can block retroflex assimilation, as shown below:

(21)

Verb Stem	Past Form
niṇḍ 'become full'	niṇḍt 'became full'
paṇḍ 'become ripe'	paṇḍt 'became ripe'
pi:ṇḍ 'squeeze'	pi:ṇḍt 'squeezed'

In (21), [ṇ] occurring after the stem vowel acquires its retroflex feature from the following retroflex consonant according to Emeneau (1955:7). In other words, the retroflex assimilation rule has spread the retroflex feature of [ḍ] to the preceding [n] in the stem. According to Steriade (1982), the rules of partial assimilation create partially linked structure. The partially linked structures formed by retroflex assimilation in the stems of (21) may lead to unmatched association lines between the rule and trigger segments for retroflex assimilation in the next cycle, thus blocking retroflex assimilation.[6] On the other hand, these partially linked structures in (21) also lead to unmatched association lines between the voice assimilation rule and target segments in the voicing assimilation process, thus blocking voicing assimilation in the next cycle too (compare the past forms in (21) with the past forms in (3h), (3i) and (3j)), though the technical details of partially linked structures related to the blocking effect need to be worked out).

4. CONCLUSION

In this paper, I have offered both linear and non-linear analyses of three types of Kolami assimilation, arguing that an adequate account of these assimilations needs a theory of non-linear phonology, in which assimilation is expressed by spreading rules. These spreading rules interact with morphological structures and other phonological rules in Kolami to determine the morphological and phonological forms of the Kolami words. I have also argued that tauto-morphemic vowels and consonants should share the same set of tiers. Finally, I have suggested that the application of the Linking Constraint to the trigger segment is parametrized in different languages.

---

[6] The reason why retroflex assimilation in the second cycle of its application in (5a) is not blocked is due to the fact that the deletion of the retroflex consonant preceding the liquid destroys the partially linked structure, as shown in (19).

REFERENCES

Archangeli, D. & Pulleyblank, D. (1989) "Yoruba Vowel Harmony" LINGUISTIC INQUIRY 20, 173-217.

Clements, G. (1985) "The Geometry of Phonological Features" PHONOLOGY YEARBOOK 2, 225-252.

Emeneau, M. (1955) **Kolami, a Dravidian Language** University of California Publications in Linguistics 12.

Goldsmith, J. (1976) **Autosegmental Phonology** Doctoral dissertation, MIT.

Hayes, B. (1986a) "Inalterability in CV Phonology" LANGUAGE 62, 321-351.

Hayes, B. (1986b) "Assimilation as Spreading in Toba Batak" LINGUISTIC INQUIRY 17, 467-499.

Kean, M-L. (1974) "The Strict Cycle in Phonology" LINGUISTIC INQUIRY 5, 179-204.

Kiparsky, P. (1982) "Lexical Phonology and Morphology" in I.S. Yang, ed., LINGUISTICS IN THE MORNING CALM, Linguistic Society of Korea.

McCarthy, J. (1982) "Prosodic Templates, Morphemic Templates, Morphemic Tiers" in Hultst & Smith, eds., **The Structure of Phonological Representations I** Foris, Dordrecht.

McCarthy, J. (1986) "OCP Effects: Gemination and Antigemination" LINGUISTIC INQUIRY 17, 207-263.

Odden, D. (1988) "Dissimilation As Deletion in Chuckchi" MS., Ohio State University.

Schein, B. & Steriade, D. (1986) "On Germinates" LINGUISTIC INQUIRY 17, 691-744.

Steriade, D. (1982) **Greek Prosodies and the Nature of Syllabification**, Doctoral Dissertation, MIT.

Steriade, D. (1986) "Yokuts and the Vowel Plane" LINGUISTIC INQUIRY 17, 129-146.

Steriade, D. (1987) "Locality Conditions and Feature Geometry" NELS 17.