Partial Tone Polarity and Tonal Feature Decomposition in Sopvoma (Mao)

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1 Introduction

Whether tone has features just like consonants and vowels have been a debate in recent phonological studies (Hyman 2010, Clements, Michaud & Patin 2010), despite it been already proposed by tonologists decades ago (Woo 1969, Maddieson 1970, Halle and Steven 1971, Yip 1980, Clements 1983, to cite some). However, more recent studies have come up with languages offering more evidence that tones do need to have features, without which tonal interactions and changes in the phonology in the respective languages would be impossible to explain (McPherson 2010, Meyase 2021, Lionnet 2023). The unfortunate state of current tone studies in the theoretical phonological literature is that most popular studies so far have been concentrated on African tone languages, which typically have a simpler tone system consisting of two tones, with the occasional three-tone system; this, despite the common knowledge that tonal languages make up the majority of the languages of the world. Much is still to be studied in tone in particular, and linguistics in general, in the intersection of the Indosphere-Sinosphere geographical area. There is therefore still a lot to be learnt in tonology from multi-tonal languages from languages in this area.

In this paper, we present tonal data from Sopvoma (also known as Mao and Mao Naga) [ISO: nbi], an endangered Tibeto-Burman language spoken in north-eastern India, with four level tones, to show that tones do need to have features to explain the various tone changes in its morphophonemic construction. We also provide distinctive autosegmental geometrical models of the four tones, made up of one minimal pair of features H and L, the usage of which allows the analysis of the tonal changes to fall in place with the use of available phonological tools. Sopvoma also displays a unique pattern of sub-tonal polarity, which is a rare case in the tonal world, and the usage of the proposed model provides an explanation for why this polarity is another (cf. Meyase 2021) case of superficial, epiphenomenal polarity as a result of other phonological processes.

2 About the language

Sopvoma is spoken in Manipur in the north-east of India close to the border of Myanmar (Burma). There are roughly 100,000 speakers of the language spoken in the native Mao villages in Manipur and in the nearby towns in Manipur and Nagaland.

Sopvoma employs a mostly CV-only syllable structure much like its neighbouring languages Chokri, Khezha, and Tenyidie, to which it is assumed related. Like these languages, Sopvoma is a lexical tonal language and employs one of four level tones on every syllable of the language. There is a report of the language having five tones, but the study itself only uses the four-way tone level contrast for tones and claims the fifth tone to be rare and specific to a few speakers (Giridhar 1994). Our data also show only four tones used in the language.

Unless otherwise indicated, all the data in this paper are from the first author's fieldwork undertaken in 2022. They are collected from two female speakers of the Punanamai village aged between 30 to 50, the older

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speaker had a semi-urban upbringing outside but close to the native village, and the other speaker is from the village itself.

The following are the four tones reported by Giridhar (1994) and confirmed by fieldwork, where the tonal contrasts are displayed on the final vowel.

(1)	(a)	Extra-High	ōdő	'art, technique'
	(b)	High	ōdó	'show; trick'
	(c)	Mid	ōdō	'paddy field'
	(d)	Low	ōdò	'field ridge'

Mid and Low are the same as in Giridhar (1994), but we have changed the other two. The highest tone is now labelled Extra-High, and the second highest is now High, as opposed to the previous naming where they are High and Lower High. The diacritic for the highest is also changed from /ó/ to /ő/; and the one for the second highest has been changed from /ǒ/ to /ó/. This is mainly because the previous diacritic usage of the latter tone /ǒ/ potentially suggests that the tone is a contour tone which is not the case, at least phonologically and auditorily, and Giridhar (1994) itself reports the tones to be 'pretty level'. This tone notation and marking also brings it in line with the related tonal language Tenyidie (Meyase 2021, Meyase 2022) which also has all these corresponding tones and with which comparisons will be made in this study for tone polarity.

3 The data

This paper deals with the changes of tone in suffixes. While most of the suffixes in the language have a fixed tone and do not change their tones after the process of suffixation, i.e., have their own lexically predefined tone, there are some suffixes that do alternate their tones upon suffixation based on the tone of the verbal stem. The data in (2) show examples of suffixes that do not undergo any tone change on suffixation regardless of the stem tone.

(2) Stable-toned suffixes:

(i)	(a)	àlő + le	→	àlő lē	'stand' + TAM
	(b)	pé + le	→	pé lē	'say' + TAM
	(c)	hū + le	→	hū lē	'climb'+ TAM
	(d)	krà+ le	→	krà lē	'cry' + TAM
(ii)	(a)	àlő + te	→	àlő té	'stand' + PRV
	(b)	pé + te	→	pé té	'say' + PRV
	(c)	hū + te	→	hū té	'climb'+ PRV
	(d)	krà+ te	→	krà té	'cry' + PRV

However, there are three other sets of alternations in Sopvoma that show dynamism and react tonally to the tone of the verbal stem. It is assumed that these suffixes do not come with a completely specified lexical tone, and therefore manifest the tone changes due to an interaction with the tone just before it.

In the set of the prohibitive suffix, the suffix alternates between the tones High and Mid. It is a High when it follows an Extra-High or a Mid tone and it becomes a Mid when it follows a High or a Mid tone. This is shown in (3); we call the suffix 'symmetrically alternating' because of the repeated pattern between of alternation between the first two and the latter two half of the data.

(3) Symmetrically alternating suffix:

(a)	àlő + ʃo	→	àlő ʃō	'stand' + PROH
(b)	pé + ʃo	→	pé ʃó	'say' + PROH
(c)	hū + ʃo	→	hū ʃō	'climb'+ PROH
(d)	krà+ ʃo	→	krà ʃó	'cry' + PROH

The next sets are a little different from the symmetrically alternating suffix in that there is a 3:1 correspondence in the tone changes to the suffix, where three of the tones in the stem trigger one tone, and one lone tone in the stem triggers a different tone in the suffix. In the first of these two sets, which we here call the ‘Type H asymmetric suffix’, stem tones Extra-High, High, and Mid trigger the Mid tone on the suffix, while Low stem tone trigger an Extra-High tone on the suffix, thereby dividing the stem tones into the higher three verses the lowest tone (hence, the aforementioned ‘3:1’). This is presented in (4) with the imperative suffix /-i/.

(4) Type H asymmetric suffix:
- (a) ala̋ + i → ala̋ í ‘stand’ + IMP
- (b) pé + i → pé í ‘say’ + IMP
- (c) hū + i → hū í ‘cover’+ IMP
- (d) krà+ i → krà i̋ ‘cry’ + IMP

The other kind of suffix in the 3:1 correspondence is the ‘Type L asymmetric suffix’, where the Extra-High stem tone alone triggers Mid tone on the suffix, while the other three lower stem tones High, Mid, and Low all trigger the High tone on the suffix. Here the four tones are thus divided into the highest tone versus the three lower tones. This is exemplified in (5) with the progressive suffix /-we/.

(5) Type L asymmetric suffix:
- (a) ala̋ + we → ala̋ wē ‘stand’ + PROG
- (b) pé + we → pé wé ‘say’ + PROG
- (c) hū + we → hū wé ‘cover’+ PROG
- (d) krà+ we → krà wé ‘cry’ + PROG

The diagrams in (6-8) illustrate the tone patterns of the data that we see in (3-5).

(6) Tone mapping for symmetrically alternating suffix (3):

Stem	*Suffix*
Extra-High	Extra-High
High	High
Mid	Mid
Low	Low

(7) Tone mapping for Type H asymmetric suffix (4):

Stem	*Suffix*
Extra-High	Extra-High
High	High
Mid	~~Mid~~
Low	~~Low~~

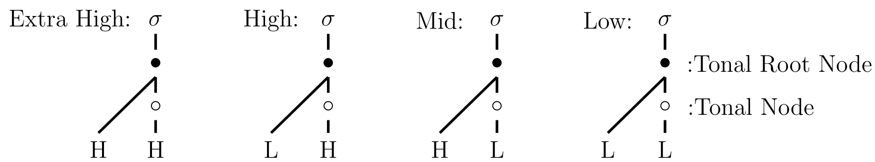
(8) Tone mapping for Type L asymmetric suffix (5):

Stem	*Suffix*
Extra-High	~~Extra-High~~
High	High
Mid	~~Mid~~
Low	Low

4 Analysis of the tone changes and autosegmental representation

For the purpose of analysing the tone changes in each of the three patterns, we propose the use of autosegmental representations of the tones which are made up of only two distinct variables H and L, where four distinctive representations are made possible by the 3D geometry. This is the representation used for Tenyidie, a related neighbouring language also with four level tones (Meyase 2021), which in turn is an adaption of the tone geometry of Hyman 1993. The difference between Meyase and Hyman is that in Meyase, H and L are tone features (not the tones High and Low), thereby proposing that tones should be further broken down into smaller units; while in Hyman, H and L are the tones High and Low respectively. The representation in (9) is the autosegmental representation that we employ in our analysis.

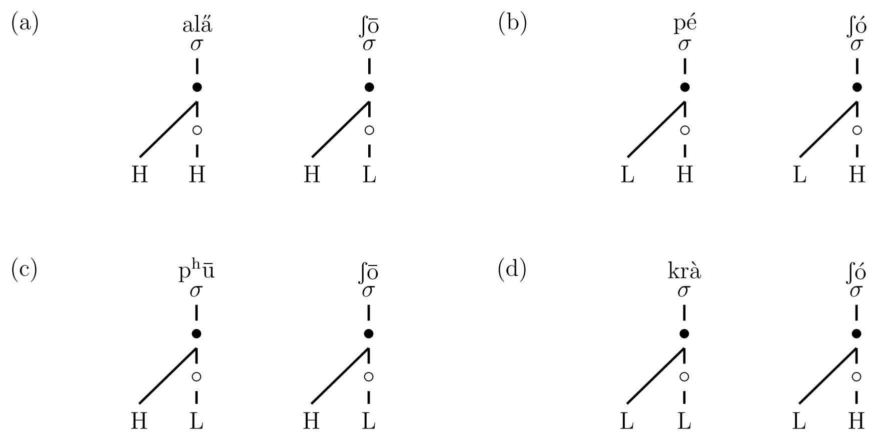
(9) Autosegmental representation of the four tones:



The sub-tonal features are arranged under nodes (borrowed from Hyman) Tonal Root Node (TRN) [●] and Tonal Node (TN) [○], with the crucial condition that the projections of these nodes are on different planes. This 3D set up allows for the spread of a feature from one tone bearing unit (TBU) to another TBU without crossing the other association line linked to the other feature in the same TBU. The TBU in the language is the syllable itself.

4.1 *Analysis of symmetrically alternating suffix* Let us first look at the symmetrically alternating suffix in (3). Using the representation in (9) for the data, we have the pattern in (10).

(10) Symmetrically alternating data in Sopvoma (autosegmental representation):



The important observation here is that the suffix /ʃo/ does not have a stable tone, and in addition, it does not have any feature that is fixed in all the four instances of the changes. This leads to the assumption that the suffix does not have any tone feature inherent to it.

In Optimality Theory (OT), the triggering mechanism for the tone change here is a highly ranked SPEC(●/○), which is essentially SPEC-T from Yip 2002, a constraint that prohibits any tone bearing unit (TBU) from being left unspecified for the tone feature (for the full tone in Yip 2002). As this constraint is highly ranked, the toneless suffix is forced to acquire the tone features from the stem. However, only the TRN (●) feature is spread (associated) to the corresponding empty node in the suffix. If the TN (○) were spread too, we would see a case of total assimilation, but this is not what happens as we see in (10a) and (10d).

The specification of the empty TN (○) node is also not a case of a default feature (either H or L) epenthesis, since this node is sometimes filled up by H and sometimes by L. The nature of the tone change appears to be such that the suffix is never Extra-High or Low, but always in the middle tone space with it being either High or Mid only. This therefore seems to have a phonetic motivation, namely that the suffix should never be realised as one of the extreme tones, as they are harder to pronounce than the ones midway. In OT terms, this can be expressed as a markedness constraint that basically says that the extreme tones, Extra-High and Low, are more marked than High and Low, meaning that a tone should not have the <u>same</u> tone feature in both the nodes (both Hs or Ls in TRN and TN). However, this is not the case in all suffixes as there are other suffixes in the language that do have Extra-High and Low tones on them. One may interpret this to morpheme specific tonal constraints prohibiting the specific suffix /ʃo/ to ever be realised with an extreme tone. However, this can be interpreted phonologically without referring to its morphology, with the constraint in (11), where there is a constraint on same features within a TBU, but with highly ranked faithfulness for pre-specified tones. This constraint is essentially *Extra-High, *Low ≫ *Mid, *High, but with the crucial addition that this affects toneless syllables more than toned syllables or partially tone-specified syllables.

(11) *SAME: Assign a violation for every time a syllable is realised with the same feature (H or L) on both the TRN and TN (i.e. realised as one of the tones in the phonetic extremity).

The other constraints at play are DEP-T, which prohibits any epenthesis of tone features, and NOSPREAD(●), the constraint against feature spreading in the TRN (●). These two constraints are lower ranked. Feature spreading in the TN (○), NOSPREAD(○), is highly ranked on the other hand. The tableau in (13) shows the working of these constraints in bringing about the tone changes seen in (3), with the constraint ranking in (12).

(12) SPEC(●/○), NOSPREAD(○), *SAME ≫ DEP-T ≫ NOSPREAD(●)

(13) Tableau for (3a): /àlã̋+ʃo → àlã̋ ʃō/

alã̋ ʃo (H H)	SPEC(●/○)	NOSPREAD(○)	*SAME	DEP-T	NOSPREAD(●)
a. alã̋ ʃo (H H)	*!*				
b. alã̋ ʃo (H H)	*!				*
c. alã̋ ʃő (H H)		*!	*		*
☞ d. alã̋ ʃō (H H L)				*	*
e. alã̋ ʃő (H H H)			*!	*	*
f. alã̋ ʃó (H H L H)				**!	
g. alã̋ ʃō (H H H L)				**!	

In the tableau in (13), the candidates (a) and (b) are instantly eliminated because they do not have their nodes (fully) specified by tone features. Candidate (c) gets eliminated because of the high-ranking spreading prohibition on TNs (○). Candidates (d) and (e) have L or H epenthesised on the TN, but this leads to (e) having a final tone of Extra-High, violating *SAME. Candidate (f) gets eliminated because it has two epenthesis of tone features as opposed to the winning candidate (d) which has only one, even though the latter violates NOSPREAD(●), which is crucially lower ranked than DEP-T. Candidate (g) is phonetically the same as the winning candidate (d) but is a more marked structure for the same reason as candidate (f).

The tone change in (3d) /krà+ʃo → krà ʃó/ works the same way as in tableau (13) except that here the epenthesised feature on the TN (○) is H, while L from the stem TRN (●) is spread to the suffix, leading to the suffix having a High tone.

What appears to be straight forward full-tone spreading in (3b) and (3c) is not the case as such, but are also cases of partial spreading of tone (spreading of tone feature) and feature epenthesis, a result of the constraint ranking in (12). The Tableau for (3b) is given in (14) showing the same.

(14) Tableau for (3b): /pé+ʃo → pé ʃó/

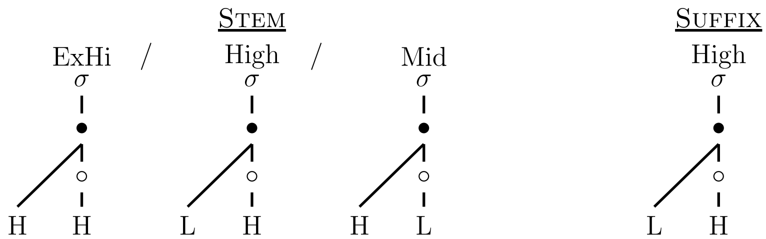
pé ʃo σ σ L H	SPEC(●/○)	NOSPREAD(○)	*SAME	DEP-T	NOSPREAD(●)
a. pé ʃó σ σ L H		*!	*		*
☞ b. pé ʃó σ σ L H H				*	*
c. pé ʃò σ σ L H L			*!	*	*
d. pé ʃó σ σ L H L H				**!	
e. pé ʃō σ σ H H H L				**!	

4.2 *Analysis of the asymmetric suffixes* Let us recall the Type H asymmetric suffix (4) repeated here in (15):

(15)
(a) alā̋ + i → alā̋ í 'stand' + IMP
(b) pé + i → pé í 'say' + IMP
(c) hū + i → hū í 'cover'+ IMP
(d) krà+ i → krà í̋ 'cry' + IMP

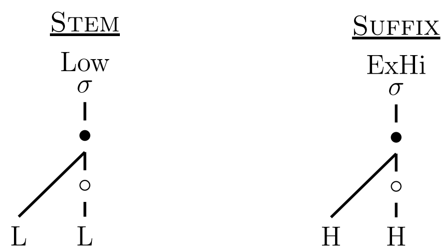
Following the tonal representation laid out in (9), the geometrical configurations of these phrase formations are laid out below in (16) for (15a, b, c) where the suffixes all have the same High tone on the output.

(16) High tone triggered on the imperative suffix by Extra-High (ExHi), High, and Mid stems:



The representation for (15d) where the lone case of the Extra-High tone triggered on the imperative suffix by the Low stem is given in (17).

(17) Extra-High tone triggered on the imperative suffix by a Low stem:



The common denominator here in (16) vis-à-vis (17) is that all the stems in (16) have at least one H, whereas (17) has no H in the stem. This suggests that whenever the stem has at least an H tonal feature, it triggers the High tone on the suffix; and when the stem has no H tonal features on it, it triggers the Extra-High tone. Let us compare this with the Type L asymmetric suffix.

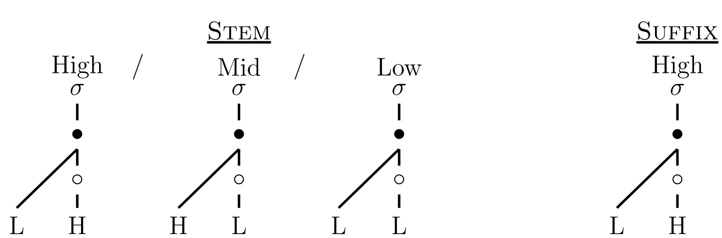
The Type L asymmetric suffix pattern in (5) is repeated here in (18).

(18)	(a)	alắ + we →	alắ wē	‘stand’ + PROG
	(b)	pé + we →	pé wé	‘say’ + PROG
	(c)	hū + we →	hū wé	‘cover’+ PROG
	(d)	krà+ we →	krà wé	‘cry’ + PROG

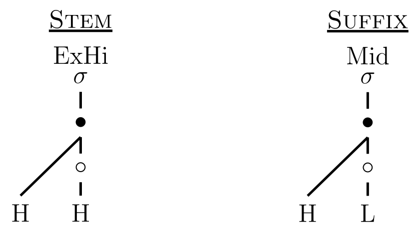
This pattern is somewhat a mirror image of the pattern in (15) with regards to the fact that in (15), the lowest stem tone (Low) triggers a different tone while all the other stem tones trigger a High tone. In (18), the highest stem tone (Extra-High) triggers a different tone (Mid) while all the other stem tones trigger a High tone. The tone triggered by the lone stem tone in each set (15 and 18) is different though: Extra-High in (15) and Mid in (18).

The autosegmental representations of the tone change in the data in (18) are shown in (19) and (20).

(19) High tone triggered on the progressive suffix by the High, Mid, and Low stems:



(20) Mid tone triggered on the progressive suffix by Extra High stem:



The mirror-image pattern is also seen when we look at the autosegmental data. Here in (19) all the stems that trigger the High tone have at least one L tonal feature in them. On the other hand, the only stem that triggers the Mid tone (20) has not L feature.

The analysis that we propose for both of these suffix types is that this falls under the realm of **phonologically conditioned allomorphy** (Nevins 2011; Bonet & Harbour 2012; Inkelas 2014, pp. 282ff.). That is, here the suffixes show allomorphy based on the phonological content of the stems, and are not analysed purely as a phonological process. In the case of the Type H asymmetric suffix (15), the utterances of the allomorphs of the imp suffix /í/ and /i̋/ depend on the content of the sub-tonal feature H in the stem, where its presence trigger /í/, and its absence trigger /i̋/. And in the case of the Type L asymmetric suffix (18), the allomorphs of the progressive suffix /wē/ and /wé/ show up based on the content of the sub-tonal feature L in the stem, where its absence triggers /wē/, and its presence triggers /wé/. As a result, in each of the Type H and the Type L asymmetric suffixes, we have a 3:1 distribution of the suffix allomorphs.

5 Alternative tone feature representation and natural tone classes

Perhaps the best-known tone feature representation for four tones is the Yip (1980) tone representation, later modified by Pulleyblank (1986). This is not autosegmental and is purely dependent on features. This model is shown in (21).

(21) Tone decomposition into features (Yip 1980/Pulleyblank 1986):

Register	Melody	
+Upper	+raised	Extra High
	–raised	High
–Upper	+raised	Mid
	–raised	Low

In this model, the four tones are first divided into two based on the tonal space (tonal register), where the higher two are indicated with the feature [+Upper] and the lower two with [-Upper], then these two spaces are further divided using only one feature [±raised] (the melody) in each. In each division, the higher one is specified [+raised] and the lower with [-raised]. In the end, all the four tones are distinctly represented with only two features, the [±Upper] and the [±raised] features as in (22).

(22) Features of tone in a four-tone system (Yip 1980/Pulleyblank 1986):

(a) Extra-High [+Upper, +raised]
(b) High [+Upper, –raised]
(c) Mid [–Upper, +raised]
(d) Low [–Upper, –raised]

The decomposition of the tones to the features in (22) also formalises the previously mentioned relation between Extra-High and Mid, both are [+raised]; and that between High and Low, both are [-raised]. Using these features, the tone changes in symmetrically alternating suffix (3) can be laid out as in (23), while assuming that the suffix originally came without any tone or tone feature specified on it.

(23) Tone changes in symmetrically alternating suffix:

	Stem	Suffix		Resulting Phrase	
a.	ala̋	+ ʃo	→	ala̋	ʃō
	Extra High $\begin{bmatrix}+\text{Upper}\\+\text{raised}\end{bmatrix}$	… $\begin{bmatrix}\varnothing\\\varnothing\end{bmatrix}$		Extra High $\begin{bmatrix}+\text{Upper}\\+\text{raised}\end{bmatrix}$	***Mid*** $\begin{bmatrix}-\boldsymbol{Upper}\\+\boldsymbol{raised}\end{bmatrix}$
b.	pé	+ ʃo	→	pé	ʃó
	High $\begin{bmatrix}+\text{Upper}\\-\text{raised}\end{bmatrix}$	… $\begin{bmatrix}\varnothing\\\varnothing\end{bmatrix}$		High $\begin{bmatrix}+\text{Upper}\\-\text{raised}\end{bmatrix}$	***High*** $\begin{bmatrix}+\boldsymbol{Upper}\\-\boldsymbol{raised}\end{bmatrix}$
c.	hū	+ ʃo	→	hū	ʃō
	Mid $\begin{bmatrix}-\text{Upper}\\+\text{raised}\end{bmatrix}$	… $\begin{bmatrix}\varnothing\\\varnothing\end{bmatrix}$		Mid $\begin{bmatrix}-\text{Upper}\\+\text{raised}\end{bmatrix}$	***Mid*** $\begin{bmatrix}-\boldsymbol{Upper}\\+\boldsymbol{raised}\end{bmatrix}$
d.	krà	+ ʃo	→	krà	ʃó
	Low $\begin{bmatrix}-\text{Upper}\\-\text{raised}\end{bmatrix}$	… $\begin{bmatrix}\varnothing\\\varnothing\end{bmatrix}$		Low $\begin{bmatrix}-\text{Upper}\\-\text{raised}\end{bmatrix}$	***High*** $\begin{bmatrix}+\boldsymbol{Upper}\\-\boldsymbol{raised}\end{bmatrix}$

Although there is a full assimilation of tone in (23b) and (23c) (as it was in (3b) and (3c)), that is not the case in (23a) and (23d), however the melody feature [±raised], is still assimilated in these two, there is therefore at least a partial assimilation in all the four tones, giving evidence that the tones are not one individual discrete unit each but made up of smaller units that separately interact in the morpheme combinations. The register feature [±Upper] is observed to be always the opposite polar value of the [±raised] value, i.e., when the stem has a [+raised] value, the suffix always has a [-Upper] value, and vice versa. Using alpha notations, this change in tone can be expressed as the rule in (24) for the toneless suffix.

(24) $$\begin{bmatrix}\varnothing\\\varnothing\end{bmatrix}_{\text{suffix}} \rightarrow \begin{bmatrix}-\alpha\ \text{Upper}\\\alpha\ \text{raised}\end{bmatrix}_{\text{suffix}} \Big/ \begin{bmatrix}\pm\text{Upper}\\\alpha\ \text{raised}\end{bmatrix}_{\text{stem}} \underline{\qquad}$$

The rule in (24) reads as follows: when a suffix with no tone features specified, $\begin{bmatrix}\varnothing\\\varnothing\end{bmatrix}_{\text{suffix}}$, follows a stem of any tone, $\begin{bmatrix}\pm\text{Upper}\\\alpha\ \text{raised}\end{bmatrix}_{\text{stem}}$ (where α is any value), the suffix copies/assimilates the register feature of the stem [α raised], and at the same time, the opposite value (-α), is assigned to the register feature [-α Upper]. An analysis following this rule however involves the use of phonological polarity as a mechanism in itself. This will be discussed in the next section.

The tone representation of Yip/Pulleyblank in (21) allows the for the classification of the four tones into the natural classes of 'register' and 'melody', represented by [±Upper] and [±raised] respectively. And the Sopvoma data in the symmetrically alternating suffix bears this out as we can see with the rule in (24). The 'melody' natural class is especially seen where Extra-High and Mid, both [+raised] tones, trigger Mid tone on the suffix, and at the same time, High and Low, both [-raised] tones, trigger the High tone on the suffix (refer to (23)).

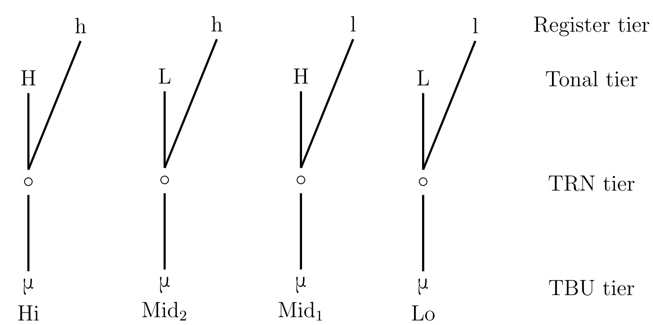
Another issue with using Yip/Pulleyblank's representation is its application to the other data sets, the Type H and Type L asymmetric suffixes. We have demonstrated in § 4.2 that both of these suffix types trigger different tones on suffixes in a 3:1 division of the four tones in the stems. However, any division of the tones where any three tones can be categorised into one natural class is not provisioned by this model. As a result, an analysis with this model is difficult, and a single rule like (24) for either Type H or Type L asymmetric suffixes is either impossible or will be cumbersome.

On the other hand, the representation that we propose to use in (9) allows for three of the tones of the four to be classified apart from the other one tone. In (15-17), the 3:1 division of the natural classes between the higher three tones Extra-High, High, and Mid versus the lowest tone Low can be seen where the higher three trigger a High on the suffix and only Low trigger an Extra-High on the suffix. In (18-20), the division of the class the other way round is made between the highest tone Extra-High versus the lower three tones High, Mid, and Low.

Another natural class that this representation can predict is the natural class comprising the High and the Mid tones to the exclusion of the Extra-High and the Low tones. High and Mid are the two tones in the middle of the pitch range, and both of these tones are made up of one H feature and one L feature, the difference only being in the geometry. Extra-High and Low are excluded from this natural class since they are made up of two H features and two L features respectively. Yip/Pulleyblank's representation does not enable for this natural class as High and Mid are featurally very different in this representation, where High is [+Upper, -raised] and Low is [-Upper, +raised] with the two having no common feature between them. Following this representation, a prediction might be made that there can be no natural class divisions of the 3:1 nature where either High or Mid is distinct from the other three tones in the inventory because they are both made up of H and L, and therefore always have a feature in common with the other three tones.

Another significant representation is Snider (1999), which uses autosegmental representations and is very similar to the one used in this paper in looks. In Snider's representation, each tone also has two projections and tones are broken down into features too. However, the representation does not employ nodes like Meyase (2021) and there are in fact four sub-tone features H, L, h, and l. This is shown in (25).

(25) Tonal representation of four tones according to Snider (1999):

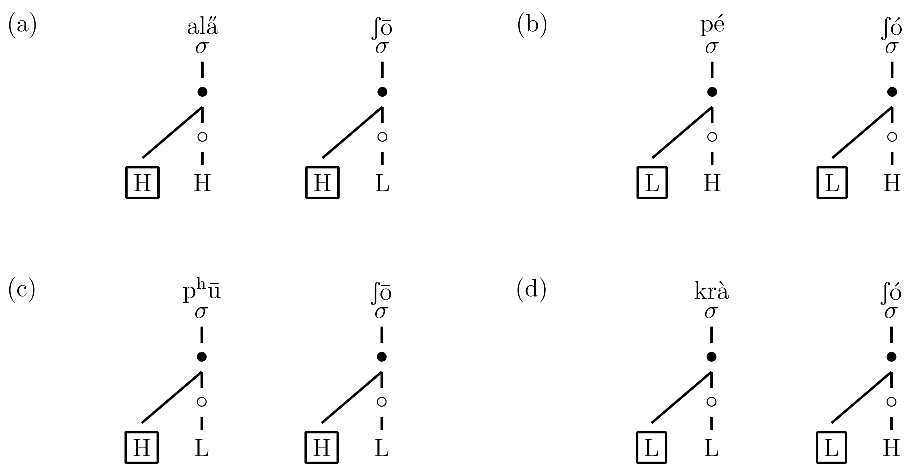


Snider's model works in almost the same way as Yip's feature representation but has the advantage of having the autosegmental manoeuvrings. However, it also shares Yip's disadvantage in the fact that it employs four unique features instead of two like the one we use. As a result, this representation also fails to give an explanation of how Extra-High tone may be tonally classed naturally as opposed to the other three lower tones, or the natural class of Low versus the other higher three, which is showed by the Sopvoma data. For example, for the latter natural class, the higher three tones, Mid$_1$, Mid$_2$, and Hi would have to have features that each one shares, but they are made up of H–○–L, L–○–h, and H–○–l, respectively, and so do not have any feature in common among them to differentiate them from Lo (L–○–l).

6 Phonological polarity and sub-tonal feature polarity

Polarity itself is a well debated phenomenon in linguistics, with the debate being whether it is an actual phonological process or merely an epiphenomenon of other phonological process. Kenstowicz, Nikiema, & Ourso (1988) and Anttila & Bodomo (2000) are studies claiming (tone) polarity to be an epiphenomenon, and Cahill (2004) and Hantgan (2009) supporting polarity being a phonological mechanism in itself. What we have done here with our analysis of the symmetrically alternating suffix in § 4.1 is that despite the data showing polarity to exist as an after-effect as seen in (24), the analysis does not propose the use of polarity as a mechanism. This surface polarity is simply a reaction of the phonological constraints laid out with the help of the autosegmental representation that we use. In doing so we give more evidence to the school of thought that proposes phonological polarity to an epiphenomenon. The surface sub-tonal polarity is seen even with the representation that we use for our analysis, where an H feature in the TRN (●) always triggers an L feature in the TN (○). We can see this in (10) with the tone features in concern highlighted with boxes in (26).

(26) Sub-tonal feature polarity in Sopvoma's symmetrically alternating suffix:



Another peculiar discovery that this study brings is the existence of sub-tonal polarity (despite it being a surface (epi-)phenomenon). The rule in (24) clearly shows that at least in the surface, there is a polarity in tone features that is observed. Such an observation is very rare in tone and has only been documented to happen in one other language so far, Tenyidie (Meyase 2021). Tenyidie is also a Tibeto-Burman language spoken in north-east India and is related to Sopvoma. They both have four level tones and are in fact neighbouring languages. They are, however, mutually unintelligible to each other. The sub-tone feature polarity in Tenyidie is also analysed with the same autosegmental representation for four level tones.

7 Tone features are real

Arguments have been made in Hyman (2010) and Clements et al. (2010) that tone features are not necessary. Their problems with tonal features are the lack of clear natural classes shown by tone features and the lack of support for assimilation or dissimilation patterns driven by tonal features. However, these very concerns are countered with examples in Seenku (McPherson 2010) and Tenyidie (Meyase 2021). We argue in this paper too that there are natural classes in Sopvoma and in addition to that there is good evidence of interactions of the tonal features that drive the patterns in the suffixation processes in the language. The analysis of these tone change patterns simply falls into place when tone features are posited.

8 Conclusion

In this paper we have discussed three main points. First, that tones need to be broken down into smaller features, and this is supported by the existence of natural classes within the tones in Sopvoma. Secondly, that tone polarity is not a phonological mechanism but rather an after-effect of other phonological processes and is thus only an observed surface polarity. And thirdly, Sopvoma is a rare example of a language showing tone polarity, at least on the surface, both in a language with more four tones (or more) and in the features of the tones rather than the whole tones.

We have also supported the autosegmental tone representation that was first introduced in Meyase (2021) for languages with four tones, and with the same representation established hitherto undocumented natural tone classes evidenced in Sopvoma and also provided prediction for a different class of tones.

9 Abbreviations

TAM	Tense–Aspect–Mood	IMP	Imperative
PRV	Perfective	PROG	Progressive
PROH	Prohibitive	TBU	Tone Bearing Unit
TN	Tonal Node	TRN	Tonal Root Node

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