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Tone and intonation in Akan

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Abstract: This chapter provides an account of the intonation patterns in Akan (Kwa, Niger-Congo). Tonal processes such as downstep, tonal spreading and tonal replacement influence the surface tone pattern of a sentence. In general, any Akan utterance independent of sentence type shows a characteristic downtrend in pitch. This chapter proposes that Akan employs a simple post-lexical tonal grammar that accounts for the shapes of an intonation contour. The unmarked post-lexical structure is found in simple declaratives. The downward trend of an intonation contour is shaped by local tonal interactions (downstep), and sentence-final tonal neutralization. In polar questions, an ι-phrase-final low boundary tone (L%) accounts for the intensity increase and lengthening of the final vowel compared to a declarative. Complex declaratives and left-dislocations show a partial pitch reset at the left edge of an embedded ι-phrase. Underlying lexical tones are not affected by intonation with the exception of sentence-final H-tones.

Keywords: downstep, low boundary tone, polar question, constituent-question, imperative, complex declarative, Akan, pitch register reset, prosodic phrasing, tonal neutralization, avoidance, lax question prosody

1. Introduction

This chapter provides an account of the intonation patterns in the tone language Akan. Akan belongs to the Kwa branch of the Niger-Congo family and the name also refers to the largest ethnic group in Ghana (Nkansa-Kyerematen 2004); the language is spoken by about 8.3 million people in Ghana and some eastern parts of the Ivory Coast (Christaller 1933; Lewis 2009). Akan consists of several dialects, some of which are more mutually intelligible than others (Schachter & Fromkin 1968). The dialects differ at the level of segments as well as tones (cf. Cahill 1985; Dolphyne 1988; Dolphyne & Kropp Dakubu 1988; Abakah 2000, 2005b; Abakah & Koranteng 2007 among others). Asante Twi is one of the three largest dialects, and "Akan is growing in its influence as a potential national language" of Ghana (Osam 2003: 3). The data discussed in this chapter are based on the Asante Twi dialect, and we will use Akan as a cover term throughout the chapter.[1]

The tone system of Akan is well studied (Stewart 1965; Schachter & Fromkin 1968; Clements 1983; Dolphyne 1988; Abakah 2005a, 2005b, 2010a; Paster 2010). Likewise, the interaction of tone and morpho-syntactic structure (Abakah 2010b; Abakah & Koranteng 2007; Paster 2010; Genzel 2013), the interaction of tone and segmental aspects (Marfo 2004; Manyah 2006, 2014), as well as the interaction of tone and information structure (Genzel & Kügler 2010; Kügler & Genzel 2012; Genzel 2013) have been studied. A number of studies have been concerned with tonal interactions, in particular downstep (Clements 1979; Stewart 1993;

[1] The acoustic data presented in this chapter (except for Figure 3) come from four native speakers of Asante Twi (two females and two males) who were recorded in Ghana in 2014. The speakers were in their mid-twenties and born and raised in the region where Asante Twi is spoken. All of them are fluent in English. Some parts of the sentence materials were taken from Genzel (2013), Genzel & Kügler (2016) and Kügler & Genzel (2012), and were partly adapted for the purposes of the present study. Data annotation and acoustic F0 analysis were conducted in Praat (Boersma & Weenink 2014). The data were hand-labelled at the levels of the syllable and segments. F0 means of syllabic nuclei were measured; these were either a vowel or a sonorant consonant (cf. Section 2). Stylized F0 contours present time-normalized F0 values averaged across the four speakers. The acoustic raw data in Figure 3 are from Genzel (2013).

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Dolphyne 1994; Abakah 2000, 2002; Abakah, Amissah & Ofori 2010; Genzel & Kügler 2011; Genzel 2013).

Genzel (2013) intensively studied the intonation of Akan in her dissertation. We will base our analysis of intonation on Genzel (2013) and extend the proposal to the following simple intonational grammar for Akan. First, a low intonation phrase boundary tone (L%) signals polar questions. In particular, the intonation in polar questions has been reported to exhibit sentence-final low pitch, lengthening of the sentence-final vowel and an intensity increase on the final vowel (Saah 1988; Rialland 2007, 2009; Saah & Dundaa 2012; Genzel 2013; Genzel & Kügler 2016). Second, an intonation phrase is associated with an initial high and final low pitch register tone (h and l, respectively) (Genzel 2013), which together with a phonetic implementation algorithm à la Liberman & Pierrehumbert (1984) account for the general downward trend in pitch in all Akan sentence types. This general downtrend in pitch, which is found in many West African tone languages, led Welmers (1959) to classify languages such as Akan as terraced-level tone languages (cf. also Clements 1979). Third, our data on complex declarative sentences suggest that the cues pitch reset and pause at the boundary of embedded clauses signal complex sentence structure.

This chapter is structured as follows. Section 2 introduces the basic tone patterns of Akan, showing that tone spreading affects surface tonal patterns and that floating tones as grammatical morphemes appear on the surface changing underlying lexical tone patterns. In addition, the well-known phenomenon of pitch downtrend over the course of an utterance, i.e. downstep or downdrift, is shown to have a crucial influence on the intonation in Akan. Section 3 presents the intonational patterns of declaratives, interrogatives and imperatives. All sentence types show a general downtrend in pitch over the utterance. Complex declaratives in contrast to simple declaratives show a pitch reset accompanied by a pause before the embedded clause. Interrogatives appear to end low in pitch, and, in addition, polar questions show a characteristic lengthening and increased intensity of the phrase-final vowel, which is interpreted as a low intonational phrase boundary tone. Finally, similar to declaratives and interrogatives, imperatives show a general downtrend in pitch. Section 4 briefly presents data on the prosodic expression of focus, where speakers employ a strategy of pitch register lowering, and in spontaneous speech, glottal stop insertion. Section 5 concludes the chapter and presents a table listing the individual intonational and prosodic events and their distribution in Akan.

2. Tonal patterns and tonal processes in Akan

Akan can be classified as a [+tone] and [–stress] language according to the classification of word prosodic systems of Hyman (2006).[2] The [+tone] feature characterizes Akan as a language in which "an indication of pitch enters into the lexical realization of at least some morphemes" (Hyman 2001: 1368 based on Welmers 1959: 2). Lexical tones are level tones characterizing Akan as a level tone language (Pike 1948). Unlike many Bantu languages, which are claimed to represent only H-tones underlyingly (cf. Myers 1998; Kisseberth & Odden 2003; see also the chapters in this collection on Bemba, Kula & Hamann this volume, on Chichewa and Tumbuka, Downing this volume, on Chimwiini, Kisseberth this volume, on Shingazidja, Patin, this volume, and on Tswana, Zerbian this volume), Akan distinguishes between lexical L-tones and H-tones, transcribed as [`] and [´], respectively (Dolphyne 1988).[3] Tones both distinguish word

[2] There is no phonetic indication of Akan having word stress (Dolphyne 1988; Purvis 2009; Anderson 2009). Note however that Christaller (1933: XXVIII) characterized stress in Akan as "emphasis put on a syllable", the details of which remain unclear though.

[3] All speech data of this chapter appear in standard IPA transcription. Glossing is based on the Leipzig Glossing Rules (Bickel et al. 2008). The following abbreviations are used in the glosses: ASS=associative marker; COMPL=completive; COORD=coordination; DEF=definite; DIM=diminutive; FM=focus marker; FUT=future; GEN=genitive; HAB=habitual; IMP=imperative; N=noun class prefix; NEG=negation; OBJ=object;

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meanings (1) and carry grammatical function (2) (Dolphyne 1988). Among other things, the grammatical function of tone relates to the expression of verb aspect, tense, and argument structures of the verb. For instance, in (2), the final tone of the verb determines verb aspect: the habitual form (2a) is characterized by a H-tone, and the stative form (2b) by a L-tone. The underlying lexical H-tone is post-lexically replaced by a grammatical tone (Paster 2010). The grammatical function of tone in Akan plays a more important role than its lexical function (Dolphyne 1988).

(1) a. pápá ‘good’
b. pàpà ‘fan’
c. pàpá ‘father’ (Dolphyne 1988: 52)

(2) a. kòfí d͡ʑìná hó
Kofi stand.HAB there
‘Kofi stands there.’
b. kòfí d͡ʑìnà hó
Kofi stand.STAT there
‘Kofi is standing there.’ (Dolphyne 1988: 67)

According to several scholars, the tone-bearing unit (TBU) in Akan is the syllable since tone sandhi affects the whole syllable and not just a mora (Stewart 1965; Dolphyne 1988: 52; Abakah 2002: 194, 2005a, 2005b). Dolphyne (1988) shows that Akan distinguishes three syllable types as shown in (3), which are either open syllables (CV, V), or a single sonorant (C) functioning as a syllabic nucleus (cf. also Christaller 1933: XXVIII; Stewart 1965; Abakah 2002).[4] Any vowel constitutes a syllable, and hence, two adjacent vowels constitute two syllables (3e) (Christaller 1933: XVII; Dolphyne 1988).

(3) a. ɔ̀-fá ‘he takes it’ b. sò-m̀ ‘hold it’
c. ǹ-sú ‘water’ d. dà-ǹ ‘turn it over’
e. ò-hú-ì ‘he saw it’ (Dolphyne 1988: 52f)

The distinction of lexical H-tones and L-tones is also reflected at the level of segmental duration. According to Manyah (2006; 2014), vowels that carry a L-tone are significantly, about 80 to 100 ms, shorter than vowels carrying a H-tone. Vowel quality does not differ for different tones.

Relevant tonal processes in Akan discussed below concern downstep, tonal spreading and tonal replacement by grammatical tone insertion. Because both L-tones and H-tones are active in tonal processes, they can be considered to be lexically specified. In addition, toneless syllables exist in Akan, which receive their tonal specification either by tonal spreading, by tone polarization or by default L-tone insertion. According to Abakah (2002; 2005b) toneless elements comprise nominal prefixes, optional nominal suffixes, pronominal clitics, and tense and aspect affixes. Further tonal processes can be found in Schachter & Fromkin (1968: 105ff), Abakah (2002; 2010a), and Paster (2010).

PFT=perfective; PRS=present; PST=past; PRO=pronoun; PROG=progressive; SBJ=subject; SG=singular; STAT=stative; TOP=topic; QP=question particle.

[4] Underlyingly, a syllabic consonant constitutes a syllable onset, and the vowel is dropped word-finally rendering the sonorant as syllabic (cf. Dolphyne 1988: 102ff; Abakah 2002: 195).

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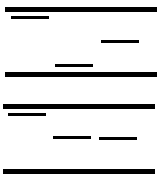
2.1. Downstep

Akan has been classified as a terraced-level tone language, indicating that lexical H-tones are subject to a lowering process after L-tones (Welmers 1959).[5] This downtrend in Akan is triggered by the presence of a lexical L-tone, be it overt (automatic downstep or downdrift) or covert (non-automatic downstep).[6] In any underlying tonal sequence of /H-L-H/, the second H-tone is realized lower than the first H-tone. Automatic downstep arises when the underlying tonal sequence /H-L-H/ is realized as in (4a). The schematized pitch register shows the H-tone and L-tone with a following lower H-tone. Non-automatic downstep arises when the underlying L-tone trigger loses its segmental association and results in a floating L-tone as in (4b); in this case, downstep is indicated by a superscript exclamation mark ('$^{!}$'). The schematic pitch register shows two downstepped H-tones without an intervening L-tone realized. Tonal stability (Yip 2002: 67) ensures that the L-tone of the noun class prefix *ɔ* is not deleted when the segment is deleted in (4b). As a result, the floating L-tone triggers downstep on the surface.

(4) a. kòfí + pàpá → kòfí pàpá
Kofi father Kofi.GEN father
b. kòfí + ɔ-dáń → kòfí ꜜdáń
Kofi N-house Kofi.GEN house



Contributing to the debate whether the two types of downtrends (automatic and non-automatic downstep) have different phonetic effects, Genzel & Kügler (2011) investigated the amount of downstep in structures like (4) which were embedded in a tonally identical sentence frame. Contrary to Dolphyne (1994), who claimed that there exist phonetic differences in the amount of downstep, Genzel & Kügler (2011) found that the amount of downstep is identical in the two types of downstep. Hence, the phonetic realization of downstep is independent of whether the L-tone trigger is phonetically realized (4a) or not (4b).

2.2. Tonal spreading

Another phonological process is H-tone spreading, or "L-stepping" in Stewart (1993). Across word boundaries, a word-initial L-tone is deleted and the H-tone of the preceding word spreads onto the L-tone segmental anchor of the following word. In (5), the initial L-tone of the object *àtààdíé* is affected by H-tone spread from the verb, gets dissociated and turns up as a floating L-tone that causes downstep on the spread H-tone. Note that Marfo (2005) and Paster (2010) discuss further cases of H-tone spread across words that do not necessarily involve downstep.

(5) ɔbétɔ́ + àtààdíé → ɔbétɔ́ ꜜátààdíé
3SG.FUT.buy garment 'S/he will buy (a) garment.'
(Stewart 1993: 194)

A case of rightward L-tone spread is discussed in Abakah (2005b: 115f). This tonal process can however be conceived of as an association of a floating L-tone (represented as L̰) rather than tonal spreading of an associated tone. The floating L-tone is underlyingly present (e.g. *hɔ́hʊ* – H L̰ H in (6)). This floating L-tone associates to the rightward adjacent TBU with the

[5] Clements (1979: 537) lists a number of other languages that show tone terracing, which are not limited to sub-Saharan languages such as Niger-Congo (e.g. Yoruba) or Bantu (e.g. Sotho), but also occur in Nilo-Saharan (e.g. Luo) and Chadic languages (e.g. Ga'anda), as well as in some native North American languages such as Acatlán Mixtec.

[6] For clarification of terminological aspects concerning downtrends, see Connell (2011), as well as the introduction to this collection (Downing & Rialland this volume). Since there is no phonetic difference between different types of downstep in Akan (Genzel & Kügler 2011), we use the term 'downstep' as a cover term.

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effect of a dissociation of a H-tone that in turn shows up on the next (toneless) TBU. There are three toneless TBUs in (6) (indicated by Ø); the re-associated H-tone shows up on the third one, an obligatory pronoun *ɔ* in the case of class-II nouns that are possessed that cliticizes to the associative construction (Abakah 2005b: 115). There are other processes taking place in (6): the associative tone is segmentless and constitutes only a floating H-tone (represented as Ḥ), which is followed by the underlying tone of the possessed noun. In the case of (6), this floating H-tone merges with the first underlying H-tone of the noun *hɔ́hʊ́* 'guest'. The class 2 noun prefix *ɔ* is deleted, and the first person singular pronoun *mɪ* receives its tone from tone polarization with the following noun (Abakah 2005b: 123).

(6) mɪ	+ Ø	+ ɔ-hɔ́ˈhʊ́	+ ɔ	→ mìhɔ́hʊ̀ɔ́
1.SG.PRO	ASS	N2-guest	PRO	'my guest'
/Ø	Ḥ	Ø H L̥ H	Ø /	[L H L H]

Marfo (2004) argues that H-tone spreading occurs across phonological phrase boundaries, and he takes the occurrence of this spreading process as a diagnostic for the presence of phonological phrases. However, Marfo (2004) also states that the H-tone spreading only occurs in certain circumstances, such as higher speech rate, which may indicate that para-linguistic effects drive the spreading process rather than prosodic phrasing. As for grammatically induced tone spreading, Paster (2010: 83f) discusses H-tone spreading in the case where the H-tone spreads from a subject noun phrase to a verb phrase in the case of the negative habitual. The negation marker, which underlyingly bears a L-tone /ǹ/, appears as a H-tone in the case of a preceding H-toned subject (7).

(7) ésí ń-ˈtɔ́ pɛ̀n
Esi NEG-buy pen
'Esi doesn't buy pens.' (Paster 2010: 83)

The H-tone spreads from the subject to the negative marker, and delinks the underlying L-tone of the negative marker /ǹ/, which results in a floating L-tone that causes downstep on the following H-tone of the verb. The negative marker cliticizes to the verb stem, and thus belongs to the verb phrase. If H-tone spread were sensitive to phonological phrase boundaries, we would not expect a H-tone spread to occur between the subject noun phrase and the verb phrase (cf. section 3.1, and Kügler 2015). However, exactly this process takes place, and Paster (2010) analyses this process with a rule of Nasal Tone Assimilation that accounts for the association of the preceding tone (be it H or L) of the negative marker. In sum, there seems to be no clear evidence that tonal spreading is sensitive to phonological phrasing such that it might be blocked at a phonological phrase boundary.

2.3. Tonal replacement

A very common tonal process in Akan is referred to as 'tonal replacement' (Abakah 2005b) or 'grammatical tone insertion' (Paster 2010), referring to the grammatical function of tone in Akan. A lexical tone is replaced by a grammatical tone, for example to indicate a particular verb aspect or tense (Dolphyne 1988: 67f; Abakah 2005b; Paster 2010: 101ff). The following illustrates a process involving a floating L-tone, and one involving a floating H-tone. For instance, the verb tense 'PAST' is represented as a grammatical floating L-tone that associates to the edge of a morpheme, in (8b) to the left edge of a verb root. The effect of the association of the floating L-tone is illustrated in (8a). Applying the rule in (8a), the floating L-tone in (8b)

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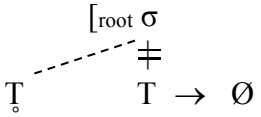
associates to the verb /*tɔ́*/ to the effect that the underlying H-tone of the verb dissociates. Hence, the verb [*tɔ̀ɔ̀*] appears as L-toned in the past tense in (8b). The general property of (8a) is that the dissociated tone does not re-associate to the next TBU if it is a lexically specified one.

In associative constructions, a similar tonal process occurs, yet with a floating H-tone. As illustrated in (6), the associative marker is a floating H-tone, which is followed by the underlying tone of the possessed noun (Abakah 2010b: 57). The association of this floating tone appears to follow the rule in (8a) although neither Paster nor Abakah formalize the H-tone association in associative constructions in this way. The association of the floating H-tone results in the dissociation of the initial L-tone of the noun *pòmá* in (8c). Since the adjacent TBU is lexically specified with a H-tone, this L-tone becomes floating and causes the following H-tone to be downstepped.

(8) a. Grammatical tone association (adapted from Paster 2010: 101)



b. Past tense: floating L-tone (Paster 2010: 101)
/ésí L̥ tɔ́ pɛ̀n/ → [ésí tɔ̀-ɔ̀ pɛ̀n]
Esi PST buy pen ‘Esi bought a pen.’

c. Associative tone: floating H-tone (Cahill 1985: 45; Abakah 2005b: 115, 2010b)
/nè H̥ pòmá/ → [nè pó'má]
PRO ASS walking stick ‘her walking stick’

This overview of tonal patterns and tonal processes in Akan has shown that the two tones are lexically specified and active in tonal processes. Local tonal interaction causes a downward trend of pitch in intonation. In addition, the grammatical function of tone in Akan becomes obvious by means of tonal processes like tonal replacement. The interaction of lexical tones and tonal processes accounts for the surface pitch contour of an Akan utterance.

3. Sentence-level intonation in Akan

This section presents the intonation of declarative sentences – both simple and complex, polar and constituent questions, as well as the imperative sentence type. As background, the first subsection briefly introduces some basic facts of Akan syntax, and relates them to prosodic phrasing.

3.1. Basic Akan syntax and corresponding prosodic structure

Akan is an SVO language, which is illustrated in (9a). NPs are right-branching, and post-nominal modifiers follow a strict order, i.e. the adjective is closest to the head noun, followed by numerals, the determiner, and finally by quantifiers (Boadi 2005; Saah 1994); cf. (9a), which illustrates the sequence of an adjective and a quantifier.

(9) a. kòfí dí kɔ́tɔ́ kɔ̀kɔ́ː bɛ̀bréː
Kofi eat.PRS crab red many
‘Kofi eats many red crabs.’ (Kügler 2015: 194)

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b. [CP [TP [DP kofi] [VP di [DP kɔtɔ kɔko bebre:]]]]

c. ((kofi)φ (di (kɔtɔ kɔko bebre:)φ)φ)ι

Following a general approach to the syntax-phonology interface (Selkirk 2011), the assumption for prosodic phrasing is that any syntactic word, phrase, and clause is matched with a corresponding prosodic word (ω), phonological phrase (φ) and intonation phrase (ι). The assumption for Akan is that phonological phrase structure is isomorphic to syntactic structure (Kügler 2015). The syntactic structure of (9a) is illustrated in (9b) (cf. e.g. Saah 1994). Lexically headed phrases are matched with phonological phrases (φ-phrase), which results in one φ-phrase containing the subject, one containing the verb phrase and one containing the object noun phrase (9c). The object φ-phrase is recursively embedded in the VP φ-phrase. As outlined in section 2.2, tone spreading appears not to be sensitive to, and thus does not indicate prosodic phrasing. Instead, the process of regressive vowel harmony between prosodic words (RVH) motivates the recursive structure (Kügler 2015). RVH occurs in a number of African languages (Casali 2008; Kügler 2015). Kügler (2015) argues that the right edge of a maximal φ-phrase blocks the general process of RVH.

RVH occurs if two adjacent words differ in [ATR] specification, more specifically, if a [–ATR] word precedes a [+ATR] word as in (10a). In some cases, however, this regressive assimilation process is blocked, as is illustrated in (10c). The subject noun and the verb fulfil the requirement of adjacent words differing in [ATR] specification, yet RVH does not affect the subject noun.

(10) a. /àdàm̀fʊ̀ tʊ́ kùbé/ / tʊ́ + kùbé / → [tʊ́ kùbé]
friend throw coconut
'A friend throws a coconut.' [–ATR] [+ATR] [+ATR]

b. [[àdàm̀fʊ̀]φ [tʊ́ kùbé]φ]ι

c. /àdàm̀fʊ̀ dí kùbé/ / àdàm̀fʊ̀ + dí / → *[àdàm̀fʊ̀ dí]
friend eat coconut
'A friend eats a coconut.' [–ATR] [+ATR] [+ATR]

d. [[àdàm̀fʊ̀]φ [dí kùbé]φ]ι

The proposal advocated in Kügler (2015) bears on recursive phonological phrasing of lower-level, or non-maximal, and higher-level, or maximal, phonological phrases (cf. Selkirk 2011; Itô & Mester 2012). A maximal φ-phrase is defined such that it is not dominated by any further φ-phrase. In (10a), the object noun forms a lower-level, i.e. non-maximal, φ-phrase, and hence RVH can affect the verb, which results in the prosodic structure (10b). In (10c), however, the verb phrase and the subject noun phrase form higher-level, i.e. maximal, φ-phrases. In this context, RVH fails to apply, which results in the prosodic structure (10d). The structural fact is that neither the verb phrase nor the subject noun phrase are headed by lexical projections in the syntax (cf. e.g. Saah 1994), which results in the prosodic structure of maximal φ-phrases. Other structures with maximal φ-phrase edges that block RVH comprise serial verb constructions or time adverbials; for a detailed analysis and data, see Kügler (2015).

Left-dislocated structures represent deviations from simple SVO word order. For instance, a topic constituent is fronted to the sentence-initial position, thus dislocated from its base position. A sentence topic may be marked morphologically with a topic marker *deɛ* (11a), but need not necessarily be (11b) (Boadi 1974; Marfo 2005; Ermisch 2006 among others). If a constituent is topicalized, an obligatory resumptive pronoun is realized in the position of the

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topicalized constituent in the matrix clause. Syntactically, the topic forms its own phrase, and the matrix clause starts with an embedded TP,[7] as illustrated in (11c) (Marfo 2005).

(11) a. [kòfí déɛ̀]$_{TOP}$ ɔ̀-à-bá hà.
Kofi TOP 3SG.SBJ-PFT-come here
'As for Kofi, he has come here.'
b. [wɔ̀fà Kòfí]$_{TOP}$, ɔ̀-à-bá hà.
uncle Kofi 3SG.SBJ-PFT-come here
'Uncle Kofi, he has come here.'
c. [$_{TOPP}$ kofi deɛ [$_{TP}$ ɔ-a-ba ha]]

A focused constituent may also be fronted but need not be (e.g. Boadi 1974; Kügler & Genzel 2012).[8] If fronted, a focus constituent is obligatorily followed by a focus marker *na*, and a resumptive pronoun is realized at the position of the focused constituent in the matrix clause (12a) if it is an animate referent (cf. Boadi 1974; Saah 1988, 1994; Ermisch 2006 among others). Syntactically, the matrix clause starts with an embedded TP (12b) as is the case for topic fronting (11c).

(12) a. àmáǹgò nà ànúm̀ tɔ̀-ɔ́ ánɔ̀pá jí
mango FM Anum buy-COMPL morning this
'It is a mango that Anum bought this morning.' (Kügler & Genzel 2012: 341)
b. [$_{FOCP}$ amango na [$_{TP}$ anum tɔɔ anɔpa ji]]

The left-dislocated topic and focus constituents form their own syntactic phrase (Marfo 2005), and the matrix clause is embedded in the entire clause (13a). Applying the syntax-phonology match (Selkirk 2011), the entire clause is matched with an intonation phrase (ι-phrase). In addition, the embedded TP is matched with an ι-phrase, which thus results in a recursively embedded ι-phrase (13b). For more elaborated syntactic analyses of Akan, see Saah (1994) and Boadi (2005). Recursive ι-phrases are prosodically expressed by means of pitch register reset before the embedded clause; cf. section 3.2.2 and Kügler (2016).

(13) a. [$_{TOPP/FOCP}$ Topic/Focus [$_{TP}$ matrix clause]]
b. (Topic/Focus (matrix clause)ι)ι

3.2. Declarative sentence type

Welmers (1959) introduced the term "terraced-level languages" for describing languages such as Akan where "an effect of terraced descent is heard" (p. 4), and where the phonological tone quality remains identical to previous non-low tones although the phonetic realization is lower, i.e. downstepped to a new terrace level which "becomes the new point of reference" (p. 4). According to Clements (1979: 537), terracing languages display a regular process of register shift which affects the F0 realization of successive tones. The shift of the total pitch register can

[7] Note that Boadi (2005) and Marfo (2005) use the term IP instead of TP for the syntactic phrase containing tense or inflectional phrasal elements. TP is used here in order to avoid a misinterpretation of the abbreviation IP as 'intonation phrase'.
[8] In the case of subject focus, subjects preferably occur dislocated in sentence-initial position (Pfeil et al. 2015). Non-subjects, in particular objects, show a preference for occurring in their base position (Genzel & Kügler 2010). Thus, Akan shows a case of a so-called subject-object asymmetry in focus marking (Fiedler et al. 2010), although not in a categorical sense, since Pfeil et al. (2015) showed that in the case of non-exhaustive focus interpretation, speakers show a tendency to realize a focused subject in its base position.

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apply downward (downstep) and/or upward (upstep). An important feature of tone terracing is that there is no limit on the number of register lowering steps in a tone group. External limits can be set by lexical, grammatical, and/or phonological factors. Terracing is thus a process on the level of the pitch register, which defines reference lines (top line, bottom line) relative to which tones are scaled (Huang 1985). The terracing property is illustrated in Figure 1; the example sentence, originally mentioned in Schachter & Fromkin (1968), is given in (14) (cf. also Abakah 2000; Abakah et al. 2010).

(14) ɔ-bɛ́-kɔ́ kùmásé ánɔ̀pá jí
3SG-FUT-go Kumase morning this
'(S)he will go to Kumase this morning.'
(Schachter & Fromkin 1968: 105; glosses added)

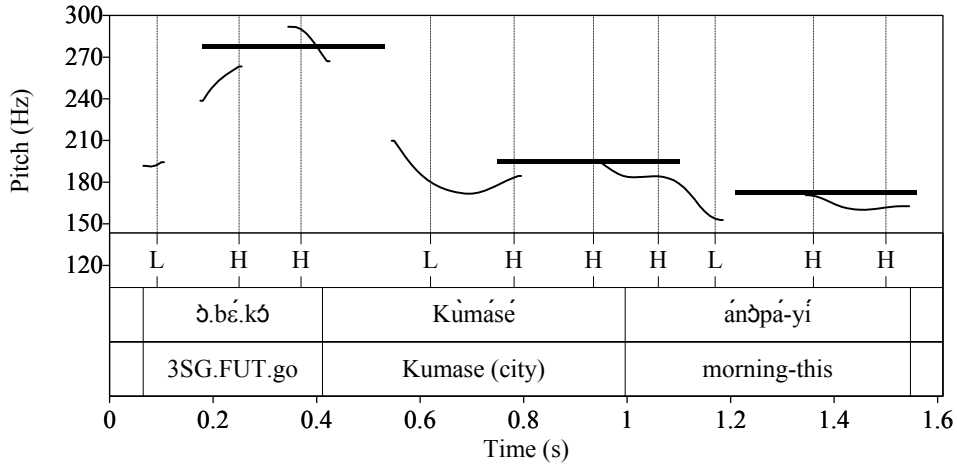

Figure 1. Tonal terracing at three distinct register levels exemplified with sentence (14). L-tones between H-tones lower the pitch register in a staircase fashion illustrated by horizontal lines (Figure from Kügler & Genzel 2012: 334).

3.2.1 Simple declaratives

The terracing property causes the intonation of every sentence to step down until a low end of the phrase, which usually lies in the lower pitch register of a speaker (cf. Figure 1); this downward trend in pitch also applies to sentences which contain like tone sequences, such as only H-tones for instance (cf. Figure 2 below). The downtrend is a result of local tonal interaction (cf. Section 2.1, example (4), and Clements 1983; Dolphyne 1988; Stewart 1993; Abakah 2000; Abakah et al. 2010). As a first approximation, no post-lexical intonational tones seem to mark a simple declarative sentence. Following Genzel (2013), Akan declarative sentences show neither an initial nor a final ι-phrase boundary tone. Hence, it appears that in a simple declarative sentence, only lexical tones shape the intonational contour.

Consider the sentences in (15). Both sentences have ten syllables, but they differ in the final lexical tone. (15a) has a sentence-final H-tone, while (15b) has a sentence-final L-tone. As shown in Figure 2 with dashed black and grey lines, the F0 declines over the course of the utterance, and the F0 of the final syllables is identical and hence independent of lexical tone. Paster (2010: 79) mentions a final lowering rule applicable in Akan that turns a sentence-final H-tone into a L-tone. We interpret this final lowering as a case of tonal neutralization at the end

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of an intonation phrase. In final position, a lexical H-tone neutralizes to low. There are instances where a final lowered H-tone is realized higher than a final low tone; see for instance the polar question with a sentence-final question particle in Figure 8. The realization of the sentence-final H-tone on the question particle could be a case of non-complete neutralization. It appears to happen in such cases where a speaker marks the final H-tone to maintain the tonal distinction. However, the variation in final H-tone realization needs further investigation. Note that in other languages final lowering of tones happens independently of tonal category. For instance, in Yoruba sentence-final L-tones are reported to be lowered (La Velle 1974). As the chapters in this collection show, final lowering indicates some kind of downtrend across languages, and its realization appears to be language specific. While we find tone neutralization in Akan, in Chichewa and Bemba it can be realized as a low register plateau (Downing this volume; Kula & Hamann this volume), as a gradual fall in Embosi (Rialland & Aborobongui, this volume), or as a sharp fall in Bemba (Kula & Hamann this volume).

(15) a. pàpá kòfí má mè-dɔ́ sìká nó.
fatherKofi give1SG-love money DEF
'Father Kofi gives my lover the money.'
b. pàpá kòfí má mè-dɔ́ àbɛ́ tɔ̀.
fatherKofi give1SG-love palm nut buy
'Father Kofi sells a palm nut to my lover.'

Sentences containing only H-tones (16a) show a similar descent of F0 over the whole utterance although no L-tone is present to trigger downstep (cf. solid black line in Figure 2). Similar to sentences with a final H-tone, the sentence-final H-tone in (16a) is neutralized to low. Similarly, sentences with only L-tones (16b) show a gradual descent of F0 terminating in a sentence-final low (cf. solid grey line in Figure 2). The downward descent of H-tones in Akan differs from tone languages such as Mambila (Connell this volume) and Mandarin Chinese where H-tones in a sentence containing only H-tones are realized at an equal F0 level (Xu 1999).[9]

(16) a. kúkúó-bá pápá nó bɔ́ dáá.[10]
pot-DIM good DEF break everyday
'The good small pot breaks everyday.'
b. wɔ́fà àdò fírì àtɕèmfò
uncle Adocome.from Akyemfo
'Uncle Ado comes from Akyemfo.' (cf. Genzel 2013: 57)

[9] In Mandarin, however, declination, a gradual decline of F0 over an utterance, has been observed in a stretch of adjacent H-tones in a sentence frame with initial low or rising tones (Shih 2000). The amount of declination in Mandarin is however much smaller than the general downward trend in Akan.
[10] Note that the word *daa* 'everyday' consists of a long vowel which appears to be affected by tonal neutralization as a whole, not just in its second part. This becomes visible in Figures 2 and 3.

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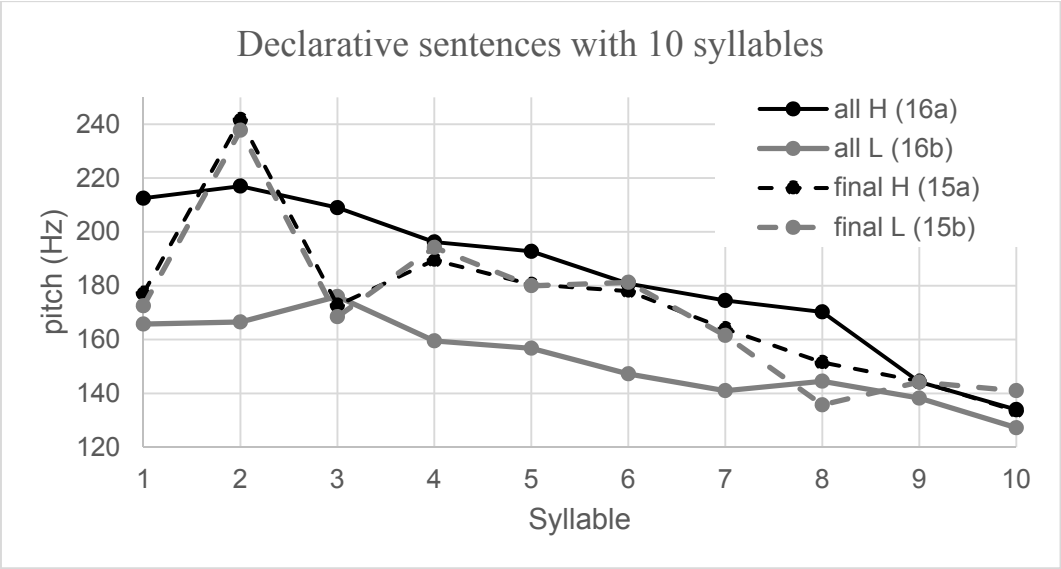

Figure 2. Averaged F0 means of four speakers per declarative sentence; examples (15) represent sentences with alternating tone sequences, and examples (16) represent sentences with like tone sequences. All sentences have ten syllables.

There are different analyses available to account for the downtrend in F0. Traditionally, downtrends have been modelled with metrical trees (Ladd 1990) or with register trees (Clements 1990; Snider 1999). Myers (1996) modelled downtrend in Chichewa in terms of a phonetic tone implementation rule à la Liberman & Pierrehumbert (1984). Metrical trees treat the global downtrend in terms of local downstep which is triggered in a particular phonological context. For instance, in the Bantu language Llogoori, adjacent H-tones are subject to downstep (Clements 1990). In Akan, a L-tone is the downstep trigger (cf. section 2.1). However, sentences that contain only like tones show a similar downward trend in F0 to sentences that contain both H-tones and L-tones (cf. Figure 2). Neither metrical trees nor register trees can easily account for this similarity. Therefore, Genzel (2013) concluded that in Akan downstep is phonologized declination, and the downward trend in F0 is accounted for by a phonetic implementation rule (cf. Liberman & Pierrehumbert 1984 for English and Myers 1996 for Chichewa). In particular, Genzel (2013) proposed that there is a phonetic implementation rule for both H-tones and L-tones independently. As a phonological trigger for the implementation rule, Genzel (2013) proposed an initial high register tone (h) and a final low register tone (l) for the domain of the downward trend. We will adopt this analysis here. The tonal representation of the declarative sentence (16) together with its prosodic phrasing is shown in (17). A sentence-initial high pitch register tone is associated with the left edge of an ι-phrase, and a sentence-final low pitch register tone with the right edge of an ι-phrase. This representation has the effect of a global downward trend of F0 over an utterance.

(17) h l
H H H H H
/ | \ \ / \ | | |\
[kúkúó-bá pápá nó bó dáá]ι

Genzel's (2013) conclusion that downstep in Akan is phonologized declination makes the prediction that the tonal realization should show effects of preplanning (cf. Connell 2011). This is indeed the case. The initial pitch height for each sentence depends on the length of the sentence itself. Longer sentences start higher, which reflects a general preplanning effect

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(Genzel 2013). We illustrate the effect of preplanning on the tonal realization with data and recordings from Genzel (2013: 138ff). The examples compare short and long sentences with five or six, and ten syllables, respectively (18). In general, H-tone sentences start higher (solid lines in Figure 3) than L-tone sentences (dashed lines in Figure 3), both short and long ones. If sentences are longer (black lines in Figure 3), speakers start higher. On average, speakers started 20 Hz higher in the longer utterances, which is shown in Figure 3.

(18) a. kúkúó-bá nó.
pot-DIM DEF
'The small pot.'
b. kúkúó-bá pápá nó bɔ́ dáá.
pot-DIM good DEF break everyday
'The good small pot breaks everyday.'
c. jàẁ fi̋ àtɕèm̀fɔ̀.
Yaw originate.HAB Akyemfo
'Yaw comes from Akyemfo.'
d. wɔ̀fà àsàrè fi̋ àtɕèm̀fɔ̀.
uncle Asare originate.HAB Akyemfo
'Uncle Asare comes from Akyemfo.'
(Genzel 2013: 138ff)

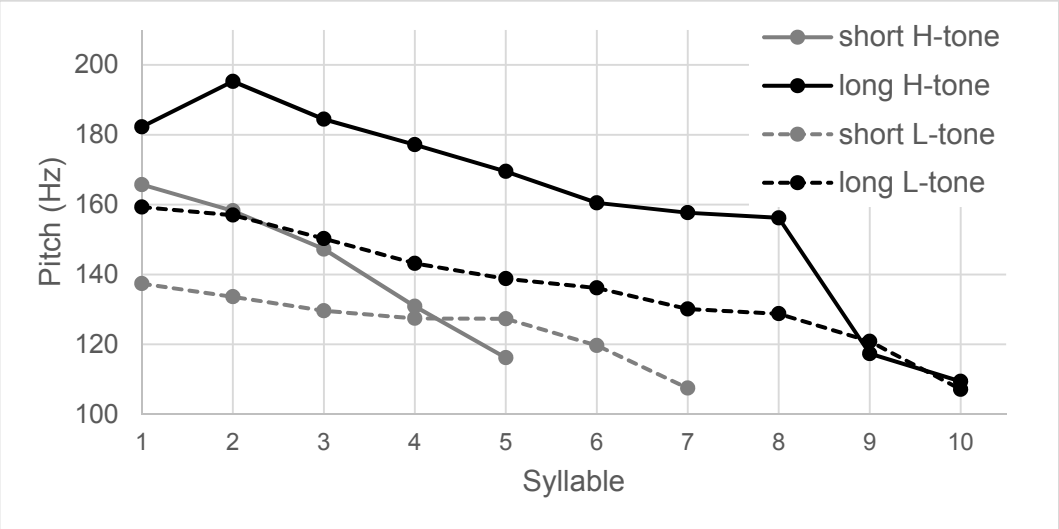

Figure 3. Averaged F0 means of six speakers (1 female, 5 male) per sentence split by short and long sentences with only H-tones (18a/b) or L-tones (18c/d); speech materials and acoustic raw data from Genzel (2013: 138ff), data plot is our own.

3.2.2. Complex declaratives

This section deals with complex declaratives, comparing a complementizer sentence and a coordination structure. Embedded sentence structures with a complementizer show a pitch reset at the left edge of the embedded clause; note that the complementizer is phrased with the matrix clause (Kügler 2016). The matrix clause ends on a low pitch at the level of the neutralized ɪ-phrase-final tone. The prosodic realization also includes pauses (cf. also Genzel 2013: 150); the pause is realized after the complementizer, but before the conjunction in the coordination.

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The first structure contains the complementizer *sɛ* as shown in (19), which prosodically belongs to the matrix clause. As illustrated in Figure 4, speakers usually realize a pause after the complementizer. The embedded clause then starts at a higher F0 level as if it were integrated in the downward trend of an SVO sentence, yet not as high as a completely new sentence. The pitch reset is indicated by the "%reset" transcription in the prosodic phrasing in (19c) and in Figure 4. This transcription convention is borrowed from Peng et al. (2005). The complementizer *sɛ* is usually realized with a falling tone (Dolphyne 1988: 65; Genzel 2013: 151), and the vowel is lengthened. The syntactic structure is given in (19b) following Boadi (2005). As introduced in section 3.1, a clause, be it CP or TP, is matched with an ι-phrase. The embedded TP (19b) thus is matched with an embedded ι-phrase (19c).

(19) a. nànáá kà-à ɛ̀nórà sɛ̀ kúkúó-bá bɔ́.
Nana say-COMPL yesterday that pot-DIM break
'Nana said yesterday that the small pot breaks.' (Genzel 2013: 59)

b. [$_{CP}$ nana ka-a ɛnora sɛ [$_{TP}$ kukuo-ba bɔ]] (cf. Boadi 2005)

c. (nana ka-a ɛnora sɛ %reset(kukuo-ba bɔ)ι)ι

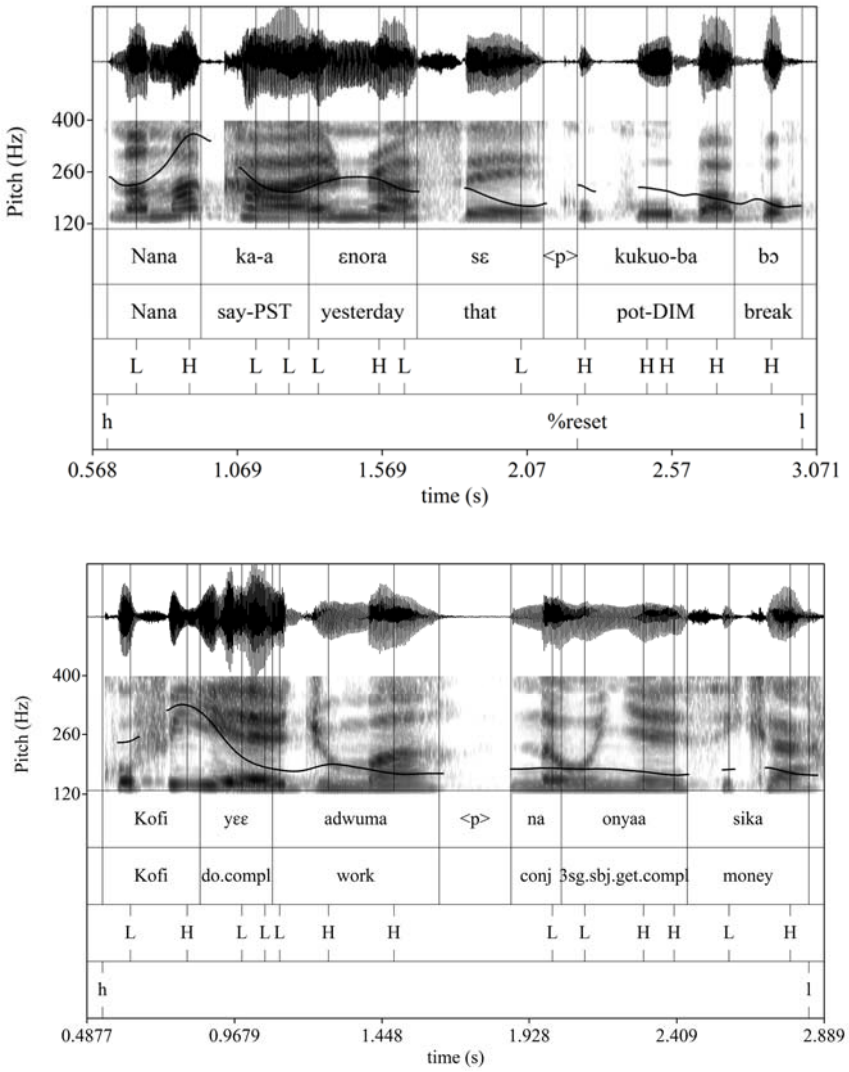

Figure 4. Waveform, spectrogram, and F0 contour of embedded declarative sentence (19) showing pitch reset (upper panel) and coordinated declarative sentence (20) with no pitch reset (lower panel).

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An example with the coordination conjunction *nà* is given in (20). Speakers realize a pause before the conjunction (see Figure 4). The prosodic structure is given in (20c) and illustrates that both conjuncts of the coordination prosodically belong to one ι-phrase. We assume a flat syntactic structure in (20b) in which each of the conjuncts functions as a head of the coordinated structure. Note that the exact syntactic phrasing of the coordination is subject to speculation here and needs further investigation.

(20) a. kòfí yèɛ̀ æ̀dɥúmá nà òŋǽǽ sìká
kofi do.COMPL work COORD 3SG.SBJ.get.COMPL money
'Kofi worked and he got money.'
b. [CP kofi yɛɛ ædɥuma & oŋææ sika]
c. (kofi yɛɛ ædɥuma na oŋææ sika)ι

The averaged pitch contours of these complex structures are compared in Figure 5. The point of comparison is syllable 10. The solid black line represents a declarative sentence containing only H-tones (cf. 16a) with ten syllables and shows the downtrend pattern with ι-phrase-final low pitch. The dotted black line represents the embedded sentence with the complementizer *sɛ* (19). The matrix clause contains seven syllables up to *sɛ*, which is divided into three parts to represent measures of the falling tone realized on the complementizer. The end of the matrix clause plus *sɛ* is thus reached at syllable 10, and it shows that the final pitch of the matrix clause ends at the identical pitch height of a simple declarative. After the pause (cf. Figure 4) there is a pitch reset at the beginning of the embedded clause, which starts with a phrase-initial lexical H-tone. The phrase-initial H-tone of the embedded clause is realized lower than an initial H-tone of a matrix clause and lower than an initial H-tone of a simple declarative (solid black line). The conclusion is thus that the pitch register reset signals embedding.

The solid grey line in Figure 5 illustrates the coordinated structure (20). The first conjunct ends at syllable 10, and the conjunction *nà* appears at syllable 11. The comparison with the embedded structure reveals that the L-tone on the conjunction (syllable 11) is realized higher than both the sentence-final low of the matrix clause of the embedded sentence, and the final low of the simple declarative (syllable 10). In addition, the first conjunct ends in a lexical H-tone (syllable 10) which is not neutralized as is the case for the ι-phrase-final H-tone of the simple declarative (solid black line, syllable 10). Thus, the first conjunct of the coordination does not constitute a case of a sentence-final low pitch register but shows that both coordinated constituents are integrated into the downward trend in F0 of an ι-phrase. If the second conjunct constituted a separate phrase which was recursively embedded, the expectations would be, first, that the L-tone of the conjunction *nà* would be higher indicating a pitch reset, and, second, that the final H-tone of the first conjunct would be neutralized to low. The conclusion is thus that a coordinated structure is phrased within one ι-phrase.

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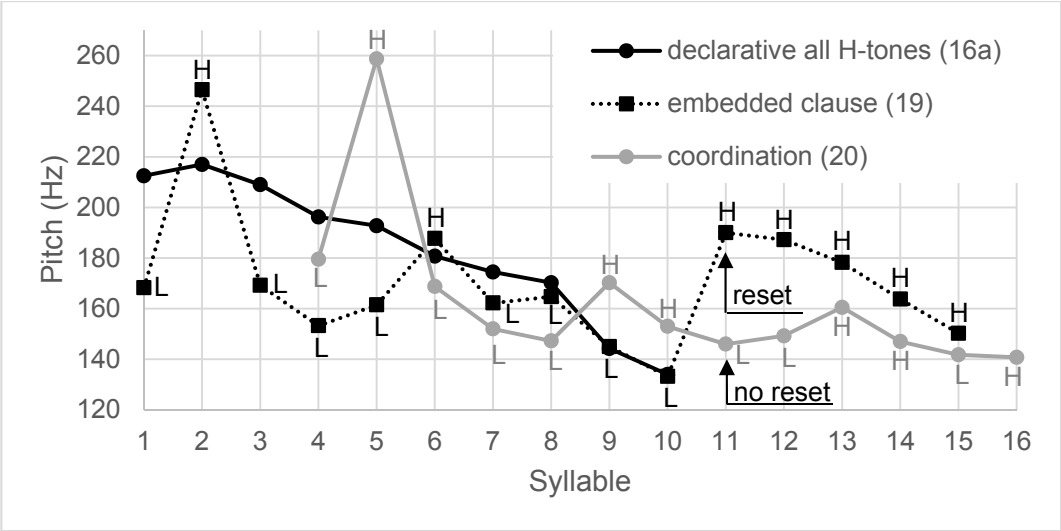

Figure 5. Averaged F0 means of four speakers per complex sentence; solid black line: declarative all H-tone sentence (16a) as reference; dotted black line: embedded *sɛ* clause (19); solid grey line: coordinated structure (20).

3.2.3 Left-dislocation

In Akan, a topic is syntactically expressed by means of constituent fronting; cf. (11) above. The topicalized constituent is dislocated to the left periphery of the sentence, and is resumed by a co-referential pronoun in its base position (Boadi 1974; Saah 1994; Marfo 2005; Ermisch 2006). Of particular interest here is the prosodic realization of topicalized constituents since a fronted topic may be accompanied by the morphological topic marker *deɛ* (21a), but need not be; cf. (21b) and (21c). This allows for an investigation of different tone patterns in the left-dislocated element. The dislocated structures in (21a–c) are compared with a simple declarative with an identical number of syllables (21d). Prosodically, speakers tend to realize a pause after the topicalized constituent; there is usually no pause within a simple declarative (cf. Figure 6). According to Marfo (2005), a topic and the matrix clause are phrased separately, each as an ι-phrase; see section 3.1 for the syntax-phonology match, which accounts for this prosodic phrasing.

(21) a. kòfí déɛ̀, ɔ-à-bá hà.
Kofi TOP 3SG.SBJ-PFT-come here
'As for Kofi, he has come here.'

b. wɔ́fà kòfí, ɔ-à-bá hà.
uncle Kofi 3SG.SBJ-PFT-come here
'Uncle Kofi, he has come here.'

c. wɔ́fà àdò, ɔ-à-bá hà.
uncle Ado 3SG.SBJ-PFT-come here
'Uncle Ado, he has come here.'

d. wòfà kòfí rè-bè-ɗídí.
uncle Kofi PROG-FUT-eat
'Uncle Kofi is about to eat.'

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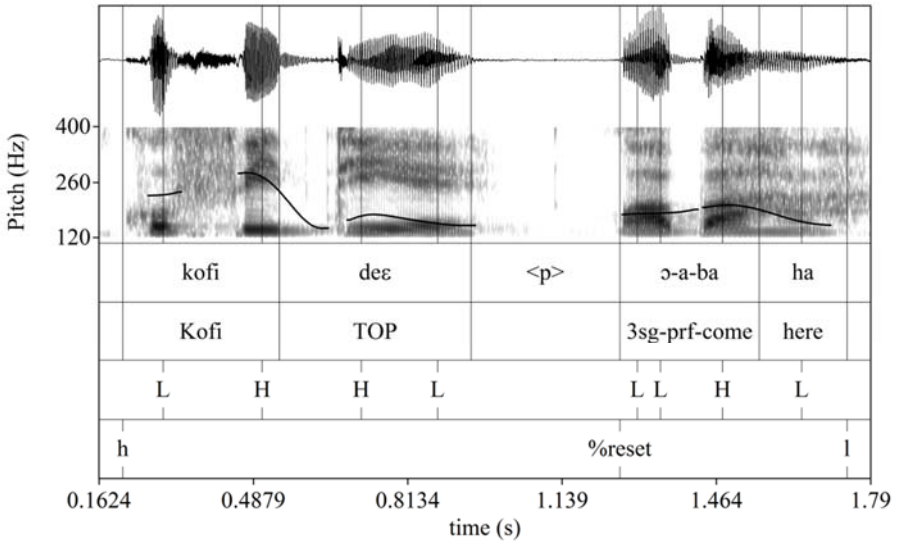

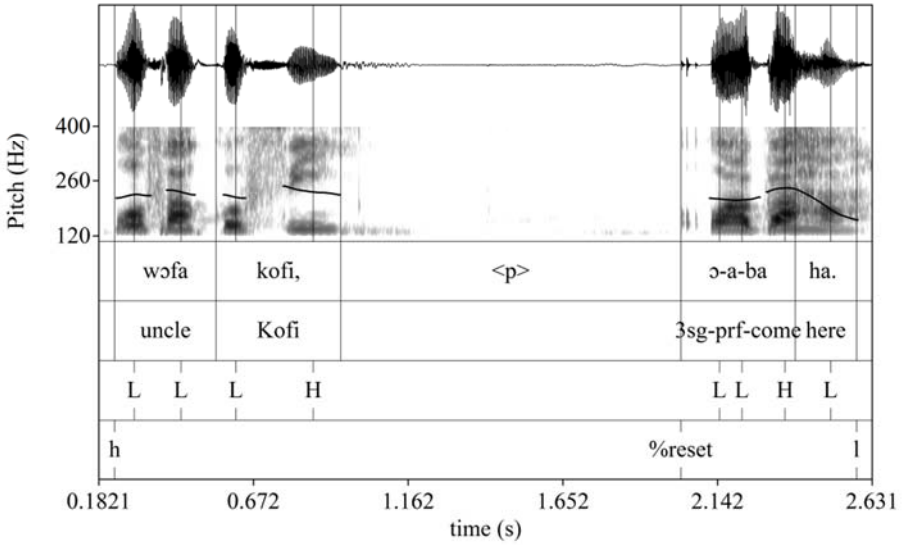

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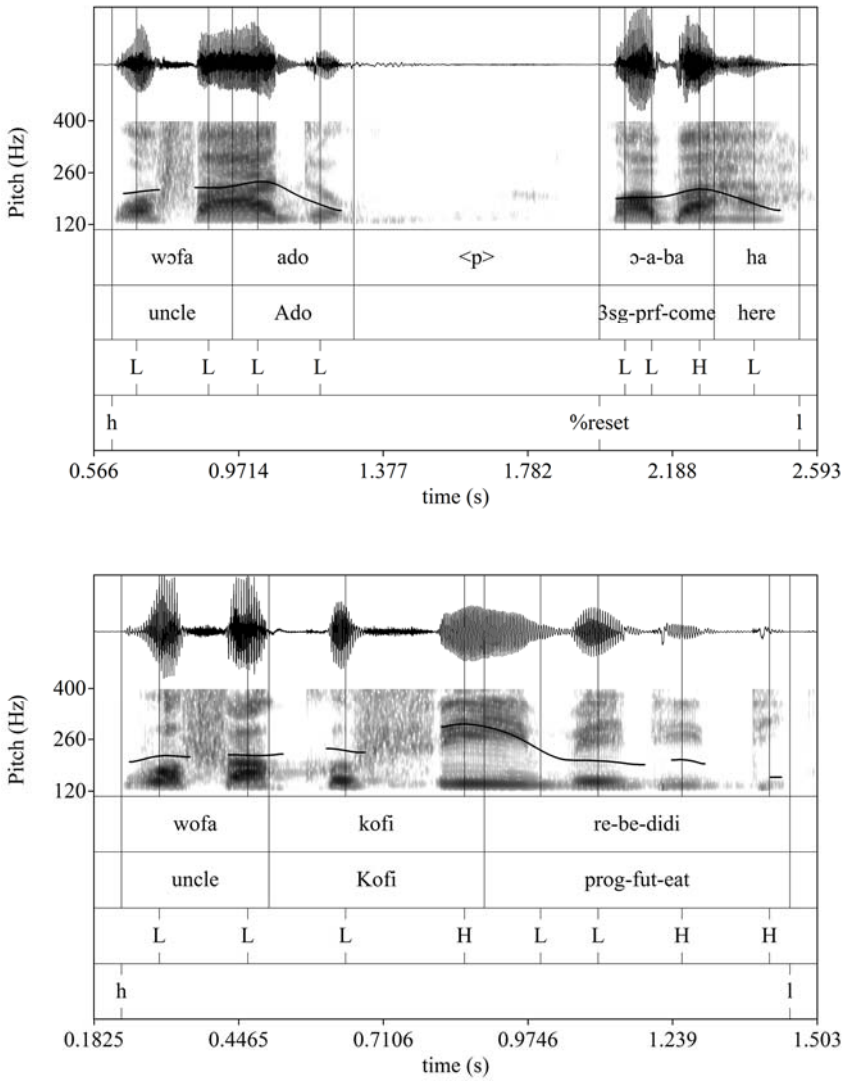

Figure 6. Waveform, spectrogram, and F0 contour of left-dislocated sentences (21a) (upper panel, *prev. page*), (21b) (lower panel, *prev. page*), (21c) (upper panel, *this page*), and simple declarative with identical number of syllables (21d) (lower panel, *this page*).

The mean F0 contours averaged over four speakers of sentences containing a topic in (21a–c) are illustrated in Figure 7 and are compared to a simple declarative sentence (21d) (solid black line). All sentences have an identical number of syllables. The topic phrases end at syllable 4. The dashed black line in Figure 7 illustrates that the topic phrase with the topic marker *deɛ* (21a) ends at a low pitch register (syllable 4) comparable to the left-dislocated topic phrase with a final L-tone (solid grey line, (21c)). The left-dislocated topic phrase with a final H-tone (dotted grey line, (21b)) ends higher.[11] This indicates that at this point no intonation-phrase-final tonal neutralization has taken place. After the topic phrase, all matrix clauses in (21a–c) start with phrase-initial lexical L-tones (syllable 5). The L-tones are realized higher than the topic-phrase-final L-tones (syllable 4), which indicates pitch reset. In line with the analysis of prosodic phrasing of Marfo (2005), the proposed prosodic structure of (21) is given in (22). The pitch

[11] Note that the topic-phrase-final H-tone is realized lower than the equivalent H-tone in the declarative (syllable 4). It appears that speakers anticipate the pitch reset of the upcoming embedded structure in (21b), while in the case of a declarative, the first H-tone needs to set the pitch register frame for the whole sentence.

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reset is equivalent to the pitch reset of embedded clauses found in complex declaratives (cf. section 3.2.2). Thus, a pitch reset indicates the left edge of a recursively embedded ι-phrase (cf. Kügler 2016).

(22) Prosodic structure of a sentence containing a left-dislocated topic phrase (cf. (13) in section 3.1)
(kòfí déɛ̀ %reset(ɔ-à-bá hà)ι)ι

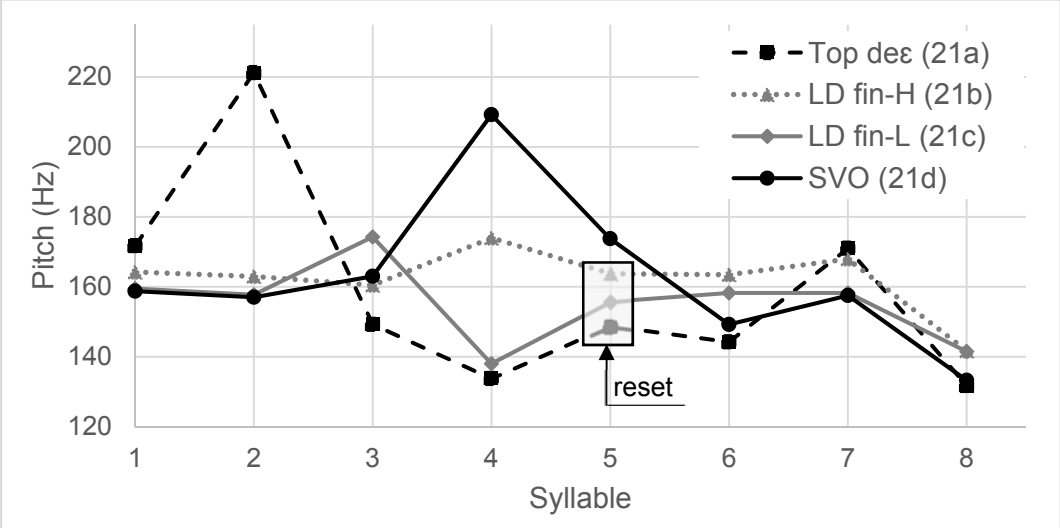

Figure 7. Averaged F0 means of four speakers for left-dislocated structures and corresponding simple declarative (solid black line); dashed black line represents left-dislocated phrase with a morphological topic marker *deɛ* (21a); dotted grey line represents a left-dislocated phrase that ends in a H-tone (21b); solid grey line represents a left-dislocated phrase that ends in a L-tone (21c).

3.3. Interrogative sentence type

Interrogativity in Akan is expressed by means of syntax, morphology or prosody. Polar questions and constituent questions differ in their linguistic means. While polar questions are marked either prosodically or morphologically, constituent questions are marked morphologically by a wh-word, which syntactically may appear in-situ, or ex-situ in sentence-initial position. We start our overview with the intonation of polar questions.

3.3.1 Polar questions

Polar questions are either marked prosodically (Dolphyne 1988; Genzel 2013; Genzel & Kügler 2016) or by means of a question particle (Boadi 1990, 2005), which appears in sentence-final position. Polar questions without a question particle are syntactically identical to declaratives and the only difference arises through prosody (Dolphyne 1988: 55; Boadi 2005; Genzel 2013; Genzel & Kügler 2016). In particular, polar questions are prosodically characterized by a raised pitch register and a sentence-final downward glide of F0 (Dolphyne 1988; Boadi 1990; Genzel 2013: chap 6). The final low pitch is accompanied by a lengthening of the sentence-final vowel (cf. Figure 8 and Table 1), higher intensity as well as breathy termination (Boadi 1990; Rialland 2009; Genzel 2013). In her seminal overview of the question prosody of a large number of African languages, Rialland (2007:45, 2009:936) classified Akan as a language with lax question prosody, which characteristically involves sentence-final low pitch, vowel lengthening

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and breathy termination. In a quantitative evaluation of question intonation in Akan, breathy termination was however not obligatorily present (Genzel 2013).

The data set in (23) compares a polar question that contains the question particle *ànáá* (23a) with a corresponding polar question without a question particle (23b) and a declarative (23c). All three sentences contain eight syllables and have an identical tone pattern. The question particle appears sentence-finally. Figure 8 illustrates the time-normalized averaged intonation contours. Both polar question contours show the characteristics of a raised pitch register compared to the declarative. In sentence-final position, characteristic differences appear between the polar questions with and without a question particle. The contour of the polar question containing the question particle shows higher F0 in sentence-final position compared to the polar question without a question particle. It appears that the raised pitch register compared to the declarative is maintained throughout the whole phrase, or that the sentence-final neutralization of H-tones is incomplete in the case of the polar question with a question particle. In the case of a polar question without a question particle, the sentence-final F0 is identical to that of the declarative. In this position, there is no raised pitch register and tonal neutralization takes place.

(23) a. àtó wɔ̀ hítà ànáá?
Ato possess.PRS heater QP
'Is it the case that Ato possesses a heater, or not?'

b. àtó wɔ̀ hítà bèbréé?
Ato possess.PRS heater many
'Does Ato possess many heaters?'

c. àtó wɔ̀ hítà bèbréé.
Ato possess.PRS heater many
'Ato possesses many heaters.' (cf. Genzel & Kügler 2016)

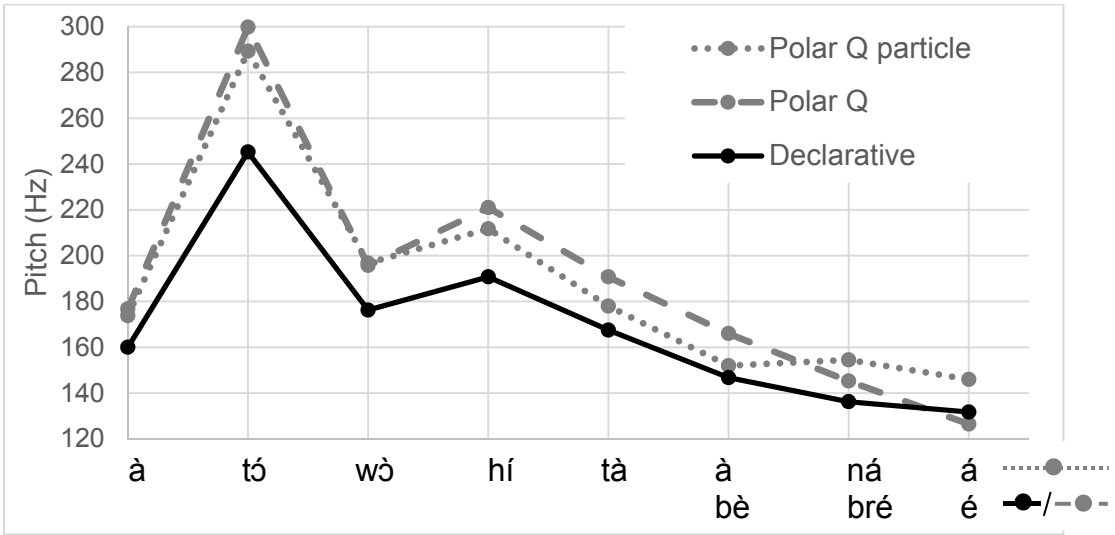

Figure 8. Averaged F0 means of four speakers; comparison between polar questions with and without question particle and corresponding declarative with identical tone patterns, sentences (23).

All four speakers recorded for this study also showed the characteristic sentence-final vowel lengthening in polar questions without a question particle. In Table 1, the individual duration

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of the sentence-final vowels of the declaratives ((23c) and (24c)) and the corresponding polar questions ((23b) and (24b)) are presented. On average, the sentence-final vowel of the polar question (23b) is 57 ms longer than the corresponding vowel of the declarative, and the sentence-final vowel of the polar question (24b) is 23 ms longer than the corresponding vowel of the declarative. In both polar questions, the sentence-final vowel is on average 29% longer than that of the corresponding declarative. The lengthening reported in Genzel (2013) and in Genzel & Kügler (2016) was about 20% on average. In addition to the lengthening, the vowels of the polar question show a higher intensity on average, and thus are perceptually louder than their corresponding declarative counterparts.

Table 1: Duration of sentence-final vowel in milliseconds (ms) – Comparison of declarative (D) and polar question (Q) and their difference (diff.) for sentences (23) and (24).

Speaker	D (23c)	Q (23b)	diff.	D (24c)	Q (24b)	diff.
1	105	157	52	109	138	29
2	135	150	15	111	117	6
3	148	181	33	48	65	17
4	134	191	57	44	82	38
mean	131	170	39	78	101	23

In order to evaluate whether global register raising or the local cues sentence-final F0 lowering, vowel lengthening and higher intensity are the most salient perceptual cues of polar questions, Genzel & Kügler (2016) ran a forced choice identification perception test where listeners were asked to rate each stimulus as a question or a declarative. Stimuli were either original polar questions and declaratives, or cross-spliced stimuli, which were cut at the last syllable and combined with either a question or declarative beginning. Overall, listeners identified original stimuli correctly most of the time (questions 98%, declaratives 89%). For cross-spliced stimuli listeners based their decision on the last syllable of the sentence: stimuli containing a final declarative syllable with the preceding raised register of a polar question were rated 80% as declaratives; stimuli containing a final question syllable with the preceding pitch register of a declarative were rated 94% as questions. This result suggests that listeners unambiguously decide on the identity of a question or declarative at the end of the sentence, where the sentence-final cues duration, intensity and F0 differentiate between polar questions and declaratives. The global cue of raised pitch register appears to be a universal phonetic side-effect of interrogativity (cf. Gussenhoven 2004).

From the acoustic analysis and the perceptual results, we can conclude that in Akan, local prosodic cues are used to identify polar questions. These local cues should thus be phonologically represented. Therefore, the proposal for Akan is that a polar question is phonologically marked by a low ɪ-phrase boundary tone (L%). The effect of this low boundary tone is an enhancement of the prosodic cues of duration and intensity of the sentence-final vowel, while sentence-final F0 is identical to declarative sentences. Note that the downward trend in F0 of an utterance is characteristic for all Akan sentence types. The L% boundary tone is a language-specific expression of polar questions and has only local scope over the sentence-final syllable. Similar findings of language-specific local cues of questions are found in the Bantu languages Xhosa (Jones et al. 1998) and Sesotho (Mixdorff et al. 2011), and in Cantonese (Ma et al. 2011). In all these languages including Akan, global register raising is also present in questions. At least in Xhosa, a globally raised register at the beginning of a sentence is already functionally interpreted as a question (Jones et al. 1998). For Akan, it is a matter of future research to determine what role the cue of global register raising plays in the disambiguation of sentence types.

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3.3.2 Constituent questions

Constituent questions in Akan are characterized by a wh-word, or by an interrogative pronoun (Saah 1988). According to Saah (1988), the wh-word may remain in-situ or may be fronted to the sentence-initial position. A fronted wh-word is obligatorily followed by a focus marker *na* (cf. focus fronting in (12)), and this construction expresses greater emphasis on the wh-word.

The data in (24) show a comparison between a constituent question with an in-situ wh-word (24a), a polar question (24b), and a declarative (24c), which are illustrated in Figure 9. All three sentences contain five syllables with an identical tonal sequence. In Figure 9, the characteristic lengthening of the sentence-final vowel in a polar question compared to a declarative is visible (157 ms vs 105 ms).

The comparison of the time-normalized averaged intonation contours in Figure 10 reveals a similar overall pattern for all three sentences. Similar to polar questions, globally raised pitch register is also found in constituent questions. Perceptually, however, the sentence-final wh-word is not as salient as the final syllable in polar questions. Nor is there a particular lengthening of the vowel or of the syllabic nasal of the wh-word *dɛn* 'what' in (24a). The phonetic cues which seem to be correlates of a low ι-phrase boundary tone in polar questions are not found in constituent questions. Hence, we propose that constituent questions are not marked by an ι-phrase boundary tone.

(24) a. ésí jí dɛ́ǹ?
Esi take_away.PRS what
'What does Esi take away?'

b. ésí jí lɛ́tà?
Esi take_away.PRS letter
'Esi takes away the letter?'

c. ésí jí lɛ́tà.
Esi take_away.PRS letter
'Esi takes away the letter.' (cf. Genzel & Kügler 2016)

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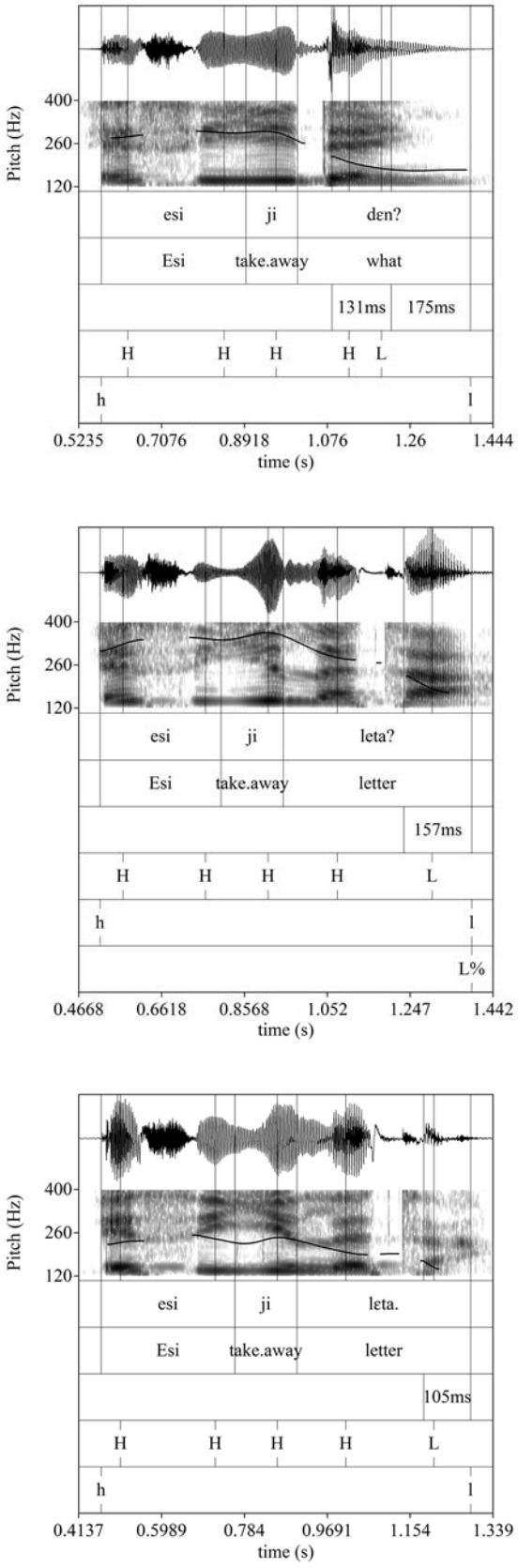

Figure 9. Waveform, spectrogram, and F0 contour of interrogatives: constituent question (24a) (upper panel), polar question (24b) (mid panel), and corresponding declarative of identical sentence length (24c) (lower panel).

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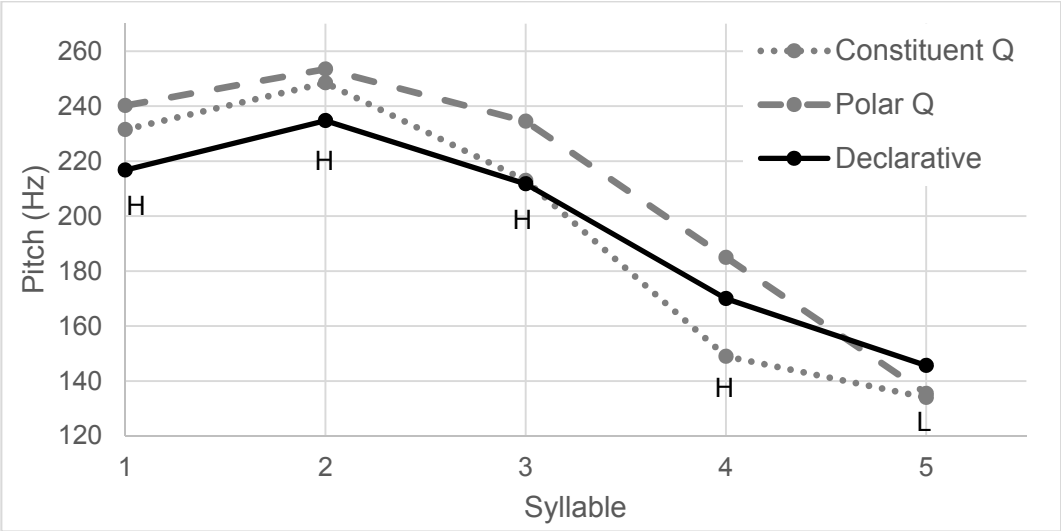

Figure 10. Averaged F0 means of four speakers; comparison between a constituent question (24a), a polar question (24b) and a declarative (24c) with identical tone patterns and sentence length.

From the data shown so far, we can propose the following phonological analysis. Akan exhibits a low intonational phrase boundary tone, which signals polar questions (cf. Genzel 2013; Genzel & Kügler 2016) but not constituent questions. A phonological representation of (24) is given in (25). The sentences are divided into two phonological phrases: one phonological phrase contains the subject noun phrase, the other one contains the verb phrase including the object noun phrase (cf. section 3.1, and Kügler 2015). Both phonological phrases are dominated by the intonation phrase, which is associated with a sentence-initial high register tone and a sentence-final low register tone. In all sentence types, the domain for the downward intonation contour is between the two register tones, and downstep is accounted for by phonetic implementation rules for L- and H-tones (cf. Genzel 2013). In the case of a polar question, a low ι-phrase boundary tone is associated sentence-finally (25b) causing lengthening and higher intensity of the final syllable.

(25) a. h l
H H H L
[[esi]φ [ji dɛn]φ]ι constituent question

b. h l
H H H L L%
[[esi]φ [ji leta]φ]ι polar question

c. h l
H H H L
[[esi]φ [ji leta]φ]ι declarative

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3.4. Imperative sentence type

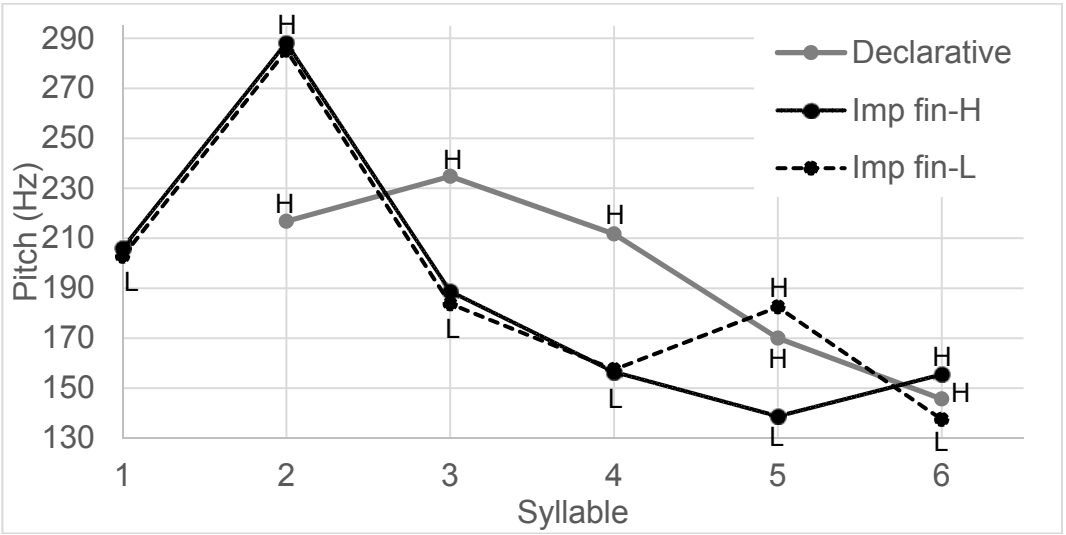
The imperative sentence type is characterized by lexical tonal changes on the verb (Dolphyne 1988; Paster 2010). In (26a/b) for instance, the underlying form of the verb 'to ask' is bìsá, which changes to bísà in the imperative. Apart from this grammatical tonal replacement (cf. section 2.3), the intonation pattern of imperatives seems to deviate slightly from that of simple declarative sentences. An imperative sentence lacks sentence-final tonal neutralization. The intonation contour in general is the result of local tonal interaction as in other sentence types.

Consider the imperatives with a sentence-final H-tone (26a) and a sentence-final L-tone (26b). In Figure 11, these two examples are compared with the simple declarative sentence (18a), which is repeated as (26c) here.[12] The tonal structure of the two imperatives is identical up to the sentence-final word. In Figure 11 (26a) is represented by the solid black line, and (26b) by the dashed black line. The sentence-final H-tone of (26a) is realized higher than the sentence-final L-tone of (26b), and higher than the sentence-final H-tone of the declarative sentence. This difference in tonal scaling seems to point to the fact that the sentence-final tone neutralization does not happen in the imperative sentence type. However, as noted before, the conditions of sentence-final H-tone lowering require further research. Hence, our findings that sentence-final H-tones are incompletely neutralized should be taken as tentative results.

(26) a. kɔ̀-bísà nò sɨ̀ká.
go-ask.IMP 3SG.OBJ money
'Go ask him for money!'

b. kɔ̀-bísà nò pájà.
go-ask.IMP 3SG.OBJ papaya
'Go ask him for papaya!'

c. kúkúó-bá nó.
pot-DIM DEF
'The small pot.'



[12] Note that the average F0 of the declarative (26c) in Figure 11 differs from that of (18a) in Figure 3. This is because in Figure 3, the data are based on the six speakers who were recorded and analysed in Genzel (2013). All other figures including Figure 11 represent the average F0 data of the four speakers recorded for this study.

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Figure 11. Averaged F0 means of four speakers; comparison between imperatives with a final H-tone (solid black line) and with a final L-tone (dashed black line), and a declarative (solid grey line); data from (26).

4. Prosodic realization of focus

Focus is known to affect the intonation, more specifically the pitch register, of utterances in many languages, among them intonation languages like German (Féry & Kügler 2008) or tone languages like Mandarin (Xu 1999). In Mandarin, for instance, register expansion leads to higher scaling of H-tones (tone 1), lower scaling of L-tones (tone 3) and higher and/or lower scaling of rising (tone 2) and falling tones (tone 4) (Xu 1999). In an overview of prosodically marked focus in selected African languages Zerbian et al. (2010) argued that, independent of the language family, neither prosodic marking of focus in general nor expansion of pitch range under focus or deaccentuation can be considered language universals. Indeed, the majority of languages in this volume do not show prosodic effects of focus. As an exception, both Akan (see below) and Bemba (Kula & Hartman this volume) show pitch register lowering under focus. The difference between the two languages is in the domain of register lowering. In Akan, the pitch register is lowered on the focused constituent whereas in Bemba, the post-focal domain is lowered.

Instead of changes of the pitch register, many languages, including African tone languages, show an effect of focus on the phrasing pattern such that a prosodic phrase break occurs left and/or right of the focused constituent (cf. e.g. Ewe: Fiedler & Jannedy 2013; Shingazidja: Patin this volume; Chichewa: Kanerva 1990; however, see Downing & Pompino-Marschall 2013, who argue against an influence of focus on prosodic phrasing in Chichewa). The tendency for languages to rephrase their prosodic structure under focus has been analysed as a tendency for focus to align with an edge of a prosodic phrase (Féry 2013).

Akan shows prosodic marking of focus in terms of pitch register effects and phrasing. The pitch register effect shows up as pitch register lowering both for H-tones and L-tones and both for in-situ and ex-situ focus (Kügler & Genzel 2012), contrary to the well-known register expansion or higher scaling of tones (cf. Gussenhoven 2004). Note however that Boadi (1974) reported tonal raising of both H- and L-tones on ex-situ focused words on impressionistic grounds. The pitch register lowering effect is illustrated in Figure 12, where the solid black line represents the course of F0 on the target word *àmáǹgò* 'mango' in the neutral, i.e. baseline, condition. In the case of contrastive focus (dashed black line), speakers lowered their pitch register significantly by about 1 to 1.5 semitones on average (Kügler & Genzel 2012: 345). The experimental data were elicited with question-answer pairs. Speakers listened to a pre-recorded question (27Q) and were asked to answer the question by reading out a provided answer (27A). The prosodic expression of correction resulted in a pitch register lowering, all other tones being equal in the target sentence.

(27) Q: ànúm̀ tɔ̀-ɔ́ kòbí ánɔ̀pá jí?
Anum buy-PST salty fish morning this
'Did Anum buy salty fish this morning?'
A: ànúm̀ tɔ̀-ɔ́ àmáǹgò ánɔ̀pá jí
Anum buy-PST mango morning this
'Anum bought a mango this morning.' (cf. Genzel & Kügler 2010: 83)

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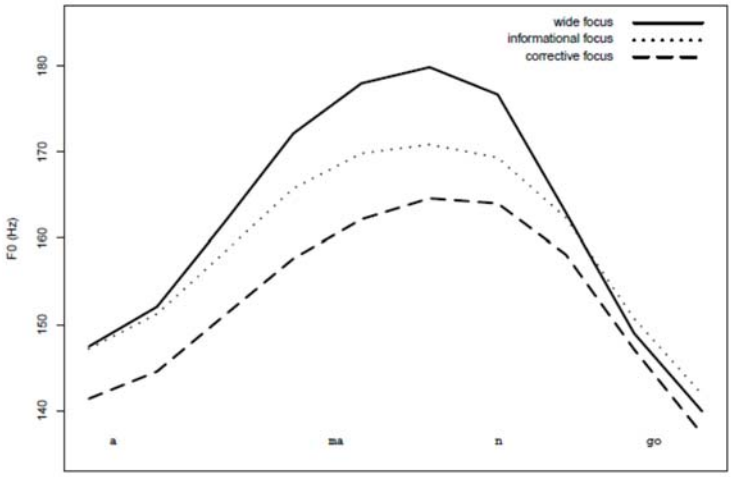

Figure 12. Illustration of pitch register lowering of a H-tone in corrective focus (dashed black line) compared to wide focus (solid black line) or narrow information focus (dotted grey line), from Kügler & Genzel (2012: 344).

As for phrasing, Genzel (2013: 195ff) shows data where a glottal stop is inserted before and/or after the focused constituent; cf. Figure 13.[13] The observation of inserted glottal stops was made on the basis of semi-spontaneous data. Glottal stop insertion was not found in the experimentally controlled data set of Kügler & Genzel (2012). The occurrence of a glottal stop may be interpreted as a prosodic boundary delimiting the focused constituent. Such a boundary would be in line with a so-called emphasis boundary observed in Kwa-languages other than Akan (Leben & Ahoua 2006). The example in Figure 13 comes from a situation-description task in which speakers were asked to spontaneously answer questions based on a picture that depicts a particular situation (Genzel & Kügler 2010). In the case cited here, two persons were visible in the picture, one in a boat and one in the water. The one in the boat is helping the other person to climb into the boat. Both persons were labelled with proper names. One of the context questions was a constituent question asking for a narrow informational object focus (28), and the answer of one of the speakers is illustrated in Figure 13 showing the focused object flanked by glottal stops. Since these are impressionistic observations, we cannot draw any quantitative conclusions about the effect of focus and phrasing. However, it seems that focus may be marked by means of a prosodic break, at least to some extent and under certain circumstances.

(28) a. ɕɥàǹ nà adʑ͡ìmàǹ bóà-à ánɔ̀pá jí
who FM Agyeman help-COMPL morning this
'Whom did Agyeman help this morning?' (Genzel & Kügler 2010: 83)

b. àdʑ͡ìmàǹ bóà-à ʔàdò ʔ ánɔ̀pá jí
Agyeman help-COMPL Ado morning this
'Agyeman helped Ado this morning.'

[13] A reviewer notes that glottal stop insertion in example (28) may be due to a strategy to prevent coarticulation of vowels in a focused position. We have no example with nasals to show a general glottal stop insertion.

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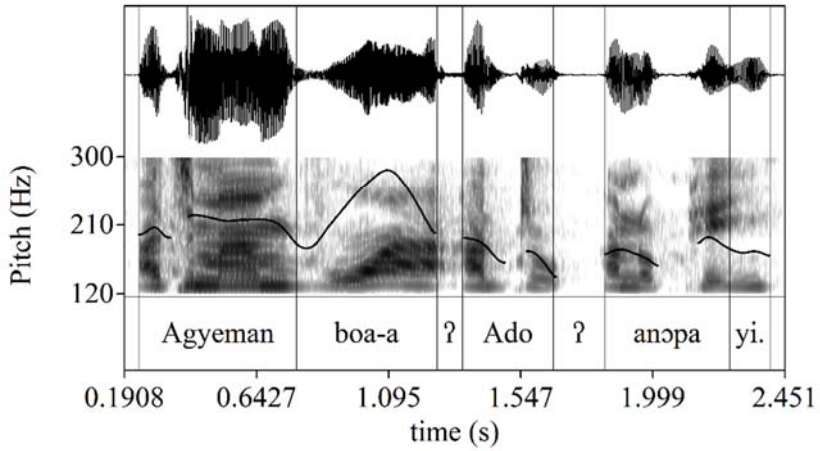

Figure 13. Glottal stop insertion before and after a focused constituent (Ado), analysis from Genzel (2013: 197), data from Genzel & Kügler (2010).

5. Conclusion

This chapter presented an analysis of the intonation in the tone language Akan. Akan employs a simple post-lexical tonal grammar that accounts for the shapes of an intonation contour. Table 2 lists the prosodic events discussed in this chapter. The unmarked post-lexical structure is found in simple declaratives. The downward trend of an intonation contour is shaped by local tonal interactions (downstep), and sentence-final tonal neutralization. The downward trend is modelled phonologically by means of a high and low pitch register tone, and the actual F0 curve is achieved by means of phonetic implementation rules à la Liberman & Pierrehumbert (1984). In the case of polar questions, an ι-phrase-final low boundary tone (L%) accounts for the intensity increase and lengthening of the final vowel compared to a declarative. Complex declaratives and left-dislocations show a partial pitch reset at the left edge of an embedded ι-phrase. The pitch reset occurs independent of the type of clause (matrix or complementizer clause). The examples discussed in this chapter contained a subordinate complementizer clause and left-dislocated structures, which both are marked by a pitch reset at the left edge of the embedded clause (cf. Kügler 2016).

The very prominent downward trend in pitch in Akan utterances was acknowledged as a terracing property occurring in many West African tone languages (Welmers 1959; Clements 1983; Abakah et al. 2010). The detailed phonetic study of downtrends in Akan of Genzel (2013) revealed the interesting insight that the downtrend is identical in utterances with differing tone qualities and in utterances which contain only like tone sequences (either only H-tones or only L-tones). Downstep as a phonological phenomenon and declination as a gradient phonetic pitch lowering (cf. Gussenhoven 2004: 98; Connell 2011) appear to be identical in surface intonation. Genzel's conclusion, which we adopt here, was that declination has been phonologized in Akan with the result that downstep is a fundamental concept in sentence-level intonation in Akan. Phonetic implementation rules predict the amount of downstep within an utterance.

Sentence-final tone neutralization as proposed in this chapter may enhance the requirement of downstepping. This tonal neutralization is clearly marked since elsewhere in the sentence tonal distinctions are maintained. Sentence-final lowering of H-tones is fairly common, as the collection of chapters in this volume shows. However, not all languages show sentence-final tone lowering. For Tswana for instance, Zerbian (this volume) presented evidence that lexical H-tones are clearly distinguished from surface L-tones in sentence-final

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position; in some contexts such as lists the tonal distinction may even be enhanced as an effect of intonation, i.e. Tswana sentence-final H-tones are realized higher in pitch than a surface L-tone.

Table 2. Prosodic events in Akan and their distribution.

Prosodic event	Distribution
L%	right edge of the ι-phrase in polar questions
h, l	high and low pitch register tone associated with the left and right edge of an ι-phrase, respectively
%reset	left edge of an embedded ι-phrase
tone neutralization	declaratives, interrogatives sentence-final H-tone drops to a low pitch level
downstep	downtrend in all sentence types, local tonal interactions

Regarding the interaction of lexical tone and intonation, this chapter has demonstrated that underlying lexical tones are not affected with the exception of sentence-final H-tones. The presence of a low ι-phrase boundary tone enhances the phonetic cues intensity and duration phrase-finally. In terms of the possible tonal interactions with intonation proposed by Hyman & Monaka (2008), Akan shows the strategy of *avoidance*. That is, intonational events are clearly separated from lexical tones. The presence of sentence-final tone neutralization could however speak in favour of Akan constituting a case of tonal *accommodation* (Hyman & Monaka 2008), i.e. a minimal interaction between intonation and lexical tone. Regarding the interaction of pitch reset and lexical tones, it is clearly a strategy of *avoidance* in Akan because the phonological distinction of lexical tones after a pitch reset is maintained, i.e. the reset is higher when a H-tone follows than when a L-tone follows.

To conclude, the interaction of tone and intonation is minimal in Akan. Intonational events consist of a low boundary tone, register tones and pitch register manipulations in terms of pitch reset. A tone language like Akan thus clearly shows intonation, corroborating the view that every language has intonation (Bolinger 1962; 1978); see however the absence of intonational cues in Mambila (Connell this volume). The inventories of intonational events that the tonal grammars of languages employ, however, necessarily differ between languages, partly also depending on the prosodic typological profiles of the languages.

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References

Abakah, Emmanuel N. 2000. A closer look at downstep in Akan. *Afrika und Übersee* 83. 1–23.

Abakah, Emmanuel N. 2002. The low tone in Akan. In Theda Schumann, Mechthild Reh, Roland Kießling & Ludwig Gerhardt (eds.), *Aktuelle Forschungen zu afrikanischen Sprachen*: *Sprachwissenschaftliche Beiträge zum 14. Afrikanistentag, Hamburg, 11.-14. Oktober 2000*, 193–210. Köln: Köppe.

Abakah, Emmanuel N. 2005a. Tone in Akan nominals. In Mary E. Kropp Dakubu & Emmanuel K. Osam (eds.), *Studies in the Languages of the Volta Basin 3*, 193–218. Legon: Linguistics Department, University of Ghana.

Abakah, Emmanuel N. 2005b. Tone rules in Akan. *Journal of West African Languages* 32(1-2). 109–134.

Abakah, Emmanuel N. 2010a. The tonomorphology of reduplication in Akan, Dangme and Gurene. In Mary E. Kropp Dakubu, Nana A. Amfo, E. Kweku Osam, Kofi K. Saah & G. Akanlig-Pare (eds.), *Studies in the Languages of the Volta Basin 6*, 121–140. Legon: Linguistics Department, University of Ghana.

Abakah, Emmanuel N. 2010b. Tone and the Associative Construction in Akan. *Journal of West African Languages* 37(2). 57–79.

Abakah, Emmanuel N., Comfort Amissah & Kwaku Ofori. 2010. Tone Terracing in Akan. *Journal of African Cultures and Languages* 1(1). 1–20.

Abakah, Emmanuel N. & Louisa Koranteng. 2007. The Interaction of Tone, Syntax and Semantics in Akan. In Mary E. Kropp Dakubu, G. Akanlig-Pare, E. Kweku Osam, Kofi K. Saah & (eds.), *Studies in the Languages of the Volta Basin 4*, 63–86. Legon: Linguistics Department, University of Ghana.

Anderson, Jonathan C. 2009. Preliminary to Preliminary: Speech Rhythm in Akan (Twi). In Jonathan C. Anderson, Christopher R. Green & Samuel G. Obeng (eds.), *African Linguistics across the Discipline*, 133–143. Bloomington: IULC Publications.

Bickel, Balthasar, Bernard Comrie & Martin Haspelmath. 2008. The Leipzig Glossing Rules. Available (December 2015) at http://www.eva.mpg.de/lingua/resources/glossing-rules.php.

Boadi, Lawrence A. 1974. Focus-marking in Akan. *Linguistics* 140. 5–57.

Boadi, Lawrence A. 1990. Questions in Akan. *Frankfurter Afrikanistische Blätter* 2. 70–92.

Boadi, Lawrence A. 2005. *Three major syntactic structures in Akan: Interrogatives, complementation, and relativisation*. Accra: Black Mask Ltd.

Boersma, Paul & David Weenink. 2014. *Praat: Doing phonetics by computer [Computer program]*. Available (December 2015) at http://www.praat.org.

Bolinger, Dwight L. 1962. Intonation as a universal. In *Proceedings of the International Congress of Linguistics*, 833–848: Oslo.

Bolinger, Dwight L. 1978. Intonation across languages. In J. Greenberg (ed.), *Universals of Human Language*, 471–524. Palo Alto: Stanford University Press.

Cahill, Michael. 1985. *An autosegmental analysis of Akan nasality and tone.* Arlington: University of Texas, MA Thesis.

Casali, Roderic F. 2008. ATR Harmony in African Languages. *Language and Linguistics Compass* 2(3). 496–549.

Christaller, Johan G. 1933. *Dictionary of the Asante and Fante language called Tshi (Twi)*. Basel: Evangelical Missionary Society.

Clements, George N. 1979. The description of terraced-level tone languages. *Language* 55(3). 536–558.

Clements, George N. 1983. The Hierarchical Representation of Tone Features. In Ivan R. Dihoff (ed.), *Current approaches to African linguistics vol. 1* (Publications in African languages and linguistics 1), 145–176. Dordrecht: Foris.

Clements, George N. 1990. The status of register in intonation theory: Comments on the papers by Ladd and by Inkelas and Leben. In John Kingston & Mary E. Beckman (eds.), *Papers in Laboratory Phonology I*, 58–71. Cambridge: Cambridge University Press.
Connell, Bruce. 2011. Downstep. In Marc Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology*, 824–847. Malden, MA: Wiley-Blackwell.
Dolphyne, Florence A. 1988. *The Akan (Twi-Fante) language*: *Its sound systems and tonal structure*. Accra: Ghana Universities Press.
Dolphyne, Florence A. 1994. *A phonetic and phonological study of downdrift and downstep in Akan* (Paper, 25th Annual Conference on African Linguistics, Rutgers University). Rutgers University.
Dolphyne, Florence A. & Mary E. Kropp Dakubu. 1988. The Volta-Comoe Languages. In Mary E. Kropp Dakubu (ed.), *The Languages of Ghana*, 50–90. London: Kegan Paul.
Downing, Laura J. & Bernd Pompino-Marschall. 2013. The focus prosody of Chichewa and the Stress-Focus constraint: A response to Samek-Lodovici (2005). *Natural Language & Linguistic Theory* 31(3). 647–681.
Ermisch, Sonja. 2006. Focus and topic Akan constructions in Akan. In Sonja Ermisch (ed.), *Frankfurter Afrikanistische Blätter* (18), 51–68. Köln: Köppe.
Féry, Caroline. 2013. *Focus as prosodic alignment.* Natural Language & Linguistic Theory 31(3). 683–734.
Féry, Caroline & Frank Kügler. 2008. Pitch accent scaling on given, new and focused constituents in German. *Journal of Phonetics* 36(4). 680–703.
Fiedler, Ines, Katharina Hartmann, Brigitte Reineke, Anne Schwarz & Malte Zimmermann. 2010. Subject Focus in West African Languages. In Malte Zimmermann & Caroline Féry (eds.), *Information structure*: *Theoretical, typological, and experimental perspectives* (Oxford linguistics), 234–257. Oxford: Oxford University Press.
Fiedler, Ines & Stefanie Jannedy. 2013. Prosody of focus marking in Ewe. *Journal of African Languages and Linguistics* 34(1). 1–46.
Genzel, Susanne. 2013. *Lexical and post-lexical tones in Akan.* Potsdam: Universität Potsdam, Humanwissenschaftliche Fakultät, PhD Thesis. Available (December 2015) at https://publishup.uni-potsdam.de/opus4-ubp/frontdoor/index/index/docId/7796.
Genzel, Susanne & Frank Kügler. 2010. How to elicit semi-spontaneous focus realizations with specific tonal patterns. In Mira Grubic, Susanne Genzel & Frank Kügler (eds.), *Linguistic Fieldnotes I*: *Information Structure in different African Languages* (Interdisciplinary Studies on Information Structure (ISIS), vol. 13), 77–102. Potsdam: Universitätsverlag Potsdam.
Genzel, Susanne & Frank Kügler. 2011. Phonetic Realization of Automatic (Downdrift) and Non-automatic Downstep in Akan. In Eric Zee & Wai-Sum Lee (eds.), *Proceedings of the 17th International Congress of Phonetic Sciences (ICPhS XVII), Hong Kong*, 735–738.
Genzel, Susanne & Frank Kügler. 2016. *Prosodic question marking in Akan - what do listeners hear?* MS, University of Potsdam.
Gussenhoven, Carlos. 2004. *The Phonology of Tone and Intonation*. Cambridge: Cambridge University Press.
Huang, Cheng-Teh J. 1985. The autosegmental and metrical nature of tone terracing. In Didier L. Goyvaerts (ed.), *African Linguistics*: *Essays in Memory of M. W. K Semikenke*, 209–238. Amsterdam: John Benjamins.
Hyman, Larry M. 2001. Tone systems. In M. Haspelmath, E. König, H. E. Wiegand & H. Steger (eds.), *Language typology and language universals: An international handbook*, 1367–1380: Berlin: Mouton de Gruyter.
Hyman, Larry M. 2006. Word-Prosodic Typology. *Phonology* 23(2). 225–257.

Hyman, Larry M. & Kemmonye C. Monaka. 2008. Tonal and Non-Tonal Intonation in Shekgalagari. In *UC Berkeley Phonology Lab Annual Report*, 269–288. Berkeley.
Itô, Junko & Armin Mester. 2012. Recursive prosodic phrasing in Japanese. In Toni Borowsky, Shigeto Kawahara, Takahito Shinya & Mariko Sugahara (eds.), *Prosody Matters*: *Essays in Honor of Elisabeth Selkirk*, 280–303. London: Equinox Press.
Jones, J., J. A. Louw & J. C. Roux. 1998. Perceptual experiments on Queclaratives in Xhosa. *South African Journal of Linguistics* 16, Supplement 36. 19–31.
Kanerva, Jonni. 1990. Focusing on phonological phrases in Chichewa. In Sharon Inkelas & Draga Zec (eds.), *The Phonology-Syntax Connection*, 145–161. Chicago: University of Chicago Press.
Kisseberth, Charles W. & David Odden. 2003. Tone. In Derek Nurse & Gérard Philippson (eds.), *The Bantu Languages*, 59–70. London: Routledge.
Kügler, Frank. 2015. Phonological phrasing and ATR vowel harmony in Akan. *Phonology* 32(1). 177–204.
Kügler, Frank. 2016. Embedded clauses and recursive prosodic phrasing in Akan. In *Proceedings of the Fifth International Symposium on Tonal Aspects of Languages (TAL 2016)*.
Kügler, Frank & Susanne Genzel. 2012. On the Prosodic Expression of Pragmatic Prominence: The Case of Pitch Register Lowering in Akan. *Language and Speech* 55(3). 331–359.
Ladd, D. R. 1990. Metrical representation of pitch register. In John Kingston & Mary E. Beckman (eds.), *Papers in Laboratory Phonology I*, 35–57. Cambridge: Cambridge University Press.
La Velle, C. R. 1974. An experimental study of Yoruba tone. *Studies in African Linguistics*, (Suppl. 5), 185–194.
Leben, William R. & Firmin Ahoua. 2006. Phonological Reflexes of Emphasis in Kwa Languages of Cote d'Ivoire. In Paul Newman & Larry M. Hyman (eds.), *Studies in African Linguistics*, 145–158. Columbus, Ohio: The Department of Linguistics and the Center for African Studies, Ohio State University.
Lewis, M. P. 2009. *Ethnologue*: *Languages of the world*, 16th ed. Dallas, TX: SIL International.
Liberman, Mark & Janet B. Pierrehumbert. 1984. Intonational invariance under changes in pitch range and length. In Mark Aronoff & Richard T. Oehrle (eds.), *Language Sound Structure*: *Studies in Phonology presented to Morris Halle*, 157–233. Cambridge: MIT Press.
Ma, Joan K.-Y., Valter Ciocca & Tara L. Whitehill. 2011. The perception of intonation questions and statements in Cantonese. *Journal of the Acoustical Society of America* 129(2). 1012–1023.
Manyah, Kofi A. 2006. Relation between Tone and Vowel Quality in Twi. In *Proceedings of the Second International Symposium on Tonal Aspects of Languages*, 37–40. La Rochelle.
Manyah, Kofi A. 2014. Relationship between Lexical Tone Contrasts and Vowel Quality. *European Scientific Journal* 10(17). 418–428.
Marfo, Charles O. 2004. On tone and segmental processes in Akan phrasal words: A prosodic account. *Linguistik online* 18(1/04). 93–110.
Marfo, Charles O. 2005. Akan Focus and Topic Constructions and the Prosody-Syntax Interface. *Journal of West African Languages* 32(1). 45–59.
Mixdorff, Hansjörg, Lehlohonolo Mohasi, Malillo Machobane & Thomas Niesler. 2011. A Study on the Perception of Tone and Intonation in Sesotho. *Proceedings of the 12th Interspeech*. 3188–3191.
Myers, Scott. 1996. Boundary tones and the phonetic implementation of tone in Chichewa. *Studies in African Linguistics* 25(1). 29–60.

Myers, Scott. 1998. Surface underspecification of tone in Chichewa. *Phonology* 15(3). 367–391.
Nkansa-Kyerematen, K. 2004. *The Akans of Ghana*: *Their customs, history and institutions*. Accra: Sebewie Publishers.
Osam, Emmanuel K. A. 2003. An Introduction to the Verbal and Multiverbal System of Akan. In Dorothee Beermann & Lars Hellan (eds.), *Proceedings of the workshop on multi-verb constructions* (Trondheim Summer School 2003). Available (December 2015) at http://www.ling.hf.ntnu.no/tross/osam.pdf.
Paster, Mary. 2010. The verbal morphology and phonology of Asante Twi. *Studies in African Linguistics* 39(1). 77–120.
Peng, Shu-hui, Marjorie K. M. Chan, Chiu-yu Tseng, Tsan Huang, Ok Joo Lee & Mary E. Beckman. 2005. Towards a Pan-Mandarin System for Prosodic Transcription. In Sun-Ah Jun (ed.), *Prosodic Typology*: *The Phonology of Intonation and Phrasing*, 230–270. Oxford: Oxford University Press.
Pfeil, Simone, Susanne Genzel & Frank Kügler. 2015. Empirical investigation of focus and exhaustivity in Akan. In Mira Grubic & Felix Bildhauer (eds.), *Mood, Exhaustivity & Focus Marking in Non-European Languages* (Interdisciplinary Studies on Information Structure (ISIS), vol. 19), 87–109. Potsdam: Universitätsverlag Potsdam.
Pike, Kenneth L. 1948. *Tone languages*. Ann Arbor: University of Michigan Press.
Purvis, T. M. 2009. Speech rhythm in Akan oral praise poetry. *Text & Talk – An Interdisciplinary Journal of Language, Discourse & Communication Studies* 29(2). 201–218.
Rialland, Annie. 2007. Question prosody: An African perspective. In Tomas Riad & Carlos Gussenhoven (eds.), *Tones and Tunes*: *Volume 1. Typological Studies in Word and Sentence Prosody* (Phonology and phonetics 12, 1), 35–62. Berlin: De Gruyter.
Rialland, Annie. 2009. The African lax question prosody: Its realisation and geographical distribution. *Lingua* 119(6). 928–949.
Saah, Kofi K. 1988. Wh-questions in Akan. *Journal of West African Languages* 18(1). 17–28.
Saah, Kofi K. 1994. *Studies in Akan Syntax, Acquisition, and Sentence Processing.* Ottawa: University of Ottawa, PhD Thesis.
Saah, Kofi K. & Mark Dundaa. 2012. *Interrogative sentences in Akan and Kaakyi: A comparative study* (Paper at the 5th Linguistics Association of Ghana conference). University of Education, Winneba.
Schachter, Paul & Victoria Fromkin. 1968. Phonology of Akan. In *Working Papers in Phonetics 9*, 1–268. Department of Linguistics, UCLA.
Selkirk, Elisabeth O. 2011. The Syntax-Phonology Interface. In John A. Goldsmith, Jason Riggle & Alan C. L. Yu (eds.), *The Handbook of Phonological Theory*, 2nd ed. (Blackwell handbooks in linguistics), 435–484. Chichester: Wiley-Blackwell.
Shih, Chilin. 2000. A declination model of Mandarin Chinese. In Antonis Botinis (ed.), *Intonation*: *Analysis, Modelling and Technology*, 243–268. Dordrecht: Kluwer.
Snider, Keith L. 1999. *The geometry and features of tone*. Arlington: SIL International and the University of Texas.
Stewart, John M. 1965. The typology of the Twi tone system. In *Bulletin of the Institute of African Studies*, 1–27: Institute of African Studies, University of Ghana, Legon.
Stewart, John M. 1993. Dschang and Ebrié as Akan-type total downstep languages. In Harry van der Hulst & Keith L. Snider (eds.), *The phonology of tone*: *The representation of tonal register*, 185–244. Berlin: De Gruyter.
Welmers, William E. 1959. Tonemics, morphotonemics, and tonal morphemes. *General Linguistics* 4. 1–9.
Xu, Yi. 1999. Effects of tone and focus on the formation and alignment of f0 contours. *Journal of Phonetics* 27(1). 55–105.

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Yip, Moira J. 2002. *Tone*. Cambridge: Cambridge University Press.
Zerbian, Sabine, Susanne Genzel & Frank Kügler. 2010. Experimental work on prosodically-marked information structure in selected African languages (Afroasiatic and Niger-Congo). In *Workshop on Experimental Approaches to Focus, Chicago, Speech Prosody 2010*. Chicago. Available (December 2015) at http://speechprosody2010.illinois.edu/abstracts/100976.htm.