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The phonological systems of the Mbam languages of Cameroon with a focus on vowels and vowel harmony

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Dominance, directionality and domain of Mbam vowel harmony

The Mbam languages provide insight into the question of ATR dominance in vowel harmony. While root- (or stem-) controlled vowel harmony is the more common analysis, due to the presence of [+ATR]-dominant suffixes, and a few [+ATR]-dominant prefixes, the vowel harmony of the Mbam languages is clearly dominant-recessive rather than root- (or stem-) controlled. Baković (2000) discusses residual stem-control and cyclic vowel harmony to describe why otherwise dominant ATR harmony seems to have directional tendencies in some languages. Directional tendencies in Mbam languages, such as Tuki (which has [+ATR]-dominant prefixes) and Mbure, however, can be explained without evoking a residual stem-control that applies only to some Mbam languages but not in others. The question of the differences in vowel-harmony spread can be explained through a discussion on directionality in vowel-harmony spread and the domain of vowel harmony.

The differences in the domain of vowel harmony reflect differences in the Mbam languages of what is a phonological word. The phonological designation of the word is important to the general Bantu issue of how verbs historically became so agglutinative.

In this chapter, we will discuss the issues of ATR dominance (section 3.1), directionality in vowel harmony (section 3.2) and the domain of vowel harmony (section 3.3).

3.1 [+ATR] dominance

Vowel harmony has generally been considered as either “root- (or stem-) controlled” or “dominant-recessive”. In the former, the harmonic feature (for example, ATR) of the root or stem vowel determines the ATR value of any affix vowels.

In dominant-recessive languages, one tongue-root feature (advanced or retracted) is considered dominant. Any dominant-featured morpheme, whether the root or an affix, determines the tongue-root feature of all the recessive vowels in the domain (often the phonological word). While most languages studied have dominant ATR harmony, there are some languages, Yoruba being the most studied, and the Bantu C languages (Leitch 1996), which have retracted tongue root (RTR) harmony.

While there is much discussion favouring both “root-controlled” and “dominant-recessive” analyses, the “dominant-recessive” approach fits the Mbam

languages better. Due to the presence of [+ATR]-dominant suffixes and of a few [+ATR] prefixes (in Nen and Tuki), which will cause [ATR] assimilation even of root vowels, dominant-recessive harmony is the most useful analysis for the description of the ATR harmony of the Mbam languages. Even in a language like Yambeta, which does not have [+ATR]-dominant affixes, the same general principle of assimilation to [+ATR] vowels is seemingly at work in all of the languages. To consider Yambeta therefore as root- or stem-controlled and the others as dominant-recessive is introducing a false dichotomy between languages which show strikingly similar vowel-harmony patterns. But if all the Mbam languages are dominant-recessive, what role is there then for root- or stem-control? What are the defining properties of a root- or stem-controlled language and how can we be sure such languages do in fact exist? This study cannot answer these questions which require reference to languages outside of the Mbam.

ATR harmony generally affects more than roots, it also occurs between affixes and roots. ATR harmony occurring in roots is sometimes called *static vowel harmony* (see various works of Kutsch Lojenga), and involves V_1-V_2 co-occurrences and co-occurrence restrictions within roots. *Dynamic vowel harmony* on the other hand involves ATR changes across morpheme boundaries. The Mbam languages generally have both *static* and *dynamic* vowel harmony.

3.2 Directionality in vowel harmony

Directionality is a relevant topic in vowel harmony because, unlike assimilation, vowel harmony is not local, and unlike umlaut, it is iterative, spreading sometimes rather far from the triggering vowel (whether in the root or in a dominant affix). How vowel harmony spreads, its domain and its direction, therefore, are essential topics in any discussion about vowel harmony. In this section, we will look at the directionality of vowel harmony and consider what various writers have said about directionality and discuss these analyses in light of the vowel harmony in the Mbam languages.

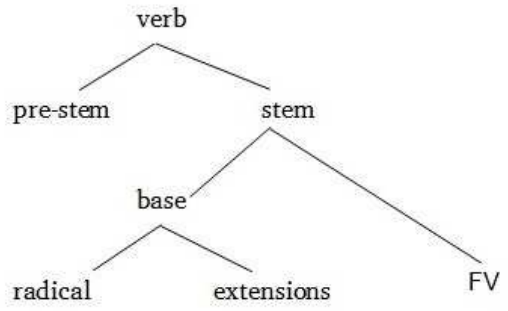
3.2.1 Overview of vowel-harmony directionality in the literature

Halle and Vergnaud (1981: 1) identify two types of harmony processes: *directional*, where the harmony features propagate in one direction only, and *dominant*, where the harmony features propagate in both directions. Later works make further precisions such as differing between root- or stem-controlled vowel harmony and dominant-recessive vowel harmony both of which can in principle be bidirectional.

Baković (2000: 7) claims "... that the 'direction' of vowel harmony is entirely dependent on the morphological structure of the language." In those languages like Yoruba which have strictly prefixing morphology, vowel harmony spreads leftward from the root towards the prefix. In languages with both prefixes and suffixes, vowel harmony spreads both leftward and rightward from the root to the affixes.

Vowel harmony is stronger between root and suffixes than between prefixes and the root. In Tuki (and in certain contexts in Mbure), the final vowel **-a** will harmonise with a [+ATR]-dominant vowel in the verb root, but prefixes with /a/ will not. Meeussen and others consider that suffixes (particularly derivational suffixes) are more closely bound to the root than prefixes, as illustrated in Figure 17 for Bantu, and that "this root + suffix stem domain is shown to be the locus of phonological activity in proto-Bantu" (Hyman 2008: 1), hence vowel harmony triggered by either a root or suffix vowel (stem) will spread throughout the root + suffix domain.

Figure 17: Meeussen (1967) Structure of the Bantu verb



In a couple of articles, Hyman discusses directionality in vowel harmony and other phonological and morphological processes. Like Baković, Hyman (2002) considers vowel harmony to be predominantly root- or stem-controlled. However, Hyman also notes that this is only part of the picture. Post-lexical vowel harmony, such as is found in Nez Perce (Hyman 2002: 17), is anticipatory (right to left), and is not dependent on the morphological structure of the language. He summarises phonological processes, including vowel harmony (Hyman 2008: 322-323), as follows:

Figure 18: Summary of phonological processes Hyman (2008: 322)

a When a process is root-controlled, either prefixes or suffixes may be affected.
b There is an anticipatory bias which should:
  i make prefixes better targets for reduction, fusion, and loss than suffixes
  ii make suffixes better triggers for harmony and other phonological processes.

Hyman (2008: 322) goes on to say that "the implication of the above is that when segments interact across identical constituent types (word-word, stem-stem, root-root, and affix-affix), the effect should be anticipatory. To test such claims, a full discussion of directional possibilities must include cases of multiple prefixation and suffixation..."

Given a typical Bantu verb with multiple prefixes and suffixes:

[P1 - P2 - R - S1 - S2]$_{word}$

Where P=prefix, R=root and S=suffix, Hyman (2008: 323, 2005: 14-15 and 2002: 15) charts the more "widely attested processes[...] (✓) includ[ing] anticipatory and root-control harmony." The VH target/trigger possibilities are attested in Table 57.

Table 57: VH target/trigger + directional possibilities of forms with two prefixes and/or suffixes (Hyman 2002: 15, 2005: 14, 2008: 322)

left to right	right to left	left to right	right to left
a. local VH		d. non-local VH -affix+rt transparency	
P1 > P2 ?	P2 > P1 ✓	P1 > S1 ?	S1 > P1 ?
P2 > R ?	R > P2 ✓	P1 > S2 ?	S2 > P1 ?
R > S1 ✓	S1 > R ✓	P2 > S2 ?	S2 > P2 ?
S1 > S2 ?	S2 > S1 ✓		
b. non-local VH -affix transparency		e. root-root compound VH	
P1 > R ?	R > P1 ✓	R1 > R2 ✓	R2 > R1 ✓
R > S2 ✓	S2 > R ✓		
c. non-local VH -root transparency		f. root-internal VH (also within P&S)	
P2 > S1 ?	S1 > P2 ?	[V > V]R ✓	[V < V]R ✓

Coming from his root-control position, Hyman (2008: 322-323) wonders whether the unattested, or less attested, prefix-controlled processes are due to

> "... a condition on prefixes as triggers, roots as targets, or both. Specifically, can a prefix initiate vowel harmony onto prefixes to its right or left? If the parameters are root-control and anticipatory assimilation, then the checks vs. question marks in [Table 57] indicate the following: (i) *P2 can harmonize P1, but P1 cannot harmonize P2 (or R)*; (ii) *S2 can harmonize S1, and S1 can harmonize R, but S1 cannot harmonize S2*" (my italics).

While a couple of Mbam languages do have [+ATR]-dominant prefixes, these occur only in closed paradigms such as numerals and display several exceptional patterns. These particular cases are better considered as exceptions rather than rule governed. This said, as we will see below, there is evidence that certain of Hyman's (2002, 2005, 2008) questionable categories are found in the vowel-harmony processes of the Mbam languages.

3.2.2 Directionality and prefix-/suffix-controlled vowel harmony in the Mbam languages

Hyman's (2005: 14-15, 2008: 322-323) parameters of root-control and anticipatory assimilation lead to two assumptions mentioned above which will be addressed in this section in light of the various vowel-harmony processes of the Mbam languages: 1) *"P2 can harmonise P1, but P1 cannot harmonise P2 (or R)*"; and 2) *"S2 can harmonise S1, and S1 can harmonise R, but S1 cannot harmonise S2"*.

3.2.2.1 "P2 can harmonise P1, but P1 cannot harmonise P2 (or R)"

Hyman (2005, 2008) claims that vowel harmony tends to be anticipatory, and puts forward a hypothesis that in a word with two (or more) prefixes the right-hand prefix may trigger vowel harmony to the left, but that the left-hand prefix will not trigger vowel harmony to the prefix to its right or to the root (progressive vowel harmony). In similar fashion, Hyman indicates that a prefix will not trigger vowel harmony on a root vowel.

While not strictly prefixes, Maande preverbal morphemes do show clear anticipatory (right-left) directionality in ATR harmony. Unlike what is normal in Common Bantu, Maande does not have a series of prefixes to a verb root. Rather, these morphemes are clitic-like elements before the verb. Certain adverbs and the indirect-object pronouns are phonological words which may occur between the subject-tense morphemes and the verb stem. They will trigger anticipatory ATR harmony only. This supports Hyman's hypothesis that P2 can harmonise P1, but not vice versa. In Example 309 below, the [+ATR]-dominant adverb is underlined, and the clitics to the left which undergo ATR harmony are bolded.

Example 309: Anticipatory [+ATR] harmony in the Maande verb

[tò	tì-ŋá	hánà	**ə̀sù**	**<u>lík-ím-ə̀</u>**]		*We are not*
1p	neg-T/A	again	1p	be.afraid		*afraid again.*
[**tù**	**tì-ŋə́**	**<u>təŋ̀ì</u>**	àsò	bànó	**bí-lítʃ-íɲ-ìɲ-ì]**	*We didn't notice*
1p	neg-T/A	quickly	1p	2p	reflx-notice	*you quickly.*

Nen is a SOV language, which means that an object noun may be present among the pre-stem elements of the verb unit. If the object noun (underlined in Example 310 below) is [+ATR], it optionally triggers ATR harmony in the pre-stem elements to its left; if it is [-ATR] it will block ATR harmony from spreading from the verb stem.

Example 310: ATR harmony in Nen pre-stem elements[228]

[mè	ná	**hìsíní**	pél-én]	~	[**mì nə́ hìsíní** pél-én]	*I put down*
1s	P1	pot	put.down-APPL			*the pot.*

[mè	ná	sànjá	**sj-ə̀k-ín**]	*I saw the*
1s	P1	mouse	see-INT-APPL	*mouse.*

Certain adverbs *may* also occur among the pre-stem morphemes of the verb unit. If an adverb occurring among the pre-stem elements has dominant vowels, as in the case of **hútú** *quickly*, it may trigger vowel harmony to its left. If it has recessive vowels, as in the case of **mɔ́ŋɔ́** *again*, it will block vowel-harmony spread. In Example 311, [+ATR] morphemes are bolded.

Example 311: Modification of ATR harmony in Nen verb pre-stem[229]

[mɛ́	ŋɔ̀	mɔ́ŋɔ́	**bín-ə́k-ə̰**]		*I will again dance.*
1s	FT2	again	dance-INT-FV		
[mí	ŋù	bín-ə́k-ə̀		tɔ́nə̰]	*I will dance again.*
1s	FT2	dance-INT-FV		again	
[**mì**	**sə̀**	**hútú**	àŋɔ́á	bɔ́ŋ-ə̰]	*I did not quickly find you.*
1s	NEG	quickly	2s	find-FV	
mɛ̀	sá	àŋɔ́á	bɔ́ŋɔ́	tɔ̀fə̰]	*I did not find you quickly.*
1s	NEG	2s	find	quickly	

The above examples confirm Hyman's premise that vowel harmony is anticipatory. There are, however, counter-examples in certain Mbam languages, in which certain prefixes will trigger vowel harmony progressively.

3.2.2.2 [+ATR]-dominant prefixes:

Certain Nen and Tuki numeral prefixes will trigger ATR harmony on the root vowel of the numerals *one* and *two* in Nen and *two* and *four* in Tuki. In Nen, only classes 3, 4 and 19 have ATR-dominant prefixes, and in Tuki only class 8 is incontestably ATR-dominant.

The [+ATR] dominant prefixes in Nen and Tuki only operate within closed paradigms such as numerals and certain demonstratives.

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[228] Bancel 1999: 8 (with my modifications of the phonetic transcriptions).

[229] Examples from Sebineni Alphonsine Flore : p.c. Aug. 2009. According to her, ATR is more likely to spread than not in normal-speed speech.

Example 312: Nen and Tuki [+ATR]-dominant numeral prefixes

Nen	1	ɔ-	mò≠ⁿdɔ̀ ɔ̀≠mɔ̀tí	*one person*
	2	pa-	pì≠ⁿdɔ̀ pá≠fàⁿdí	*two people*
	3	u-	mò≠lɛ́má **ú≠mòtí**	*one heart*
	4	i-	mì≠lɛ́má **í≠fàⁿdí**	*two hearts*
Tuki	2	βá-	βà≠tò βá≠βání	*two people*
			βà≠tò βá≠íní	*four people*
	8	βí-	bⁱ≠ìrá **βí≠βáni**	*two arrows*
			bⁱ≠ìrá **βí≠íni**	*four arrows*

However, not all [+ATR] prefixes are dominant and trigger ATR harmony. Tuki noun-class prefixes 5, 8 and 19 are [+ATR], invariable, and do not trigger ATR harmony on the noun root.

Example 313: Tuki invariable [+ATR] NC prefixes

5	i-	**ì**≠bání	*breast, teat*
		ì≠bíɾɔ́	*oil palm*
8	βi-	βì≠kɔ́hí	*shoulders*
		βì≠tɔ́tí	*roosters*
19	i-	**ì**≠hóɾá	*broom*
		ì≠dʒìjə	*fire*

So while Tuki has [+ATR] prefixes on nouns and on numerals, only the [+ATR] prefixes on numerals will trigger ATR harmony on the root vowels. These counter-examples of dominant prefixes in Tuki and Nen are perhaps stored as complete words rather than as a result of word-formation processes. This would also explain the [-ATR] "dominance" found for other numerals in Nen. These two counter-universal properties suggest a paradigmatic regularisation within a closed set.

3.2.2.3 Rounding-dominant prefixes

Noun class 3 in Mmala generally is a non-high (open) round vowel except for noun stems beginning with /a/ or its [+ATR] counterpart /e/. With these nouns, the noun-class prefix vowel is [-round] as seen in Example 314. The [-round] noun-class 3 prefixes for nouns with /a/ and /e/ in V_1 position in the root are bolded.

Example 314: Mmala noun-class 3 prefix vowels

/i/	ò≠ŋìní	*louse*
/ɪ/	ɔ̀≠dìm	*heart*
/ɛ/	ɔ̀≠mɛ̀ⁿdɛ̀	*liver*
/e/	**è≠mèkú**	*flesh*
/a/	**à≠hàb**	*green mamba*
/ɔ/	ɔ̀ŋ≠kɔ̀gɔ̀	*wine (gen)*
/o/	òm≠bòkò	*squirrel*
/ʊ/	ɔ̀n≠dònɔ̀	*commerce, riches*
/u/	òn≠dùl	*pot for cooked meat*

There are, however, indications that the noun-class 1 and 3 prefixes in Mmala may in certain circumstances be dominant and will cause the [-round] stem vowels /a/ and /e/ to become [+round]. When V_1 of the noun root is a [+high] vowel, and V_2 is either /a/ or /e/, the noun-class 1 or 3 prefix will trigger rounding on the root V_2, as is seen in Example 315. As will be discussed in chapter 4, all high vowels are transparent to rounding harmony in Mmala.

Example 315: Noun classes 1 and 3 rounding-dominant vowels

ò≠ŋídò	ì≠ŋídè	*c3/4.hair*
ɔ̀ŋ≠fɛ̀ŋɔ̀	ìm≠fìŋà	*c3/4.termite sp.*
ɔ̀m≠bùlɔ́	bà≠bòlá	*c1/2.girl*

Generally, rounding harmony only affects vowels which are contrastively [-round], that is, the non-high vowels /a/ and /e/. There are only a handful of words found in the corpus which clearly show the noun-class 1 or 3 prefixes triggering rounding in a noun-stem vowel. This lack of examples may be due to the limitations of the database, and it is assumed that any noun root which fits the pattern, [+high] V_1 and a [-high, -round] V_2, in noun-class 3 and certain noun-class 1 prefixes would likewise undergo progressive rounding. In addition, the "unrounding" of the noun-class 3 prefix vowel before noun roots with /a/ or /e/ in V_1 position, as in Example 314 above, prove to be stem-preserving. Rather than permitting a round-dominant prefix vowel to trigger rounding harmony on a susceptible vowel in the stronger V_1 position, the prefix vowel loses its [+round] feature, whereas, when the susceptible vowel is in the weaker V_2 position, it undergoes rounding harmony triggered by the dominant [+round] prefix vowel.

Rounding harmony also occurs between preverbal morphemes in Nen, Maande and Gunu. In the first two, this rounding harmony is clearly anticipatory, meaning that P2 will trigger rounding in P1. In Maande, the 2s indirect object pronoun (underlined) will trigger rounding on the present tense marker, and in Nen, the future tense marker **ŋɔ** (underlined) will cause rounding in the negative **sá**.

Example 316: Rounding harmony P2>P1 in Maande and Nen

Maande	ò-ŋǎ≠tók-à	*3s-PR draws (water)-FV*
	ì-**ŋɔ̌**-mí **<u>ɔ̀</u>**≠lìtʃ-à[230]	*1s-PR-1s-2sIO≠see-FV*
	ì-**ŋǒ**-mí-**<u>ò</u>**≠téŋ-ít-ì	*1s-PR-1s-2sIO≠greet-FV*
Nen	à-nɔ́ ɲá[231]	*s/he drank*
	á-sá ɲá	*s/he didn't drink.*
	á-**<u>ŋɔ̀</u>** ɲá	*s/he will drink*
	à-**sɔ́-<u>ŋɔ̀</u>** ɲá	*s/he will not drink*

This anticipatory P2>P1 vowel harmony fits Hyman's hypothesis, however, Maande also has a progressive P1>P2 rounding harmony, as does Gunu. In these cases, the subject pronoun (P1) clearly triggers rounding harmony in the tense marker (P2). The trigger vowels are underlined.

Example 317: Rounding P1>P2 (progressive) in Gunu, Maande

Gunu[232]	à-dɛ̀-ᵐbá bɔ̀l-à	*s/he did not arrive*
	<u>ò</u>-dò-ᵐbá bɔ̀l-à	*you did not arrive*
	<u>nò</u>-dò-ᵐbí ìɲè	*you (pl) did not refuse*
Maande	ò-ŋǎ≠tók-à	*s/he draws (water)*
	ù-ŋə̌≠túk-ə	*s/he nourishes (child)*
	<u>ɔ̀</u>-ŋɔ̌≠tók-à	*you draw (water)*
	<u>ò</u>-ŋǒ≠túk-ə	*you nourish (child)*

In Maande, root-triggered rounding harmony is blocked by a high vowel (see section 4.3.2.3), but in progressive P1>P2 rounding harmony, the high (front) vowels are transparent.

3.2.2.4 Height-dominant prefix

Noun-class 3 prefix in Mmala is not only dominant for rounding harmony, but also is height dominant. It has been found with every root vowel except for the [-ATR] high vowels /ɪ/ and /ʊ/. As shown above, the noun-class 3 prefix is either **o-** or **ɔ-** for all vowels except /e/ and /a/, in which cases, the prefixes are unrounded (see Example 314 above). As there are indications that **ɔ-** is dominant for rounding, there are also indications that it is dominant for height. The verb **gɔ̀fɔ́mà** *to win* has a nominalised form **ɔ̀fɔ́m** *winnings, profits*. In Example 318, the root vowel of the nominal form has a distinctly higher F1, averaging 581 Hz and only 462 Hz in the verbal form. A similar phenomenon occurs with the front vowels, although the difference is smaller.

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[230] Following examples from Taylor 1990: 12 with my phonetic transcriptions. Maande has repeated subject pronouns that occur between the tense marker and the indirect object pronoun.
[231] Following examples from Kongne 2011: 136, 140.
[232] Taken from Robinson 1999: 10.

Example 318: Mmala height-dominant noun-class 3 prefix

	gloss	**Ave. F1**	**Ave. F2**
gò≠f**ɔ́**mà	*win*	462	859
ɔ̀≠fɔ́m	*winnings, profits*	581	922
gò≠g**í**gà/gò≠g**ɛ́**gà	*remain, watch*	511	1722
ɔ̀≠gɛ́g	*surveillance, check*	577	1653

While dominant [+ATR] prefixes are limited to closed paradigms and display several exceptional patterns, the same cannot be said for the dominant [+round] noun-classes 1 and 3 prefixes and the noun-class 3 height-dominant prefix in Mmala. The latter, in particular, is rather prominent in deverbal nouns of class 3. These rounding- and height-dominant prefixes are not limited to a closed class of words, and are found wherever the required conditions occur. Hyman's (2005, 2008) premise that a prefix cannot harmonise a root (P2>R) is contradicted by the presence of dominant vowels in other types of vowel harmony found in the Mbam languages.

3.2.2.5 "S2 can harmonise S1, and S1 can harmonise R, but S1 cannot harmonise S2"

Hyman's (2005, 2008) second hypothesis is that, due to anticipatory vowel harmony, the right-hand suffix will trigger vowel harmony on suffixes to its left and the root, but a suffix will not trigger vowel harmony progressively onto another suffix to its right.

The Mbam languages have many examples of S2>S1 vowel harmony. The [+ATR] causative suffix, which occurs at the right edge of the verb, will cause the vowel in the suffix (and the root) to its left to change into its [+ATR] counterpart. In Example 319 below, the [+ATR]-dominant vowels are underlined.

Example 319: S2>S1/R ATR harmony

Maande	≠lɔ̀l-à	*burn*	≠lùl-ìk-**ì**	*cause to burn*
	≠màn-à	*finish*	≠mə̀n-ìs-**ì**	*put to an end*
Mmala	≠dád-ìd	*sing*	≠déd-ìd-**ì**	*cause to sing*
	≠ɔ̀ᵐb-ɔ̀	*grow*	≠ò^{m}b-ìd-**ì**	*cause to grow*
Yangben	≠sɔ́ːk-ɔ̀	*grow*	≠sóːk-òŋ-ìŋ-**ì**	*germinate for*
	≠ɛ̌j	*become*	≠ěj-ès-**ì**	*transform*
Baca	hɔ̀ɔ̀n-à	*sweep*	hòòn-àŋ-**ì**	*cause to sweep*
	tɛ́g-à	*draw water*	tég-ìs-**ì**	*cause to draw water*

Height harmony found in Mmala also has height-dominant suffixes (underlined in Example 320 below). The vowels which undergo lowering are bolded. These, following Hyman's (2005, 2008) hypothesis, are anticipatory. As noted in section 4.3.3.2, the vowel /a/ is opaque in height harmony.

Example 320: Mmala S2>S1 height harmony:

[gʷ≠àd-òg-àn]	/gò≠àd-òg-àn	*rise-CONT*
[gʷ≠àd-**òg-<u>ɛ̀d</u>-<u>ɛ̀d</u>**]	/gʷ≠àd-òg-ɛ̀d-ɛ̀d/	*rise a little*
[gʷ≠ǎd-**ɛ̀g-<u>ɛ̀n</u>**]	/gò≠ǎd-ìg-ɛ̀n/	*seize*
[gò≠dáɲ-**ɛ́g-<u>ɛ̀n</u>**]	/gò≠dáɲ-íg-ɛ̀n/	*put pot on fire*
[gò≠dáɲ-íg-àn-**<u>ɛ̀n</u>**]	/gò≠dáɲ-íg-àn-ɛ̀n/	*put pot on fire-APPL*

In Tuki, Gunu and Elip, the [+ATR]-dominant causative suffix occurs before the final vowel and will trigger ATR harmony progressively on the final vowel. Since the final vowel is in direct contact with the vowel of the causative, and because there are no verbal extensions which occur to the right of the causative, these examples are not the most convincing counter-example of Hyman's hypothesis. The juxtaposition of the vowels of a verbal extension and the final vowel, however, is not sufficient, in itself, to cause the alternation in the final vowel. In Tuki, another verbal extension, **-ɪj**, has a [-ATR] high vowel and as a result does not trigger ATR harmony nor alter the form of the final vowel in any way. The **-ɪj** extension gives evidence that it is the [+ATR] feature of the causative which affects the final vowel progressively, not some other feature connected to a high front vowel. The trigger vowel is underlined in Example 321.

Example 321: Bidirectional ATR harmony from S1 to Rt and S2.

Nen	ò≠fɔ̀l-ɔ̀	*borrow*	ù≠fòl-**<u>ì</u>**-ə̀	*cause to borrow*
	ò≠síp-à	*peel*	ù≠síp-ə́s-**<u>ì</u>**-ə̀	*cause to peel*
	ò≠sàl-à	*chop*	ù≠sə̀l-ə̀n**<u>ì</u>**-ə̀	*chop into pieces*
	ɔ̀≠tát-à	*guard*	ù≠tə́t-ə́n**<u>ì</u>**-ə̀	*guard often/together*
Tuki	≠sɔ́t-ɔ́	*live, dwell*	≠sót-**<u>í</u>**j-è	*caus. to live*
	≠kɔ́t-á	*dry(INTR)*	≠kút-**<u>í</u>**j-è	*caus. to dry*
	≠àt-á	*break (TR)*	≠àt-íj-à	*burst (INTR)*
Gunu	≠gɔ̀s-ɔ̀	*descend(INTR)*	≠gòs-**<u>ì</u>**-ò	*descend (TR)*
	≠ság-à	*dry (INTR)*	≠ség-**<u>ì</u>**-è	*dry (TR)*
Elip	gò≠sɔ́d	*live*	gù≠sód-**<u>ì</u>**-è	*cause to live*
	gò≠bɔ́l-íg	*climb*	gù≠búl-íg-**<u>ì</u>**-è	*raise*

In root-root compounds, vowel harmony can be bidirectional. In Yangben, many verb-verb compounds have an anticipatory vowel harmony, while in Mmala noun-noun and noun-modifier compounds may be either anticipatory or progressive. The root that triggers vowel harmony is underlined in Example 322.

Example 322: ATR harmony in compound words

Yangben:

ò-kànʲɛ́ ètím=è	c1-to.be leave	ùkétímè	*s/he is leaving*
ò-kànʲɛ́ òpók=è	c1-to.be cry	ùkópókè	*s/he is crying*

Mmala:

sógò è^{m}bʲéŋè	other nephew	sé^{m}bʲéŋ	*co-nephew (same generation)*
sógò òŋìnò	other brother-in-law	sóŋìnò	*co-brother-in-law (between in-laws)*
òwú wàmɛ̀	celui 1sPoss	èwɛ̌mḭ	*co-wife*

In Mmala, ATR harmony in compound words may spread bidirectionally from either the right-hand or the left-hand root.

In dominant-recessive vowel-harmony systems, bidirectionality is often assumed. The Mbam languages support this assumption of bidirectionality with only a minor exception.

The only clear example of a directional vowel harmony is found in a post-lexical anticipatory vowel harmony in Nen (Bancel 1999: 8-9). A final [a] or [ə] will optionally assimilate to the tongue-root feature of a word to its right.

Example 323: Post-lexical vowel harmony (Bancel 1999: 9)

	word	**gloss**	**harmonisation**			***gloss***
a)	[nìhɔ́ká]	*axe*	[nìhɔ́k**ə́**	**ní**	m^{w}ə^{n}dú]	*axe of the woman*
	[ìtákà]	*shelf*	[mɛ́nd	ɛ̀ták**ə̀**	sìn]	*I see the shelf*
			1s-pr	shelf	see	
b)	[ù≠mìnə̀]	*taro*	[ùmìn**à**	wà	mə̀^{n}dɔ̀]	*taro of the man*
	[hʲ≠ə́mə́]	*my*	[hʲə́m**á**	hʲɔ̀fɔ̀]		*my fish*

3.2.3 Conclusions

As seen, there are several contradictory ideas concerning directionality in vowel harmony: from Baković (2000), who claims that vowel harmony is stem-controlled and therefore directionality is entirely dependent on the morphological structure of the language, to Halle and Vergnaud (1981), who find that both stem-controlled and dominant vowel harmony can be bidirectional. Hyman (2002, 2005, 2008), while considering vowel harmony to be predominantly root-controlled, finds a tendency towards anticipatory vowel harmony which is not dependent on the morphological structure of the language.

Although the Mbam languages provide strong evidence for bidirectionality because of the existence of [ATR]-dominant prefixes, they also show that there is something

to be said for a bias in anticipatory harmony. Dominant prefixes are few, in few languages, and often restricted to closed sets of function words.[233] Preverbal prefixes and proclitics show predominantly anticipatory harmony. Dominant suffixes may spread to the right, but morphology requires that the suffixes which happen to be dominant are the rightmost in their category.

In the next sections we will look at the domain of vowel harmony, the phonological word, and how the mismatches between phonological and grammatical words affect the spread of vowel harmony.

3.3 The domain of vowel harmony

The criteria for identifying the word are complex. Certain criteria address phonological properties of a "word"; others the grammatical properties. Following Dixon and Aikhenvald (2002), this study will consider the phonological properties as defining the "phonological word" and the grammatical properties as defining the "grammatical word". It is not a given that the phonological and the grammatical criteria coincide, and as a result, there are often mismatches between the grammatical and the phonological word.

3.3.1 The phonological word

Dixon and Aikhenvald (2002: 13) define the phonological word as "... a phonological unit larger than the syllable [...], which has at least one (and generally more than one) phonological defining property...

- *Segmental features* -- internal syllabic and segmental structure; phonetic realisations in terms of this; word boundary phenomena; pause phenomena.
- *Prosodic features* -- stress (or accent) and/or tone assignment; prosodic features such as nasalisation, retroflexion, vowel harmony.
- *Phonological rules* --some rules apply only within a phonological word; others (external sandhi rules) apply specifically across a phonological word boundary."

It is the *Prosodic features*, especially vowel harmony, which are the most germane in determining what the phonological word is in the Mbam languages.

3.3.2 The grammatical word

"A grammatical word..." according to Dixon and Aikhenvald (2002: 19), "... consists of a number of grammatical elements which:

[233] This statement is true for ATR-dominant prefixes, but less so for rounding-dominant or height-dominant prefixes such as those found in Mmala noun-class 1 and 3 prefixes.

- always occur together, rather than scattered through the clause (the criterion of cohesiveness);
- occur in a fixed order;
- have a conventionalised coherence and meaning."

While certain of the Mbam languages have clearly agglutinating verbs, others, in particular Nen and Maande, permit nouns, adverbs or pronouns to be inserted between the verb root and certain preverbal morphemes. In these languages, it is clear that the criterion of cohesion is violated and, as a result, these non-cohesive preverbal elements must be considered as grammatically distinct words.

3.3.3 Clitics

In between the phonological word and the grammatical word are clitics. "Clitics occupy an intermediate position between a full-fledged phonological word and an affix, and may fall into different classes depending on their phonological properties and grammatical characteristics" (Aikhenvald 2002: 42-3). A clitic attaches to an adjacent morpheme and becomes one phonological word with it. Proclitics attach before the host morpheme, and enclitics attach after.

In many of the Mbam languages, the preverbal morphemes are less than full grammatical words and attach to another lexeme and become one phonological word with it. These proclitics will attach either to the verb stem or to another lexeme to the right: an adverb, object noun or pronoun, depending on the language. In Maande in particular, these preverbal proclitics obligatorily undergo vowel harmony if the grammatical word to its right is [+ATR].

Prototypically, the verbal word in Bantu languages has an agglutinative structure. Nurse (2003: 90) summarises this structure as:

Initial- Subj- Neg- T(A)- Obj≠ Root -Extension(s) -Final -Sffx

Hyman (2005: 26) notes that in Bantu languages, the phonological word often consists of the grammatical word and any associated clitics. With some minor differences, this is more-or-less true for the Mbam languages. Nurse (2003: 91) explains that in some Cameroonian languages "... there may be a structural spectrum, from the languages having the one word structure... through languages where this structure is loosening, to languages where some or all of the pre-stem material is not phonologically bound at all..."

Hyman (2005: 27) explains "When a language has enough going on in its P-domains, there can be "mismatches", syntactic conditions, and "look ahead" phenomena..." In this section, we will look into the phonological word in each of the Mbam languages, discuss its structure and explain why there are mismatches.

3.3.4 Vowel harmony and the phonological word

The phonological word is the domain of vowel harmony. Clitics, being morphemes that are a category separate from affixes, tend to attach to a host word and will assimilate to the vowel harmony of that host word. The phonological word, therefore, in the majority of the Mbam languages, consists of an independent grammatical word, such as a verb stem, and may include one or more prefixes and/or proclitics, the latter of which attach to the grammatical word and become one phonological word with it. In languages such as Nen, with an SOV word order, and Maande, which has separate adverbs and pronouns in the verbal construction, the subject-tense complex forms a proclitic, that will attach to the separate object noun, adverb or pronoun to its immediate right.

While the phonological word is the domain of vowel harmony, there seems to be a mismatch between the spread of ATR harmony and the spread of rounding harmony in certain languages. This mismatch, however, is superficial and can be explained. The difference in spread between ATR and rounding harmony is due to three circumstances:

1) Whether rounding-neutral vowels are transparent or opaque;
2) Whether other phonological words occur between the verb stem and the subject concord complex, as happens due to the SOV word order in Nen, and
3) Where the dominant vowel is located (verb stem or preverbal morpheme).

These three circumstances will be discussed in turn in the sections below.

3.3.4.1 Vowel-harmony spread and neutral vowels

In languages like Yangben, Mmala and Elip, which do not have any ATR-neutral vowels but only transparent rounding-neutral vowels, both ATR and rounding harmony spread equally throughout the phonological word. All preverbal morphemes obligatorily undergo both ATR and rounding harmony. In Example 324, the [+ATR] or [+round]-dominant vowel is underlined.

Example 324: Unrestricted ATR and rounding harmony: Yangben

ò-tì-mà-tò≠jòk-àn-ín	màkɛ̀p
c1-NEG-P5-1p≠bring-CONT-APPL	wine
S/he did not bring us wine.	

ù-tì-mè-tù≠**<u>tím</u>**-én	kʲɛ̌sì
c1-NEG-P5-1p≠dig-CONT	hole
S/he did not dig us a hole.	

ò-mɔ́-sì-ŋ≠**<u>kɔ̀l</u>**-ìn nsùnú
c1-P0-DIR-1sIO≠take-APPL clothes
S/he brought me the clothes.

ù-mó-nʲò-**<u>sòl</u>**-ò
c1-P0-DIR≠pour_libation-FV
S/he poured (a libation) there.

Mmala
ò-sà-sì-ŋ≠àl-ìn bʷòlì
c1-P1-DIR-1sIO≠do work
S/he did work here for me.

tì-mè-nè≠**<u>bíŋ</u>**-ín àkɛ̀ ɛ̀yɔ̀mɔ̀
1p-P5-DIR≠enter-APPL into forest
We entered into the forest.

ù-mò-m-bí-**<u>dòl</u>**-ìg-òn-ì
c1-P5-1sIO-REFL-listen-INTENS-APPL-CAUS
S/he caused me to listen.

ɔ̀-sɔ̀-nɔ̀-ŋ-**<u>ɔ̀ⁿd</u>**-ɛ̀n gìlà
2s-P1-DIR-1sIO-buy-APPL clothes
You went to buy me clothes.

ò-sò-nò-ŋ-**<u>od</u>**-in-ìn gìgàd
2s-P1-DIR-1sIO-fill-CONT-APPL sack
You went to fill me a sack.

Elip
ò-wá- nà-sòg-án mbʷíɲì jâm
c1-P4-DIR-tie-CONT goat 1s.POSS
S/he tied my goat there.

ù-wé-sì-**<u>núb</u>**-é jɔ́
c1-P4-DIR-whip-CONT 3s
S/he whipped him here.

bɔ́-sɔ̀-sɔ́≠**<u>ɡɔ́l</u>**-ɔ̀n
c1-P2-NEG≠take-CONT
They didn't take.

ò-mò-só≠**<u>dól</u>**-ìd
2s-P4-NEG≠tickle-DIM
You didn't tickle.

In those languages where neutral vowels may be opaque, rounding harmony spreads differently from ATR harmony. In Maande, all high vowels are opaque to rounding harmony but participate in ATR harmony. The result is that rounding harmony is blocked where ATR harmony is not. In Example 325 below, the bolded segments have ATR or rounding-dominant vowels. The underlined segments have rounding-opaque vowels. Note that the high vowels participate fully in the ATR harmony.

Example 325: Maande rounding-opaque vowels in vowel harmony

tò-<u>tì-</u>ŋá-àsò≠lók-óm-à 1p-NEG-T/A-1p≠understand-SEPAR-FV	*we do not understand*
tù-<u>tì</u>-ŋɔ́-ɔ̀sù≠**lík**-ím-ɔ̀ 1p-NEG-T/A-1p≠be.afraid-POS -FV	*we are not afraid.*[234]
bɔ́-ŋɔ̂≠**bɔ́k**-ɔ́k-ɔ̀ c2-P1≠create-INTENS-FV	*they created.*
bá-<u>tì-</u>ŋɔ̂≠**bɔ́k**-ɔ́k-ɔ̀ c2-NEG-P1≠create-INTENS-FV	*they did not created.*
bó-ŋǒ≠**bòk**-ò c2-PR-scream-FV	*they scream.*
bɔ́-<u>tì</u>-ŋǒ≠**bòk**-ò c2-NEG-PR-scream-FV	*they did not scream.*
ì-ŋǎ≠**kɔ́n**-ɔ̀[235] 1s-PR≠be.sick- FV	*I am sick.*
ì-ŋǎ-<u>mí</u>≠**kɔ́n-ɔ̀** 1s-PR-1s≠be.sick-FV	*I am sick.*

In Yambeta, like Maande, all high vowels are opaque and block rounding harmony. In Example 326 below, the segments with an ATR and/or rounding-dominant vowel are bolded; the opaque vowels are underlined.

Example 326: Yambeta rounding-opaque vowels in vowel harmony

mʷǒ≠**sóp**-ò
c.*mu*.P1≠be.sweet
they (foods) were sweet

mó^{ŋ}gòlòʔ	móònì	má-<u>tì</u>-**ɔ́kɔ̀**	ɔ̀-<u>kù</u>≠**sóp**
c6.mangos	DEM	c6-NEG-be	CONT-INF≠be.sweet

these mangos are not sweet

[234] Examples from Taylor 1990: 11
[235] Taylor 1990: 12, my phonological interpretation.

ɔ̀≠**ɲɔ́ŋ**-ìn...
c1(3s)-want-APPL
s/he wants to...

à-<u>tì</u>≠**ɲɔ́ŋ**-ìn...
1s-NEG-want-APPL
s/he doesn't want to...

ɔ̀≠**sɔ̀k**-ìn	ùdì
c1(3s)≠wash-APPL	3.face

he washes his face

à-<u>tì</u>≠**sɔ̀k**-ìn	ùdì
c1(3s)-NEG≠wash-APPL	3.face

he didn't wash his face

pá-má=<u>mò</u>	**bɔ́k**	mɔɔnɛ́
3p-P1=3sIO	grab	money

they took money from him

In Gunu, providing there are no inserted grammatical words, the subject concord/tense proclitic will attach to the verb stem as its host and undergo full ATR harmony. However, only the tense marker will undergo rounding harmony. Where both ATR and rounding harmony apply, triggered by a [+ATR, +round]-dominant vowel in the verb stem, rounding harmony is not only blocked from spreading onto the subject concord, but ATR harmony is also blocked, so that the subject-concord surface representation is [-ATR, -round]. In Example 327, the shaded cells indicate the spread of ATR and rounding harmony.

Example 327: Gunu pre-stem ATR and rounding harmony

à-	gàá=	sɔ̀g-á	gìlà
c1-	FT1=	wash-FV	cloth

S/he will wash the clothes.

à-	báà=	tʃɔ̀g-ìn-à	gìlà[236]
c1-	P1=	1s.wash-APPL-FV	cloth

She washed the clothes for me.

è-	béè=	**tím**-ín-é	gìbílá
c1-	P1=	1s.dig-APPL-FV	hole

S/he digged the hole for me.

[236] The 1sIO. marker is a homorganic nasal. The /N/+/s/ is realised on the surface as [tʃ]. /N/ + /d/ is realised on the surface as [t]. This phenomenon is more clearly explained in Robinson (1984: 44).

è-	gèé=	**dím**-é	gìbílá
c1-	FT1=	dig-FV	hole

S/he will dig a hole.

à-	bɔ́ɔ̀=	**gɔ́l**-ɔ̀
c1-	P1=	take-FV

s/he took

à-	bóò=	**pòl**-ò
c1-	P1=	pierced
*è-	bóò=	pòl-ò

s/he pierced

Although there is no obvious reason why the subject-concord prefix does not undergo rounding harmony, one possible reason is to ensure the differentiation between the c1 (3s) subject concord and the 2s concord, **o-**.

3.3.4.2 Vowel harmony and phonological-word boundaries

With the exception of post-lexical anticipatory spread such as found in Nen, no phonological word will assimilate to the vowel harmony of another phonological word. This is most clearly seen in Nen which, unique among the Mbam languages, has a SOV word order. The object noun or pronoun customarily occurs between the subject-concord/tense complex and the verb stem. The Nen subject-concord/tense complex is not its own phonological or grammatical word. It is a proclitic, which attaches to whatever host word is to its immediate right, whether that is the verb stem or an object noun or adverb. When the object noun (underlined in Example 328 below) is [+ATR], it generally triggers ATR harmony in the subject concord/tense proclitic to its left. Segments which are [+ATR] are bolded.

Example 328: ATR harmony in Nen pre-stem elements[237]

[mì-	ná=	<u>hìsíní</u>	píl-ín]	~	[**mì-nə́=<u>hìsíní</u>** p!íl-ín]
1s-	P1=	pot	put.down-APPL		

I put down the pot.

[mì-	ná=	<u>sànjá</u>	**<u>sɨ</u>-ək-ín**]
1s-	P1=	mouse	see-INTENS-APPL

I saw the mouse.

Certain adverbs may also occur among the pre-stem morphemes of the verb unit. The subject-concord/tense proclitic will attach to the adverb to its right and if the adverb has a [+ATR]-dominant vowel, the proclitic may undergo vowel harmony. Example 329 illustrates the ATR-harmony assimilation of the subject-concord/tense

[237] Bancel 1999: 8 (with my modifications of the phonetic transcriptions).

complex in the context of two adverbs, **hútú** *quickly* and **mɔ́ŋɔ́** *again*. The [+ATR] morphemes are bolded and the adverbs are underlined.

Example 329: Modification of ATR harmony in Nen verb pre-stem[238]

[mí-	ŋɔ̀=	<u>mɔ́ŋɔ́</u>	**bín-ə́k-ə̰**]	*I will again dance.*
1s	FT2	again	dance-INTENS-FV	

[mí-	**ŋù=**	**bíb-ə́k-ə̀**	tɔ́nə̰̀]	*I will dance again.*
1s	FT2	dance-INTENS-FV	again	

[**mì-**	**sə́=**	**<u>hútú</u>**	àŋɔ́á	bɔ́ŋ-ə̰]	*I did not quickly find you.*
1s	NEG	quicky	2sIO	find-FV	

mì-	sá=	àŋɔ́á	bɔ́ŋɔ́	tɔ̀fə̰̀]	*I did not find you quickly.*
1s	NEG	2sIO	find	quickly	

Unlike in Nen, ATR harmony spreads obligatorily throughout the preverbal morphemes in Maande. Although Maande does not have full object nouns occurring before the verb stem, it does have full object pronouns and adverbs that do. These object pronouns and adverbs are phonological and grammatical words and as such interrupt vowel-harmony spread from the verb stem. Like Nen, however, an adverb with a [+ATR]-dominant vowel will trigger ATR harmony to the left, as is seen with the adverb, **téɲì** *quickly*, in Example 330. The interposing words are underlined. As discussed earlier, Maande repeats the subject pronoun, one occurs with the subject-tense proclitic and the second before the verb stem.

Example 330: ATR harmony in Maande pre-stem elements

tù-	**tì-ŋə́=**	**sù≠**	**lík-ím-ə̀**
1p-	NEG-T/A=	1p≠	be.afraid-POS-FV

We are not afraid.[239]

tò-	tì-ŋá=	<u>hánà</u>	**ə̀sù=**	**lík-ím-ə̀**
1p-	NEG-T/A=	again	1p	be.afraid-POS-FV

We are not afraid again.

tù-	**tì-ŋə́=**	**<u>téɲì</u>**	àsò=	<u>bànó</u>	**bí≠lítʃ-íɲ-ìɲ-ì**
1p-	NEG-T/A=	quickly	1p	2pIO	REFL-notice

We did not notice you quickly.

In Gunu also, adverbs and object pronouns are phonological as well as grammatical words and as such interrupt vowel-harmony spread from the verb stem. The subject-

[238] Examples from Sebineni Alphonsine Flore: p.c. Aug. 2009. According to her, ATR harmony is more likely to spread than not in normal-speed speech.
[239] Examples from Taylor 1990: 11

concord/tense proclitic attaches to the host word to its right. Unlike in Maande, none of the adverbs or object pronouns has a dominant vowel, so they cannot trigger vowel harmony. The negative marker **dì** is illustrated in Example 331 (a); the adverb **gɔ̀nɔ̀** *again*, in Example 331 (b), and the object pronouns in Example 331 (c) below. The interposing lexemes are underlined.

Example 331: Gunu adverb and object lexemes

a)

à=	dì	báà≠	sɔ̀g-à
c1=	NEG	P1	wash-FV

S/he did not wash.

à=	dì	**béè≠**	**dím-è**
c1=	NEG	P1	dig-FV

S/he did not dig.

b)

bá-	báà=	gɔ̀nɔ́	bá≠sìg-à
c2-	P1=	again	REFLEX-insult-FV

They insulted each other again.

bá-	ná=	gɔ̀nɔ̀	**dím-è**	gìbílá
c2-	FT2=	again	dig-FV	hole

They will dig a hole again.

c)

à-	báà=	gʊ̀	**dím-èn-è**	gìbílá
c1-	P1=	2sIO	dig-CONT-FV	hole

S/he dug you a hole

à-	báà=	tʃʊ̀	**dím-èn-è**	gìbílá
c1-	P1=	1pIO	dug-CONT-FV	hole

S/he dug us a hole.

ŋkɔ̀	ᵐbà=	mʊ̀	bɔ́≠sɔ̀n-ìn-ɔ̀
leopard	P3=	3sOBJ	REFLEX≠decide.against-FV

Leopard decided against him.

à-	báà=	tʃʊ̀	**not-on-i-o**
3s-	P1=	1pIO	oblige-CONT-CAUS-FV

S/he made us (do it).

Tuki,[240] Baca and Mbure are the only Mbam languages which have no vowel-harmony processes in the preverbal morphemes. The subject concord is a phonological as well as grammatical word and the tense markers are possibly enclitics which attach to the host word to their left. There are phonological processes

[240] There is one exception in Tuki, which will be discussed below.

which occur between the subject concord and the tense marker, including nasal assimilation to the point of articulation of a following consonant. These morphemes are generally [-ATR], but there are some which are [+ATR]; all are invariable. In Example 332, illustrating the preverbal morphemes of Baca and Mbure, the [+ATR] verb roots are bolded.

Example 332: Lack of vowel harmony in preverbal elements

Mbure	à	sɔ́h-à			*S/he smoked.*
	c1	smoke-FV			
	ì=ní	pâr	mùɾònè		*I pulled up peanuts.*
	1s=FT2	pull up	peanuts		
	w=ă	kàⁿd	ìᵐbàs		*You harvested maize.*
	2s=P2	break	maize		
	à	**pín-è**			*S/he dances.*
	c1	dance-FV			
	ò=ní	**pín-ìt**			*You will dance a little.*
	2s=FT2	dance-DIM			
Baca	jì	tɔɾ-à	àká	nʲòŋò	*I sell at market.*
	1s	sell-FV	PREP	market	
	jì	**kès-ìm-à**			*I sneeze.*
	1s	sneeze-POST-FV (PRES)			
	ŋ̀=gɛ̀	sáᵐb			*I will pay.*
	1s=FT	pay			
	ŋ̀=gɛ̀	**kòᵐb**		bìlìgí	*I will throw away garbage.*
	1s=FT	throw.away		filth	
	ò=m	**fʷák-isi**[241]		kʲàⁿtʃ	*S/he builds me a house.*
	c1(3s)=1sIO	build-CAUS		house	

Tuki, like Mbure and Baca, does not harmonise preverbal tense or subject concord morphemes. These morphemes remain invariable whether the verb is [+ATR] or not, as is seen in Example 333.

[241] The vowel /a/ in Baca has a [+ATR] variant [ɜ]; this word therefore is [òm fʷɜ́kisi kʲàⁿtʃ].

Example 333: Lack of ATR spread in Tuki preverbal morphemes

Tuki[242]	à		**gún-**ámò		*S/he hunts.*
	c1		hunt-PERF		
	à=	má	**gún-ə́**		*S/he hunted.*
	c1=	P2	hunt-FV		
	ò=	ɾə́[243]	mìn-à	mètí	*You swallowed saliva.*
	2s=	P1	swallow-FV	saliva	
	ò=	ɾə́	**húm-ə́**		*You left.*
	2s=	P1	exit-FV		

However, according to Kongne (2004: 118-9), the completive aspect of the P2 (recent past) has two forms: **mâ** and **mə̂**, depending on the ATR value of the verb. Unlike the other preverbal morphemes, Kongne attaches this P2 morpheme to the verb stem, as in Example 334

Example 334: ATR harmony of completive-recent past (P2) in Tuki

Tuki[244]	ă	mâ≠bàn-à	*S/he has already read.*
	c1	COMP.P2≠read-FV	
	ă	**mə̂≠tù^{m}b-ə̀**	*S/he has already bathed.*
	c1	COMP.P2≠bathe-FV	

The completive aspect/recent past, with its obligatory ATR harmony is clearly a prefix of the verb stem. All other preverbal morphemes are invariable and indicate the presence of a phonological word boundary.

3.3.4.3 Rounding-dominant vowels in preverbal morphemes

The spread of ATR harmony also differs from the spread of rounding harmony because of the presence of rounding-dominant vowels in the preverbal morphemes of some Mbam languages. These rounding-dominant morphemes spread only within the proclitic or between the proclitic and its host word.

Both Gunu and Maande have certain subject concords which have a dominant round vowel. In Gunu, for example, 2s **o-** and the 2p **no-** will trigger rounding harmony in an adjacent negative marker. What is most interesting in this situation, however, is that the negative morpheme is **dɪ-**, which contains a transparent neutral vowel that is not generally susceptible to rounding harmony. The reason for this is not clear. However, due to the fact that the vowel *is* transparent rather than opaque makes it

[242] Examples from Kongne Welaze J. 2004: 61 with my phonetic modifications.
[243] Tuki has [+ATR] preverbal morphemes. It does not trigger ATR harmony.
[244] Examples from Kongne Welaze J. 2004: 119.

more apt to rounding harmony. There is nothing impeding its harmonisation, unlike what would be true for an opaque vowel.

In Maande, only the 2s subject and object concords, **o-/ɔ-**, have a [+round] vowel. Like the 2s/2p pronoun vowels in Gunu, these morphemes will trigger the rounding of adjacent preverbal morphemes. In Maande, this morpheme is [-ATR] and is also susceptible to ATR harmony, whereas in Gunu, the second person subject concord is always [+ATR], as in Example 335. The trigger vowels are underlined and the domains in which they operate are bolded in the examples below.

Example 335: Rounding-dominant preverbal morphemes.

Gunu[245]	à=dì	ᵐbá	≠bòl-à	*s/he did not arrive*
	c1=NEG	P3	≠arrive-FV	
	<u>ò</u>=dò	ᵐbá	≠bòl-à	*you did not arrive*
	2s=NEG	P3	≠arrive-FV	
	<u>nò</u>=dò	ᵐbí	≠ìɲ-è	*you (pl) did not refuse*
	2p=NEG	P3	≠refuse-FV	
Maande	ò-ŋǎ	≠tɔ́k-à		*s/he draws (water)*
	c1-PR	≠draw-FV		
	<u>ɔ̀</u>-ŋɔ̌	≠tɔ́k-à		*you draw (water)*
	2s-PR	≠draw-FV		
	ù-ŋə̌	≠túk-ə̀		*s/he nourishes (child)*
	c1-PR	≠nourish-FV		
	<u>ò</u>-ŋǒ	≠túk-ə̀		*you nourish (child)*
	2s-PR	≠nourish-FV		
	ì-**ŋɔ̌**-mí=**<u>ɔ̀</u>**	≠lìtʃ-à[246]		*I see you*
	1s-Pr-1s=2s	≠see-FV		
	ì-**ŋǒ**-mí=**<u>ò</u>**	≠tə́ŋ-ít-ì		*I greet you*
	1s-Pr-1s=2s	≠greet-DIM-CAUS		

High vowels in Maande are generally opaque and block rounding harmony. However, in the case of the anticipatory rounding triggered by the second person indirect-object pronouns, the high front vowels of the first person concord, in Example 335 above, exceptionally do *not* block rounding.

While Nen does not have robust rounding harmony in the preverbal morphemes, it does have a rounding-dominant vowel in the subject concord/tense proclitic. The future tense morpheme **ŋɔ̀-** (underlined below) will cause the negative marker **sá-** to undergo rounding, as seen in Example 336.

[245] Taken from Robinson 1999: 10, my phonological interpretation.
[246] Following examples from Taylor 1990: 12

Example 336: Rounding of negative marker with the future in Nen[247]

[à-	nɔ́		≠ɲá]	*S/he drank.*
[á-	sá		≠ɲá]	*S/he didn't drink.*
[ɔ́	**<u>ŋɔ̀</u>**		≠ɲá]	*You will drink.*
[ɔ̀-	**sɔ́-**	**<u>ŋɔ̀</u>**	≠ɲá]	*You will not drink.*

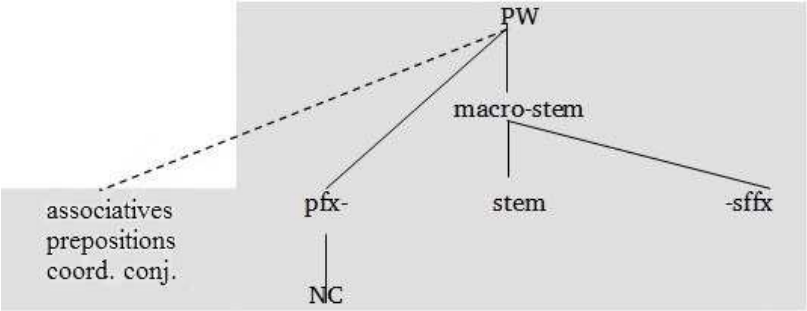
In summary, the differences in the spread of rounding harmony and ATR harmony in the verb can be explained by the location of dominant vowels, the type of neutral vowel (transparent or opaque), and the presence of word breaks and cliticisation. There is variation among the Mbam languages in the position of the grammatical word boundaries in the preverbal morphems. With the exceptions of Yangben, Mmala and Elip, all show grammatical word boundaries in the verb and thus differ from cannonical Bantu in that respect.

3.3.5 Mismatches in the noun phrase

Similar to the mismatches between the grammatical and phonological word in the verb phrase, there are also mismatches between the grammatical and the phonological word in the noun phrase. The associative marker, the coordinating conjunction and prepositions are either proclitics, full lexemes or have characteristics of both, depending on the language.

3.3.5.1 All noun-phrase elements are proclitics

The associative markers, prepositions and the coordinating conjunction are proclitics which attach to the noun to their right. ATR, rounding and fronting vowel harmonies will anticipatorily spread to these proclitics. Only height harmony in Mmala does not spread to these associated proclitics. In Figure 19, the phonological word (PW) is shaded. Solid lines show the constituents of the phonological word and the dotted lines show the association of the proclitics to the phonological word. The vowel-harmony features spread throughout the expanded phonological word.



[247] Kongne 2011: 136, 140

Figure 19: Phonological-word structure: Yangben, Mmala, Elip and Maande nouns

Table 58 gives examples of the participation of associative markers, the conjunction *with* and various prepositions in vowel harmony. In the associative construction, the associative marker (translated by *of* below) agrees with the noun class of the head noun. The examples which undergo vowel harmony are bolded.

Table 58: Vowel harmony in the associative markers, conjunctions and prepositions: Elip

associatives	gʲàⁿtʃì gʲá=mɔ̀ⁿd	*c7.house of the man*
	gìlímb **gʲé=bʷébì**	*c7.tongue of thieves (liar)*
	mìᵐbì **mɔ́=gìdɔ̀ŋ**	*c6.water of the village*
	mègúd **mó=gìgǒ:gè**	*c6.fat of bone*
conjunctions	ŋŋíᵐbíkɔ nà=gʲáⁿsì	*sparrowhawk and cockroach*
	ntʃɔ́ⁿdɔ́ **nè=ŋŋúné**	*antelope and tortoise*
	ŋŋɔ̀jí, nsɔ́g **nɔ̀=gìjɔ̀b**	*lion, hare and hyena*
	màɲán **nò=mǒkʰòné**	*yams and sweat potatoes*
prepositions	ògʷá=gʲàⁿtʃì	*in the house*
	ùgʷé=mèsígè	*in the fields*
	ògʷɔ́=m̀pɔ́m	*in the forest*
	ùgʷó=jòógi	*in the fire*

Mmala:

associatives	gʲàⁿsì gá=móòⁿd	*c7.house of the man*
	gʲàⁿsì **gé=sʲê**	*c7.house of the father*
	màdàdà **mɔ́=jɛ̀ŋɔ̀lɔ̀**	*c6.sap of "Jengolo" tree*
	ɔ̀sɔ́ŋ **wó=gìkʰò**	*c3.soup of the bone (marrow)*
conjunctions	bòdɛ̂d nà=nìdàŋ	*tree and stone*
	àsàg **nè=mèbìn**	*song and dance*
	ɲ̀tʃédí **nɔ̀=gɛ̀bɔ̀sɔ̀sɔ̀**	*diker and toad*
	bòtɔ̂ **nò=bòkónó**	*yam and sweet potato*
prepositions	àgá=gʲàⁿtʃì	*at the house*
	ègé=mèsíg	*at the field*
	ɔ̀gɔ́=nùbɔ̀mɔ̀	*at the river*
	ògó=ɲòɲì	*at the market*

Yangben:

associatives	màkìp má=móòⁿd	*c6.the wine of the man*
	màkìp **mé=sí**	*c6.the wine of the father*
	mèté **mɔ́=nɔ́kɔ̀mɔ̀**	*c6.sap of "nukɔmɔ" tree*
	mèkút **mó=kìkòkó**	*c6.fat of bone (marrow)*
	mèté **mɛ́=kítɛ̀ⁿdɛ́**	*c6.sap of the palm*

conjunctions	èmèkú nà=mànóŋ	*flesh and blood*
	mbùŋ **nè=kìtétì**	*goat and cock*
	ɔ̀mbɔ̀k **nɔ̀=kìkɔ́nd**	*hand and foot*
	nò=mòòᵐb	*with water*
	nɛ̀=pʲɛ̀j	*with the spirits*
prepositions	á=nìtáŋ	*on the rock*
	é=kùsì	*on the ground*
	ɔ́=mɔ̀kɔ̀	*at the cemetery*
	ó=ɲòŋí	*at the market*
	ɛ́=kìtɛ̀ndɛ̀	*on the palm tree*

Maande:

associatives	ìcálì tʃî=báhɔ́lì[248]	*c9.fight of the Bafias*
	ɲìkòtʃà **ɲí=mèhúɲì**	*c5.group of words*
	bàánà **bɔ́=jɔ̀ɔ́kɔ́kɔ́lɔ̀**	*c2.children of the frog*
	bàánà **bó=Bókìtò**	*c2.children of Bokito*
conjunctions	tònàànà nà=bìlàŋà[249]	*pots and clothes*
	ìbálà **nɔ̀=hìsétì**	*leopard and duiker*
	hìsɔ́tì **nɔ̀=jɔ̀ɔ́kɔ́kɔ́lɔ̀**	*duiker and frog*
	òòtʃó **nò=tʃójò**	*fire and smoke*
prepositions	àá=bóŋáᵘdà	*at the feast*
	ɔ̀ɔ́=tʃíìbè[250]	*at the house*
	ɔ̀ɔ́=mɔ̀lɔ̀kɔ̀	*to Moloko market*
	òó=ɲòŋí	*to market*

3.3.5.2 Certain noun-phrase elements are proclitics

In Gunu, the prepositions and the conjunction are proclitics which will always undergo ATR and rounding harmony triggered by the vowels of the following noun, but the associative markers act differently. While they will obligatorily undergo ATR harmony, they only optionally undergo rounding harmony. Due to these tendencies, the associative marker is considered as a separate phonological word which in certain circumstances becomes associated with the phonological word of the noun and undergoes vowel harmony, as in Figure 20.

[248] Taylor 1990: 8. The associative marker is always [+ATR] before [+ATR] nouns in the associative construction. There is variation only before [-ATR] nouns. According to some, a majority of Maande speakers actually use the [+ATR] form of the associative in *all* contexts.
[249] Taylor 1990: 8 with my phonetic transcriptions.
[250] Taylor 1990: 13 with my phonetic transcriptions.

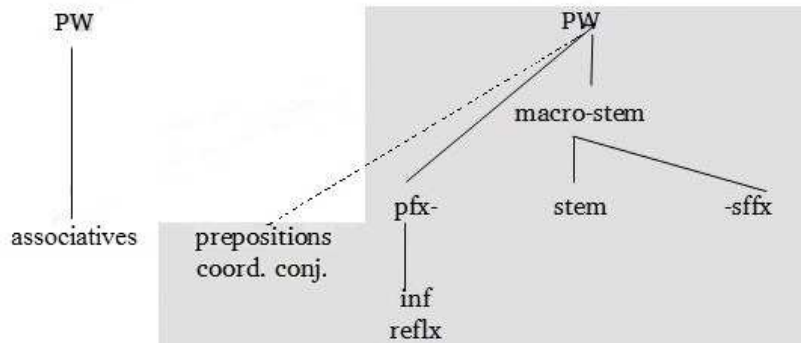


Figure 20: Phonological word structure: Gunu nouns

In Table 59, the examples which undergo vowel harmony are bolded. The shaded cells highlight the optional rounding harmony in Gunu associative markers.

Table 59: Vowel harmony in the associative markers, conjunctions and prepositions: Gunu

associatives	gìlèfì gá gílà	*c7.wripped c7.ASSOC clothing*
	gìsìnì **gé cí**[251]	*c7.matter c7.ASSOC land*
	bìfólìnà bá mòtɔ̀	*c14.cultivation c14.ASSOC the man*
	bìfólìnà **bé ùtʃèé**	*c14.cultivation c14.ASSOC yams*
	mègúdé má/**mɔ́ pɔ́ŋí**	*c6.oil c6.ASSOC the bee*
	gìsìnì ná/**nó nʲòŋì**	*c7.affaire c7.ASSOC the market*
conjunctions	bùgúlè nà=mòtɔ̀[252]	*friendship with a man*
	àlí **nè=bùsùgé**	*s/he is with the meat*
	tʃédì **nɔ̀=ŋkɔ̀i**	*duiker and panther*
	gìsìgì **nò=bòkó**	*monkey and squirrel*
prepositions	nàá=ntímí	*in the field*
	nèé=nùfèⁿdù	*in the ravine*
	nɔ̀ɔ́=gʲɔ̀lɔ̀	*in the granary*
	nòó=nʲòŋì	*at the market*

It is the coordinating conjunction in Nen is a phonological word in itself which never undergoes vowel harmony. The prepositions and the associative markers are proclitics which, in certain circumstances, may undergo ATR harmony. None of these noun-phrase proclitics will undergo rounding harmony (Figure 21).

[251] Robinson 1984: 77.
[252] Robinson 1984: 76.

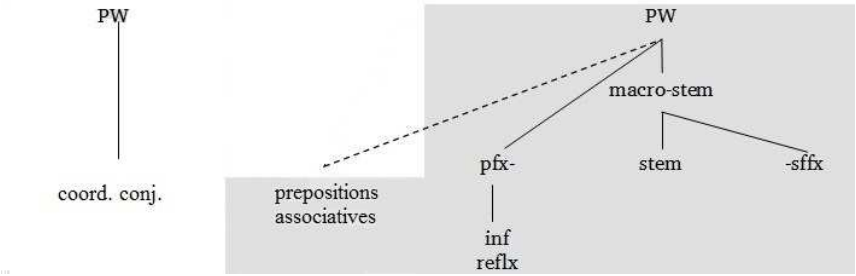


Figure 21: Phonological word structure: Nen nouns

In Table 60, the examples which undergo vowel harmony are bolded. The shaded cells highlight the lack of vowel harmony in the Nen conjunctions. The symbol = indicates the clitic boundary.

Table 60: Vowel harmony in the associative markers, conjunctions and prepositions: Nen

associatives	nìhɔ́ká **ní**=mɔ̀^{n}dɔ̀[253]	*c5.axe c5.ASSOC the man*
	nìhɔ́ká **ní/ní**=m^{w}ə̀^{n}dú	*c5.axe c5.ASSOC the woman*
	məlùk **mà=**p^{w}ɔ̀jḭ́	*c6.wine c6.ASSOC honey*
	bàná **bá**=mɔ̀kɔ́ŋ̰	*c2.children c2.ASSOC the frog*
	bàná **bá/bə́**=mùkójḭ̀	*c2.children c2.ASSOC the co-wife*
conjunctions	ìsɔ̀bɔ́ **nà** mìk^{w}à	*civet cat and leopard*
	hìsélì **nà** mìsèkú	*duiker and elephant*
	nà bɔ̀lɔ̀mɔ́	*with baggage*
prepositions	**ù**=n^{w}ìjì	*to the river*
	ɔ̀=wàjí íbókà	*to their places*
	ɔ̀=nìsɔ́^{m}bɔ́l[254]	*on the termite mound*

In the Yambeta noun phrase, the coordinating conjunction, the prepositions and the associative markers all undergo anticipatory [+ATR] vowel harmony in the context of a [+ATR] noun. However, only the associative markers and the prepositions undergo anticipatory rounding harmony. The coordinating conjunction never undergoes rounding (Figure 22).

[253] Bancel 1999: 7 with phonetic changes according to my databases.
[254] Dugast 1971: 218 (with my phonetic modifications).

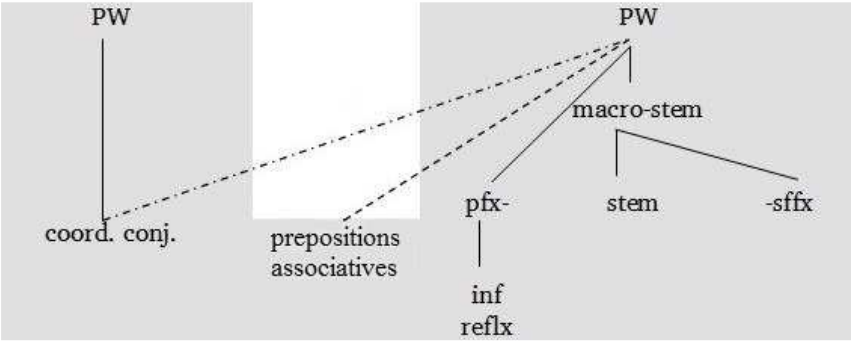


Figure 22: Phonological word structure: Yambeta nouns

In Table 61, the examples which undergo vowel harmony are bolded. The shaded cells highlight the lack of rounding harmony in the conjunctions.

Table 61: Vowel harmony in the associative markers, conjunctions and prepositions: Yambeta

associatives	mɔ̀ɔ́n ò=mɔ̀ɔ̀d	*c1.child c1.ASSOC the man*
	mɔ̀ɔ́n **ù=kìíd**	*c1.child c1.ASSOC the devil*
	pɔ̀ɔ́n pá=mɔ̀ɔ̀d	*c2.children c2.ASSOC the man*
	pɔ̀ɔ́n **pə́=kìíd**	*c2.children c2.ASSOC the devil*
	pɔ̀ɔ́n **pɔ́=pɔ́lɔ́ⁿlɔ́k**	*c2.children c2.ASSOC the deaf-mutes*
	pɔ̀ɔ́n **pó=pólòⁿdók**	*c2.children c2.ASSOC sorcerers*
conjunctions	nà sì	*with father*
	ɔ̀tʷîŋ **nə̀ nììs**	*ear and eye*
	ŋŋòníà nà gʲɔ̌kɔ̀n	*boar and monkey*
	nà pòmóŋŋí	*with sisters*
prepositions	**à=pɔ̀lím**	*to the plantation*
	ə̀=mə̀ní	*to the water (hole)*
	ɔ̀=pìjɔ̀	*in the marshes*
	ò=nʲòn	*to the market*

3.3.5.3 No noun-phrase elements are proclitics

In Tuki, Baca and Mbure noun phrases, no associative marker, preposition or coordinating conjunction will assimilate to the vowel harmony of the noun. These morphemes are considered independent phonological words.

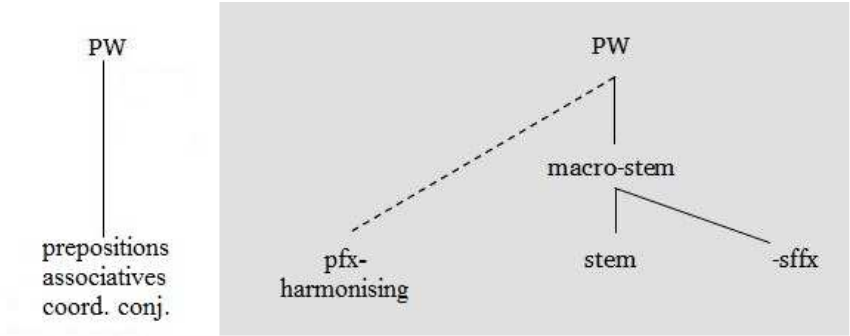


Figure 23: Phonological word structure: Tuki nouns

Table 62 illustrates the complete lack of vowel harmony in the associative markers, conjunctions and prepositions in these three languages. The nouns with [+ATR] vowels are bolded.

Table 62: Lack of vowel harmony in the associative markers, conjunctions and prepositions: Baca

assocatives	kìpíl kí ŋkɔ̀ᵘdɛ̀	*c7.bunch c7.ASSOC bananas*
	tʃɛ́nɛ́ sí **mpʊ̃̀tʃú**	*c10.worms c10.ASSOC stomach*
conjunctions	àká:nd nà mɔ̀ɔ́n	*woman and child*
	àtû nà **nìîs**	*ear and eye*
prepositions	àká **nʲòŋò**	*at the market*
	ò Kàlɔ̀ŋ	*to Kalong (Yangben)*
	ò **Béŋí**	*to Begni*

Mbure:

assocatives	m̀bót dʒì m̀bàs	*c10.seed c10.ASSOC maize*
	m̀bót dʒì **ɾònè**	*c10.seed c10.ASSOC peanuts*
	màbéŋ má **ɲò**	*c6.place c6.ASSOC burial*
conjunctions	ŋ̀káᵘd nì mɔ̀ɔ́n	*woman and child*
	ŋ̀káᵘd nì **nùᵐbét**	*woman and man*
prepositions	kó kìbɔ́ᵐbɔ́	*on the bed*
	kó **ɲtʷè**	*on the head*

Tuki:

associatives	ǹtʃɔ́ ɾá mbàsà	*c6a kernel 6a.ASSOC c9.maize*
	mʷànà wà **mbⁿìnì**	*c1.child c1.ASSOC c9.goat*
conjunctions	tʃĩtí nà mbà:né	*duiker and porcupine*
	kúɾè nà **tʃĩtí**	*turtle and duiker*
prepositions	nà jàⁿdʒè	*at the house*
	nà **wùtú**:	*at night*
	nà kòⁿdò	*in the savannah*
	nà **dévere**[255]	*on the table*

3.3.6 Conclusion

The phonological word is made up of a grammatical word and various clitics which will attach to it, forming a phonological unit. A dominant vowel found within this phonological unit will spread throughout the word, unless blocked by an opaque neutral vowel.

The difference in spread between ATR and rounding harmony in the verb is due to three factors: the presence and type of neutral vowels, phonological word breaks between the subject-concord/tense proclitic and the verb stem, and the location of harmony-dominant vowels. Only one of these factors plays a role in the difference in the spread of vowel harmony in the noun phrase: phonological word breaks. Since neither neutral vowels nor [+ATR] and/or [rounding]-dominant vowels occur outside of the noun, associative markers, conjunctions and prepositions undergo vowel harmony only if they are proclitics which attach to the head noun as its host.

Vowel harmony in the Mbam languages is obligatory in the phonological word and between a clitic and its host. Vowel harmony spreads in the direction of cliticisation. As a result, Baković (2000: 7) is to some degree correct in saying that the morphological structure of the language plays a role in the directionality of vowel harmony.

There is a mismatch between the scope of ATR harmony and that of rounding harmony in the noun phrase in certain languages; this may be the result of a change in the structure of the phonological noun word. Noun-phrase proclitics may be in the process of becoming independent grammatical words rather than proclitics, resulting in an increasingly irregular spread in vowel harmony. In all cases of mismatches in the spread of ATR harmony as opposed to the spread of rounding harmony, the latter is less robust.

[255] Essono 1980: 53. Essono has the coordinative conjunction with a high tone in this example.

While Bantu languages[256] are generally considered to be agglutinating, the Southern Bantoid languages, especially the Grassfields languages tend to be isolating. The Mbam languages are found geographically and historically[257] between these two groups and share characteristics with both groups. For example, in his study of the consecutive morpheme in Bamileke-Ngomba,[258] Satre (2010: 48) summarises that the preverbal morphemes are considered elements of the verb phrase rather than of the verb word.

If the constraint to vowel-harmony spread in the preverbal morphemes is due to a residual historical phonological boundary, the tendency of vowel harmony to spread right-to-left has perhaps, to a greater or lesser extent, eroded the phonological boundaries within the morphosyntactic domain. If the preverbal morphemes are indeed morphosyntactic prefixes, then the anticipatory tendencies of vowel harmony, barring other impediments, will spread throughout the entire grammatical word, which is the case for Yangben, Mmala and Elip.

On the other hand, strong morphosyntactic boundaries signalled by the SOV word order in Nen and the periphrastic tense constructions in Yambeta would be the most obvious and powerful blockages to the spread of vowel harmony in these languages. Nen, despite strong morphosyntactic boundaries, does have anticipatory vowel harmony. Its spread is less powerful, having the tendency to be optional and gradient, rather than the vowel-harmony spread of other Mbam languages with similar morphosyntactic boundaries, such as Gunu and Maande. At the other extreme, strong morphosyntactic boundaries prevent any anticipatory vowel-harmony spread in the preverbal morphemes, as is the case for Tuki, Baca and Mbure.

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[256] Many of the Bantu languages of Cameroon are written in a rather isolating manner. This is especially true for the A70 languages of Ewondo and Bulu and the A40 language of Basaa. My assumption is that the orthography somewhat camouflages the underlying agglutinating nature of these languages.

[257] See Chapter 5 for more discussion on the historical classification of the Mbam languages.

[258] Bamileke-Ngomba [jgo] is a Western Bamileke, Grassfields Bantu language spoken primarily on the Bamileke plateau in the Mbouda Subdivision of the Bamboutos Division in the West Region of Cameroon.