Verb height indeed determines prosodic phrasing: evidence from Iron Ossetic*

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1. Introduction

It is widely accepted that a correspondence exists between the syntactic and prosodic structures of an utterance, see e.g. Bennett and Elfner 2019 and references therein. Nevertheless, opinions vary as to how the mapping is organized between the syntactic and prosodic structure. We provide novel evidence in favor of the proposal by Hamlaoui and Szendrői (2015, 2017), who argue that the mapping between an Intonational phrase (ι) and syntactic constituents is flexible. This view stands in opposition to more traditional approaches that tie the size of ι to a particular XP. Our evidence comes from Iron Ossetic (East Iranian).

In most existing approaches, ι is assumed to map onto a syntactic clause, but a 'clause' has been variably defined as a syntactic or semantic/information-structural unit, or as one whose size is determined by a combination of these factors. Hamlaoui and Szendrői (2015, 2017) propose that ι is flexible and corresponds to the highest projection that hosts verbal material, together with its specifier (HVP, 'highest verbal projection'). Their approach provides a unified, syntax-based account of cross-linguistic variation in ι-size. It also predicts that the size of ι covaries with the height of the verb, if the latter is variable.

Iron Ossetic, with several projections available for verb raising, is a uniquely suitable testing ground for this prediction. Adopting the flexible ι-mapping approach, we show that, first, the HVP indeed determines the size of ι in Iron Ossetic, in utterances containing narrow foci and negative indefinites. Second, the flexible ι-mapping hypothesis interacts with phonological markedness constraints on prosodic phrasing in complex wh-questions (those involving multiple wh-phrases and/or negative indefinites).

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2. The flexible ι-mapping hypothesis

Hamlaoui and Szendrői (2015, 2017) propose that the size of ι is flexible and corresponds to the highest projection that hosts overt verbal material ("the verb itself, the inflection, an auxiliary, or a question particle"), together with its specifier (HVP). Accordingly, unlike in most existing approaches, ι does not rigidly correspond to a specific syntactic projection (e.g., CP, TP, and/or vP). The proposal is based on Hungarian narrow focus constructions (HVP=FocP=ι), English wh-questions, German V2 clauses (HVP=CP=ι), and Bàsàá (Bantu) zero-coded passives (HVP=TP=ι). The mapping is enforced with the help of the following constraints.

(1) *Syntax-prosody mapping on the 'clause'-level*

a. ALIGNHVP-L: Align the left edge of the highest projection whose head is overtly filled by the verb, or verbal material, with the left edge of an ι.

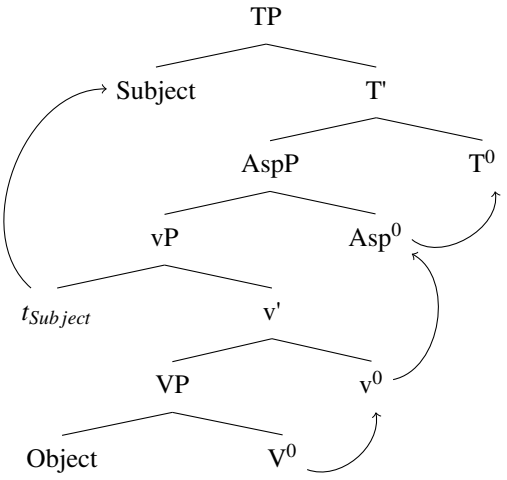
b. ALIGNHVP-R: Align the right edge of the highest projection whose head is overtly filled by the verb, or verbal material, with the right edge of an ι.

Besides syntactic factors, ι-formation may be affected by phonological factors, known as eurhythmic constraints. If high ranked, eurhythmic constraints may lead to non-isomorphism between syntactic and prosodic constituency (Selkirk 2011).

3. Background on Iron Ossetic

Iron Ossetic is an East Iranian language spoken in the Central Caucasus. The neutral word order is SOV, but, in the context of discourse, word order is largely determined by information structure. We take the clause structure to be left-branching up to the level of TP, as in (2). The finite verb is assembled via head movement. Asp^0 is occupied by aspectual prefixes; their linearization on the left is achieved by means of a diacritic [+prefix]. The subject is generated in Spec, vP and moves to Spec, TP.

(2)



3.1 Preverbal complex

A remarkable property of the Ossetic syntax is that certain items – specifically, negative indefinites, wh-phrases, and focused phrases – must be placed immediately preverbally, subject to ordering restrictions. We call the cluster they form the preverbal complex. Below, we schematically illustrate the ordering restrictions for all the types of preverbal items. Specific examples will be adduced in the sections on prosody.

A clause in Iron Ossetic can contain any number of negative indefinites, subject to the constraint that they all appear, as a cluster, immediately preverbally and are not separated from each other. The marker of sentential negation is in complementary distribution with negative indefinites.

(3) XP . . . Neg-indefinite$_l$ (*YP) . . . Neg-indefinite$_k$ (*YP) V (ZP)

Likewise, all wh-phrases in a wh-question must appear, as a cluster, immediately preverbally; nothing may separate wh-phrases from each other or from the verb.

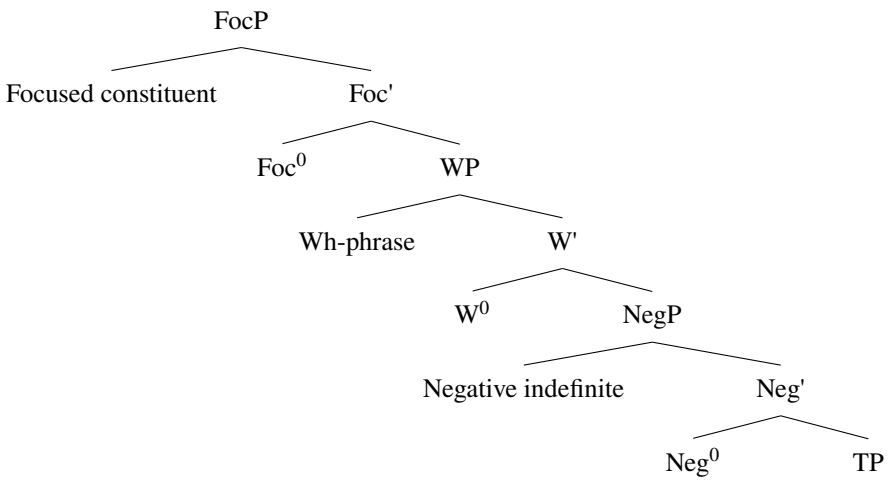
(4) XP . . . Wh-phrase$_l$ (*YP) . . . Wh-phrase$_k$ (*YP) V (ZP)

Finally, the same requirement for preverbal placement holds for narrowly focused constituents – e.g., those modified by 'only', or, in responses to wh-questions, those corresponding to the wh-phrase in the wh-question. If co-occurring, the elements in the preverbal complex have a fixed order, shown in (5).

(5) focus > wh-phrase(s) > negative indefinite(s).

Topicalized constituents precede the preverbal complex; given material may also follow the verb. To account for the word order within the preverbal complex and its properties, we adopt the clausal architecture above the TP as shown in (6).

(6)



The respective elements of the preverbal complex are housed in the specifiers of dedicated projections, and the verb is raised to the head of the lowest projection with a filled specifier.

3.2 The stress system of Iron Ossetic

Prosodic grouping in Iron Ossetic is closely connected with stress. Word stress can only appear on the first or second syllable of a prosodic word (Bagaev 1965:17; Isaev 1959:28; Dzakhova 2010:10), the 'stress window'. Stress placement within the stress window is conditioned by vowel quality. Iron Ossetic has 'strong' (S: /a, e, i, o, u/) and 'weak' (W: /ɐ, ə/) vowels. Stress falls on the first syllable, unless the vowel in the first syllable is weak.[1] That is, the possible stress windows are ŚS, ŚW, WẂ, and WŚ. Personal names, regardless of vowel quality, are stressed on the second syllable.

According to traditional descriptions, in connected speech, stress is assigned within a larger prosodic constituent: a so-called prosodic group, as opposed to a prosodic word (Abaev 1924, Bagaev 1965, Isaev 1959). Within a prosodic group, the stress window is formed by the first two syllables. Prosodic groups are determined in the context of a larger utterance. The distribution of stresses, therefore, allows for tracking prosodic groups.

4. Current study

In the current study, 13 speakers of Iron Ossetic (8M, 5F, 20-60 y.o.) were involved. All speakers came from North Ossetia and had a complete or in-progress university degree. The recordings were made in Vladikavkaz, Russia, in 2019. The data were recorded with a head-worn microphone, at a sampling rate of 44.100 Hz and 16 bits per sample, in a quiet room. The dataset consisted of 97 utterances. It comprised declarative clauses with verbal arguments of varying syntactic complexity, including negative indefinites (n=9); wh-questions of varying complexity: with one or two wh-phrases, as well as negative indefinites (n=59); and utterances containing narrow foci, of varying complexity (n=29). The recordings were analyzed in Praat (Boersma and Weenink 2021).

5. Results and analysis

Based on our experimental results, we show that there are three levels of prosodic constituency above the level of the prosodic word in Iron Ossetic: a Phonological Phrase (ϕ), an Intonational Phrase (ι), and an utterance phrase (υ). In accordance with Hamlaoui and Szendrői 2015, the left boundary of ι is determined by verb movement: it aligns with the projection that hosts the verb (HVP) and includes the specifier of that projection. At the same time, the prosody of wh-phrases shows that the flexible ι-mapping hypothesis cannot account for the full range of the Iron Ossetic data. We demonstrate that the prosody of wh-phrases is instead determined by phonological requirements/eurhythmic constraints.

[1] Some exceptions to these patterns, where stress is initial, have historically had an initial /ə/, which in today's language is pronounced weakly/not pronounced, and is not rendered in orthography, but still influences stress placement (Bagaev 1965).

The resulting prosodic picture, therefore, is governed by two kinds of factors: those rooted in syntax and those independent from it.

5.1 Proposal

The phonological phrase, ϕ, is the domain of stress assignment; it maps onto smaller constituents (e.g. DPs, PPs) and carries a single pitch accent H*. The alignment of H* is determined by stress placement within the stress window in a ϕ: H* is realized on the post-tonic syllable, or the juncture between the stressed and post-tonic syllables. We call this process H*-delay. H*-delay to the post-tonic syllable may happen across a word boundary within a ϕ, but never across a ϕ-boundary (or ι-boundary). Within an ι, H* on non-initial ϕs is suppressed. In wh-questions, ιs additionally carry a high initial boundary tone %H.

Following Hamlaoui and Szendrői (2015, 2017), we propose that the correspondence between ι and syntactic projections in Iron Ossetic adheres to the flexible ι-mapping principle. Specifically, the right and left edges of the HVP are mapped onto the corresponding edges of ι, respectively, by a family of ALIGN-R/L(HVP, ι) constraints. The right and left edges of smaller constituents that do not include the clausal spine (e.g. DPs, PPs) are mapped onto the right and left edges of ϕ, respectively, by ALIGN-R/L(XP, ϕ). The edges of the full ('illocutionary') clause are mapped onto the respective edges of υ by ALIGN-R/L(CP, υ). Besides that, we posit certain eurhythmic constraints to account for the idiosyncratic behavior of wh-phrases, to be described in Section 5.4. Let us now examine several case studies in more detail.

5.2 Negative indefinites

Based on the structure in (3), the prediction of our proposal in Section 5.1 is that negative indefinites, no matter how many, are always part of an ι, together with the following verb. The predicted prosodic parse for (7a) is shown in (7b).[2]

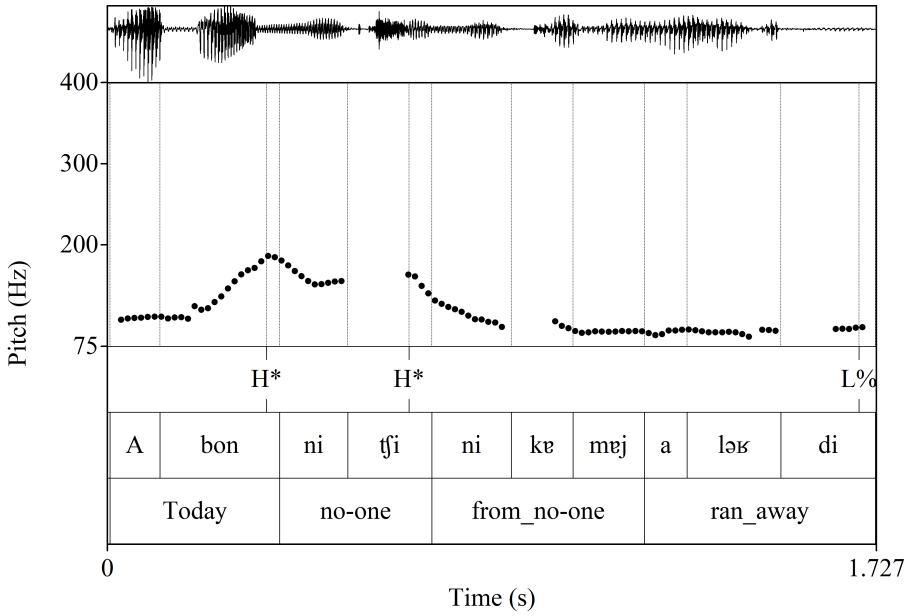
(7) a. abon [$_{\text{NegP}}$ **ni-ʧi** [$_{\text{NegP}}$ **ni-kɐmæj** [$_{\text{Neg'}}$ alәʁdi]]].
today NEG-who.NOM NEG-who.ABL ran.away
'Today no-one run away from anyone.'

b. $_{\iota}$($_{\phi}$(abon)) $_{\iota}$($_{\phi}$(**nitʃi**) $_{\phi}$(**nikɐmæj**) $_{\phi}$(alәʁdi)).

This prediction is borne out. The figure in (8) shows the F0 contour that spans (7a). There is an H* on *nitʃi* 'no-one', followed by a sharp fall in F0. Lack of further H* pitch accents is a hallmark of ι-formation — here, it includes the two negative indefinites and the verb. The left-peripheral topic, *abon* 'today', carries its own H*, and is excluded from the core ι. Based on the degree of final lengthening that left-peripheral topics receive, we conclude that they form their own ιs (Myrberg 2013).

[2]Glosses in the examples follow the Leipzig Glossing Rules.

(8) *Realization of the utterance in (7a) (M4, pt1_9).*



5.3 Wh-questions

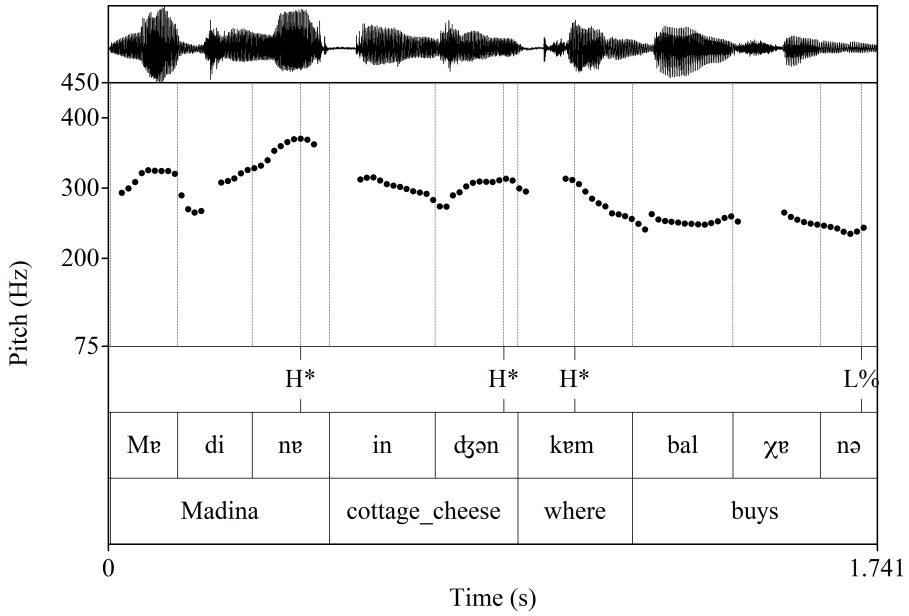
The prediction for wh-phrases is the same as it was for negative indefinites: a wh-phrase should be part of the *ι*, together with the following verb, as shown in (9b).

(9) a. mɐdinɐ inʤən [$_{WP}$ **kɐm** [$_{W'}$ balχɐnə]]?
Madina cottage.cheese where buys
'Where does Madina buy cottage cheese?'

b. $_{ι}$($_{ϕ}$(mɐdinɐ)) $_{ι}$($_{ϕ}$(inʤən)) $_{ι}$($_{ϕ}$(**kɐm**) $_{ϕ}$(balχɐnə)).

This prediction, too, is borne out, as the figure in (10) shows. At the same time, the phonological shape of wh-words (monosyllabic, or with WŚ or WẂ stress window) also allows us to show that all wh-phrases, regardless of the quality of the vowel, form a *ϕ* to the exclusion of the verb. Specifically, the H* associated with a wh-phrase is never realized outside of the wh-phrase itself. This is illustrated in (10) for a monosyllabic wh-word *kɐm* 'where' with a weak vowel /ɐ/. Had the wh-phrase formed a *ϕ* with the following verb, the stress window would have been of WŚ shape, containing the wh-phrase and the first syllable of the verb. After H*-delay applied, H* would have been realized on the second syllable of the verb or between the first and the second syllables. Yet, H* is realized on the wh-phrase, whch means that it forms a *ϕ* on its own. Finally, lack of H*s further to the right also indicates that the wh-phrase forms an *ι* with the following verb.

(10) *Realization of the utterance in (9a) (F2, pt2_5).*



5.4 Wh-questions with negative indefinites

The behavior of more complex wh-questions – multiple wh-questions and those that involve negative indefinites between the wh-phrase(s) and the verb – is not explainable by the syntax-prosody mapping constraints alone. The properties of these constructions are rooted in the prosodic requirements of Iron Ossetic, which are independent from the flexible ι-mapping hypothesis. To recap, a wh-phrase in Ossetic may be separated from the verb by a negative indefinite (or several): in such constructions, the word order is strictly *wh-phrase > negative indefinite(s) > verb*. This is illustrated in (11).

(11) mɐdinɐ [$_{WP}$ **kɐmɐn** [$_{NegP}$ **nik^{w}ə** [$_{NegP}$ **ni-sə** [$_{Neg'}$ razurə]]]]?
Madina who.DAT never NEG-what.NOM tells
'Who does Madina never tell anything?'

Given the syntax in (4), the flexible ι-mapping hypothesis predicts that these constructions should be prosodified as in (12). This is because the wh-phrase is not part of the HVP, NegP.

(12) $_{ι}$($_{ϕ}$(Wh-phrase)) $_{ι}$($_{ϕ}$(Neg. indefinite) $_{ϕ}$(Neg. indefinite) $_{ϕ}$(Verb))

However, *wh-phrase > negative indefinite(s) > verb* constructions instead have the prosody of the shape in which ι includes not only the negative indefinite but also the wh-phrase to its left. We will mark this unexpected left-edge ι-boundary as '(!', in contrast with '(',

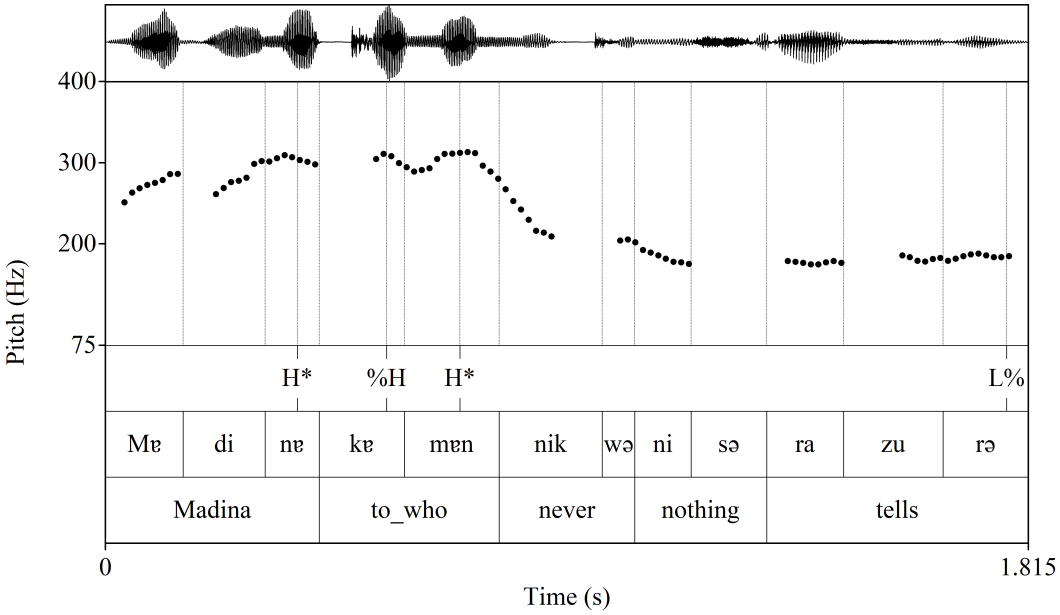
as shown schematically in (13a), and for a specific example sentence, in (13b). The actual pitch contour for (13b) is shown in (14).

(13) a. $_{\iota}(^{!}{}_{\phi}$(Wh-phrase) $_{\phi}$(Neg. indefinite) $_{\phi}$(Neg. indefinite) $_{\phi}$(Verb))

b. $_{\iota}(_{\phi}$(mɐdinɐ)) $_{\iota}(^{!}{}_{\phi}$(**kɐmɐn**) $_{\phi}$(**nik^{w}ə**) $_{\phi}$(**ni-sə**) $_{\phi}$(razurə))
Madina who.DAT never NEG-what.NOM tells
'Who does Madina never tell anything?'

The ιs that involve wh-phrases differ from all others in that they carry a high initial boundary tone %H. The presence of %H is a prosodic property that is unique to ιs formed by wh-questions.[3]

(14) *Realization of the utterance in (13b) (F5, pt2_13).*



We propose that the presence of %H is responsible for the special behavior of wh-phrases with respect to prosodic phrasing. An insertion of a %H ι-boundary leads to the deletion of all initial ι-boundaries to its right, other than those also formed by %H. Specifically, we postulate the following eurhythmic constraint, which requires that no '$_{\iota}$(' be found to the right of '$_{\iota}(^{!}$'. This constraint is ranked higher than the ALIGN constraints described in Section 5.1.[4]

[3]The presence of %H in (10) is obscured by the fact that, in a monosyllabic wh-word, %H and H* coincide.

[4]This analysis is reminiscent of the approach to the prosody of focus in Japanese proposed by Pierrehumbert and Beckman (1988): a left edge of a Major Phrase is inserted at the left edge of the focused constituent

(15) **POST-%H DEPHRASING**: delete all initial ɪ-boundaries to the right of %H, other than those also formed by %H.

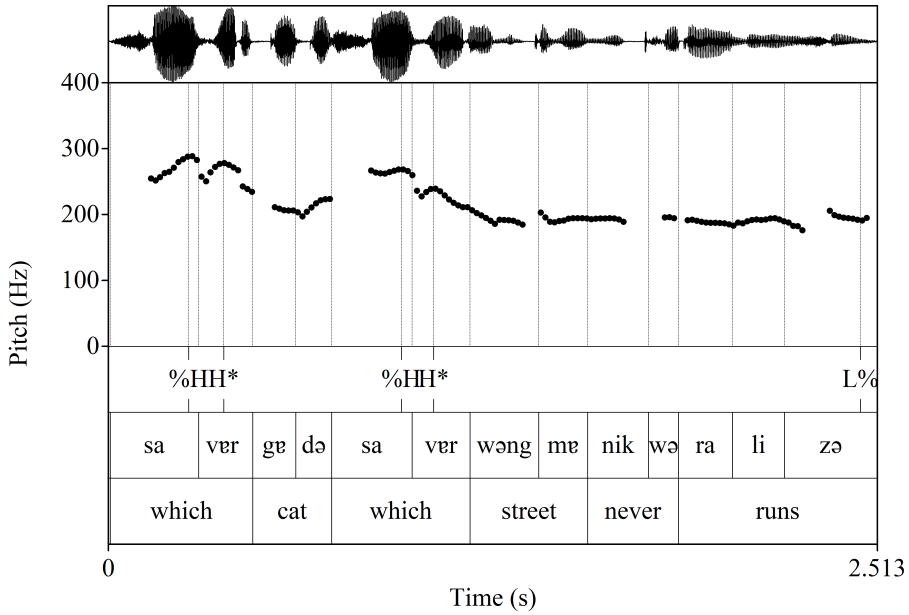
5.5 Multiple wh-questions

We propose that POST-%H DEPHRASING is also responsible for the prosody of multiple wh-questions. In multiple wh-questions, the left edge of each wh-phrase is aligned with an ɪ-boundary. The pitch track in (17) shows that each of the wh-phrases in (16) indeed carries its own H*, as well as an initial high boundary tone %H.

(16) ɪ(ꜜϕ(**savɐr gɐdə**) ɪ(ꜜϕ(**savɐr wəng-mɐ**) ϕ(nik^{w}ə) ϕ(ralizə))?
which cat which street-ALL never runs.out
'Which cat never runs out onto which street?'

So far, no prosodic evidence has been discovered to indicate whether multiple wh-questions form nested ɪs or sister ɪs. For this reason, only one of the right edges of ɪ is marked in (16).

(17) *Realization of the utterance in (16) (F3, pt2_41).*



(MaP Boundary Insertion Rule), followed by the deletion of all Major Phrase boundaries to the right of focus (MaP Dephrasing). A similar analysis was proposed by Nagahara (1994) – cf. his FOCUS-LEFT-EDGE and FOCUS-TO-END constraints, respectively; for the deletion of prosodic boundaries in the post-focal domain, see also Ishihara 2002 for Japanese, and Jun 1998 for Korean, among others.

6. Conclusion

The flexible ι-mapping approach – but not more rigid approaches to ι-formation – can account for the properties of the Intonational Phrase in Iron Ossetic. This applies to the prosody of utterances that contain negative indefinites, narrow foci, and single wh-phrases. The Iron Ossetic facts, in turn, provide support for the flexible ι-mapping approach, which has not been tested until now on languages that have multiple projections available for verb raising, depending on context.

More complex wh-questions (those with multiple wh-phrases and/or negative indefinites) provide evidence that syntax-based flexible ι-mapping approach also interacts with language-specific eurhythmic constraints.

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