

Tonal Alternations and Prosodic Structure in Somali

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Abstract

This paper investigates the prosody of focalisation in Somali, a cushitic tonal accent language. The Somali nouns undergo many tonal accent alternations according to the discursive contexts. A primary aim of the study is to explain these alternations by assuming that they are triggered by intonative tones. However, very little attention has been devoted to the intonation of Somali. As Somali has morphological focus particles, it has been traditionally accepted that this language has no intonative focus marking. This paper disproves this assumption, by providing a phonetic description of f_0 configurations and showing that a process of downdrift, intonative high tones and a low tone of focalisation express the information structure.

Finally, a phonological model of the prosody of Somali will be proposed. To be precise, it will be argued that the low tone of focalisation is the central element of a recursive hierarchical structure, and that it triggers tonal accent alternations and governs intonative tones. Furthermore, it will be suggested that Somali has two independent tonal tiers, and that the coalescence of these tonal tiers produces the melodic patterns at the phonetic level.

1. Introduction

1.1. Information structure and focalization in Somali

It will be assumed, along with [8], that the focus and the topic are the two main components of sentence information structure, where the topic expresses the *aboutness* of an utterance, and the focus its *unrecoverable* element. The notion *contrastive* can be defined as *contrary* to some predicted or stated alternative given by the context. This information structure can be formally expressed with grammatical markers, the ordering of the different constituents, but also with prosody. Therefore, this paper focuses on how prosody expresses these constituents in a language that uses morphological focus particles.

It is traditionally assumed that Somali encodes the *topic-focus* articulation by means of the **focus markers** ("FM") *ayaa* and *waxaa*, as can be seen in (1) below.

Focus markers and location of focus in Somali (1)

	Ma	Cáli	ayaa	lá	hadlaý	Kulmiyé ?
	Inter	Ali	FM	with	spoke	Kulmiye
a)	Máya,	Yoónis	ayáa	lá	hadlaý	Kulmiyé
or	No,	YOONIS	FM	with	spoke	Kulmiye
b)	Máya,	Kulmiyé	wáxaa	lá	hadlaý	Yoónis
	No,	Kulmiye	FM	with	spoke	YOONIS

"Did ALI speak with Kulmiye ? No, YOONIS spoke with Kulmiye".

FM appear before the verb ([1],[13]). The location of the focalised NP depends on the FM used : *ayaa* focalises the **left-**

adjacent NP, while *waxaa* focalises the **final** NP of the sentence. As for the topics, their locations are not limited.

1.2. Prosody of Somali

Since [6], Somali has been considered as a tonal accent (henceforth "TA") language. The TA has been represented by [6] as a high tone ("H") associated with an underlying accent ("*") assigned to the vocalic mora of a word.

The TA of nouns undergoes many complex alternations according to two main parameters : the *Nominal Class* ("NC") and the *syntactic/discursive* context. The nouns can be divided into the four NC shown in table 1 [9]:

Table 1 : the Nominal Classes (NC) of Somali

NC 1	FSg.	<i>gabadh</i> «girl»
NC 2	MSg.	<i>Yoonis</i> «Yoonis»
NC 3	MSg. -e	<i>Kulmiye</i> «Kulmiye»
NC 4	Pl. -o	<i>bahallo</i> «beast»

[9] has shown that 3 syntactic/discursive contexts are pertinent to capture the TA alternations of Somali nouns (see table 2 below): **[±Focus]**, which indicates whether the noun is focalised or not, **[±Subject]** which refers to the syntactic function of the noun, and **[±Final]** which specifies the location of the noun in the sentence.

Table 2 : TA alternations of Somali nouns.

	[+Focus]		[-Focus]	
	[±Subject]		[-Subject]	[+Subject]
	[-Final]	[+Final]	[±Final]	[±Final]
NC1	gabádh			gabadhi
NC2	Yoónis			Yoonis
NC3	Kulmiyé Kulmiye	Kulmiyé	Kulmiyé	Kulmiyé
NC4	bahalló		bahallo	

The NCs 1 and 2 can be considered as "canonic" from the accentual point of view (cf.[1],[6],[9],[13]): they are unaccented in the [-Foc,+Sub] context but exhibit a high tone in the other positions (final in NC1 and penultimate in NC2). The nouns of the NC3 have different and more complex tonal variations : in [-Foc,+Sub] position, the high tone is not deleted as in the NC 1 and 2 but becomes penultimate (*Kulmiyé*), in [-Foc,-Sub] position, the high tone is always ultimate (*Kulmiyé* "Kulmiye"). Finally in focalised position, two tonal shapes can be observed depending on the location of the noun in the sentence : at the end of the utterance ([+Final]), *i.e.* focalised by *wáxaa*, the TA is always penultimate, but in [-Final] position, *i.e.* left-adjacent to FM *ayáa*, the high tone is final **or** penultimate. As far as the NC4 is concerned, the TA only appears in [+Foc] context. In [-Foc] position, these nouns remain atonic even in [-Foc,-Sub] contrary to the other classes.

This paper aims to provide a phonological account of the TA alternations of Somali. It will be assumed that *intonative tones* interact with those of TA and trigger the particular TA

patterns of NC3 and 4. Therefore, particular attention will be paid to the intonation of Somali.

Very few researchers have studied the intonation of Somali. However, two phenomena have been recognized. [4] claimed that a boundary high tone, which he notes "H%" may appear at the end of all phrases in a sentence. The other phenomenon is one of *downdrift*, an iterative lowering of successive high pitches. [6] pointed out that downdrift is sensitive to syntactic structure and probably to the "relative weight" of the words..

This study aims to show that the distribution of H% and the downdrift are in fact closely related to the information structure of the sentence. Moreover, it will be claimed that the latter is expressed by other intonative tones and processes.

2. Methodology

The speech materials consist of sentences with the following syntactic structure :

Table 3 : general syntactic structure of the corpora.

Adv	NP1	FM	VP	NP2.
Maanta Today	NC	{ ayaa waxaa }	la hadlay with spoke	NC

A noun of each NC has been placed successively in NP1 (=[-Final]) and NP2 (= [+Final]) positions. In each NP position, the noun was successively [\pm Focus] and [\pm Sujet]. There were therefore 8 utterances for each NC. The sentences were written on individual sheets of paper with an appropriate question of the kind presented in (1) to produce contrastive focalisation. Two somali native male speakers (S1 and S2) read each sentence 5 times and were recorded on a tape recorder. The sentences have been digitalized with a PC computer (11kHz, 16 bits) and analysed with the WinPitch software created by Ph. Martin.

3. Phonetic analysis

In figures 1 and 2 below, examples of utterances produced by the speakers S1 and S2 are shown. These utterances contain a noun of NC3 in NP1 position (*Kulmiye* "Kulmiye"), and a noun of NC2 in NP2 context (*Yoonis* "Yoonis"). Each noun is successively [+Foc] and [-Foc].

The curves represented the average F0 of the five utterances realised by the speakers. A measurement was taken for each vowel and on segments with a pitch turning point. Then, the F0 values in Hz were converted in quarter tones on the basis of the final melodic minimum (the latter is therefore represented by 0 quarter tone in the tables).

3.1. The focus

Firstly, the speaker S1 will be considered (figure 1). From a paradigmatic point of view, we observe that the focalised noun is higher than the non-focalised one in the same position ([\pm Final]). From a syntagmatic point of view, the focus is as high as the initial adverb *maanta* in the NP1[+Foc] sentence, or higher than the preceding verb *hadlay* the NP2[+Foc] sentence. In other words, no downdrift applies on the focalised NP, which confirms [6]'s insight. It has to be noted, however, that a final focus is lower than a non-final one, and even lower than the preceding preverb *la*. In fact, the lowering of the final focus is triggered by the phonetic process of **final lowering**, which occurs at the end of read sentences ([2],[5]).

As far the speaker S2 is concerned (figure 2), the high tones of NP1[\pm Focus] have the same value (20 quarter tones).

However, the NP1[+Foc] is higher than the left adjacent adverb and displays a more important melodic rising than the NP1[-Foc]. At the end of the utterance, the melodic configuration is similar to the first speaker, which corroborates the idea of a final lowering.

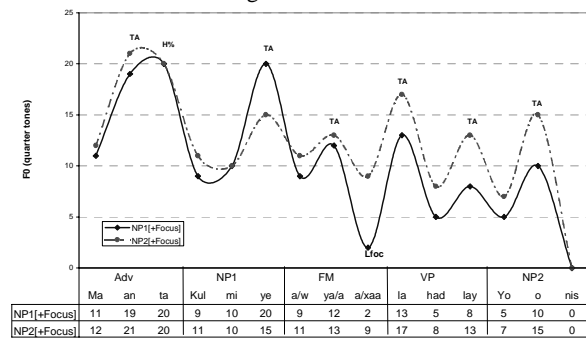


Figure 1: average f_0 of Speaker S1

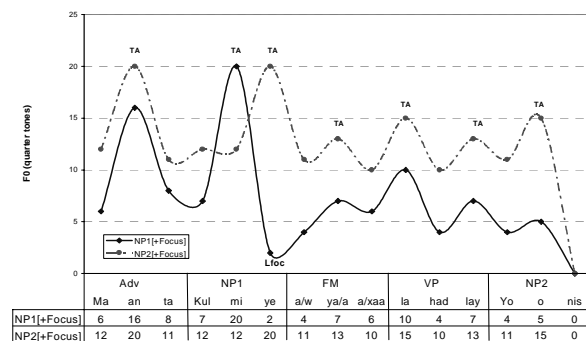


Figure 2: average f_0 of Speaker S2

To sum up, focus is marked by greater prominence, which is perhaps the most common prosodic feature of focalisation across languages. But, figures 1 and 2 reveal that focus is marked by another intonative phenomenon: after the NP1[+Foc], both speakers realise a low tone, which is much lower than the neighbouring ones. This low tone appears either on the ultimate vowel of the NC3 noun *Kulmiye* (figure 2, speaker S2) or, at the end of the FM *ayaa* (figure 1, speaker S1). Hereafter, this low tone will be referred to as the **low tone of focalisation** or L_{foc} .

The fact that focalisation is expressed by a low tone is not surprising because a similar tone -or a deep f_0 fall- can be found in other languages such as French ([3],[10],[12],[14]), Greek [2] or Swedish [14] for example. Thus L_{foc} is likely to be a widespread prosodic marking of focalisation, and it may be more important that some intonative prominence carried by high tone. For instance, focus in French is not systematically marked by the highest tone of the sentence [12], and in scannian Swedish, only a melodic minimum is needed to express focalisation [14].

Another argument for L_{foc} is provided by the TA alternations in the NC3 noun *Kulmiye*. There is a correlation between the location of L_{foc} and that of the TA: when L_{foc} occurs on the FM *ayaa* (Speaker S1), the TA is realised on the final vowel of *Kulmiyé*, but when L_{foc} appears on the final vowel of *Kulmiye* (speaker S2), the TA is penultimate (*Kulmíye*). This suggests that L_{foc} triggers the TA shift in NC3, and is not a (phonetic) default low tone but an intonative (phonological) morpheme. In section 4, the phonological mechanism of the TA alternation in NC3 will be further explained.

3.2. The Topics

Figures 1 and 2 indicate that the height of the topics varies according to the speaker and their locations in the sentence. For instance, downdrift affects the NP1[-Foc] in utterances of speaker S1, but not in those of speaker S2. The preverb *la* is higher than the preceding NP1[-Foc] in S1's sentences while it is realised on a lower level by S2.

We have seen that the focus is not lowered by the preceding word. This implies that downdrift is not a phonetic or physiological process but a linguistic one associated with the informational weight of the phrases. It can be assumed, therefore, that the relative height of the topics manifests the informational hierarchy the speaker makes in order to organise the pre-focal topics into informational foreground and background. Thus, speaker S2 places the pre-focal Adv and NP1 on the same informational level whereas speaker S1 sends the pre-focal NP1, which is prosodically dominated, to the informational background.

The idea that the downdrift is a linguistic process is reinforced by the fact that the verb *hadlay* is lowered by the preverb *la*: they both belong to the same phrase VP. In other words, downdrift also indicates the syntactic cohesion, as proposed by [6].

In addition to the downdrift, both speakers realise a melodic contrast between pre- and post-focal topics: the latter undergo a significant lowering of all the tones whereas the pre-focal topics are realised on a high register. This contrast is especially marked in S2's sentences.

The literature often reports such a contrast in many languages. In particular, it is often mentioned that post-focus presents a low and flattened f0 ([2],[3],[5],[7],[10],[12],[14]) in intonation languages. One may ask why such a contrast appears in Somali and other languages. In section 4, a phonological account for this contrast will be provided.

3.3. The boundary high tone H%

The data shows that only speaker S1 produced H% following the interesting distribution given in table 4 below:

Table 4 : distribution of H%

	Adv	NP1	Verb
Non-final focus	80%	80%	10%
Final focus	80%	40%	60%

The most important fact concerns the VP in post-focal position: H% may appear only in 10% of the utterances. On pre-focal topics and on the NP1[+Foc], H% may occur in 40-80% of the cases. Remember that speaker S1 produces L_{foc} on the FM *ayaa*, located after NP1[+Foc]. Thus, H% can appear **before** L_{foc} , but not **after** L_{foc} . In other words, it appears that the occurrence of H% is governed by L_{foc} .

This brings me to the issue of the NC4. The nouns of this class are only accented when they are focalised (cf. table 2). Considering the distribution of H%, it will be assumed that the TA of NC4 is in fact the tone H%. However, it must be explained why the nouns of NC4 remain unaccented in [-Foc] position whereas the other NCs display a TA. An answer to this question is provided in the following section, where a phonological model to account for the prosody of Somali is proposed.

4. Phonological model

4.1. The prosodic structure

This paper puts forward a hierarchical and recursive tree

structure inspired by [7] and his structure of tunes which updates the proposals of the X-bar theory of constituent structure (cf. figure 3). Following [11] and [3], it will be assumed that the tonal segments are directly linked to the prosodic constituents.

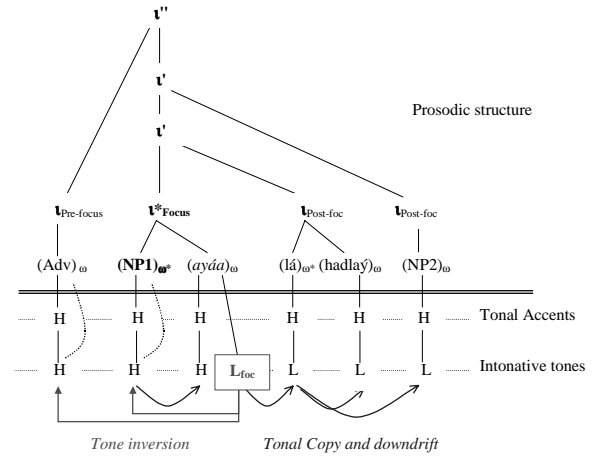


Figure 3 : prosodic structure, tonal tiers and phonological rules

In this hierarchical structure, the minimal prosodic unit is the **prosodic word** (henceforth ω), including a lexical head (noun, verb etc.) and right-bounded by the high tone of the TA. On the level above, ω s form higher constituents called **intonational phrases** (henceforth t), which are right bounded by intonative tones such as L_{foc} or $H\%$. An t can contain one or several ω . This is indicated by the relative height of the TAs. For example, the fact that the FM *ayaa* and the verb *hadlay* are lower than the preceding item, namely the NP1[+Foc] and the preverb *la* puts forward the idea of the existence of a hierarchy between each pair of words. In such case, it can be claimed that ω s combine into a unique t where the prosodic **head** of the t is the ω on the left (i.e. NP1 or *la*, represented as an ω^*). Finally, on a higher level, the t s combine together to form the recursive prosodic structure given in figure 3, where the t bearing the focus is the **head** of the whole structure (noted t^*). The t -focus must be considered as the head because of the role it plays on the phonological level, as shown in the following section.

4.2. Tonal tiers and phonological process

In the proposed model, it is assumed that the tones are distributed onto **two** independent tonal tiers. The first tonal level consists of the high tones of TAs. On the other tier are the intonative tones, which consist of L_{foc} , preceded by high tones ("Ht") and followed by low tones ("Lt", cf. figure 3). The coalescence of these phonological tonal tiers gives the melodic configurations on the phonetic level.

This representation enables us to capture the melodic contrast between the post-focal topics and the pre-focal ones. Thus, the lowering of post-focal topics results from the association of the accentual H with L_{foc} , whereas the pre-focal topics are the combination of the accentual H with Ht. In the same manner, the focus is pronounced on a high register because its TA combines with an Ht. Finally, it can be assumed that H%, which only occurs before L_{foc} is the optional spreading (represented with dashed lines in figure 3) of Ht on the right edge of pre-focal topics and the focus.

One may ask where do the intonative tones come from. In section 4.1, it was suggested that the **t-focus** is the head of the structure. Being the head of the structure, the **t-focus** bears the **tonal primitive** of the utterance, which is L_{foc} . L_{foc} is called the tonal primitive of the utterance primarily because **all** the other intonative tones can be derived from L_{foc} , according to two phonological rules, which indicates the dominance relationships within the prosodic structure:

1) *Tone Inversion* rule: this rule deals with the relationships of dominance from **right to left**. This rule, which is directly inspired by [10]'s rule of *inversion de pente*, defines the tones on the left of L_{foc} . Thus, L_{foc} generates the intonative H_t on the head of pre-focal **ts** (i.e. *maanta* in figure 3), and on the NP[+Foc].

2) *Tone Copy* rule: this rule deals with the relationships of dominance from **left to right**, and implies downdrift. As shown in figure 3, this rule intervenes between the **t-focus** and the heads of the post-focal **ts**. The copy of L_{foc} on the post-focal topics has also been proposed by [3] and [12]. However, the tone copy put forward in this paper does not apply only on post-focal topics but is a general rule intervening within any **ts** in pre- or post-focal position as well as within the **t-focus**, as can be seen in figure 3.

4.3. TA alternations

In section 3, it was suggested that the tonal shift in the focalised nouns of NC3 was triggered by L_{foc} . It was also assumed that the high tone that occurs in NC4 was the $H\%$ tone. However, it has to be explained why the TA moves in NC3 but not in the other NCs and why NC4 does not display a high tone in [-Foc] positions contrary to the other classes.

In this section, it is explained that the particular TA alternations of NC3 and 4 are due to specific underlying accentual shapes. NC1 and 2 have only one underlying accent located either on the final vowel (NC1) or on the penultimate one (NC2). The assumption that the nouns of NC3 have **two** underlying accents associated with both final and penultimate vowels. In fact, these nouns are made up of two adjunct morphemes, each of them carrying an accent: the lexical radical (*Kulmi*- "to meet") and the agentive suffix *-e*, which nominalises a clause [13]. Finally, it can be suggested that the nouns of NC4 are unaccented, which constitutes a plural mark [9].

The different tonal patterns are derived as follows: the high tone associated with the prosodic word (ω) percolates to the first accented vowel from right to left. According to this rule, in [-Foc] position, the nouns of NC2 will have a high tone on the penultimate vowel, and those of NC1 and 3 on the ultimate one (cf. figure 4 below). As the nouns of NC4 are unaccented, the high tone can not be associated with any vowel and remains floating (figure 4).

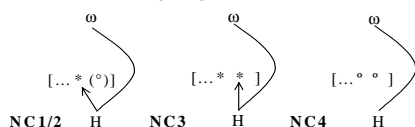


Figure 4 : association of the TA high tone with the accented vowel (*)

In [+Foc] position, the high tone of NC3 can be shifted by L_{foc} because there is another accented vowel on the left with which the high tone can be re-associated. In NC1, however, there is only one lexical accent : as the high tone can not be re-associated with any other accented vowel, it remains in its

place and blocks the association of L_{foc} to any other vowel of the word (cf. figure 5). Note that L_{foc} can normally be linked to the final unaccented vowel in NC2 (cf. figure 5).

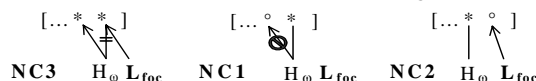


Figure 5: L_{foc} can disassociate H in NC3 but not in NC1

It was suggested in section 3.3. that the final high tone of the focalised nouns of NC4 is the $H\%$ tone. In fact, the final high tone in question is the intonative H_t generated by L_{foc} following the tone inversion rule. H_t associates with the default vowel of the word which is the ultimate one, and blocks the association of L_{foc} .

5. Conclusion

The ultimate aim of this paper was to propose a phonological model to account for the TA alternations and the melodic patterns of Somali. In particular, it has been stated that the focus is marked by a low tone of focalisation which is the tonal primitive of a prosodic structure: L_{foc} triggers the TA alternations and governs the intonative tones according to two oriented phonological rules which indicate the relationships of dominance within the structure. Furthermore, it has been shown that the proposition of two independent tonal tiers explains the melodic contrast between pre- and post-focal topics.

Finally, this paper pointed out that some similarities appeared between the Somali and other languages. This suggests that the prosodic structure that has been proposed for Somali might apply similarly to other languages.

6. References

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