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A DOUBLE TIERED ANALYSIS OF SICITE TONE

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S̀̀c̀̀t̀̀é, a Senufo language of Burkina Faso, has three level tones, a characteristic typical of Senufo languages. The questions addressed here are first, how to represent the Mid tone in terms of features, and secondly, how to formulate rules involving Mid tone. In some West African languages Mid tone can be analysed as a downstepped High tone. In other cases, it has been analysed as toneless while many analyses simply label it Mid tone in their rule formulations. None of these analyses have proved adequate for S̀̀c̀̀t̀̀é. In fact, research has revealed at least three different types of Mid tones, making it necessary to posit a different underlying form for each type. This has led to modifications of the current autosegmental approach for tonal analysis, in that two tonal tiers (instead of one) are proposed.

Le s̀̀c̀̀t̀̀é, une langue senoufo parlée au Burkina Faso possède trois niveaux de tons, caractéristique des langues senoufos. Les questions auxquelles cet article tente de donner une réponse sont premièrement, quels sont les traits distinctifs du ton moyen et deuxièmement, comment formuler les règles qui concernent le ton moyen? Dans certaines langues d'Afrique de l'Ouest, le ton moyen peut être analysé comme un 'faible tonale' du ton haut. Dans d'autres cas, des analyses considèrent le ton moyen comme essentiellement sans ton, tandis que d'autres utilisent simplement le terme, moyen dans leurs règles tonales. Cependant, aucune de ces approches ne convient pour rendre compte des faits du s̀̀c̀̀t̀̀é. En effet, il existe au moins trois types de ton moyen, ce qui exige une forme sous-jacente pour chaque type. Ces découvertes nous ont amené à modifier l'approche autosegmentale du ton en proposant l'utilisation de deux paliers à la place d'un seul.

0. INTRODUCTION

S̀̀c̀̀t̀̀é¹ (or Tagba, as it is frequently called by others) is the Senufo language spoken in the Department of Koloko of the Kénédougou Province in southwestern Burkina Faso. A language of approximately 30,000 speakers, it is most closely related (i.e. high level of intercomprehension) to the Tuvunro dialect of Shenara, to the southwest in Mali and to Supyire, to the west and northwest, also in Mali.

Like most other Senufo languages, Sàcòté has three level tones, High, Mid, and Low tone. The peculiar problem for Sàcòté is that it has five different types of Mid tone distinguishable by their tonal behaviour. In this paper, I identify these five types and attempt to provide an analysis which accounts for each type. The approach used here is the autosegmental approach. However, it will be seen that an analysis using two tiers is needed to account for the data².

1. MID TONE TYPES

These five types of Mid tone are given below. In (1) we see two types of Mid tone noun. The first, Strong Mid, is essentially not subject to any tonal change, while the Weak Mid in (1b) can be Mid tone, High, Low-High, or Mid-Low depending on the tonal environment.

- (1)a. Strong Mid tone **gbaxa** 'house' **gbaké** 'house-Def'
 gbaxa ba mé 'It is not a house'
 mɔ gbaxa ba mé 'It is not your house'
 cà gbaxa ba mé 'It is not a child's house'
 wə gbaxa ba mé 'It is not his house'
- b. Weak Mid tone **soxo** 'mortar' **soké** 'mortar-Def'
 soxo ba mé 'It is not a mortar'
 mɔ sóxó bà mé 'It is not your mortar'
 cà sòxó bà mé 'It is not a child's mortar'
 wə soxò bà mé 'It is not his mortar'

In (2) we see a third type found in the first constituent of certain complex nouns. It is either Mid or Low depending on the tone that follows.

- (2) gbòn-cèngɛ 'a good granary'
gbòn-lɛ́xɛ 'an old granary'

A fourth type is the Mid tone verb, found in (3). It also alternates between Mid and Low tone but in an environment different from the noun in (2).

- (3) a. wə ya sòrì 'she is cooking'
 b. wə ya sori la 'is she cooking?'
 c. wə ya m̀lò sori 'she is cooking rice'
 d. wàà fáláxá nyà 'he saw a rock'
 e. wàà fáláxá nya la 'did he see a rock?'

Finally, there are Mid tone verbal particles which like the strong Mid tone noun, do not undergo tonal changes, but differ in the way they trigger tonal changes on following verbs. (4) is an example of contrasting behaviour, where the strong Mid tone noun, **fini** 'fonio', has no effect on the Mid tone verb, while the verbal particle **ya** triggers tone lowering of the same verb.

- (4)a. **wə ya fini sori** (she is fonio cooking) 'she is cooking
fonio'
b. **wə ya sori** → **wə ya sòrì** 'she is cooking'

2. POSSIBLE SOLUTIONS AND PROBLEMS

In order to account for these various types of Mid tone special measures need to be taken. We cannot, as I find in so many other analyses involving Mid tone, simply assign the label Mid tone, and then formulate rules using this Mid tone. Nor is it desirable to simply number Mid tones and then formulate separate rules for each. Such an approach would not allow the analysis to get to the root of the problem. Downstep might be suggested by someone not familiar with the language, but a short study of the data would quickly reveal that no Mid tone can be considered a downstepped high tone, because no Mid tone causes the register lowering of any following High tone (see Hyman, 1986, for criteria distinguishing downstepped High and Mid tone). Another possible suggestion is that perhaps one of the Mid tones is toneless, underlyingly, and is assigned a Mid tone by rule later in the derivation of rules (Pulleyblank, 1983, for detailed arguments for toneless vowels). This is an unlikely solution, since all Mid tones except for the possible exception of Mid tone verbs, trigger tonal rules. It is difficult to see how a toneless vowel could trigger tone changes of following words if it has not tone of its own.

3. PROPOSALS

3.1 LOW-HIGH TONE

Another possibility is that Mid tone is a complex tone consisting of a High and Low or a Low and High linked to a single tone-bearing unit (see Hyman, 1985). There are two Mid tone types in Sòcòtè that could be analysed as such. The first is the mid tone found on the first constituent of the complex noun in (5).

- (5) **gbòn-cènḡè** '(granary-good) a good granary'

When the first constituent is given in isolation as in (6), it has a Low-High tone.

- (6) **gbònló** 'a granary'

Consequently we can suggest that when restricted to a single TBU, both the Low and the High are linked to the TBU, producing as a result, a surface mid tone³. This Low-High analysis for Mid tone can allow for a rule formulation accounting for the lowering of Mid tone to Low before another High tone as seen in (7). The tone lowering would be accounted for by the simple delinking of the High tone of the Low-High contour⁴.

- (7) **gbòn-léxé**
 $\begin{array}{cc} \swarrow & \searrow \\ \text{LH} & \text{H} \end{array}$

Mid tone verbal particles can also be analysed as Low-High but for different reasons than the ones given above. Since a Mid tone verbal particle never changes its own tone, it is necessary to examine how it triggers tonal changes on following words. We see in (8) that it triggers the same tonal changes as High final

nouns, that is, the lowering of the Mid tone verb to Low tone when the latter is in phrase final position. This behaviour is in contrast to that of the strong Mid tone noun which does not trigger tone lowering.

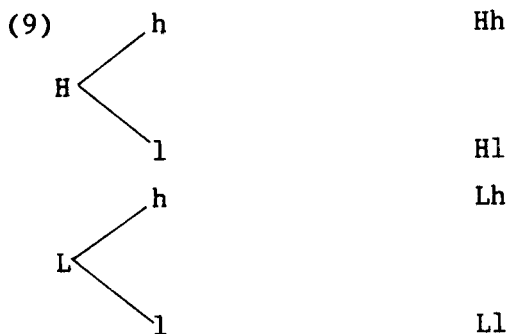
- (8) High final nouns:
 wə ya càlá sòrì 'she is cooking beans'
 wə ya káforó sòrò 'she is cooking eggplant'
- Mid tone verbal particles:
 wə ya sòrì 'she is cooking'
 wə sà da sòrì 'she will be cooking'
- Mid final noun:
 wə ya fini sori 'she is cooking fonio'

As a result we suspect that the verbal particle is also underlyingly High final. The surface Mid tone of the particle can then be considered to be an underlying complex Low-High tone.

3.2 TONE SPLITTING

This leaves us with Mid tone verbs and weak and strong Mid tone nouns. For the purpose of this analysis we group strong Mid tone nouns and Mid tone verbs together⁵.

Another possible solution for Mid tone feature representation can be found in Clements' tone feature system (1983) (also Hyman, 1985 and 1986). Based on the premise that the Niger-Congo language family has historically two level tones High and Low, and that a proliferation of tones came about, in some cases at least, as a result of a tonal split of these two basic tones, Clements proposes a tone feature system where a third or fourth tone level can be considered a tonal split of either the High or Low tone. An illustration is given below in (9). According to this system, if there are four level tones, the two higher tones can be considered a split of the High tone register, while the two lower tones can be considered a split of the basic Low tone register.



As synchronic evidence, Clements cites the case of Ewe (among others), where the Mid tone alternates productively with Low tone but not with High tone. Thus he suggests that the Ewe Mid tone is part of the Low tone register, that is, the upper split of the Low tone register, as seen in (9)⁶.

If a Mid tone can alternate productively with a Low tone and as a result be considered part of the Low tone register, it is also conceivable that some language has a Mid tone that alternates with the High tone register, and thus be considered a split of that register. This argumentation can lead to a further argument that conceivably a language can have two Mid tones, one which alternates with a High tone and the other which alternates with a Low tone.

3.2.1 Lowered High Tone

This is exactly what happens in Sòcòtè. The weak Mid tone behaves very much like the High tone verb. As seen in (10), both are High tone after Mid (and also High tone) and both become Low-High after Low tone as in (11).

- (10) NOUN mo soxo → mo sóxó 'your mortar'
 VERB waà mo wée 'He looked at you'
- (11) NOUN cà soxo → cà sòxó 'a child's mortar'
 VERB waa cà wée → waa cà wèé 'He looked at a child'

In addition, High tone nouns, which are few in number and are not subject to any tonal changes, are almost all loan words, leading one to speculate that a weak Mid tone noun was historically High tone in Sòcòtè, and that a split in the High tone register took place when these High tone loan words were introduced to the language.

3.2.2 Raised Low Tone

The strong Mid tone, on the other hand, alternates very productively with Low tone. Low tone nouns become Mid after Mid tone, while Low tone verbs are Mid-High after Mid tone, as in (12).

- (12) NOUN mɔ mɔ̀lɔ̀ → mɔ mɔ́lɔ́ 'your rice'
 VERB waà mɔ gbàrà → waà mɔ gbará 'he met you'

As mentioned above, Mid tone verbs alternate between Mid and Low tone, becoming Low after High final nouns. In a few cases, Mid tone nouns, as well as verbs, do lower to Low tone in certain lexical environments, but a Mid tone noun or verb never becomes High tone in any environment.

Additional evidence that strong Mid and Low tones may have originated from the same tonal source comes from a statistical study of minimal pairs. In a corpus of three hundred verbs 28 tonal minimal pairs were found contrasting High versus Mid (15) and High versus Low (10). However, only three were found contrasting Mid and Low tone. A similar situation occurs among noun tone minimal pairs. There are examples of Low tone contrasting with every other tone, weak Mid, Mid-Low, High-Mid, and Low-High, except High and High-Low, which comprise mainly borrowed nouns, and strong Mid tone nouns. This lack of lexical contrast between Low and strong Mid tone nouns indicates that perhaps historically, these tones originated from a single relatively Low tone.

As a result of the evidence, we can propose that the weak Mid is a lower split of the High tone register, represented by the symbol, Hl, while the strong Mid tone is an upper split of the Low tone register (Lh).

4. AUTOSEGMENTAL REPRESENTATION OF TONAL SPLITS

In autosegmental representation, Clements proposes to represent these split tones through the use of a set of two symbols, the first, called a primary register feature which represents the basic High or Low tone, is placed in the first row, as shown in (13) while the subregister feature indicating the type of split, is placed in the second row. The first two sets of tone features represent splits of the Low tone register while the last two represent splits of the High tone register. As a set, each feature bundle is linked to the segmental tier.

(13)

L	L	H	H
H	L	L	H
CV	CV	CV	CV

Clements, however, does not allow for linking and spreading between the two rows.

Hyman (1986) goes one step further, however, and suggests that the second row containing the subregister tones be considered a tonal tier, which allows linking of tones between the two tiers as well as tone spreading of the subregister or secondary tier to other primary tier tones, as in (14).

(14)

X	X	X
H	H	H
L	L	

In contrast to what I shall propose below, though, Hyman's assumption is that complex tonal information will be given on the first tier only. Thus a H L tone is placed first on the primary tier (according to Hyman, the H is linked but the L is not linked) and then by rule the unlinked Low tone is linked to the secondary tier: H L → H.

|
L

The difference between Hyman's approach and mine is that I propose a double tiered underlying representation for two types of Mid tone, rather than a series of features on the primary tier⁷. Thus, a strong Mid tone is composed of a primary register Low tone linked to a subregister High tone, while the weak Mid tone is underlyingly, a primary register High tone linked to a subregister Low tone as seen in (15). Note that I have indicated the subregister features with a lower case letter in contrast to the uppercase representation of the primary register feature.

- (15)a. Strong Mid tone: L b. Weak Mid tone: H
 | |
 h l

As we shall see below, in order to account for the behaviour of these two types of Mid tones through rule formulation, a mechanism is required that allows for the spreading, linking, and deletion of the subregister tones.

5. TONAL RULES

5.1 LOW TONE SPREAD

We look first at Low tone spread. If a High tone verb has two tone-bearing units, the Low tone spreads onto the High tone verb creating a Low tone on the first TBU and a High tone on the second TBU, as in (16).

- (16) waa wà pèré → waa wà pèré 'He sold some'
 | \ | |
 L H L H⁸ (he some sold)

This Low tone spread occurs on weak Mid (Hl) tone nouns too⁹. Here in (17), the Low tone spreads onto a lowered High tone (Hl), causing the deletion of the lowered High tone's subregister Low tone, and as a result, producing the same Low-High contour as found on High tone verbs.

- (17) cà soxo → cà sòxó 'a child's mortar'
 | \ | |
 L H L H
 | | | |
 l l l ①

If both the weak Mid and the High tone have a primary register High tone, as we have proposed above, then we can formulate a single rule which states that a Low tone can spread onto a segment linked to a primary register High tone regardless of its subregister specification. This rule, shown in (18), then causes the deletion of the subregister Low tone.

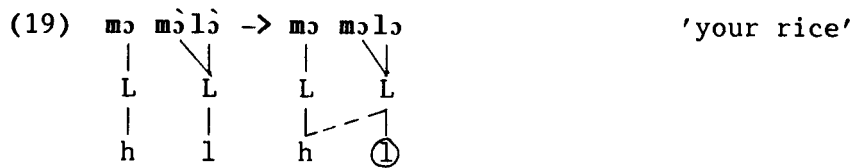
- (18) Low tone spread X
 / \
 L H
 |
 l

We see here that the use of features showing the interrelation between High and weak Mid aids greatly in the formulation of a single rule that can account for the tone change of both High and weak Mid tones.

5.2 SUBREGISTER HIGH TONE SPREAD

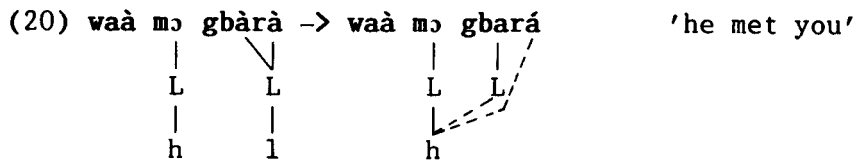
The next example shows how this double tiered tonal specification is used to capture a general raising of tones from Low to strong Mid and from weak Mid to High through the spreading of a single tone on the secondary tier.

First of all, let us consider the 'raising' of the Low tone noun to Mid after a Mid tone. If a strong Mid tone noun has the feature specification of Lh, a rule spreading the secondary tier High tone onto the following Low tone can effectively create this required Mid tone, as seen below in (19). Note that the subregister Low tone is deleted as a result of the spread.

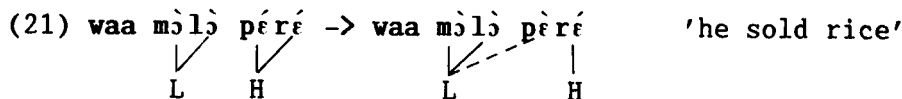


Note that the subregister Low tone is deleted as a result of the spread.

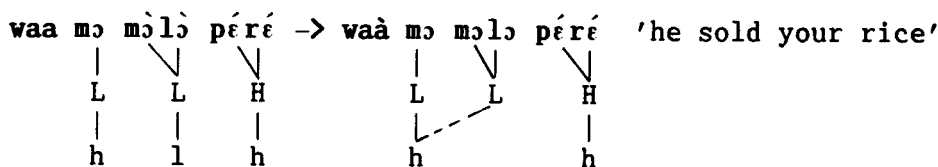
When a Low tone verb is subject to High tone spread, however, it becomes Mid-High tone. Without really knowing why this happens, this Mid-High tone can be accounted for by spreading the subregister High tone not only to the Low tone on the primary tier but also to the segment following the Low tone, as in (20).



One advantage for the formulation of this High spreading rule is that it effectively wipes out any ability for the Low tone to trigger any rules. The subregister High tone spreading rule actually transforms the features for Low tone to the features for Mid tone. Below notice two sentences, the first in which mɔlɔ̌ 'rice' triggers Low spread and a second in which the same word can no longer trigger Low tone spread because it is subject to subregister High spreading.



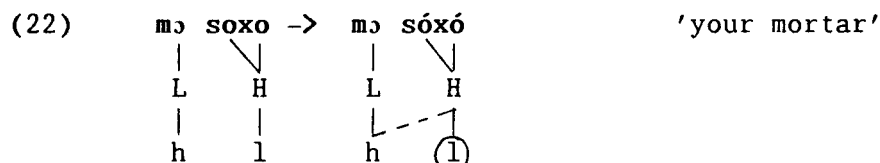
LOW SPREAD



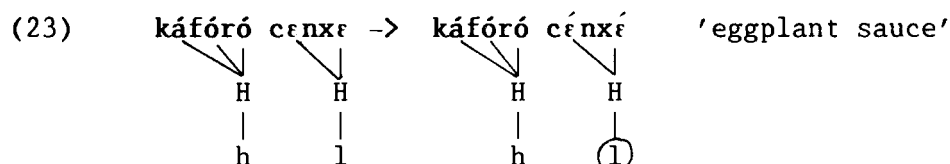
HIGH SPREAD

This subregister High tone spreading rule can also account for the raising of weak Mid nouns (Hl) to High tone after Mid tone.

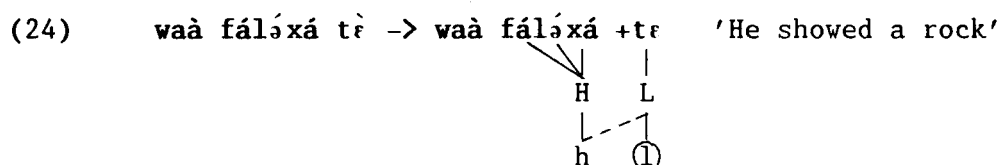
Consider the example (22), where the subregister High tone of the Lh noun spreads onto the High tone of the Hl noun, and as a result deletes the subregister Low tone, creating a High tone on the noun.



The subregister High tone of Hh words also spreads onto Hl tone changing the Hl feature to Hh, as in (23).

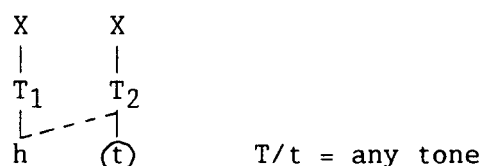


This subregister High tone spreading can take place everywhere, in fact, except in the following situation. A High final (Hh) word cannot spread its subregister High tone onto a Ll word. In example (24), the verb tɛ́ 'show' cannot be raised to Mid tone after a High tone noun.



In order to avoid the above spreading, then, the subregister High spread rule must be stated as follows:

(25) spread any subregister High tone onto the following primary register tone, T₂ and delete any subregister tone previously linked to T₂.

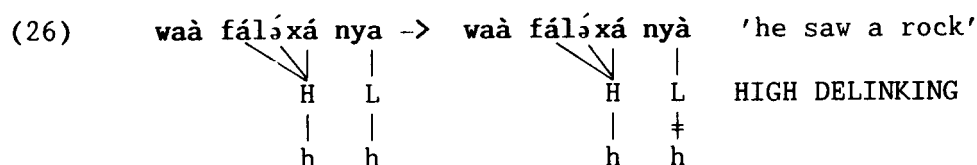


Condition: If T₂ is Low tone, then T₁ must also be Low tone.

The above condition does not allow for the subregister High tone of a Hh tone to spread to a Low tone. This subregister High tone spreading rule, then, can account for related tonal processes, the raising a Low tone to Mid tone, and the raising of Mid tone to High tone after Mid tone and High tone. In a single tier autosegmental approach, it is probable that these processes would require three separate rules, namely, Mid tone spreading, Weak Mid tone raising, and High tone spread.

5.3 SUBREGISTER HIGH TONE DELINKING

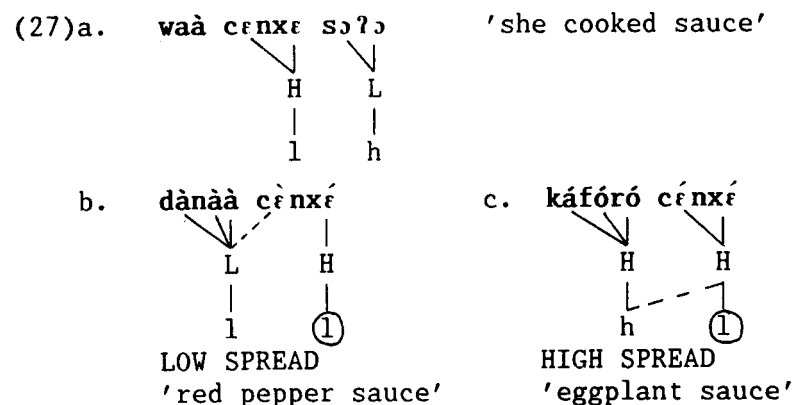
Finally, it was noted earlier that Mid tone verbs and more rarely, strong Mid tone nouns were lowered to Low tone in select environments. Without discussing the motivating factors for such a lowering phenomenon, note that this lowering can easily be dealt with by positing a subregister High tone delinking or deleting rule for Lh tone. When the subregister High tone is delinked, the remaining Low tone on the primary tier surfaces as such, a Low tone. For example, in (26) a Mid tone verb becoming Low tone after a High final (Hh) in phrase final position can be accounted for by a subregister High delinking rule.



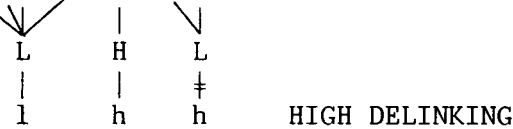
Through the double tiered analysis, then, we can account for certain tone feature changes and their subsequent effect on other tones through the spreading, delinking and deleting of secondary tier tones. Three rules have been highlighted here which involve the second tier: Low tone spread (deleting the subregister Low of the Hl tone), subregister High tone spread (causing the feature changes of Ll to Lh and Hl to Hh), and subregister High tone Delinking (lowering Mid tone to Low tone).

5.4 INTERACTION OF TONAL RULES

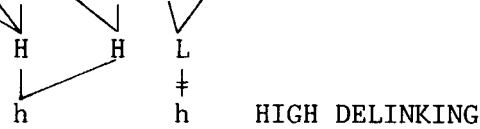
The interaction of these rules can be seen in the following derivations. First, in (27a) below, there are no tonal changes. In the second and third phrases, we see examples of Low tone spread and High tone spread respectively. When a Mid tone verb follows both of these phrases, as seen in (27d) and (27e), it undergoes subregister High tone delinking because *cɛnxɛ* 'sauce' has lost its subregister Low tone specification through both Low tone and High tone spread, and its resulting word final Hh tone triggers High tone delinking.



d. waà dànáà c'ènxé s'òʔʔ 'she cooked red pepper sauce'

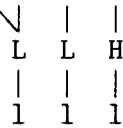


e. waà káfóró c'ènxé s'òʔʔ 'she cooked eggplant sauce'

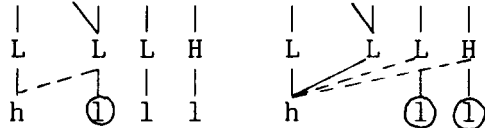


A final example shows that subregister High tone can spread onto a series of tones. Below in (28a) note that there are no tonal changes. When the Lh pronoun, mɔ is added, however, its subregister High tone spreads not only the tone of the first word but also to the tones of the two following words.

(28)a. mɔlɔ̀ bā mɛ 'it is not rice'



b. mɔ mɔlɔ̀ bā mɛ → mɔ mɔlɔ̀ bā mɛ 'it is not your rice'



6. CONCLUSION

This brief discussion of a double tiered tonal analysis does not allow for a formal development of the theory, nor does it deal with all the intricacies of Sòcòté tonal behaviour. In addition, there remain some problems in the analysis. However, the presentation of the data in this paper clearly points to the need for alternate solutions when dealing with systems consisting of complex underlying tonal structure. The advantages for a double tiered approach are that it not only provides distinctive features for various types of Mid tones, it also provides a tool for efficient and explicative rule formulation by accounting for some generalizations missed when using only a single tier for tone. For this reason, I believe this particular double tiered approach merits further testing and investigation in other languages with three or more tonal levels.

NOTES

¹Reflecting a major theme in my thesis (see Garber, 1987), this paper was initially presented at the 18th Congress of the West African Linguistics Society in Niamey, Niger, March 20-25, 1988.

²See Garber (1987) for a fuller analysis of Səcəté tone. Tone is represented by the following diacritics: High ' , Mid 'unmarked', and Low ' . Note needs to be made of the following symbols: x=velar fricative, c=alveo-palatal affricate. Nasalization is marked with an 'n' after the nasalized vowel.

³Low-High tones realized as Mid tone can also be derived by rule. High tone verbs are subject to a Low spread rule (L H → L LH). When the Low tone of an object noun spreads onto a High tone verb with a single TBU, the resulting Low-High contour is realized as a Mid tone e.g.:

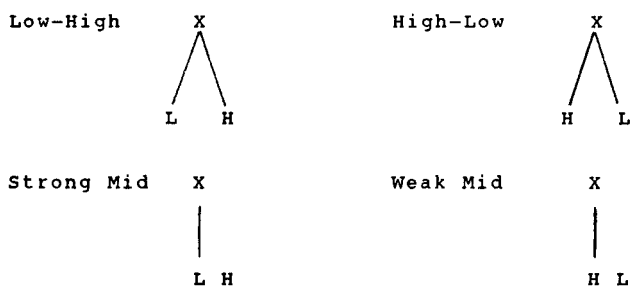
waa mɔ̃lɔ̃ lɔ̃ la → waa mɔ̃lɔ̃ lɔ̃ la 'Did he take rice?'
 ↙
 L H L H (he-TA rice take?)

⁴See Garber (1987) for more precise details of this rule.

⁵There are a few problems in grouping 'strong' Mid nouns and Mid tone verbs together that do not become apparent in this analysis. Since these problems are minor and do not avail themselves to an easy solution, they are set aside for later discussion.

⁶For instances of suggested tone splitting in African languages, see Clements (1983) for Kikamba, Trifkovic (1977) for Lendu, Maddieson (1974) for Cama, Yoruba, and others, and Ford (1986) for Siya (Avatime).

⁷A major reason for not putting all this complex tonal information on the primary tier and then using a rule to shift the second or unlinked tone to the secondary tier is because of the confusion that could arise between the real contour tone nouns possessing Low-High and High-Low tones and the strong and weak Mid tone nouns. In fact, it was noted above that LH is actually different in tonal behaviour from the strong Mid or Lh tone. It is possible, perhaps, that the strong and weak Mid tones are first given features on the primary tier but that they differ from Low-High and High-Low nouns in that their second tone does not link to the segmental tier whereas the latter would link both features to the segment, as shown below.



This possibility needs to be explored. However, even if it were found to be viable for Səcəté, a rule introducing the shift of unlinked tones to

the secondary tier would have to be introduced at the beginning of the derivation of tonal rules, since, as will be seen later, tones on the secondary tier are crucial for the formation of other tonal rules, which are the focus of attention here. Therefore, we set this particular question aside for now, and deal with how tones on the secondary tier are used in the formulation of tonal rules in Sàcàtè.

⁸The actual process of spreading and delinking of the tones to acquire the desired output, as well as other details of the tonal processes outlined here, is discussed in Garber (1987).

⁹Recall that High tone nouns are not subject to tonal changes and therefore must be excepted from this Low tone spread.

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