

## Chapter 1

# A featural analysis of mid and downstepped high tone in Babanki

Pius W. Akumbu

University of Buea, Cameroon

In this study, I examine the occurrence of the surface Mid (M) and downstepped High ( $\downarrow$ H) tone in Babanki, a Central Ring Grassfields Bantu language of Cameroon. Hyman (1979) has demonstrated that Babanki has two underlying tones, namely, High (H) and Low (L), and that on the surface, it contrasts three level tones, H, M, L, plus a downstepped High ( $\downarrow$ H). There is also contrast between a falling (L) and a level low (Lo) tone before pause in the language. I demonstrate in this paper that the M tone is from two different phonological sources and derived by the regressive spread of the high register feature of a following H tone while  $\downarrow$ H is caused by the progressive spread of the low register feature of a preceding floating L tone. The M and  $\downarrow$ H tone are phonetically identical in the language but differ in that  $\downarrow$ H establishes a ceiling for following H tones within the same tonal phrase.

## 1 Introduction

Part of the complexity of tone in Grassfields Bantu (GB) languages of Northwest Cameroon such as Babanki (a Central Ring GB language) is the lack of correspondence between underlying and surface tones as well as the presence of many floating tones. There is no underlying M tone in Babanki, yet it occurs on the surface with the constraint that it must be followed by a H tone. Hyman (1979) has given a historical account of this M tone which is unnecessarily abstract as a synchronic analysis. I demonstrate in this paper that M tone results from the regressive spread of the [+R] feature of high tones which is blocked only by a nasal in NC initial roots. Downstep on its part results from the progressive spread of the [-R] feature of a floating L tone. The synchronic reanalysis of Babanki surface tones in this paper addresses the following issues: 1) What are the underlying



sources of the M tone? 2) How should the M tone be represented, as opposed to the downstepped H? I begin by illustrating in §2 that the lexical tones of Babanki are H and L even though a number of other tonal distinctions are found on the surface. I then proceed to examine the sources of M tone in the language in §3 before turning to discuss how the M tone is derived in §4. In §5, I provide evidence that both M and ↓H are phonetically identical and differ only in that the register is reset to high after M tone but not after ↓H which establishes a ceiling for future H tones within the same tonal phrase.

## 2 Babanki lexical tone

Babanki has two underlying tones, namely H and L, illustrated in (1). As a native speaker, I have provided most of the data but have also taken some from prior literature, particularly Hyman (1979) and a lexical database of 2,005 Babanki entries in Filemaker Pro™.<sup>1</sup>

(1)	ndòŋ	‘potato’	ndónŋ	‘cup’
	kà-bwìn	‘witchcraft’	kà-bwín	‘ridge’
	à-sè	‘grave’	à-sé	‘profit(n)’
	kà-mbò	‘bag’	kà-mbó	‘madness’

On the surface, however, several tonal realizations are possible. As noted by Hyman (1979: 160-161), there is a distinction between falling low (L) and level low (Lo) tones before pause as in (2):

(2)	L		L <sup>o</sup>	
	kà-ntò	‘cross (n)’	kà-mbò <sup>o</sup>	‘bag’ /kà-mbò’/
	nyàm	‘animal’	dzàm <sup>o</sup>	‘back’ /dzàm’/
	tàn	‘five’	wàn <sup>o</sup>	‘child’ /wàn’/
	à-sè	‘grave’	dzè <sup>o</sup>	‘kind of fruit’ /dzè’/

The level low tone is considered an effect of a floating high tone that follows the low tone and prevents it from falling. A mid (M) tone also occurs even though with an unusual constraint that it must be followed by a H tone:

<sup>1</sup>The IPA symbols for the following orthographic symbols used in this paper are given in square brackets: ny [ɲ], sh [ʃ], zh [ʒ], gh [gɥ], ch [tʃ], j [dʒ], y [j].

1 A featural analysis of mid and downstepped high tone in Babanki

- (3) a. káŋ fāsés<sup>2</sup>  
       káŋ ´ fā-sés  
       fry IMP c19-pepper  
       ‘fry pepper’  
   b. kùmá kākí  
       kùm ´ kà-kí  
       touch IMP c7-chair  
       ‘touch a chair’  
   c. ghá? kāvú  
       ghá? ´ kà-vú  
       hold IMP c7-hand  
       ‘hold a hand’

The data show that the M tone is derived from a L tone found between two H tones as illustrated in §3.1 and discussed elaborately in §4. Finally, there is a downstepped H tone as in (4):

- (4) a. kà-fó` ↓ká nyàm  
       kà-fó` ká nyàm  
       c7-thing AM c9-animal  
       ‘thing of animal’  
   b. kàmbó ↓ká wì?  
       kà-mbó` ká wì?  
       c7-madness AM c1.person  
       ‘madness of person’  
   c. kàkáj ↓ká byí shóm  
       kà-káj` ká byí shóm  
       c7-dish AM goat.c10 mine.c10  
       ‘dish of my goats’

The data in (4) illustrate that the H tone of the associative marker (AM) is produced at a lower level than that of the preceding noun root because of the intervening floating L tone. This is discussed further and formalized in §5. The presence of both M and ↓H in the same language is of interest for two reasons. First, Babanki is unique in that Grassfields Bantu Ring languages are typically said to have either M or ↓H. As Hyman puts it:

<sup>2</sup>There is a change in the root vowel because in Babanki, /e/ and /o/ are realized as [ɛ] and [ɔ] respectively in closed syllables (Mutaka & Chie 2006: 75).

For example, it is known that the western Ring languages and Babanki (of the central Ring group) have similar downstep systems. The remaining languages of the central group (Kom, Bum, Bafmeng, Oku, Mbizinaku) all have systems with M tone instead of ↓H, a system which Grebe & Grebe (1975) have also documented for Lamnsoq of the eastern group (Hyman 1979: 176-177).

Second, although phonologically distinct, the M and ↓H tones are phonetically identical, as I shall show below, which is of particular interest to the study of tone in general. It is therefore necessary to examine how the M tone is derived and how it should be formally represented.

It is important to note that contour tones are rare in the language, allowed mainly in a few borrowed words. In the lexical database of 2,005 Babanki entries in Filemaker Pro™, only eight monosyllabic nouns with low-Rising (LH) and four with high-falling (HL) tones were found.<sup>3</sup>

### 3 Sources of Babanki M tone

The M tone is derived in Babanki from L via two separate processes which I will refer to as prefix L-Raising and stem L-Raising.

#### 3.1 Prefix L-Raising: H # L-H → H # M-H

The L tone of a prefix is raised to M if it appears between two H tones as in the following examples.

- (5) a. tətóʔ tətáʔ  
       tə-tóʔ   tə-táʔ  
       c13-bush c13-three  
       ‘three bushes’
- b. kəkím kə vətsoŋ  
       kə-kím kə   və-tsoŋ  
       c7-crab AM c2-thief  
       ‘crab of thieves’

<sup>3</sup>LH: *əŋkəpəm* ‘pig’, *bələŋ* ‘groundnut’, *fəndzəndzə* ‘type of bird’, *kəŋgū* ‘fool (n)’, *mbwī* ‘nail’, *ŋgū* ‘rake (n)’, *sə* ‘saw (n)’, *tələm* ‘cobra’.

HL: *bībī* ‘deaf’, *bəbó* ‘Lord’, *byə* ‘pear’, *lām* ‘lamp’, *kī* ‘key’, *chôs* ‘church’, *wəs* ‘watch’.

The presence of words like *sə* ‘saw (n)’, *lām* ‘lamp’, etc. suggests that many of the Babanki words with contour tones are borrowings.

- c. tətʔ tə̀bò  
 tət-tʔ tət-bò  
 c13-bush c13-two  
 ‘two bushes’
- d. kəkím ká vələmè  
 kət-kím ká vət-ləmè  
 c7-crab AM c2-sibling  
 ‘crab of siblings’

Raising applies in (5a) where the L is flanked by Hs but not in (5b) where it is followed by a L tone. I return to the issue in §4 to provide a featural analysis of the raising.

### 3.2 Stem L-Raising: L-L # H → L-M # H

In Babanki, the L tone of certain noun roots that also have a L prefix is realized as M if it is followed by a H tone. The following sets of data show stem L-Raising when the noun is in N1 position in an associative N1 of N2 construction (6a), when the noun is followed by a modifier (6b), and in verb phrases (6c). Forms without raising (i.e. with surface L tone) are given in (6d):

- (6) a. kəkəs ká wìʔ  
 kət-kòs ká wìʔ  
 c7-slave AM c1.person  
 ‘slave of person’
- b. fəkʔ fə̀ nyàm  
 fət-kòʔ fə̀ nyàm  
 c19-wood AM c9.animal  
 ‘wood of person’
- c. fəsò fə̀wén  
 fət-sò fə̀ wén  
 c19-abscess AM him  
 ‘his abscess’
- d. kəkyē lá kəmùʔ  
 kət-kyè lá kət-mùʔ  
 c7-basket just c7-one  
 ‘just one basket’

- e. wyé kàzhwī tsú  
wyé kà-zhwì tsú  
put c7-air there  
'inflate it'
- f. kú kàlāŋ lúwèn  
kú kà-lāŋ lúwèn  
give c7-cocoyam now  
'give cocoyam now'
- g. nyàm à wì?  
nyàm à wì?  
c9.animal AM c1.person  
'animal of person'
- h. kàkòs kà mù?  
kà-kòs kà-mù?  
c7-slave c7-one  
'one slave'
- i. áshù kàlāŋ nè mú↓ú  
á-shù kà-lāŋ nè múú  
INF-wash c7-cocoyam PREP c6a.water  
'to wash cocoyam with water'

To account for the raising in (6a-c), Hyman (1979: 168) offers a synchronic analysis which mirrors the historical developments, as in (7):

(7) kákòs ká → kákòs ká → kàkòs ká → kàkòs ká ...

As seen, the prefix originally had a H tone which spreads onto the L tone stem.<sup>4</sup> After spreading, the prefix H changes to L and then the resulting L-HL # H sequence becomes L-M # H by contour simplification. While this historical account derives the correct output, it appears to be unnecessarily abstract as a synchronic analysis. Instead, the H tone on the prefix can rather be analyzed as L (Akumbu 2011) and the change from L to M can be accounted for as a raising rule (see §4). There is, however, a complication that either analysis must deal with: L-L nouns that have a nasal as part of the root initial NC do not become L-M before H as illustrated in (8):

---

<sup>4</sup>Hyman's pre-autosegmental analysis also posits a floating L after the L stem, i.e., /-kòs/ 'slave'. This is ignored here because it is unnecessary and also an OCP violation.



*ká wì?* ‘mucus of person’, that do in fact become M. So far, the two sources of M tone have been presented: prefix L becomes M between Hs and stem L becomes M when preceded by a L prefix and followed by a H. It should be noted that this occurs over a word boundary although it is still unclear what the influence of the boundary is. In addition, there is another context in which a stem L becomes M. This arises when a coda consonant is deleted intervocalically (see Akumbu 2016 and references cited therein for more information on coda deletion in Babanki). As seen in (9), when the CVC stem is H and the following prefix vowel is L, the H+L sequence resulting from coda deletion is realized M:

- (9) a. *kàbā: kóm*  
      *kà-bán      à-kóm*  
      *c7-corn.fufu c7-my*  
      ‘my corn fufu’
- b. *kàŋkō: kóm*  
      *kà-ŋkón à-kóm*  
      *c7-fool c7-my*  
      ‘my fool’
- c. *kàbā: kóm*  
      *kà-báŋ      à-kóm*  
      *c7-home c7-my*  
      ‘my home’

I propose to account for this by invoking the prefix raising rule. Thus, in (9a) for example, the input /*kà-bán à-kóm*/ first undergoes prefix L-Raising to become *kà-bán ā-kóm*. Next, the coda consonant (alveolar or velar nasal) is deleted in intervocalic position, creating the structure *kà-bá ā-kóm*. This is followed by vowel (schwa) deletion which allows its M tone to float: *kà-bá<sup>-</sup>-kó*. The floating M tone docks leftwards and causes the deletion of the H tone, since HM contour tones are not permitted in the language. The vowel that causes vowel deletion then undergoes compensatory lengthening, resulting to the surface structure [*kàbā: kóm*].

#### 4 Featural analysis of Babanki M tone

In this section I show that the M tone can be insightfully accounted for using tonal features which spread. Various proposals for the use of features in the representation and analysis of tone have been addressed by Yip (1980), Clements

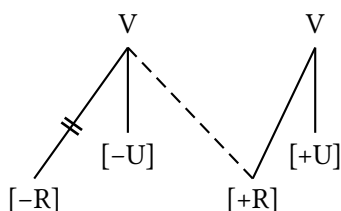


(1983), Pulleyblank (1986), Odden (1995), Snider (1999), Hyman (2011) and others. Following the tone features introduced by Yip (1980) and modified by Pulleyblank (1986), I assume the feature system in (10) for the two underlying Babanki tones:

(10)	H	L	
	Upper	+	-
	Raised	+	-

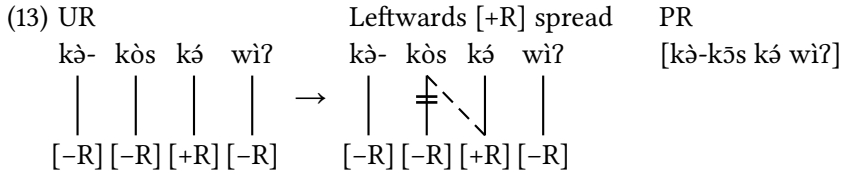
I propose that Babanki M tone be represented as [-U, +R] which can be derived directly from the leftwards spreading of the [+R] feature of a H tone to a preceding L tone, whose [-R] feature automatically delinks. I formulate the process in (11) where I link features directly to the TBUs even though there are arguments in the literature to link features to tonal nodes, e.g. Yip (1989) and Hyman (2011). This implies that linking features directly to TBUs is merely for expository convenience.

(11) Leftwards [+R] spread



It should be recalled that there are two different morphological restrictions on the application of this rule: the L tone that is raised must either be that of a prefix found between two H tones (§3.1) or of a stem preceded by a prefix L tone and followed by a H tone (§3.2). The first is an instance of register plateau where [-R] becomes [+R] between [+R] specifications. In both cases, the application of the rule results in a M tone with the features [-U, +R], as illustrated in the following derivations:

(12) UR	Leftwards [+R] spread	PR
tə-   tóʔ   tə-   tsén	tə-   tóʔ   tə-   tsén	[tətóʔ tətсэн]
	†	
[-R] [+R] [-R] [+R]	[-R] [+R] [-R] [+R]	



To summarize this section, the resulting feature system of Babanki is as follows:

(14)

	H	M	L
Upper	+	-	-
Raised	+	+	-

The use of features allows for a unified account of the Babanki derived M tone using one tone rule (albeit with constraints) thereby avoiding Hyman’s abstract intermediate contour tones which are not realized on the surface. In the next section, I address the analysis of the ↓H downstep tone.

## 5 Babanki downstepped high tone

While the different sources of the M tone have been discussed above and its realization shown, nothing has been said about the ↓H tone which, like M is also a derived tone in the language. Downstep is commonly used to describe successive lowering of H tones in an utterance. The two kinds of downstep commonly mentioned in the literature are non-automatic downstep, phonologically conditioned by a floating L tone (Clements & Ford 1979; Pulleyblank 1986) or by one that had been lost historically, and automatic downstep, caused by an associated low tone (Stewart 1965; Odden 1982; Snider 1999; Connell 2014). Downstep has been described as a downward shift in register (e.g. Snider 1990; Snider & van der Hulst 1993; Snider 1999; Connell 2014). Automatic downstep occurs in Babanki but the focus in this study is on non-automatic downstep which has been noted in the Babanki nominal system (Hyman 1979; Akumbu 2011) as well as in the verb system (Akumbu 2015). As seen in the following data, the floating low tone that causes downstep in Babanki may be underlying:

(15)

a.	á`-sé	→	á↓sé	‘to sharpen’
	á`-sám	→	á↓sám	‘to migrate’
b.	á`-bùm	→	ábùm	‘to meet’
	á`-sìm	→	ásìm	‘to tighten’

As shown in (15a), a H verb stem is realized as a downstepped H after the infinitive prefix. Downstep can be accounted for by assuming that the H tone schwa of the infinitive prefix is followed by a floating L. The presence of this floating L tone is justified by the fact that the H tone of the verb root is realized on a lower register than the preceding H tone. When the H tone prefix is followed by a L tone verb, the verb tone does not change (15b). These data are analyzed as involving ↓H as opposed to the previous cases analyzed as involving M specifically because it is shown, subsequently (see Figure 1), that ↓H sets a new ceiling for subsequent Hs producing a terracing effect as opposed to M which results from the local raising of L and is obligatorily followed by H.

In the noun system, certain H tone stems have a following floating L tone in their underlying representation. Evidence has been presented that in Babanki, “class 7 nouns fall into three subclasses, A, B, C [corresponding to (16a, b, c)] which behave differently in context” (Hyman 1979: 163-164).<sup>5</sup> Hyman illustrates the distinction between the three using noun-plus-noun (N1 of N2) associative constructions (AM). When H tone roots are in N1 position and are followed by the H tone of the AM, the latter is lowered to ↓H after A and B, but not C. Secondly, when in N2 position after a L toned AM, A and C become L-Lo, while B remains L-H. Finally, when in N2 position after the H toned AM, A becomes H-Lo, while B and C become H-↓H.

As said above, A and B cause the following H tone of the AM to be realized at a lower level than the preceding root H tone (16a,b):

- (16) a. kə̀fó ↓kə́ wì?  
           kə̀-fó` kə́ wì?  
           c7-thing AM c1.person  
           ‘thing of person’
- b. kəkáŋ ↓kə́ ndòŋ  
           kə̀-káŋ` kə́ ndòŋ  
           c7-tin AM c1.potato  
           ‘tin of potato’
- c. kə̀fú ↓kə́ wì?  
           kə̀-fú` kə́ wì?  
           c7-medicine AM c1.person  
           ‘medicine of person’

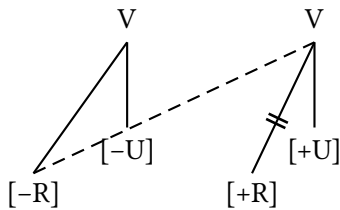
---

<sup>5</sup>The historical origins of the different classes adopted synchronically by Hyman (1979) were: A = \*LH, B = \*HL, C = \*HH.

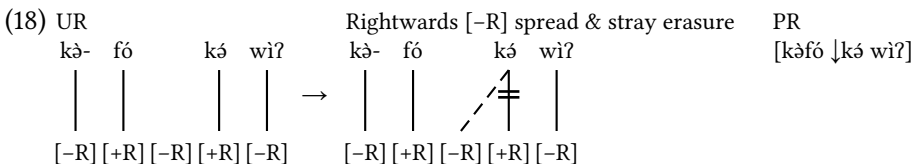
- d. kətyí ↓kə nyàm  
 kə-tyí' kə nyàm  
 c7-stick AM c9.animal  
 'stick of animal'
- e. kəkím kə kə↓kú  
 kə-kím kə kə-kú  
 c7-crab AM c7-gift  
 'crab of gift'
- f. kəshí kə kə↓təŋ  
 kə-shí kə kə-təŋ  
 c7-place AM c7-belt  
 'place of belt'

Downstep of the AM H tone is best explained by the presence of a floating L tone on N1 noun roots. Hyman's class C nouns (16c) do not cause downstep of the following H tone of the associative marker because they do not have a floating tone in their underlying representation. The forms in (16c) further show that the H tone of the AM spreads rightwards and delinks the L tone of the prefix of N2 nouns. It is this floating L tone that causes downstep of the H tone of N2 noun roots. Its [-R] feature spreads rightwards and delinks the [+R] feature of the following H tone as follows:

(17) Rightwards [-R] spread (Downstep)



The application of this rule yields a ↓H tone with the features [+U, -R], as illustrated in the following derivations:



1 A featural analysis of mid and downstepped high tone in Babanki

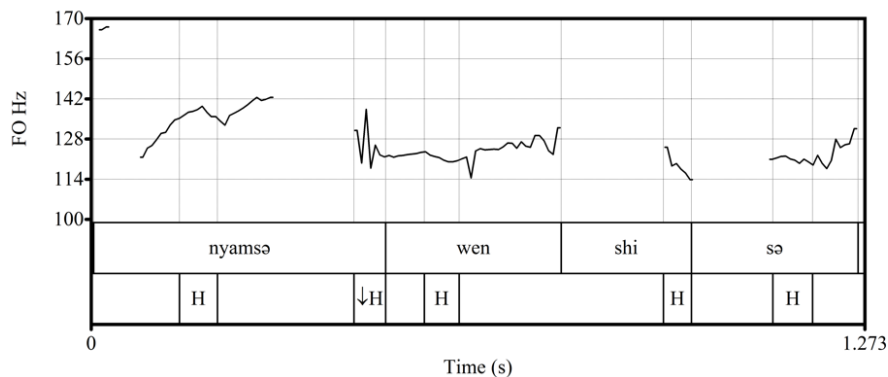
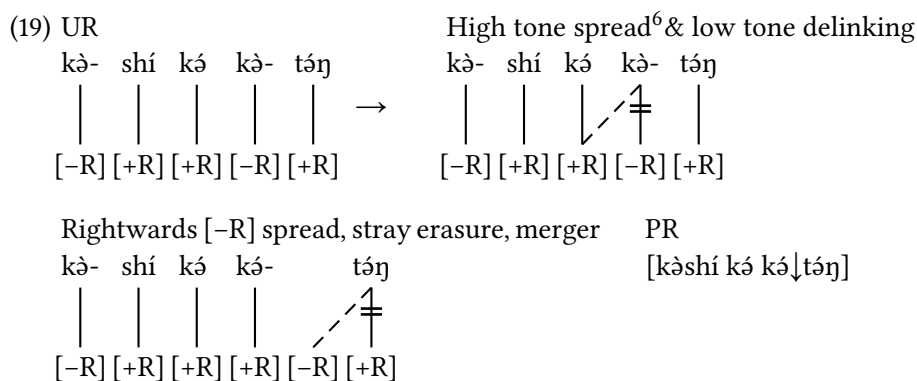


Figure 1: Downstep



Each [+U, -R], i.e., ↓H, sets a new ceiling for subsequent Hs such that H tones after the one downstepped in the same tonal phrase do not rise above it as seen in (20), where italics have been used to indicate downstep of all Hs following H:

- (20) kàkàŋ ↓ká byí shóm            ‘dish of my goats’  
 nyám ↓sá wén shí sá            ‘those animals of his’

The pitch traces in Figure 1 show lower F0 values (120Hz-125Hz) for all the H tones after ↓H compared to the F0 value of the H tone before ↓H which is

<sup>6</sup>I have shown only the spread of [+R] here but it must be said that it is the entire tone root node that spreads both [+U,+R] and delinks [-U,-R] of the L tone.

approximately 138Hz (In this and subsequent Figures, vowels are demarcated by vertical lines and marked by tone labels (L, H, M, ↓H) on the second tier.)<sup>7</sup>

We are now in a position to complete the tonal feature matrix to accommodate the downstepped high tone.<sup>8</sup>

(21)		H	↓H	M	L
	Upper	+	+	-	-
	Raised	+	-	+	-

An issue this raises is whether the M tone [-U, +R] and the ↓H tone [+U, -R] are phonetically distinguishable from one another. Hyman (1979: 162) has observed that “...the sequence H-M is identical, phonetically, to the sequence H-↓H.” He further states that “the two are distinguishable, however, since ↓H establishes a ceiling for future H tones within the same tonal phrase, while M does not.” The two tones therefore differ only in that they come from separate sources as well as on the effect they have on subsequent H tones. The pitchtracks in Figure 2 show that M and ↓H are not phonetically distinguishable.

In both phrases, the F0 of vowels with M and ↓H tones are around 120 Hz while the intervening H tone has an F0 of about 135 Hz, confirming that M and ↓H are phonetically very similar, particularly if all other factors surrounding the utterance are the same. It is not likely that the two tones are discriminable if they typically exhibit this small F0 difference. The phonetic sameness of Mid and downstepped H is not unique to Babanki as it has been reported in other languages e.g. Bimoba (Snider 1998).

Figure 3 and Figure 4 show that the phonetic pitch levels of H tones differ slightly depending on whether the preceding tone is M or ↓H. These pitchtracks show that a M tone may be followed by a H tone whereas the H tones following ↓H, are pronounced at the same level as the ↓H. Figure 3 shows that the F0 of vowels with H tone is about 126 Hz, slightly higher than the F0 of vowels with ↓H in Figure 4 which is about 120 Hz.

---

<sup>7</sup>The pitch traces used in this paper were obtained from recordings of the author’s speech at the Phonology Laboratory at UC Berkeley and analyzed in Praat (Boersma & Weenink 2016).

<sup>8</sup>The matrix is said to be complete because although Babanki has two contrastive underlying tone heights but five in derived forms, I do not treat the fifth - the prepausal level low tone as separate phonological tone features because I analyze it as the late phonetic effect of a floating high tone that follows the low tone and prevents it from falling.

1 A featural analysis of mid and downstepped high tone in Babanki

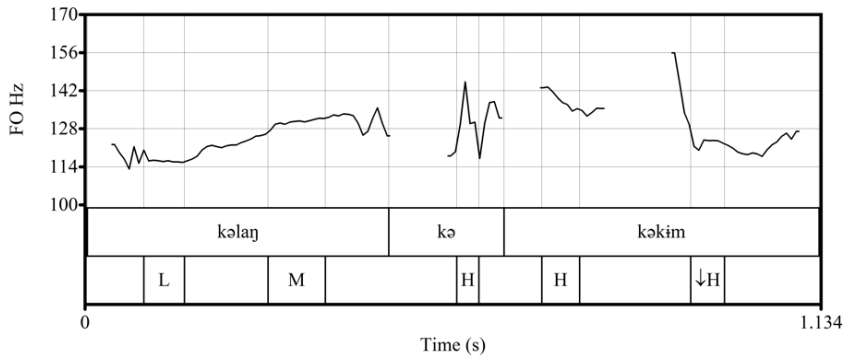
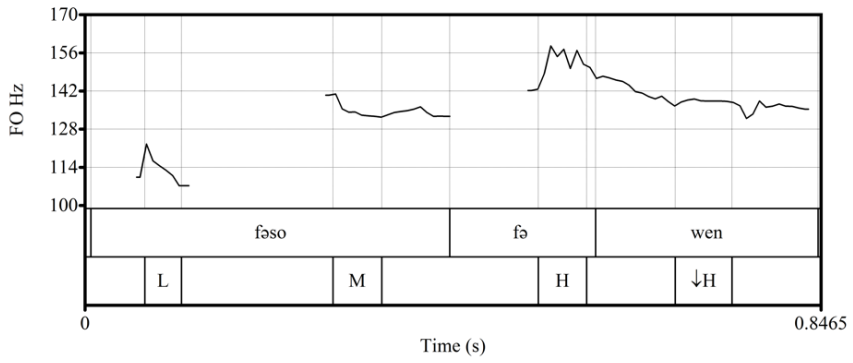


Figure 2: Comparison between M and ↓H

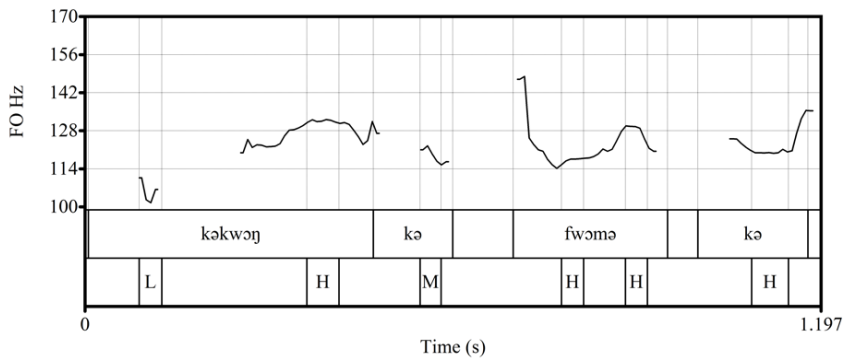


Figure 3: Comparison of H tone following M

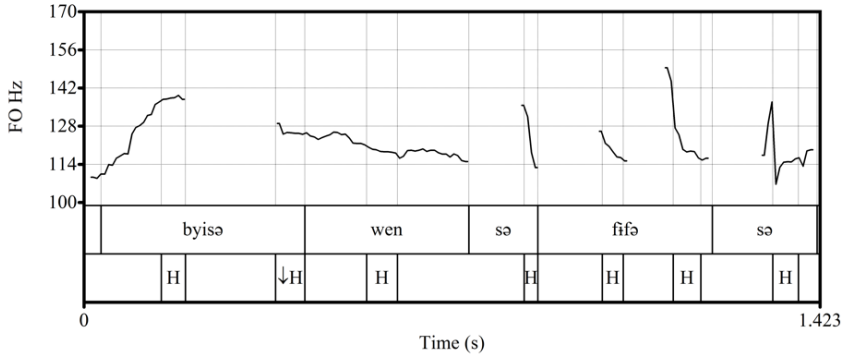


Figure 4: Comparison of H tone following ↓H

## 6 Conclusion

Although there is no underlying M tone in Babanki, it appears on the surface when a prefix or stem L tone is raised in two separate conditions: prefix L-Raising takes place if it is found between two H tones while stem-Raising takes place if preceded by a L prefix and followed by a H tone. I have given a synchronic account of the processes that derive the M tone, arguing that it results from the regressive spreading of the [+R] feature of high tones which is blocked only by a nasal in NC initial roots. Downstep on its part results from the progressive spread of [-R] feature of a floating L tone. Simple acoustic analyses have confirmed that both M and ↓H are realized with similar F0 levels.

It was stated above that the other Central Ring languages such as Kom have a much more general M tone (see Hyman 2005), while Western Grassfields Bantu languages instead have a downstepped ↓H. Babanki is unusual in having both M and ↓H. However, whereas the source of the M in other Central Ring languages is from an underlying /H/ that is lowered after a L, we have seen that Babanki creates output Ms from underlying /L/. Although Hyman's (1979: 166-168) account is unnecessarily abstract as a synchronic analysis, it clearly shows that M tone originates to avoid tonal ups and downs (Hyman 2010: 15). In particular, it is meant to avoid tonal contours surrounded by the opposite tone. As we have seen, unlike most other Ring languages, Babanki has rid itself of nearly all contours, but has developed a M tone level that is phonetically identical to ↓H, but phonologically distinct.



## Acknowledgements

I worked on this paper while at the University of California, Berkeley as a Fulbright research scholar (Sept. 2015-May 2016) and I would like to express profound gratitude to Larry Hyman for discussing the data extensively with me, reading the drafts and making very critical and thought-provoking comments. I also wish to thank Mike Cahill, Robert Hedinger and the audience at ACAL47 for their stimulating feedback.

## Abbreviations

AM	associative (possessive) marker	INF	infinitive
c1-19	class Marker	n	noun
IMP	imperative	PREP	preposition

## References

- Akumbu, Pius W. 2011. Tone in Kejom (Babanki) associative constructions. *Journal of West African Languages* 38(1). 69–88.
- Akumbu, Pius W. 2015. Babanki verb tone. *Studies in African Linguistics* 44(1). 1–26.
- Akumbu, Pius W. 2016. Babanki coda consonant deletion and vowel raising: A case of allomorphy. In Emily Clem, Virginia Dawson, Alice Shen, Amalia Horan Skilton, Geoff Bacon, Andrew Cheng & Erik Hans Maier (eds.), *Proceedings of the 42nd Annual Meeting of the Berkeley Linguistics Society*, 3–20. Berkeley, CA: Berkeley Linguistics Society.
- Boersma, Paul & David Weenink. 2016. *Praat: Doing phonetics by computer*. Amsterdam: University of Amsterdam. Version 6.0.14.
- Clements, George N. 1983. The hierarchical representation of tone features. In Ivan R. Dihoff (ed.), *Current approaches to African linguistics*, vol. 1, 1–17. Dordrecht: Foris Publications.
- Clements, George N. & Kevin C. Ford. 1979. Kikuyu tone shift and its synchronic consequences. *Linguistic Inquiry* 10. 179–210.
- Connell, Bruce. 2014. *Downdrift, downstep, and declination*. Paper presented at the Typology of African Prosodic Systems Workshop. Bielefeld University, Germany, May 18-20, 2001.
- Grebe, Karl & Winnifred Grebe. 1975. Verb tone patterns in Lamnsok. *Linguistics* 149. 5–23.

- Hyman, Larry M. 1979. Tonology of the Babanki noun. *Studies in African Linguistics* 10. 159–178.
- Hyman, Larry M. 2005. Initial vowel and prefix tone in Kom: Related to the Bantu augment? In Koen Bostoen & Jacky Maniacky (eds.), *Studies in African comparative linguistics with special focus on Bantu and Mande: Essays in honour of Y. Bastin and C. Grégoire*, 313–341. Köln: Rüdiger Köppe Verlag.
- Hyman, Larry M. 2010. *Do tones have features?* (Paper presented at Tones and Features: A Symposium in Honor of G. Nick Clements, Paris, June 18-19, 2009).
- Hyman, Larry M. 2011. The representation of tone. In Marc van Oostendorp, Colin Y. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell companion to phonology*, vol. II, 1078–1102. Malden, MA: Wiley-Blackwell.
- Mutaka, Ngessimo M. & Esther P. Chie. 2006. Vowel raising in Babanki. *Journal of West African Languages* 33(1). 71–88.
- Odden, David. 1982. Tonal phenomena in KiShambaa. *Studies in African Linguistics* 13(2). 177–208.
- Odden, David. 1995. Tone: African languages. In John A. Goldsmith (ed.), *The handbook of phonological theory*, 444–475. Cambridge: Blackwell.
- Pulleyblank, Douglas. 1986. *Tone in lexical phonology*. Dordrecht: D. Reidel.
- Snider, Keith. 1990. Tonal upstep in Krachi: Evidence for a register tier. *Language* 66. 453–74.
- Snider, Keith. 1998. Phonetic realisation of downstep in Bimoba. *Phonology* 15(1). 77–101.
- Snider, Keith. 1999. *The geometry and features of tone*. Dallas: The Summer Institute of Linguistics & The University of Texas at Arlington.
- Snider, Keith & Harry van der Hulst. 1993. Issues in the representation of tonal register. In Harry van der Hulst & Keith Snider (eds.), *The phonology of tone: The representation of tonal register*, 1–27. Berlin: Mouton de Gruyter.
- Stewart, John M. 1965. The typology of the Twi tone system. *Bulletin of the Institute of African Studies, Legon* 1. 1–27.
- Yip, Moira. 1980. *The tonal phonology of Chinese*. Massachusetts Institute of Technology. (Doctoral dissertation).
- Yip, Moira. 1989. Contour tones. *Phonology* 6. 149–174.