http://dx.doi.org/10.4314/gjl.v10i2.3

PROGRESSIVE VOWEL HARMONY IN GOMOA

John Odoom
Kwasi Adomako

Abstract:

Previous studies on Akan ATR vowel harmony have centered on the concepts of regressive (anticipatory) directionality, very little empirical evidence has been provided for the existence and robustness of progressive ATR vowel harmony in Akan. This paper, therefore, discusses progressive ATR vowel harmony (VH) in Gomoa, a sub-dialect of Fante, one of the major dialects of Akan (Kwa, Niger-Congo). The paper attempts to argue that Gomoa unlike the other Akan dialects has progressive ATR vowel harmony. In this study, we show that the +ATR vowel in the root/stem word triggers rightward to harmonize with the -ATR vowel in the suffix or a following vowel in the same domain. Data gathered, show that Gomoa extensively displays progressive vowel harmony in stem words, verbal suffixes, and nominal suffixes, and also shows +ATR dominance vowel harmony. We discuss this occurrence within the framework of Autosegmental phonology (following Goldsmith, 1976) to show the directionality and spreading ATR harmony. This paper, therefore, contributes to the study of the directionalities of vowel harmony in Akan.

Keywords: Vowel harmony, ATR, Gomoa, Autosegmental Phonology

1. Introduction

This paper discusses progressive ATR vowel harmony (VH) in Gomoa. The paper argues that Gomoa, unlike the other Akan variants, has progressive ATR vowel harmony. The paper adds to the existing knowledge of the directionality of vowel harmony in Akan. Existing literature shows that vowel harmony in Akan phonology is mainly regressive (Berry 1957; Stewart 1967; Schachter & Fromkin 1968; Clements 1981, 1984, 1985;

Dolphyne 1988). Clement (1981) and Baković (2002) have established that Akan ATR harmony involves featurally symmetric assimilations of affixes to root, i.e. it is root-controlled. Stewart (1967), Schachter & Fromkin (1968), and Dolphyne (1988) posit that Akan ATR vowel harmony is based on the asymmetric anticipatory direction of [-ATR] to [+ATR]. In the words of Dolphyne (1988:117);

> vowel harmony in Akan is basically a regressive process in which advanced vowels assimilate unadvanced vowels that precede them.

According to Casali (2012:34), "Akan manifests a number of patterns that superficially appear to involve right-to-left spreading of [+ATR], and there is considerable evidence that harmonic alternations in Akan are based on (anticipatory) assimilation to [+ATR]." He further adds that "...instances of /a/ to the *right* of a [+ATR] vowel (as in sìká 'money') do not surface as [æ]."

Other phonologists like Boadi (1991), Obeng (2000), O'Keefe (2003), Mahanta (2007), Ballard (2010), Owusu (2014), Kügler (2015), and many others emphasize that Akan has more prefixes than suffixes and for that matter, postulate that Akan possesses regressive vowel harmony. Abakah (1978) demonstrates that progressive vowel harmony exists in Boka (Eastern) Mfantse but he did not account for it in detail.

Albeit these scholarly ideas are factual in most of the Akan dialects, however, Gomoa, a variant of Fante, exhibits robust progressive (i.e. left-to-right) vowel harmony. Here, the [+ATR] vowel in the stem spreads rightward to assimilate the [-ATR] vowel in the suffix morphemes. This paper, therefore, discusses progressive tongue root vowel harmony in the Gomoa variant of Fante (henceforth, referred to as Gomoa). It demonstrates that the Gomoa ATR harmony system is distinctive and manifests many features that are not in the other Fante varieties and for that matter, Akan in general.

Data presented in this paper are drawn from a variety of sources, including primary and secondary. In addition, we make use of various examples elicited from twelve adults (including six men and six women) speakers of the Gomoa Mfantse in Gomoa Otapirew, Gomoa Abonyin, and Gomoa Afransi, all in Gomoa Central District in the Central Region of Ghana. One of the author's intuition as a native speaker was useful in the data gathering and analysis processes. The data gathered were categorized, transcribed, and glossed into

English. The descriptive analysis is formalized within the Autosegmental Phonology (AP) framework by Goldsmith (1976).

2 Background

2.1 Gomoa variety and its speakers

Gomoa is one of the major variants of the Fante language. Fante has several known varieties, which makes it different from the other two major dialects of Akan (Asante and Akuapem). These varieties include Gomoa, Agona, Breman, Bɔrbɔr, Iguae, and Anee (western) Mfantse. Abakah (1978, 2016) classifies these major Fante variants into three groups, namely; Boka Mfantse (Eastern Fante), Iguae Mfantse (Cape Coast Fante), and Anee Mfantse (Western Fante). The Boka Mfantse comprises Gomoa, Bɔrbɔr, Ajumako, and Etsii-Kwaman-Kɛse (cf. Abakah 2016). The Iguae Mfantse consists of the Fante spoken in Cape Coast and its environs, and the Anee Mfantse also constitutes Fante spoken in Takoradi and its environs.

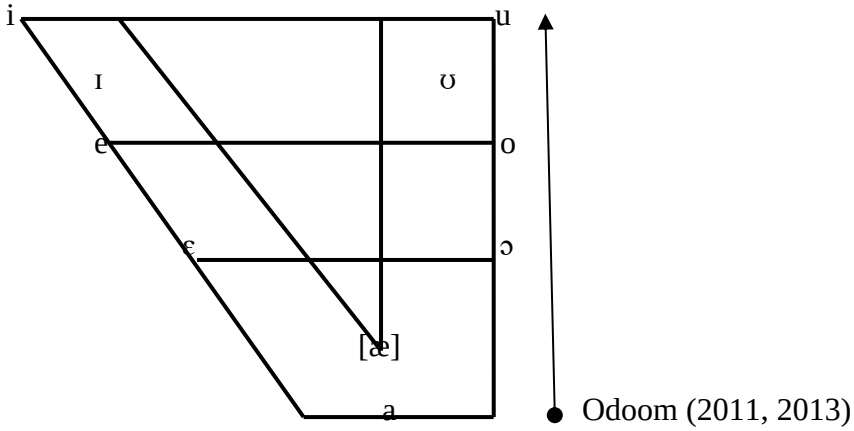
We argue that Gomoa is an autonomous variant of Fante and not just a subcategorize variant of Fante. This is because Gomoa, Agona, Ekumfi, Breman, Bɔrbɔr, Enyan, and Ajumako are all in the said Boka (Eastern) Fante. Thus, in this study, we modify the Boka Mfantse and classify them into three main nodes, namely; Gomoa, Agona, and Breman, where the Gomoa is one node for Ekumfi, Bɔrbɔr, Enyan, and Ajumako Mfantse. This is based on the fact that all these variants are phonologically similar.

The indigenous Gomoa speakers occupy the inland and coastal zone of Gomoa East, West, and Central in the Central Region of Ghana. They share geographical boundaries with the Agona, Breman, Mankessim, Assin, up to the Greater Accra borders. People usually refer to their dialect as a "deep Fante" due to the naturalness of its phonology or pronunciation. The language has several properties that differentiate it from the other variants. Vowel harmony in Gomoa is both regressive and progressive (bidirectional) and not just regressive as generalized by some Akan phonologists. Another disparity to consider between Gomoa and other Fante variants is that the latter display –ATR vowel harmony in most root words and the former shows synchronic +ATR vowel harmony in such words. This variety has received virtually no erudite attention in the Akan literature both in its phonology, syntax, morphology, and other linguistics-related subfields.

2.2 Gomoa Vowel Inventory

Gomoa, as a variety of Fante and for that matter Akan, has ten (10) oral vowels [**i, ɪ, u, ʊ, e, ɛ, o, ɔ, a, æ**] at the systematic phonetic level **(**Schachter & Fromkin 1968; Clements 1976; Dolphyne 1988; Eshun 1993; Abakah 2002, 2006, 2013) and five (5) phonemic nasal vowels [**ã, ĩ, ĩ, ũ, õ] (**Eshun, 1993; Abakah 2002, 2006,2013; Manyah, 2008; Dolphyne, 2006). In terms of their distribution, eight vowels [**i, ɪ, e, ɛ, a, æ, ɔ, o**] occur word-initially in Fante and six [**e, ɛ, a, æ, ɔ, o**] in Akuapem and Asante. All the ten (10) phonetic vowels occur at the word medial position. In Fante, all the ten phonetic oral vowels occur word-finally. However, in Asante and Akuapem, only nine (9) vowels [**i, ɪ, u, ʊ, e, ɛ, o, ɔ, a**] occur word-finally (Abakah, 2006; Odoom, 2011). The vowel [æ] is allophonic, not phonemic. It is in complementary distribution with [a], where [æ] occurs before advanced high vowels and [a] occurs elsewhere (Clements, 1981, 1984; Stewart, 1983; Dolphyne, 1988 Abakah, 2004; and Adomako, 2015). Dolphyne (1988) explains that [æ] is a predictable [+ATR] allophonic variant of [a] before a following [+ATR] vowel. The chart below shows the ten phonetic oral vowels in Akan.

Chart 1: Gomoa Vowel Chart



Based on the tongue root position, Gomoa vowels are grouped into two main features as tabled below. Table (1) shows Gomoa vowels based on tongue root position.

Tongue Root	Front	Central	Back
[+ATR]	/i/		/u/
	/e/		/o/
		/æ/	
[-ATR]	/ɪ/		/ʊ/
	/ɛ/		/ɔ/
		/a/	

Table (2) below also shows the categorization of Gomoa vowels based on the lip posture.

Lip Posture	+ATR	-ATR
[+ROUND]	/u/	/ʊ/
	/o/	/ɔ/
[-ROUND]	/i/	/ɪ/
	/e/	/ɛ/
		/a/

Table (1) and (2) demonstrate the matching pairs of [±ATR] vowels and [±Round] vowels respectively. In Gomoa, the [+ATR] vowels, which are the triggers, target the [-ATR] vowels in the given word domain. That is, the [+ATR] vowels cause the vowel assimilation and the [-ATR] vowels undergo harmonization (Kaye, 1982; Baković,2002; Pavlik, 2003; Mahanta, 2007). Examples in (1a) are words with [+ATR] vowels and (1b) are words with [-ATR] vowels.

1 (a)	**[+ATR]**	**Gloss**	**1(b)**	**[-ATR]**	**Gloss**
(i)	æb**u**r**oo**	'maize'		as**ɔ̃**mdʑq**ɪ**	'peace'
(ii)	**æ**t**u**d**u**r	'gun powder'		**a**bɔd**a**m	'madness'
(iii)	**æ**k**o**k**o**mp**e**	'jumping on one toe'		ŋfɔts**ɪ**	'termites'
(iv)	**æ**s**i**tɕ**i**r**e**	'sugar'		**a**hɔ̃ɔdz**ĩ̃**	'strength'
(v)	k**o**kr**o**m**e**ts**i**r	'thump'		p**ã**ŋk**ʊ**r	'a tall person'
(vi)	kw**e**s**ie**ɲ**ĩ**mp**i**	'by force'		**ɔ**t**ɔ̃ã̃**	's/he is lying'

The [+ATR] and the [-ATR] vowels are in bold faces. The data below also shows [±round] within words. Examples in (2a) are words with [+round] vowel and (2b) are words with [-round] vowels.

2 (a)	**[+Round]**	**Gloss**	**2 (b)**	**[-Round]**	**Gloss**
(i)	nt**u**r**o**p**o**	'a kind of garden egg'		**e**dʑq**a**p**a**dz**ɪ**	'treasure'
(ii)	**o**k**o**s**oo**p**uu**	'kind of shell-fish'		**a**ɛq**ɪ**ɛq**ɛ**ɲ**ĩ**w**æ**	'spectacles'
(iii)	**o**t**o**k**u**r	'a hole'		ŋk**e**m**i**ns**ææ**	'a shirt'
(iv)	k**ɔ**k**ɔ**b**ʊ**	'a fox'		**a**d**a**dʑ**ɪ**r	'time'
(v)	ns**u**k**oo**k**oo**	'lily plant'		kw**e**s**i**l**æ**	'Sunday

The [±round] vowels are in bold faces. Rounding vowel harmony affects both stems and affixes. Gomoa rounding harmony is purely regressive. In a verb stem in which vocalism is [-round, +round], the [+round] vowel spreads right-to-left to assimilate the [-round] vowel(s) in that word domain as shown in the examples below.

3	**UR**	**[+Round]**	**Gloss**
(i)	mɪk**ɔ**	mʊk**ɔ**	'I go'
(ii)	mɪrɪkɔh**ʊ**wu	mʊrʊkɔh**ʊ**w	'I'm going to smoke'
(iii)	mɪrɪbɛt**u**	murubot**u**	'I'm coming to remove it'
(iv)	wɔrɪbɛh**u**ro	woruboh**u**ro	they're coming to hoot'
(v)	mɪ # **o**kunu	mu k**u**n	'my husband'

The triggering vowels are in bold faces. It is discernable that the [+round] vowel in the verb stem spreads leftward to assimilate the [-round] vowels in the prefixal morphemes. In

examples (3i-ii), the high front unrounded vowel /ɪ/ surfaces as high back rounded vowel /ʊ/. In example (3iii-v) too, all the unrounded vowels in the underlying form surfaced as rounded vowels. The unadvanced mid rounded vowel /ɔ/ surfaces as advanced mid rounded /o/. In example (3v), there is a feeding and bleeding process at the output form. The mid-high back rounded vowel /o/ spreads and deletes at the phonetic level (P-level). It is apparent to state that Gomoa vowel harmony is root-controlled. These occurrences are very common in Gomoa phonology. However, this paper mainly focuses on ATR harmonic feature.

3 Literature Review

3.1 Vowel Harmony (VH)

The subject of vowel harmony has received appreciable theoretically informed attention in the Akan and other African languages. Among the pioneering authors who have made such contributions to Akan vowel harmony are Christaller (1933), Stewart (1967), Schachter & Fromkin (1968), Clements (1981, 1985), Dolphyne (1988), among others. It is an archetypical feature of Akan phonology. Vowel harmony is generally defined as a phonological process that groups vowels in a particular language into two or more sets so that in a particular word domain, all vowels are required to share the same feature (Goldsmith, 1990:304). It constrains the distribution of vowels in a language so that vowels in lexical stocks or across words must have identical feature values (Clement 1981, 1985; Goldsmith 1990; Dolphyne, 1988; Abakah, 2012, Cohen 2013). In the view of Clements (1976), vowel harmony consists of a co-occurrence restriction upon the vowels that may occur in a word. In other words, all the vowels in a word must be drawn from one or another of two or more mutually exclusive sets. If within a domain the vowel features are not harmonious, then a harmony process is triggered (Katamba, 1989; van der Hulst & van der Weijer, 1995; Akanlig-Pare & Asante, 2016).

Dolphyne (1988) explains that Akan vowel harmony is a property of the word, and it characterizes a whole word at a time. She argues that Akan undergoes harmony with respect to both tongue root position and lip rounding. She pays much attention to verb stem and the prefix morphemes as discussed in (1a&b) below.

4 (a) Subject-Concord Prefixes in Akan

	Prefix and Verb Stem	**Gloss**	**[±ATR]**
(i)	**o**d**i**	's/he eats'	[+ATR]
(ii)	m**æ**d**i**	'I've eaten it'	[+ATR]
(iii)	**ɔ**d**ɪ**	's/he is called'	[-ATR]
(iv)	m**ẹ**d**ẹ**[1]	'I am called'	[-ATR]

Dolphyne (1988:15)

4 (b) Tense/Aspect Prefix

	Prefix and Verb Stem	**Gloss**	**[±ATR]**
(i)	**o**b**e**h**u**	'he will see'	[+ATR]
(ii)	**o**k**o**h**u**	'he goes and sees'	[+ATR]
(iii)	**ɔ**b**ɛ**k**ọ**[2]	'he comes and fights'	[-ATR]
(iv)	**ɔ**k**ɔ**k**ọ**	'he goes and fights'	[-ATR]

Dolphyne (1988:16)

The datasets above demonstrate asymmetric assimilation of [-ATR] to [+ATR]. The pioneering works of Berry (1957), Stewart (1967), Schachter & Fromkin (1968), Clements (1981, 1985), and Dolphyne (1988) have helped scholars like Obeng (2000), Abakah (2003), O'Keefe (2003), Ballard (2010), Casali (2012), and Kügler (2015) to do further research works in the language. O'Keefe (2003) clarifies that Akan exhibits a strong system of harmony for tongue root position. In his study, he enlightens that a language with vowel harmony should have two sets of vowels with a highly marked co-occurrence. He identifies tongue root position and lip rounding as the two kinds of vowel harmony in Akan as already identified by the Akan phonology pioneers. On the domain this harmony occurs, O'Keefe (2003) identifies three main domains, which are stem, prefixes, and suffixes. He copiously draws examples from Dolphyne (1988) to demonstrate asymmetric anticipatory assimilation (regressive) of [-ATR] to [+ATR] harmony as discussed above.

According to Casali (2012), instances of /a/ to the *right* of a [+ATR] vowel as in sìká 'money' do not surface as [æ] in Akan and this assertion seems to be an overstatement. Meanwhile, Boadi (1981) and Abakah (2002, 2003, 2016) have given instances where

[1] The segment [ẹ] is represented as the unadvanced front high [ɪ] in the IPA chart.

[2] Also, the vowel [ọ] in Dolphyne's example is presently represented as [ʊ] in Akan phonology.

unadvanced low vowel /a/ surfaces as [æ] to the *right* direction of [+ATR] in Gomoa. Thus, the generalized [+ATR, -ATR] fusion of 'sìká' in Akan surfaces as [+ATR, +ATR] in Gomoa.

These works and many others have consistently regarded Akan vowel harmony as an asymmetric anticipatory of [-ATR] to [+ATR] (regressive) process. This paper attempts to provide empirical evidence to suggest an alternative view to this notion, albeit regressive vowel harmony which predominantly exists in Akan, progressive vowel harmony is productive in the Gomoa variety. This paper, therefore, discusses progressive vowel harmony in Gomoa within the Autosegmental framework.

3.2 Directionalities of Vowel Harmony in Gomoa

Directionality plays a major phonological and morphological role in the vowel harmony process. Morphologically, it helps us to know the harmonic domain and the affixes that undergo alternations. Phonologically, it shows the curtain of the harmonic feature, the one which triggers and one which undergoes alternation. There are phonological and morphological domain constraints that control the direction the dominant feature may affect the target vowels to assimilate (Archangeli & Pulleyblank 2007 p.363). Depending on where the dominant feature, also called the trigger, is placed, the vowels to its left or right will be affected. Archangeli and Pulleyblank (2007 p.367) further explain that the root is morphologically the trigger in root-controlled harmony, causing affixes to undergo the alternation of spreading its feature both regressively to the prefixes and progressively to the suffixes. The directions of spreading in vowel harmony are discussed below.

3.2.1 Regressive Directionality

Regressive vowel harmony occurs when in the sequence of segments AB, segment B exerts influence on segment A. In other words, segment B is the assimilator while segment A is the assimilee: A⟸B (Pavlik 2003). Abakah (1993, 2004) also claims that regressive vowel harmony occurs when the [+ATR] vowel in the stem/root word spreads leftward or backward to assimilate the [-ATR] vowel in the prefix, as illustrated below.

Figure 2: *+ATR feature spreading and –ATR feature delinking*

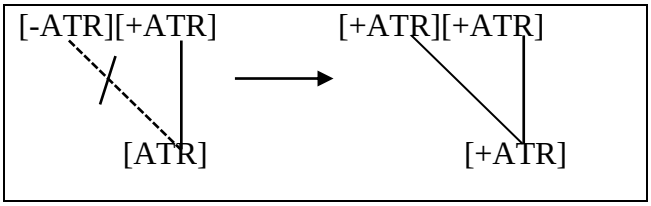


Illustration 2 above shows the right-to-left spreading of the [+ATR] feature to the [-ATR] vowel in the prefix. The [+ATR] vowel in the stem/root word spreads backward to assimilate the [-ATR] in the prefix. The following examples from Akan (O'keefe 2003) show this directionality.

5.	**UR**	**Regressive vowel harmony**	
(i)	mɪ-di	mi-di	'I eat'
(ii)	wʊ-di	wu-di	'you eat'
(iii)	ɔ-di	o-dzi (Fa.)	's/he eats'
(iv)	ɔ-bɛ-tu	o-be-tu (Ak./As.)/obotu (Fa.)	's/he comes and digs it up'

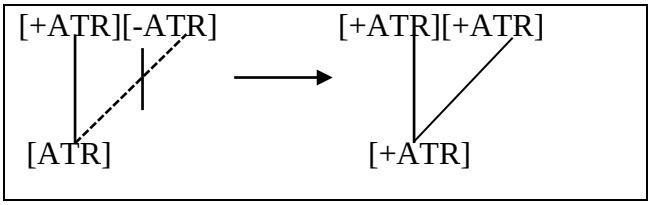
(O'keefee, 2003: 11, 13)

It can be seen from example 2 that the [+ATR] vowel in the stem verb harmonizes with the [-ATR] vowel in the pronominal prefix. This direction of harmonizing is what is termed regressive or anticipatory vowel harmony (see Schachter & Fromkin 1968, Dolphyne 1988, O'keefe 2003, Ballard 2010, and Casali 2012 for evidence of regressive vowel harmony in Akan).

3.2.2 Progressive Directionality

Progressive vowel harmony occurs when in the sequence of segments AB, segment A exerts influence on segment B. In other words, segment A is the assimilator while segment B is the assimilee: A ⇒ B (Pavlik 2003). In a given harmonic feature, say ATR, the [+ATR] vowel in the stem word spreads rightward or carries over to assimilate the [-ATR] vowel in the suffix morpheme or the [-ATR] vowel in the same word domain, as illustrated below.

Figure 3: *+ATR feature spreading and –ATR feature delinking*

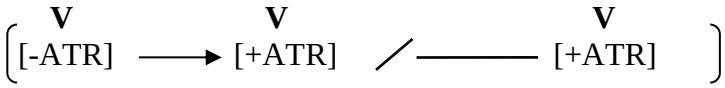


It can be seen that the [+ATR] vowel in the stem word spreads left-to-right to harmonize with the [-ATR] vowel in the suffix or within the same word domain. The following examples from Dagara (Kuubezelle & Akanlig-Pare 2017) summarize this directionality.

6.	**UR**	**Output level**	**Gloss**
(i)	ý́úorɛ	ý́úore	'opening'
(ii)	kõnɛ	kone	'the crying'
(iii)	gɓolʊ	gɓolu	'the penetration'

(Kuubezelle & Akanlig-Pare 2017: 4, 5, 6)

It can be seen from example 3 that the [+ATR] vowel in the root/stem word spreads progressively to assimilate the [-ATR] suffix vowel to surface as [+ATR]. The nominal suffix /ɛ/ and /ʊ/ surface as /e/ and /u/ (see Kuubezelle & Akanlig-Pare 2017 for more information). Akan phonologists such as Dolphyne (1988), Abakah (2002, 2004), O'Keefe (2003), and Adomako (2008) elucidate that, it is [+ATR] feature that spreads to assimilate the [-ATR] vowel in the affixes, and for that matter [-ATR] vowel features, on the other hand, cannot spread to assimilate [+ATR] vowel in Akan. This process is ruled as;



This rule explains that [-ATR] vowel is assimilated to [+ATR] in the environment where [+ATR] follows [-ATR] or [-ATR] precedes [+ATR] in the word or morphemic boundary domains.

3.2.3 Trigger and Target

Trigger and target are the basic elements in vowel assimilation. Contextually, the trigger is a vowel, which assimilates another vowel sound (transfers some features to it) and the target is the vowel that changes (cf. Kaye 1982, Pavlik 2003, Mahanta 2007). In other words, the trigger is the vowel that causes the vowel assimilation, and the target is the vowel that the trigger assimilates or harmonizes with. The trigger is the dominant feature. Van der Hulst &Van de Weijer (1995) claim that the harmonic domain of vowel harmony is the morphological word. Hence, in Gomoa, the vowel that usually causes the vowel harmony of the target vowel is from the stem/root word. The trigger can spread right-to-left or left-to-right to assimilate or value a feature in the target vowel. When vowel harmony follows this nature of spreading, the stem/root word becomes the harmonic domain. The following examples show the trigger and the target vowel.

7. Vata Vowel Harmony	**Output level**	**Gloss**
(i) /pi + lɛ/	pile	'prepare with'
(ii) /ɓlɪ + lɛ/	ɓlɪlɛ	'sing in'

(Mahanta, 2007: 18)

It can be seen from example 4 that the stem-final [+ATR] vowel spreads progressively to assimilate the [-ATR] instrumental-locative suffix /-lɛ/ vowel /ɛ/ to surface as [+ATR] vowel /e/. This means vowel /i/ and /ɪ/ are the triggers and the instrumental-locative suffix vowel /ɛ/ is the target.

4. Theoretical Framework

This study is framed within Autosegmental phonology. Autosegmental phonology was developed within the tradition of the classical Generative phonological theory of Chomsky and Halle (1968), following the works of Williams (1971) and Leben (1973) on tone systems in West African languages such as Margi, Igbo, and Mende. But the principal and remarkable innovations of Autosegmental phonology are exemplified in Goldsmith (1976) in his dissertation to Massachusetts Institute of Technology (MIT).

Autosegmental phonology is not different from the principles of Generative phonology organized in Chomsky and Halle s *Sound Pattern of English* (*SPE*) in 1968. It is a non-linear version of phonological analyses of Generative phonology while SPE is a linear

version of phonological analyses. In this theory, there are conditions governing a well-formed association of tones and vowels such as one-to-one mapping and from left-to-right without unassociated tones or vowels deriving the surface patterns by simple rules operating in local environments. Instead, tone stability occurs; since tones are autonomous, when a vowel is deleted, the tone persists on its tier and maps to an adjacent syllable to ensure maximal association. Phenomena such as stress, the syllable, vowel harmony (Clements 1976), and nasalization, which could not be represented in SPE were addressed in generative phonology so that phonological processes could be expressed in autosegmental terms (Hyman 1982, Clements & Keyser 1983). Therefore, vowel harmony, which involves two vowels showing agreement in the values for a particular feature can be represented within this theory of autosegmental phonology using feature spreading. The main idea of autosegmental phonology is that a segment, which is the abstract representation of sound, can be accounted for under phonological operations of deletion or the spreading. In this framework, phonological representations are made up of more than one linear sequence of segments.

Goldsmith (1976) proposes that non-linear phonological representations should be comprised of multiple tiers of segments, which agree to the different gestures of speech and differ according to the features that are specified for the segments on them. A linear sequence constitutes a separate parallel tier with each tier representing a segment known as autosegment. The tiers are joined by association lines between the segments. The effect of restructuring results in the addition and deletion of association lines. The autosegmental analysis is useful because it can be used to analyze and account for both segments and suprasegments as in this study. Thus, three tiers/levels of representation linked by association lines are employed as follows; the featured tier (harmonic tier), which is represented as ATR, the skeletal tier is represented as X - the intermediate tier that links segments on the featured tier to segments on the segmental tier, the segment tier is represented as second - features are assigned to segments by association lines.

Based on the well-formedness condition for vowel harmony, all vowels are associated with the harmonic feature with lines that link segments on the featured tier to segments on the segmental tier (association lines) defined as follows;

(i) A solid association line indicates pre-linking.
(ii) A broken association line indicates active linking (using spreading).

(iii) A crossed-through association line shows delinking or disassociation
(iv) Brackets show the boundaries of a phonological form.

In the autosegmental representations, assimilation is represented by spreading a feature from one fasten to another, represented by a broken association line. The autosegmental representation makes it possible to display the naturalness of assimilatory processes since it shows how features spread from one tier to affect features on other tiers (van der Hulst, 2016; Kuubezelle & Akanlig-Pare, 2017).

5. Data Presentation and Analysis

5.1 *Progressive vowel harmony within stems in Gomoa Mfantse*

Generally in Akan, when unadvanced low vowel /a/ follows advanced vowel in stem verbs, the unadvanced low vowel /a/ does not undergo harmonization (cf. Dolphyne 1988:20). However, in Gomoa Mfantse, this phenomenon does not exist. The unadvanced low vowel /a/ undergoes harmonization. The [+ATR] vowel in the stem word spreads progressively to assimilate the unadvanced low vowel /a/ to surface as an advanced low vowel [æ] as demonstrated in the following comparative data below.

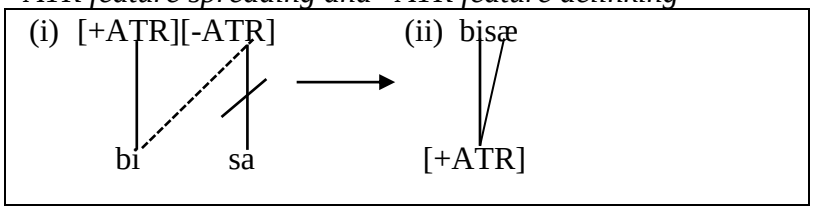
8. Progressive vowel harmony within verb stems

	Stem	**Gomoa**	**Agona**	**Iguae**	**Gloss**
(i)	tua	t^{w}**uæ**	tɥia	tɥia	'to pay'
(ii)	dua	d^{w}**uæ**	dɥia	dɥia	'to plant'
(iii)	fua	f^{w}**uæ**	fɥia	f^{w}uwa	'to plant'
(iv)	kura	k^{w}**u**ræ	k^{w}ura	k^{w}ura	'to hold'
(v)	bisa	b^{j}**i**sæ	b^{j}isa	b^{j}isa	'to ask'
(vi)	tɕia	tɕ**i**æ	tɕia	tɕia	'to greet'
(vii)	hia	h^{j}**ĩ**æ	h^{j}ĩa	h^{j}ĩa	'in need'

It can be seen that the Gomoa variant shows extensive [+ATR] progressive harmony within all the given verb stems. The stem-initial [+ATR] vowel spreads left-to-right to assimilate the unadvanced low vowel /a/, which directly follows it. The unadvanced low vowel /a/ surfaces as an advanced low vowel [æ]. This shows that, in Gomoa, when the unadvanced low vowel /a/ comes after an advanced vowel, the unadvanced vowel is assimilated to the

feature of the preceding vowel. This spreading process is formalized at the systematic phonetic level as; [+ATR, -ATR]$_{stem}$ = [+ATR, +ATR]$_{stem}$. In Agona and Iguae, it is discernable that both advanced and unadvanced vowels co-occur within the stems. It has a stem-initial advanced vowel and stem-final unadvanced vowel and this leads to an exception to the Akan vowel harmony rule (cf. Dolphyne 1988). The Autosegmental representation below shows the [+ATR] feature spreading on [-ATR] features.

Figure 4: *+ATR feature spreading and –ATR feature delinking*



It is not only verb stems that exhibit progressive vowel harmony within stems in Gomoa, noun stems also demonstrate the same phenomenon as illustrated below.

9. Progressive vowel harmony within noun stems

	Stem	**Gomoa**	**Agona**	**Iguae**	**Gloss**
(i)	sika	s**i**kæ	sika	sika	'money'
(ii)	bura	b^{w}**u**ræ	b^{w}ura	b^{w}ura	'well'
(iii)	aduwa	æd^{w}**u**wæ	ed^{w}uwa	ed^{w}uwa	'beans'
(iv)	akuma	æk^{w}**u**mæ̃	ek^{w}umã	ek^{w}umã	'axe'

It can be seen from example (9) that the [+ATR] vowel in the stem word progressively assimilates the unadvanced low vowel /a/ to surface as [æ]. In examples (6iii-iv), the [+ATR] vowel spreads leftward in Agona and Iguae Mfantse but spreads bidirectionally in Gomoa Mfantse. This shows that Gomoa exhibits both regressive and progressive vowel harmony as discussed already. Following the regressive spreading of the [+ATR] vowel, it can be seen from examples (9iii-iv) that, while the unadvanced stem initial low vowel /a/ surfaces advanced low vowel /æ/ in Gomoa, it surfaces advanced mid-high vowel in Agona and Iguae Mfantse.

The analyses so far show that progressive vowel harmony exists in Akan, specifically in Gomoa Mfantse. Therefore, the description of some phonologists (Berry 1957, Stewart

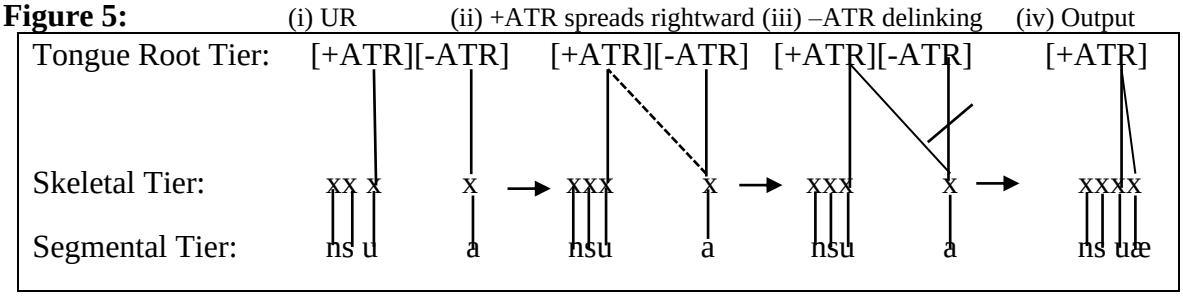
1967, Schachter & Fromkin 1968, Clements 1981, Dolphyne 1988, Casali 2012) that Akan does not exhibit left-to-right vowel harmony is faulted. According to Dolphyne (1988:20), there are instances where advanced and unadvanced vowels co-occur in stem words, particularly, the unadvanced low vowel /a/ occurring after advanced vowels, and this phenomenon violates the vowel harmony rule. We have seen that these phenomena exhibit full progressive harmony in Gomoa Mfantse.

Another phonological related variant of Fante known as Bɔrbɔr Mfantse also demonstrates progressive vowel harmony. Bɔrbɔr and Gomoa fall within the Bɔka Mfantse as classified by Abakah (1978, 2016). Let us consider the examples below.

10.	**Root**	**Gomoa**	**Bɔrbɔr**	**Gloss**
(i)	sika	sʲikæ	sʲikæ	"money"
(ii)	bisa	bʲisæ	bʲisæ	"to ask"
(iii)	aɲiwa	æɲĩwæ	æɲĩwæ	"eye"
(iv)	nsu a	nsʷu æ	nsʷu æ	" it's water"
(v)	awi a	æɥi æ	æɥi æ	"s/he is a thief"
(vi)	ayi a	æji æ	æji æ	"it's funeral"

All the examples demonstrate progressive vowel harmony. The [+ATR] vowel in the stem progressively assimilates the [-ATR] vowel /a/ to surface as [+ATR] vowel [æ]. The [+ATR] feature again spreads leftward to harmonize with the stem-initial unadvanced vowel to surface as [æ] as illustrated in the autosegmental representation below.

Figure 5:



It is discernable from Fig. 5 that the [-ATR] low vowel /a/ has surfaced as a [+ATR] low vowel /æ/ due to the progressive influence of the stem-initial advanced feature.

5.2 Progressive vowel harmony in verb stem and past suffixes

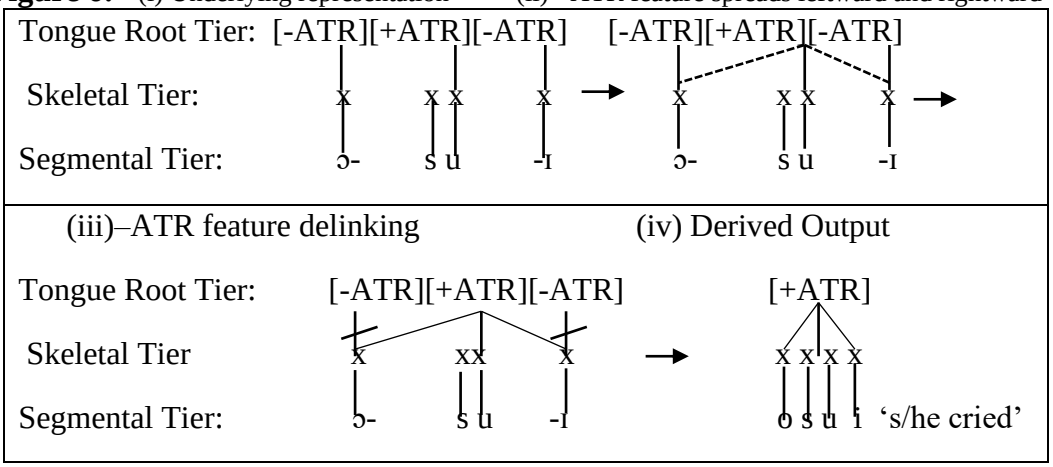
In Gomoa, the past suffix has two different realizations. It can be realized either as /-i/ or /-ɪ/ for intransitive verb stems. Using the harmonic feature ATR, the variant /-i/ occurs after [+ATR] vowels verb stems, and the other variant /-ɪ/ too occurs after [-ATR] vowels in verb stems. Odoom (2011, 2013, 2020) explains that the underlying past suffix morpheme /-ɪ/ is progressively assimilated to advanced high front vowel /-i/ when preceded by [+ATR] vowel in the verb stem. The [+ATR] vowel in the verb stem spreads rightward to harmonize with the [-ATR] vowel in the underlying form to surface as [+ATR] at the phonetic level (PL). These two variants are distinct only in the advancement of the tongue root, and that is the feature we have used to describe them. Example (11) below shows the progressive vowel harmony between verb stems and suffixes.

11.	**UR**	**Gomoa**	**Gloss**
(i)	ɔ-su + -ɪ	o-s^{w}ũ-ĩ	's/he cried'
(ii)	ɔ-bu + -ɪ	o-b^{w}u-i	's/he broke it'
(iii)	ɔ-di + -ɪ	o-dzi-i	's/he ate it'
(iv)	ɔ-da+ -ɪ	ɔ-da-a	's/he slept'
(v)	ɔ-kasa +-ɪ	ɔ-kasa-a	's/he talked'
(vi)	ɔ-pɪra +-ɪ	ɔ-pra-a	's/he swept'
(vii)	ɔ-tɞɛ+ -ɪ	ɔ-tɞɛ-ɛ	's/he shared it'

The [-ATR] high suffix morpheme /-ɪ/ surfaces as advanced high vowel /-i/ irrespective of the lip posture of the triggering vowel after [+High, +ATR] verb stem as shown in examples (11i-iii) above. The [+High, +ATR] vowel in the verb stem spreads progressively to assimilate the underlying [+High, -ATR] suffix vowel to be realized as [+High, +ATR] at the phonetic level. This leads to progressively advanced height harmony. Height harmony occurs when the [+High, +ATR] feature precedes the [+High, -ATR] vowel. The [+High, +ATR] feature spreads rightward to assimilate the [+High, [-ATR] vowel to surface as [+High, +ATR] as shown above. Stahlke (1971) referred to it as "Equal-Height Condition". This makes all vowel sequences at the systematic phonetic level have only vowels that are identical at least as to tongue height and tongue root position.

In examples (11iv-vii), since the vowel in the verb stem is [-ATR], it progressively agrees with the underlying [-ATR] suffix vowel morpheme. The [-ATR] feature in the suffix morpheme deletes and is replaced by the lengthening[1] of the same stem-final [-ATR] vowel at the output level. We, therefore, formalized the [+ATR] spreading in the autosegmental representation below.

Figure 6: (i) Underlying representation (ii) +ATR feature spreads leftward and rightward



In Fig. 6, the [+ATR] vowel in the verb stem harmonizes with the 3rd person singular subject pronominal and is realized as [o] at the phonetic level. The same [+ATR] verb stem vowel spreads left-to-right to harmonize with the [-ATR] past suffix morpheme to surface as [i] at the derived output. The [u]~[i] harmony is influenced by the height of the preceding advanced vowel.

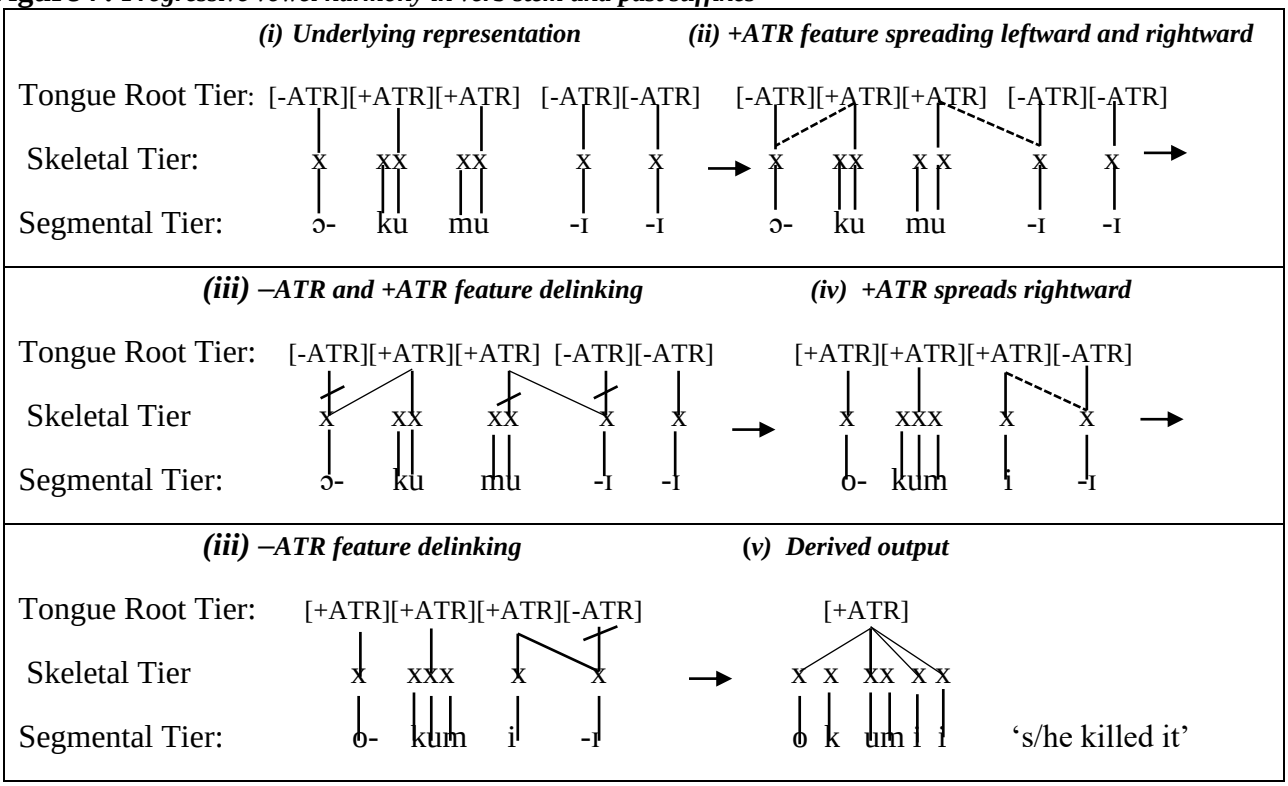
Following the verbal suffix morphemes, Gomoa moreover displays identical lengthening past suffix morphemes [-ii] or [-ıı] after intransitive verb stems which have nonvowel sonorants at its final segment. Similarly, morpheme /-ii/ harmonizes with [+ATR] verb stems, and the morpheme /-ıı/, on the other hand, harmonizes with [-ATR] verb stems as discussed already. The suffix /-i/~/-ii/ occurs in the same phonological environment, while /-ɪ/~/-ıı/ occurs in the same phonological environment. These verbal suffix morphemes are controlled by [+ATR] stem/root word, as demonstrated in example (12) below.

12.	**UR**	**Gomoa**	**Gloss**
(i)	ɔpuowu+-ɪɪ	op^{w}oɥii	's/he barked'
(ii)	ɔkumu + -ɪɪ	ok^{w}umĩĩ	's/he killed it'
(iii)	ɔfiri + -ɪɪ	of^{j}irii	's/he credited it'
(iv)	ɔdʑimi + -ɪɪ	odʑimĩĩ	's/he fooled'
(v)	ɔnʊmʊ + -ɪɪ	ɔnʊ̃mĩĩ	's/he drunk'
(vi)	ɔkɪnkanɪ + -ɪɪ	ɔkɪŋkaĩĩ	's/he read it'
(vii)	ɔnantsɪwʊ+ -ɪɪ	ɔnãntsɪɥɪɪ	's/he walked'

The dataset above is divided into two main features. Examples (12i-iv) display [+High, +ATR] harmony and the examples in (12v-vii) demonstrate [+High, -ATR] harmony. As discussed in data (12), the stem-final [+High, +ATR] or the trigger, spreads rightward to harmonize with the underlying [+High, -ATR] suffix morpheme to surface as [+High, +ATR] feature as shown in examples (12i-iv). In example (12v-vii), since the trigger in the verb stem and the underlying suffix morpheme have the same [-ATR] feature value, they agree in harmony.

Moreover, all the underlying word-final high vowels are deleted at the systematic phonetic level. This makes the non-vowel sonorants emerge as a word-final consonant (Abakah 2012). This emphasizes that no morpheme in Akan is consonant-final at the systematic phonemic level and, for this reason, any analysis that posits an underlying consonant as a morpheme-final consonant starts on a faulty note (Abakah, 2005:7). We formalize example (12ii) within the Autosegmental representation as seen below.

Figure 7: ***Progressive vowel harmony in verb stem and past suffixes***



5.3 *Progressive Vowel Harmony in Verb Stem and Nominal Suffixes*

In Gomoa, some nouns are derived from verbs. These derived nouns are simply acquired by adding nominal affixes. The nominal prefixes are either vowels [i-, e-, a-, o-, ɔ-, ɪ-] or homorganic nasal [n-, m-, ŋ-, ɱ-, ɲ-]. In addition to the nominal suffixes [-fʊ, -nʊm, -wa, -ba, -ɲi], Gomoa has other derived nominal suffixes [-ɪ, -ɪɪ] for verbal nouns. When these underlying nominal suffixes are preceded by [+ATR] vowel from the verb stem, they surface as /-i/ or /-ii/, in harmony with the ATR value of the stem-internal vowel. The ATR value of the suffix vowel is determined by that of the stem-internal vowel. The same process applies to the nominal vowels. The following examples show the verb stem and nominal suffix harmony for derivational nouns.

13.	**UR**	**Gomoa**	**Gloss**
	P V S		
(i)	ø fitsi + ɪ	fʲitsĩĩ	'gimlet'
(ii)	a +pue + ɪ	æpʷuwei	'eastern'
(iii)	N +bubu+ ɪ	mbʷubʷui	'paralysis'
(iv)	N +butuwu+ɪɪ	mbʷutʷuɥii	'kneeling'
(v)	a +tsɪna + ɪ	atsɪnaɪ	'sitting place'
(vi)	a +nʊm + ɪɪ	anʊ̃mĩĩ	'river bank'
(vii)	N+tsɪ + ɪ	ntsɪɪ	'hearing'

It is discernable from the above data that the stem-internal ATR feature of the verb progressively assimilates the [+High, -ATR] feature of the suffix morpheme at the phonetic level as shown in examples (13i-iv). In examples (13v-vii), since the verb stem stem-final vowel is [-ATR], it progressively agrees with the [+High, -ATR] feature of the suffix morpheme. This makes the harmony span have height and ATR feature value.

Comparatively, the occurrence of progressive vowel harmony in verb stem and suffixes in Gomoa has similar counterparts in the Asante Twi dialect. In Asante, the nominal suffixes -e/-ɛ, -o/-ɔ agree in lip position with the vowel of the noun stem (Dolphyne, 1988) as demonstrated in the examples below.

14 (a)	**UR**	**Gomoa**	**Asante**	**Gloss**
(i)	owu	owu	owu-o	'death'
(ii)	nsu	nsu	nsu-o	'water'
(iii)	etu	itu(r)	etu-o	'gun'
(iv)	kʊkʊ	kʊkʊ	kʊkʊ-ɔ	'chest'
(v)	dʊdʊwʊ	dʊdʊw	dʊdʊ-ɔ	'stamina'
(vi)	ɛbʊ	ɔbʊ/abʊbaa	ɛbʊ-ɔ	'stone'

It can be seen that Asante Twi exhibits progressive rounding suffix harmony. The suffix morphemes agree in lip position and tongue root with the vowel of the noun stem. This makes the examples in (14i-iii) surface as [+Round, +ATR] and the examples in (14iv-vi) emerge as [+Round, -ATR] progressive vowel harmony. Moreover, in data (14b) below,

the examples in (14i-iii) demonstrate [-Round, +ATR] feature value, and that of the (14iv-vi) show [-Round, -ATR] feature value.

14(b)

	UR	**Gomoa**	**Asante**	**Gloss**
(i)	efi	ofʲie	efʲi-e	'house/home'
(ii)	esi	isʲiw	esʲi-e	'anthil'
(iii)	dʑquwu	idʑquw	edʑqi-e	'louse'
(iv)	asɪ	asʲɪ	asʲɪ-ɛ	'the base of
(v)	kɛsɪ	kɛsʲɪ	kɛsʲɪ-ɛ	'big'
(vi)	adɪ	adzɪ	adʲɪ-ɛ	'thing'

We, therefore, conclude that the nominal suffix progressive harmony in Gomoa occurs with the [+High, -ATR] feature of the suffix morpheme and that of Asante Twi occurs with [±Round, ±ATR] feature of the noun stem.

6. Conclusion

This paper discussed the robustness of progressive vowel harmony in Gomoa Mfantse. The paper tried to challenge a long-held view about the directionality of vowel harmony in Akan. This is because the previous studies have been focused on the concepts of regressive (anticipatory) directionality, and very little empirical evidence has been given for the existence of progressive ATR vowel harmony in Akan. We demonstrated that the [+ATR] vowel in the stem verb or noun triggers the harmonic process and targets the [-ATR] vowel(s) in the suffix morpheme. We discussed that the [+ATR] in the stem/root word triggers rightward to harmonize with the [-ATR] vowel in the suffix or a following vowel in the same domain [VH=$(-ATR)_{prefix}$ + $(+ATR]_{stem}$ + $(-ATR)s_{uffix}$= [(+ATR, +ATR, +ATR)]. We moreover added that there is a process of compensatory lengthening when forming past tense with verb stems whose root final vowel is [-ATR] in Gomoa Mfantse.[3] The various major domains of progressive vowel harmony discussed in this paper included stem/root words, verb stems and verbal suffixes, and noun stems and nominal suffixes.

[3] Compensatory lengthening (CL) refers to processes where deletion of a segment leads to lengthening of another segment (Campos-Astorkiza, 2005). It can be seen from examples (8iv-vii) that the deletion of the underlying suffix high vowel leads to the lengthening of the stem-final vowel, which has [-ATR] feature value as the delinked segment.

Additionally, the paper comparatively revealed that there is evidence of progressive vowel harmony in Bɔrbɔr Mfantse[4] and Asante Twi. The paper added that the Gomoa nominal suffix progressive harmony occurs with the [+High, -ATR] feature value while the Asante Twi nominal suffix progressive harmony occurs with [±Round, ±ATR] feature value. Therefore, this paper contributed to the study of the directionality of vowel harmony in Akan.

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