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Intonational Phonology of Georgian

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Abstract

This paper proposes a prosodic structure and the tonal pattern of Georgian, the national language of Georgia. The language has three prosodic units above the Word: Intonation Phrase (IP), Intermediate Phrase (ip), and Accentual Phrase (AP). All these units are marked by a boundary tone, but an AP in Georgian is unique typologically in that it has pitch accent linked to a stressed syllable and phrase accent (H+L) linked to an antepenultimate syllable of an AP. Contrary to previous studies on Georgian stress, we claim that this High tone on the antepenult is a property of an AP, not linked to a stressed syllable of a word. This phrase accent occurs in questions and focus phrases, suggesting its connection to an emphatic meaning. The intonation of a declarative sentence consists of a sequence of rises, with a lowering of f0 peaks over the utterance. The height of the f0 peak/valley and the tonal pattern of an AP mark a prosodic grouping of words, which often matches a semantic/syntactic grouping of words.

1. Introduction

Georgian, also known as Kartuli ena, is the national language of Georgia, a country located in the Caucasus. It is a member of the South Caucasian language group, and is spoken by over 4 million people (Hewitt 1995).

Georgian is well known for its complex morphology and segmental properties, but not much is known about its intonation. The language is claimed to have stress, although its exact realization is debated in the literature. Robin and Waterson (1952) examined 'a word in isolation' data from one speaker, and proposed the following rules for stress assignment. They added that stress is weak in Georgian and is realized through high pitch.

(1)	Number of syllables in word	Location of stress
	2	1st syllable
	3	1st or 2nd syllable
	4	2nd or on 1st & 3rd syllables
	5	1st & 3rd or on 2nd & 4th syllables
	6 +	1st & antepenult (primary stress)

Slightly different stress assignment rules were proposed in Aronson (1990). See (2).

(2)	Number of syllables in word	Location of stress
	4 or fewer	1st or antepenult syllable
	5 or more	1st & antepenult syllables

So, what is common in these two studies is that the first syllable of a word is stressed, and when a word is longer than 4 syllables, the 1st and antepenultimate syllables are stressed.

Our study investigates the intonation of Georgian in the Autosegmental-Metrical (AM) model of intonation (e.g., Pierrehumbert 1980, Beckman & Pierrehumbert 1986, Ladd 1996). Georgian intonation has rarely been studied in this framework except for a few studies on question intonation (Bush 1999, Müller 2005). As far as we know, this study is the first systematic investigation of Georgian intonation conducted by examining various sentence types in both broad and narrow focus contexts. Section 2 introduces our method of data collection, Section 3 reports our analysis, and Section 4 discusses the results and provides the summary of the tonal inventory and the prosodic structure of Georgian.

2. Methods

The data for this study are from four Georgian speakers, three females (MB, JB, N) and one male (L), in their 30s and 40s. Speaker MB's production was collected through 20 weeks of fieldwork (January-June 2007), one hour per week, in a quiet classroom or office at UCLA. She produced 575 sentence types (154 declaratives, 49 yes/no-questions, 153 wh-questions, 185 focus sentences, and 34 others (e.g., list, vocative, tag questions), with at least two repetitions of each sentence. Focus was elicited either by asking wh-questions or by providing the context for corrective focus (*not* A *but* B). Three other speakers read selected sentences from MB's data, at least twice each: 30 declaratives, 15 yes/no-questions, 40 wh-questions, and 30 focus sentences.

Procedure: Subject wore a head-mounted microphone connected to a laptop computer. Utterances were recorded, using *PitchWorks* (Scicon R&D), directly into a laptop computer at 11 or 22 kHz sampling rate, in a quiet room. Target sentences were extracted from the original session recording. Pitch tracks were created using *PitchWorks* and word boundaries and the meaning of each word were labeled on two tiers (words and glosses). Pitch tracks were analyzed by examining the location of f0 peak/valley and the timing of each pitch targets. Tones were added on the 'Tones' tier after discussion.

3. Results

In Georgian, each content word tends to be marked by a tonal pattern, either by a rising tone pattern over a word (L H), or a falling tone pattern over a word (H L). In general, this tonally marked unit includes one word but can include more than one word. Since this tonally marked unit is slightly larger than a word, we call it an **Accentual Phrase** (AP), as proposed in other languages (e.g., Japanese (Beckman & Pierrehumbert 1986), Korean (Jun 1993, 1998), French (Jun & Fougeron 1995, 2000, 2002), Farsi (Jun 2005, Arbisi-Kelm 2007, Esposito & Barjam 2007, Sadat-Tehrani 2007), and Bengali (Khan 2006, 2007).

The first syllable of an AP is often prominent by having stronger amplitude and longer duration (though not as prominent as stress in English). This suggests that the first syllable of a word is stressed in Georgian, as proposed by Robin and Waterson (1952) and Aronson

(1990), mentioned above. However, the antepenultimate syllable of a word did not show stronger amplitude or longer duration. Instead, it sometimes showed a high tone, immediately followed by a low tone on the penultimate syllable. But this HL falling tone over the antepenult-penult sequence was not confined to a word level. Our data show that the HL falling tone occurs on the antepenultimate-penultimate syllables of an Accentual Phrase. That is, that falling tone was the property of an AP, not of a word. For this reason, we sometimes found a falling tone over a word boundary (i.e., a High tone at the end of a word and L tone at the beginning of the following word, when these two words are in the same AP). This suggests that the antepenultimate syllable of a word is not stressed at the lexical level. Since the sharp falling tone over antepenultimate-penultimate syllables is quite salient, we call this falling tone an **AP phrase accent, H+L**. The AP phrase accent commonly occurs in interrogatives or when a sentence is produced with focus on a certain word. See Figures 5, 7-10, 12-13.

Since the AP-initial syllable is prominent in Georgian and is often realized with a low pitch (in declaratives) or high pitch (interrogative or focus), we proposed that Georgian has a pitch accent linked to the stressed syllable of a word. The tonal shape over the stressed syllable can be Low (L*), high (H*), or rising (L*+H, where the f0 peak comes after stressed syllable, or L+H*, where the f0 peak is on the stressed syllable). An AP can have more than one word, but only the first stressed syllable is realized with a pitch accent.

The end of an AP is also marked by a tone, i.e., **an AP boundary tone**. It can be either High (Ha) or Low (La) realized on the AP-final syllable, or Rising (L+Ha) realized on the penultimate-final syllables. L+Ha comes after a bitonal pitch accent, and is much rarer than La or Ha.

In addition to an AP, Georgian has two higher prosodic units marked by a tone and duration. We call them an Intermediate Phrase (ip) and an Intonation Phrase (IP). Both units are marked by a boundary tone and phrase-final lengthening, but the degree of juncture is stronger at the end of an IP than that of an ip. A prosodic structure of Georgian and the affiliation of tones are shown in Figure 1.
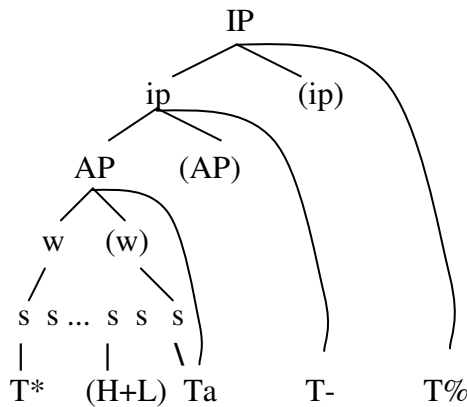
```
                          IP
                      ip        (ip)
                  AP      (AP)
               w    (w)
             s  s ... s  s    s
             |       |      \
             T*   (H+L) Ta      T-        T%
```

Figure 1. A Prosodic Structure and Tone Affiliations in Georgian

AP: Accentual Phrase. It can have one or more words and have only one pitch accent (T* = L*, H*, L+H*, or L*+H) on AP-initial syllable, a possible phrase accent (H+L) on the antepenult of an AP, and a boundary tone realized on AP-final (Ta = Ha, La) or AP-penult & final syllables (Ta = L+Ha).
ip: Intermediate Phrase. It can have one or more APs, and is marked by a boundary tone (T- = H-, L-, L+H-) on the ip-final syllable, which is slightly lengthened.
IP: Intonation Phrase. It can have one or more ips, and is marked by a boundary tone (T% = H%, L%, or HL%) on the IP-final syllable, which is substantially lengthened.
w: word; s: syllable

3.1 Declaratives

The default tonal pattern of a declarative sentence in Georgian is a sequence of rising APs, [L* Ha], with a lowered peak of Ha over a sentence. The sentence final boundary tone is often L%. Figure 2 shows an example pitch track of a sentence, *Manana washed Lali*. The preferred word order in declarative is SOV:

[Mananam][Lali][dabana]
'Manana   Lali washed'

As shown in the figure, each word forms one AP with a Low tone (L*) on the word-initial syllable and a High tone (Ha) at the end of the word. The pitch accented, initial-syllable nuclear [a]-sounds in [mananam] and [dabana] are longer and their amplitudes are greater than those of the [a]-sounds in non-initial syllables.
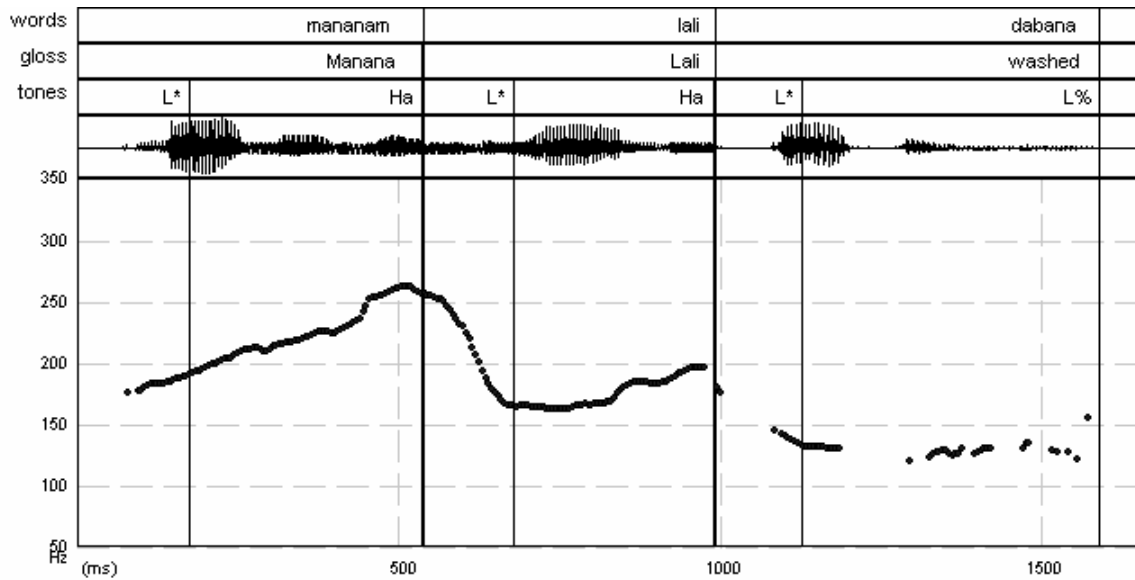
Figure 2. An example pitch track of a sentence, *Manana washed Lali*. Each word forms one AP [L* Ha], and the last AP ends with L%, a common IP-boundary tone for a declarative sentence.

However, when adjacent words are semantically linked and form one syntactic group, they are often prosodically marked by forming one prosodic unit. Figure 3 shows an example. Here, a heavy Noun Phrase subject, [Possessive noun + Adjective + Head noun], forms one Intermediate Phrase. In this case, the ip-final H- boundary tone is either the same or higher in pitch than the preceding AP-final High tone, Ha. That is, it is not lower than the preceding H, as is the case in Figure 2. When more than one AP forms one ip, an ip-initial AP can have Ha or La but the second AP often has La (preceded by H* pitch accent). When the f0 peak of H* is substantially lower than the preceding H tone, we labled !H*, to reflect the downstep-like High pitch accent, but we believe this downstepped !H* is not distinctive, but an allo-tone of H*.

Figure 4 shows another example pitch track of a complex declarative sentence. The subject noun phrase is modified by a relative clause, and this heavy NP subject forms one intermediate phrase, marked by H-. In this example, the main subject noun and the relative pronoun each forms one AP, while the embedded subject noun and the predicate together form one AP. The first AP shows a rising pitch accent, L*+H, and both the first and the second APs show a La boundary.

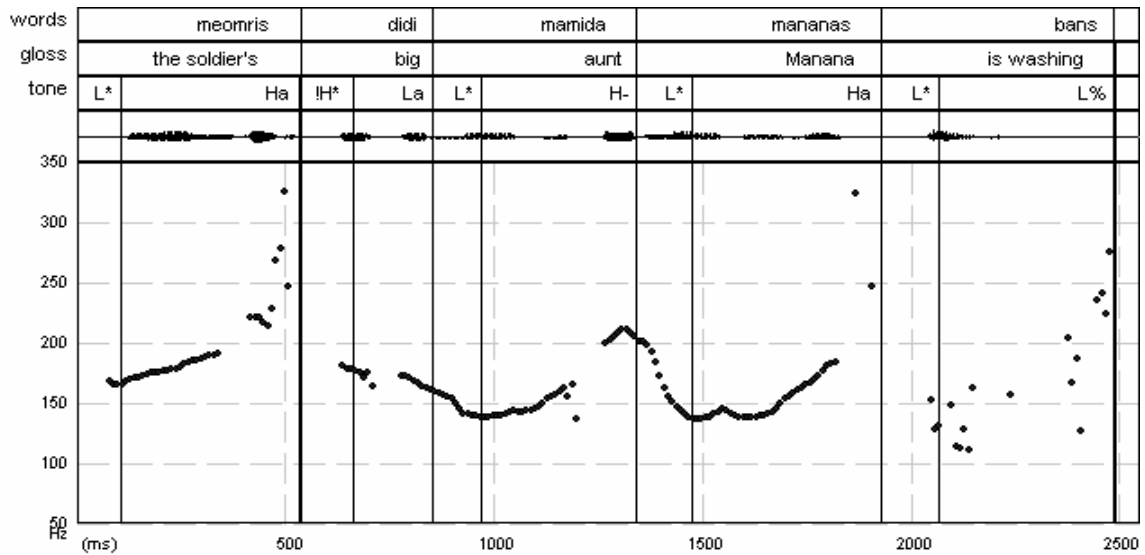| words	meomris	didi	mamida	mananas	bans
gloss	the soldier's	big	aunt	Manana	is washing
tone	L* Ha	!H* La	L* H-	L* Ha	L* L%

Figure 3. An example pitch track of a complex declarative sentence, *The soldier's big aunt is washing Manana*. Here, *The soldier's big aunt* forms one ip, and the end of this unit is marked by a H- boundary tone. The prosodic grouping of the sentence is: /{[the soldier's][big] [aunt])} {[Manana][is washing]}/. In this paper, [ ] is used for an AP grouping, { } for an ip grouping, and / / for an IP grouping.

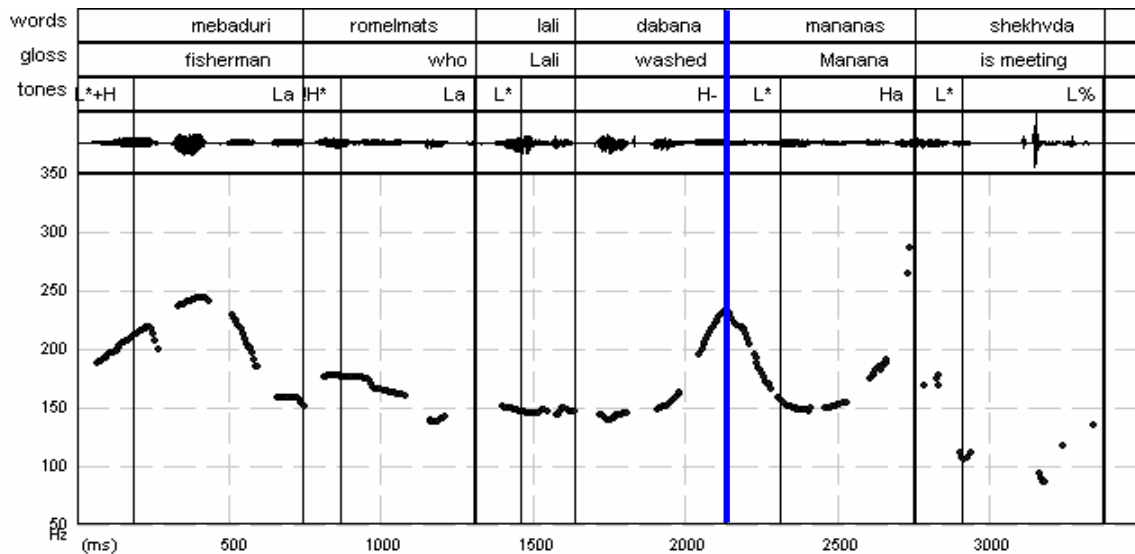| words	mebaduri	romelmats	lali	dabana	mananas	shekhvda
gloss	fisherman	who	Lali	washed	Manana	is meeting
tones	L*+H La	!H* La	L*	H-	L* Ha	L* L%

Figure 4. An example pitch track of a complex declarative sentence, *The fisherman who washed Lali is meeting Manana*. The prosodic grouping is: /{[the fisherman][who][Lali+washed]} {[Manana.][is meeting]}]. The heavy NP subject forms one ip which includes three APs. The 1st and 2nd APs have La.

3.2 Yes/No-Questions

The default word order of a simple yes/no-question in Georgian, when the complement is not heavy, is "Subject + Verb + Complement". Prosodically, a big prosodic break (often an Intermediate phrase boundary) is produced after the Verb, with a H- or L- boundary tone,

and the sentence final boundary tone is either H% or HL%: Subject+Verb (H-/L-) Complement (H%/HL%). When the Verb comes after a short complement phrase, it is interpreted as an echo-question. In general, the first AP of a yes/no-question has H* pitch accent and a La boundary tone.

As mentioned earlier, in yes/no-questions, 'H+L' AP-phrase accent is commonly found on the antepenultimate syllable of an AP when the AP has H* pitch accent and is longer than 3 syllables.[1] Figure 5 shows an example pitch track of a simple Yes/No-Question, *Is Miriam washing beautiful Lali?*. Here, the subject noun and the verb together form one AP and one ip, showing H+L phrase accent followed by an ip-boundary tone, H-. Here, the H and L phrase accent tones are realized, respectively, on the penultimate and final syllables of the first word, *miriami*, illustrating that the H+L phrase accent is not a property of the first word, but of the first AP. That is, they are the antepenult and penult of the first AP.

The complement phrase, Adjective + Noun, in Figure 5 also forms one AP with L* pitch accent (but no H+L phrase accent). The question sentence as a whole forms one IP, with a H% boundary tone. An IP-boundary tone is realized on the IP-final syllable and is not directly interpolated with pitch accent.
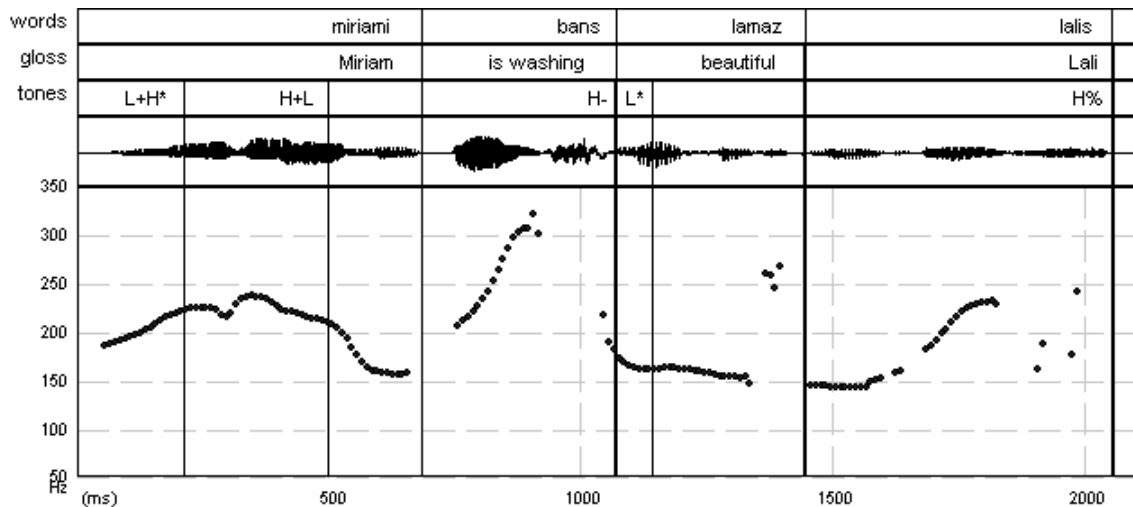

Figure 5. An example pitch track of a simple Yes/No-Question, *Is Miriam washing beautiful Lali?*. The prosodic grouping of this sentence is /{[Miriam +is washing]} {[beautiful+Lali]}/. The first ip has one AP, and the H+L phrase accent is realized on the penultimate (H) and final (L) syllables of the first word, which are the antepenultimate and penultimate syllables of the AP.

When the complement NP is heavier, Adverb+Adj.+Noun, for example, they can still form one AP, as shown in Figure 6. This illustrates that, as was the case in the declarative examples above, prosody marks a syntactic/semantic grouping in Georgian. The sentence

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[1] When an AP had L* pitch accent, the H+L phrase accent was in general not realized, but we have seen a few cases where H+L phrase accent was realized on a focused word. In that case, an AP-initial syllable showed a L tone and the antepenultimate syllable showed an f0 peak with stronger amplitude, suggesting the pitch accent might have shifted to the antepenult of the AP. More focus data needs to be observed.

in Figure 6 is *Did Manana drop very big sourcherry?*. The prosodic grouping of this sentence is /{[Manana][drop]} {[very+big+sourcherry]}/. The Subject forms its own AP ending with La, and the Verb is followed by a bigger juncture, marked by a H- ip-boundary tone. The complement NP forms one AP, having H* and H+L phrase accent. The final syllable carries a High boundary tone, H%, marking the end of a whole question.
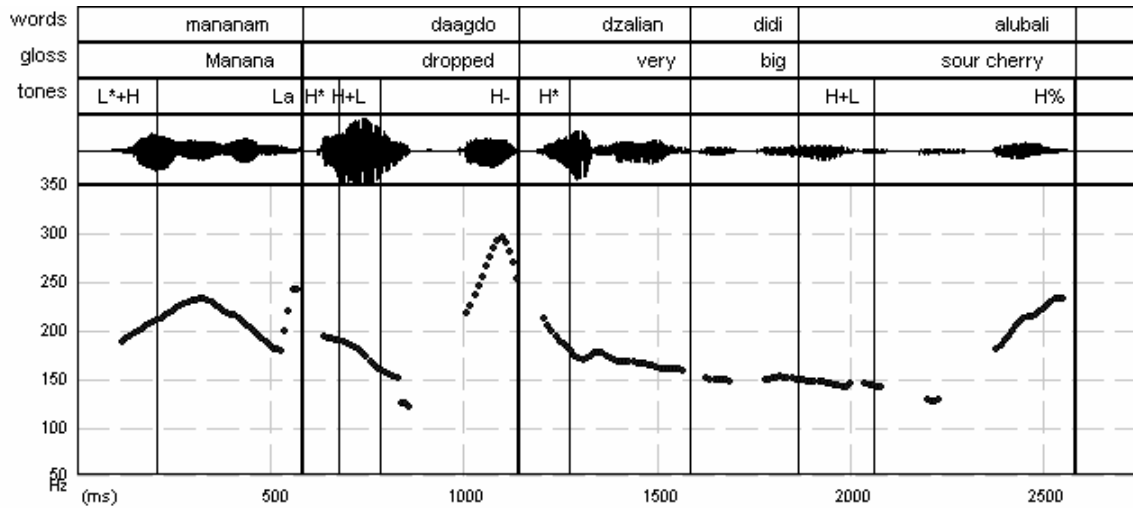

Figure 6. An example pitch track of a Yes/No-Question with a heavy object NP. The sentence is *Did Manana drop very big sourcherry?*. The prosodic grouping of this sentence is /{[Manana][dropped]} {[very+big+sourcherry]}/. The last three syllables of each ip have a H-L-H contour, i.e., H+L phrase accent and H boundary tone (H- or H%). The object NP has three words (*Very big sourcherry*) but forms one AP, prosodically marking a syntactic group.

When the subject NP is heavy in Yes/No-question, the verb does not come sentence-medially. Figure 7 shows an example where a subject NP is modified by a relative clause. Here, the verb comes at the end of a sentence, thus having the word order preferred in a declarative sentence. However, if we compare this example with the example in Figure 4 where a pitch track of a declarative sentence of a similar structure is shown, we can see that even though the word order and a higher level prosodic grouping are the same in these two sentences, the tonal pattern of an AP and the sentence final boundary tone are different. In the declarative, the phrasing was /{[The fisherman][Who][Lali][washed]} {[Manana][is meeting]}/, with an H- Intermediate Phrase boundary after the relative clause and L% at the end of a sentence, but in the Yes/No-question, shown in Figure 7, the prosodic phrasing is /{[the fisherman][who+Lali+washed][Manana+is meeting]}/, with an La AP boundary after the head noun and after the relative clause, H+L phrase accent in each AP, and HL% at the end. The H* in the second and third AP is much lower than the preceding H target, thus downstepped H* or !H*.
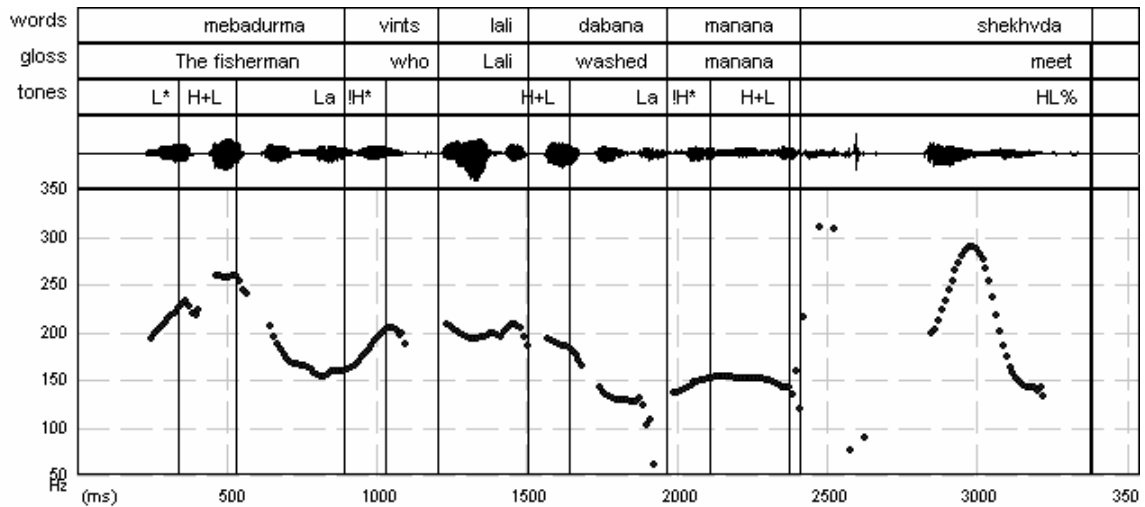
Figure 7. An example pitch track of a Yes/No-Question with a heavy subject NP. The sentence, *Is the fisherman who washed Lali meeting Manana?,* is prosodically grouped as /{[the fisherman] [who+Lali.+washed] [Manana+is meeting]}/. The relative clause has three words but forms one AP with H+L phrase accent. The main verb comes at the end of a sentence with HL% boundary tone on the last syllable. Compare this with the declarative shown in Figure 4.

3.3 Wh-Questions

The default tonal pattern of wh-question in Georgian is similar to that of the Yes/No-question in that the H+L phrase accent is often found, and a bigger juncture marked by H- follows a sentence-medial verb. But, unlike the verb in Y/N-questions, the verb in wh-questions is included in the same AP as the wh-phrase. A typical tonal pattern of wh-question is: {(L+)H* ... H+L H-}   {T* ... ((H+)L) H%}.

A monosyllabic wh-word is realized with H* or L+H* pitch accent but polysyllabic wh-words are often realized with L*+H (i.e., High tone on the second syllable). Since the wh-phrase and the verb form one AP, thus often longer than 4 syllables, the AP has H+L phrase accent, and is followed by an ip boundary tone at the end of the Verb. The post-verbal complement phrase also tends to form one AP with much reduced pitch range. But the tonal contour of this AP is very similar to the main wh-phrase AP: [H* ... H+L H%]. In other words, the final three syllables of both Intermediate Phrases (the wh-phrase and the complement phrase) show a H-L-H contour, with each tone realized on the last three syllables of the phrase. When the post-verbal complement phrase is three syllables long, each of the three tones is realized on each syllable. We analyzed this contour as H* on the first syllable, H+L phrase accent on the first syllable (H on the first syllable (=antepenult) and L on the second syllable (=penult)), and H% on the final syllable of the phrase. When the phrase has only two syllables, such that it cannot carry all three tones, two patterns were found. Either the first syllable shows L* pitch accent followed by H% on the final syllable, i.e., the initial H tone was deleted (Figure 8), or all three tones were realized on two syllables by lengthening the first syllable, thus carrying two tones (H and L), followed by H% on the final syllable (i.e., H* (H+)L H%). That is, H* and H+L are realized as a falling

tone in one syllable. When the phrase has only one syllable, either a L-H or a H-L-H contour was realized on the single syllable by lengthening the syllable. In this case, we labeled as L* H% or H* (H+)L H%, respectively.

Figures 8, 9, and 10 show example pitch tracks of wh-question sentences with varying length of the wh-phrase and the post-verbal complement phrase. Though the boundary tones shown in these figures are all High tones (H- after the Verb and H% at the end of the sentence), some speakers produced L- after the Verb and HL% at the end of the sentence. When the boundary tone was HL%, the tonal pattern of the complement phrase was [H* ... H+L HL%]. That is, the antepenult showed a H tone, the penult showed a L tone, and the final syllable showed a HL contour tone. We are not sure at the moment if the choice of a different boundary tone is associated with a different meaning. Though speakers tend to have their favorite tone choice, we sometimes found that the same speaker was using a different type of the boundary tone in the same session.

In Figure 8, the first ip (*how many fox sat*) has one AP with H+L phrase accent. Here, the H tone of the phrase accent is realized on the last syllable of the second word, [mela] 'fox', and the L tone is realized on the first syllable of the third word, [ijda] 'sat', supporting our claim that the phrase accent, realized as a sharp f0 fall, is not associated with the antepenult of a word, but with the antepenult of an AP.
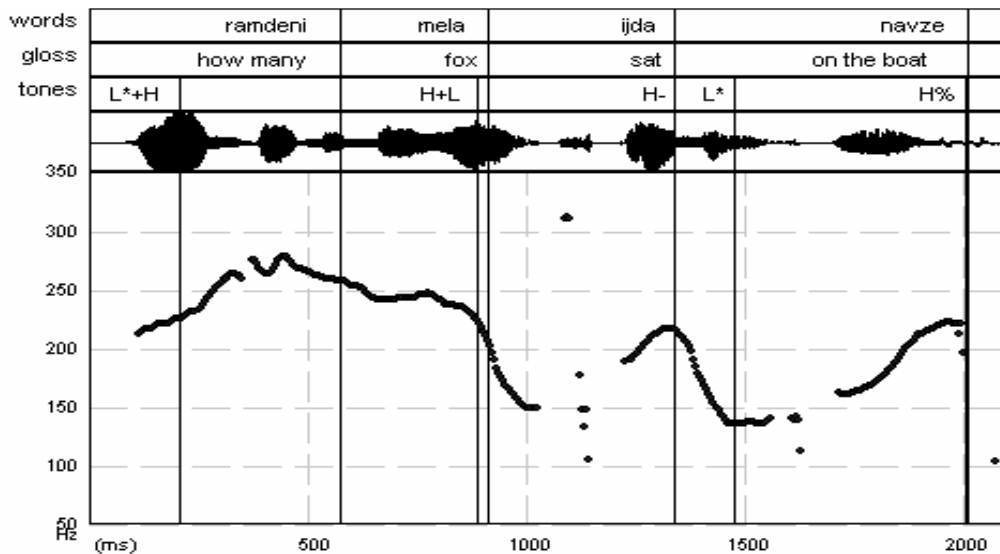

Figure 8. An example pitch track of a wh-question with a seven-syllable wh-phrase and a two-syllable post-verbal phrase. The sentence means *How many foxes sat on the boat?*. The wh-phrase shows a H-L-H contour at the end (H+L phrase accent followed by H- boundary tone), but the complement phrase shows a L-H contour only (L* pitch accent and H%). The H of phrase accent is on the final syllable of the 2nd word [mela] and the L part of the phrase accent is realized on the first syllable of the 3rd word [ijda], rejecting the claim that stress on an antepenultimate syllable is a property of a word. As shown here, the f0 peak is on the antepenultimate syllable of an AP.

Figures 9 and 10 show a pitch track of a wh-question with a longer wh-phrase and a longer post-verbal phrase than that in Figure 8. Here, each phrase forms one ip, and shows a H-L-H contour at the end (H+L phrase accent followed by a H boundary tone). Note that the f0 peak of the pitch accent in the complement phrase is much lower than that of the wh-phrase (i.e., the downstep happens across an ip boundary). In Figure 10, the pitch tracking is not successful on the penultimate syllable of the post-verbal phrase. The speaker produced extremely low pitch by using creaky phonation. The creakiness can be observed from the waveform.
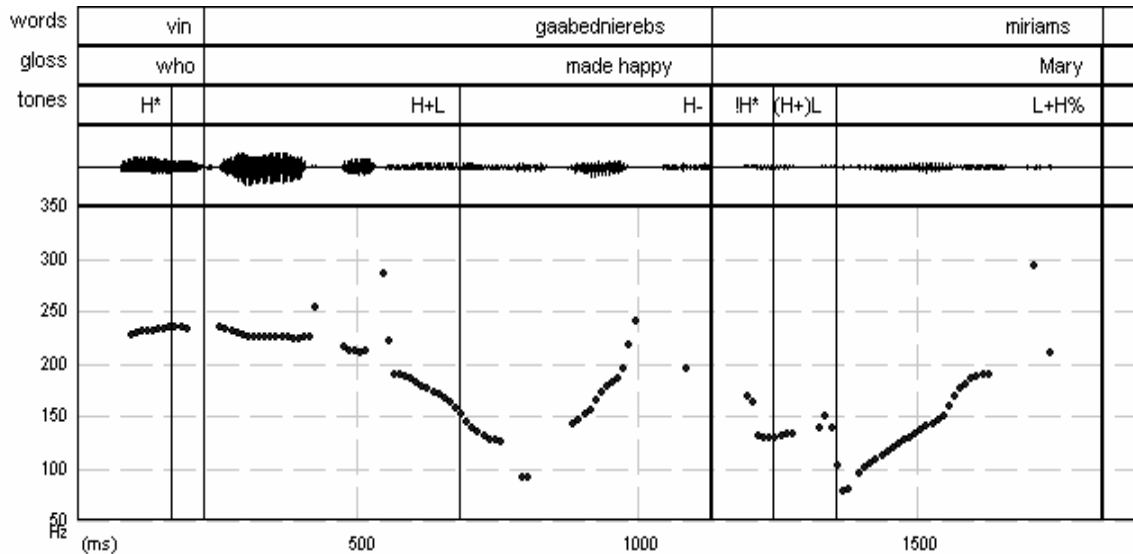

Figure 9. An example pitch track of a wh-question with a seven-syllable wh-phrase and a three-syllable post-verbal phrase. The sentence means *Who made Mary happy?*. Both the wh-phrase and the complement phrase show a H-L-H contour at the end (H+L phrase accent followed by a H- boundary tone in the wh-phrase, and H* pitch accent followed by the L part of phrase accent and a H% boundary tone in the complement phrase). Note that the f0 peak of the pitch accent in the complement phrase is much lower than that of the wh-phrase (see !H*).

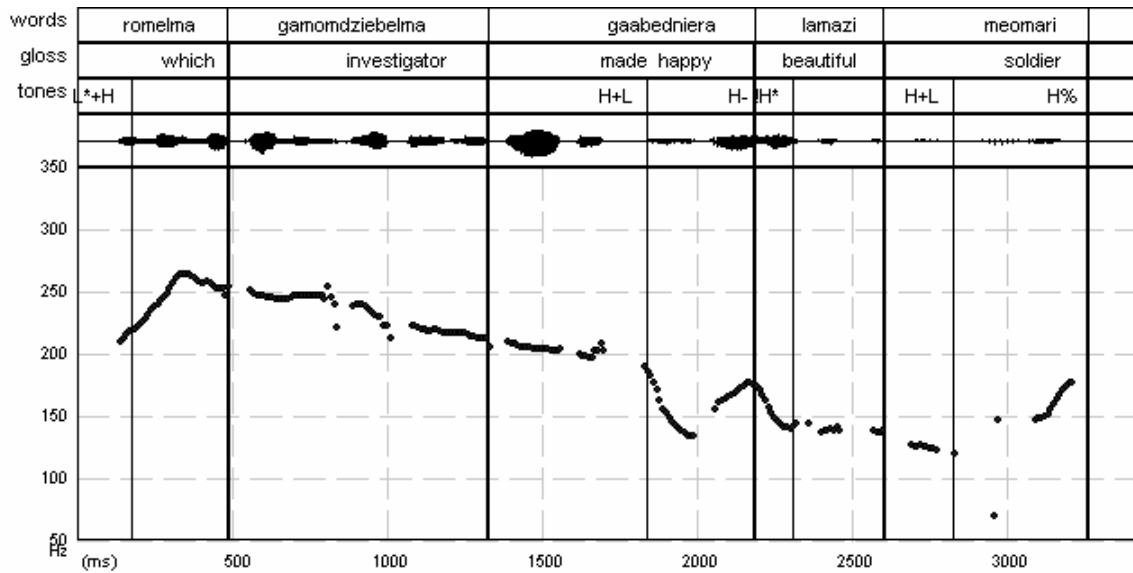| words | romelma | gamomdziebelma | gaabedniera | lamazi | meomari | |
| gloss | which | investigator | made happy | beautiful | soldier | |
| tones | L*+H | | H+L   H- H* | H+L | H% | |

Figure 10. An example pitch track of a wh-question with a nine-syllable wh-phrase and a seven-syllable post-verbal phrase. The sentence means *Which investigator made the beautiful soldier happy?*. Both the wh-phrase and the complement phrase show a H-L-H contour at the end (H+L phrase accent followed by a H- boundary tone). The pitch range of the complement phrase is reduced. The pitch track is not clear on the penultimate syllable of the post-verbal phrase. A creaky phonation (observable from the waveform) was used to produce an extremely low pitch.

3.4 Focus

A focused word in Georgian, either narrowly focused as an answer to wh-question or correctively focused in the 'not A but B' frame, is realized with High pitch accent, H* or L+H*. A focused word is generally produced in expanded pitch range, and the post-focus word is either deaccented (such that a pitch accent is deleted) and/or dephrased (such that a prosodic boundary is deleted), or integrated with the focused word and carries H+L phrase accent.

Figure 11 shows an example of deaccenting/dephrasing and Figure 12 shows an example of integration. In Figure 11, the subject 'the drummer' is correctively focused (*X is hiding behind the ship. No, the DRUMMER is hiding behind the ship*), and all the following words (*the ship, behind, hide*) lost their pitch accent and there is no AP boundary after the focused word. Figure 12 shows an answer to *Who traveled to the ruins?*, (*MANANA traveled to the ruins*). Here, the subject and the verb together form one AP, eight-syllable long, and carry a H+L phrase accent on the antepenultimate syllable of the AP. This "hat" pattern (H pitch accent followed by H+L phrase accent), which was used in yes/no-question and wh-question, seems to be linked to the meaning of emphasis. It's quite common cross-linguistically that a wh-word behaves as a focused word prosodically (e.g., Korean (Jun & Oh 1996), Japanese (Maekawa 1991)), and the verb in a yes/no-question behaves as a focused word in prosody (e.g., Greek; Baltazani & Jun 1999, Arvaniti & Baltazani 2005).
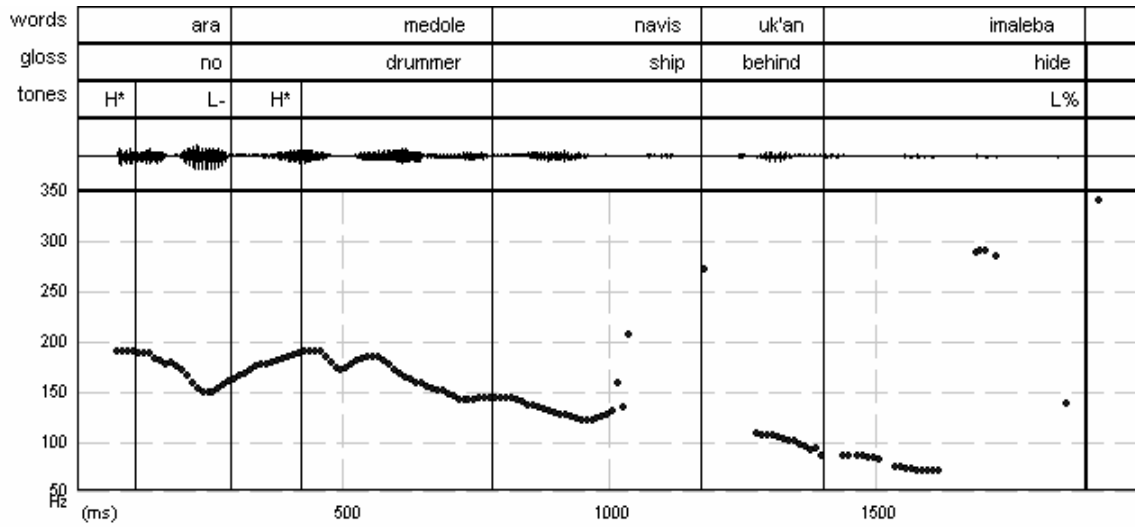
Figure 11. An example pitch track of a sentence with corrective focus on the subject noun, *(No.) The DRUMMER is hiding behind the ship*. There is no pitch accent/boundary after the subject noun, illustrating the case of deaccenting and dephrasing.
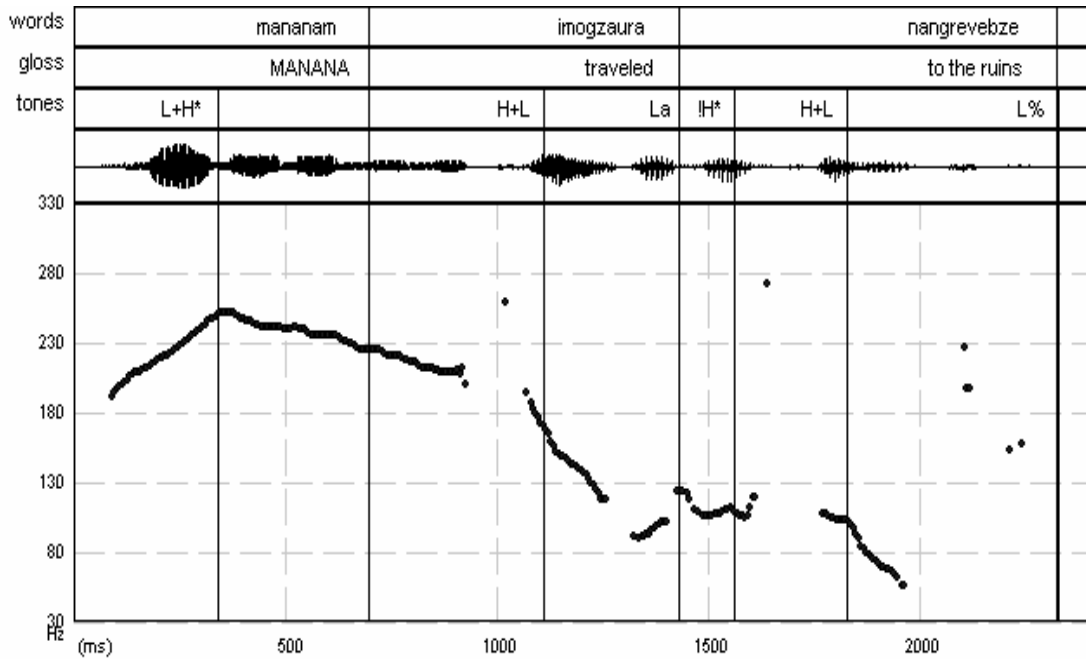

Figure 12. An example pitch track of a sentence with focus on the subject noun: *MANANA traveled to the ruins* (as an answer to *Who traveled to the ruins?*). Here, (*MANANA traveled*) forms one AP and carries H+L phrase accent on the antepenult of the AP, forming a "hat" pattern (H* ... H+L). The complement phrase also shows a "hat" pattern in a reduced pitch range.

However, when a sentence-final word gets focused, there was little or a very minor effect in prosody, especially if the word is short. A focused, sentence-final, short word did not show much change in pitch range and/or amplitude, compared to the same word produced

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in a neutral condition. But when the word is polysyllabic, the effect was more visible, though not as strong as that in non-final position.

Finally, when a focused word is in a sentence-medial position, it can begin a new prosodic unit. Figure 13 shows an example where an embedded subject in yes/no-question is narrowly focused. The neutral production of the same yes/no-question sentence is shown in Figure 7. In the focus condition, an Intermediate Phrase boundary is inserted just before the focused word (after the complementizer, *who*, which is prosodically cliticized to the preceding head noun). Here, even though narrow focus was given only to the subject noun, the focused subject and the following verb are integrated to form one AP and show the "hat" pattern. The focus, however, did not affect the phrasing or the tones after the verb.
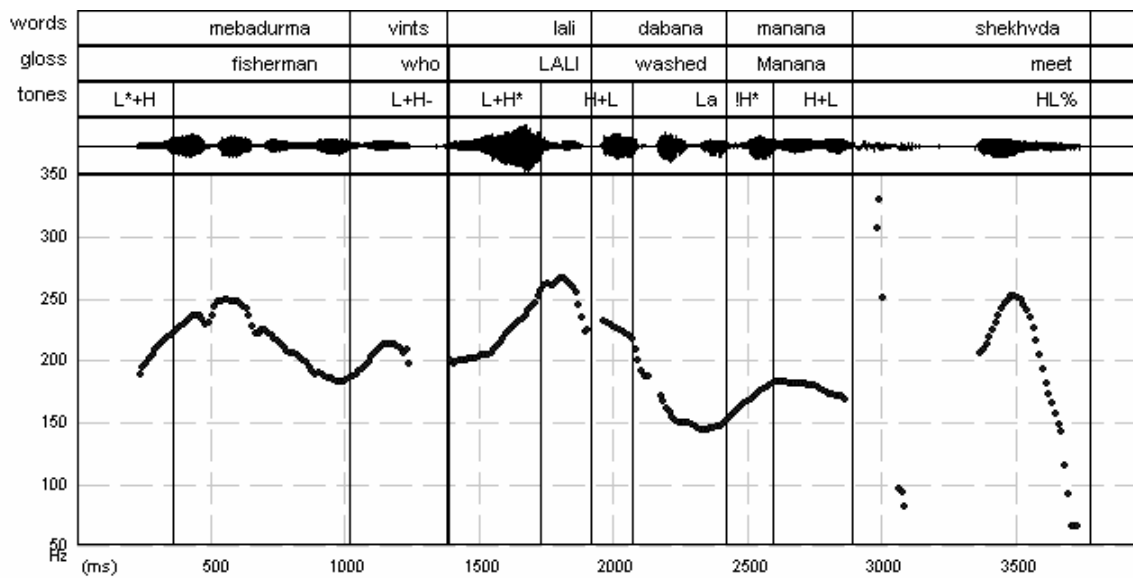

Figure 13. An example pitch track of a sentence with focus on the embedded subject noun: *Is the fisherman who washed LALI meeting Manana?*. There is an Intermediate Phrase break before the focused word, *Lali*, and the focused subject and the following verb form one AP showing the "hat" pattern. Compare with Figure 7 where a neutral production of this yes/no-question is shown. The phrasing and tonal pattern of the current utterance is the same as that in yes/no-question. The only difference is the insertion of an ip-boundary right before the focused subject.

4. Discussion and Summary

In this paper, we have proposed a prosodic structure of Georgian and the tonal pattern of each unit. There are three prosodic units above the Word: Intonation Phrase (IP), Intermediate Phrase (ip), and Accentual Phrase (AP). The right edge of each unit is marked by a boundary tone, and the ip and IP are also marked by phrase-final lengthening. Georgian AP is exotic by virtue of having two additional tones. An AP has post-lexical pitch accent and H+L phrase accent. Pitch accent is realized on the first syllable of an AP, and phrase accent is realized on the antepenultimate and penultimate syllable of an AP (H

on antepenult and L on penult). Previous studies on Georgian stress claimed that the antepenultimate syllable of a word has stress in addition to the first syllable. Observations of pitch at a sentence level, however, suggest that the high pitch on the antepenultimate syllable is not a property of a word, but of a phrase, AP. The high pitch was on the antepenult of an AP regardless of its location in a word. We assume that the earlier claim on stress is based on the case where a phrase has one long word or when a phrase ends with a long word so that the antepenult of a word matches the antepenult of a phrase. The antepenultimate syllable, however, was not as prominent as the word-initial syllable. So, we categorized this tone as a phrase accent of an AP, not a pitch accent which is linked to a stressed syllable. In questions and focus phrases, this H+L phrase accent was often realized after H-toned pitch accent, creating a "hat"-like pitch contour.

Compared to English or Spanish, Georgian shows much closer connection between syntactic/semantic grouping and prosodic phrasing. In general, each content word in Georgian forms one AP, but a sequence of words that are semantically and syntactically close tends to form one AP (similar to Farsi; Arbisi-Kelm 2007), or one ip by changing the tonal pattern of an AP and adding an ip- boundary tone. The default tone pattern of an AP is L* pitch accent and a Ha boundary tone ([L* Ha]), but when a sequence of APs forms one ip, the ip-medial AP tends to have High pitch accent and a Low boundary tone (i.e., [H* La]). The grouping of APs was also achieved by a higher H boundary tone (H-) or a lower L boundary tone (L-).

Another interesting property of Georgian intonation is the complex tonal contour, HLH or HLHL, and its syllable affiliation at the end of a question phrase. The complex contour, occurring on the last three syllables of a phrase, is due to the combination of the H+L phrase accent and the IP-final boundary tone. That is, HLH is H+L phrase accent (thus, on antepenult and penult, respectively) followed by a H% boundary tone, and HLHL is H+L phrase accent followed by HL%.

Even though Georgian is known to have free word order, we found that certain sentence types have a preferred word order and pitch contour:
• Declarative: SOV order; rising [L* Ha] AP contour and L% sentence-final boundary
• Yes/No-Q: SVO order in a simple sentence (but, SOV order in a complex sentence); falling [H* La] AP contour Subject. An ip break after a sentence-medial verb (can be L- or H-), H+L phrase accent possible, and sentence-final HL% (or H%).
• Wh-Q: SVO order; (L+)H* on wh-word followed by H+L phrase accent, and a sentence-final H% (or HL%).

In sum, the inventory of tones in Georgian is as follows:

1 <u>AP pitch accent</u>
   ➢ L*, L*+H (in longer word): common in declaratives
   ➢ H*, L+H* (in longer word): common in focus & questions
2 <u>AP phrase accent,</u> H+L: associated with the antepenult of AP, but realized on the antepenult and the penult of the AP

3 AP boundary tones
- ➤ Ha: common after L*
- ➤ La: common after H*
- ➤ L+Ha: common after L*+H; on AP-final two syllables

4 ip boundary tones
- ➤ L- or H-: on ip-final syllable
- ➤ L+H-: on ip-final two syllables

5 IP boundary tones
- ➤ L%: common in declaratives; on IP-final syllable
- ➤ H% and HL%: in questions; on IP-final syllable
- ➤ L+H% (or LH% if not enough syllables): in questions, on final 2 syllables.

Finally, the prosodic structure and tonal patterns proposed in this paper are based on limited data collected from four speakers. More data need to be collected to confirm and improve our analysis.

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