

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

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### 1. Introduction

- We provide novel evidence in favor of flexible mapping between an **Intonational phrase (ι)** and syntactic constituents, based on evidence from Iron Ossetic (East Iranian).
- In the existing approaches, ι is commonly 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 factors.
- Hamlaoui & 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’/ ‘highest projection of the verb’).
  - Their approach provides a **unified, syntax-based account** of cross-linguistic variation in ι-size.
  - A **prediction** that it makes is that ι-size is also determined by HVP in languages where the height of the verb varies with utterance type.
- **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:
  - the **HVP indeed determines the size of ι** in Iron Ossetic, in utterances containing narrow foci and negative indefinites.
  - the flexible ι-mapping hypothesis interacts with phonological (i.e., independent from syntax) markedness constraints on prosodic phrasing in complex wh-questions (those involving multiple wh-phrases and/or negative indefinites).

### 2. Approaches to ι-mapping

#### 2.1 Existing literature

ι is commonly assumed to map onto a syntactic clause, but a ‘clause’ has been defined as a syntactic or semantic/information-structural unit, or as one whose size is determined by an interplay of factors.

Some examples:

- ι = clause (**S**) in syntax, where a clause is an S that is not dominated by a node other than S (Downing 1970; Emonds 1970; Bing 1979; Nespor & Vogel 1986);
- ι = a **semantic/information-structural unit** that is larger than a word and variable in its extent, not necessarily isomorphic to any syntactic constituent; a single sentence may contain one or more ι (Selkirk 1984);
- ι = **Comma Phrase** in syntax, roughly equivalent to a speech act (Selkirk 2005; based on Potts 2005);
- ι = **speech act** (“or, rather, its ‘syntactic pendants’”) (Truckenbrodt 2015)

- $\iota$  = **CP** (Cheng & Kula 2006; Truckenbrodt 2005; 2007; Pak 2008; Henderson 2012)
- $\iota$  = **complement of C<sup>0</sup>** ('standard clause') and/or **Force<sup>0</sup>** ('illocutionary clause') (Selkirk 2009; 2011):
- $\iota$  = syntactic **phase** (CP and vP), with some caveats (Cheng & Downing 2007; 2009):
- $\iota$  = **TP** (based on Northern Sotho, where the existence of a CP-layer in matrix clauses is debated) (Zerbian 2006; 2007)

$\iota$ -formation is also known to be affected by other, purely **phonological factors**, known as **eurhythmic constraints** (in addition to syntactic and semantic/information-structural ones):

- the most obvious non-syntactic factor in  $\iota$ -formation is **phonological weight** (cf. e.g. Gussenhoven 2004)
- Selkirk (2011) on  $\iota$ -formation in Xitsonga:  $\iota$  corresponds to a clause, but left-dislocated constituents also form  $\iota$ s (**STRONGSTART**: the leftmost prosodic constituent cannot be lower on the prosodic hierarchy than the following one). Cf. also Elfner (2011; 2012), Bennett, Elfner & McCloskey (2017)
- Elordieta, Frota & Vigário (2005): differences in the eurhythmic constraints lead to Spanish having a preference for (S)(VO) prosodic phrasing, and European Portuguese preferring (SVO).

Despite definitional discrepancies, the notion of  $\iota$  has been useful in linguistic theorizing: e.g., it has been argued to be the domain of application of morphological processes (in addition to prosodic ones): cf. morphological alternations in K'ichee' (Mayan; Henderson 2012).

## 2.2 Hamlaoui & Szendrői (2015; 2017)

Hamlaoui & Szendrői (2015; 2017) propose that  $\iota$  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, 'highest verbal projection'). That is, the size of  $\iota$  is relative and does not rigidly correspond to a syntactic projection (e.g., CP, TP and/or vP).

Their proposal is based on Hungarian narrow focus (HVP=FocP=  $\iota$ ), English wh-questions /German V2 clauses (HVP=CP= $\iota$ ), and Bàsàá (Bantu) zero-coded passives (HVP=TP= $\iota$ ).

This means that elements that target specifier positions and are accompanied by verb movement are internal to  $\iota$ . This is the case even if the targeted position is relatively high within a clause, as in **Hungarian focus** or **German V2**. At the same time, an XP can be  $\iota$ -external even if relatively low in the structure, if not accompanied by verb movement to the head of the same projection, as in (low) left-dislocation in Bàsàá (Bantu).

Information-structural status of the constituent in Spec, XP does not play a role here – only whether it is found in the specifier of HVP.

(1) *Syntax-prosody mapping on the ‘clause’-level<sup>1</sup>*

- (i) 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  $\iota$ .
- (ii) 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  $\iota$ .
- (iii) ALIGNSA-L: Align the left edge of a syntactic constituent expressing illocutionary force (speech act) with the left edge of an  $\iota$ .
- (iv) ALIGNSA-R: Align the right edge of a syntactic constituent expressing illocutionary force (speech act) with the right edge of an  $\iota$ .

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In **Hungarian**, topics do not form an  $\iota$  with the verb, but narrow foci (obligatorily preverbal) do. Evidence comes from stress: within every  $\iota$  in Hungarian, the leftmost  $\phi$  is stressed.

**Hungarian: topicalization**

- (2) a. [<sub>TopP</sub> A *postás-t<sub>o</sub>*  $\iota$  ([PredP *meg-harapta<sub>v</sub>* [<sub>VP</sub> a *kutya* *t<sub>v</sub>* *t<sub>o</sub>* ]])]  $\iota$   
           the postman-ACC PRT-bite.PST the dog.NOM  
           ‘The dog bit the postman.’
- b. [<sub>TopP</sub> *Péter<sub>s</sub>*  $\iota$  ([PredP *meg-szerette<sub>v</sub>* [<sub>VP</sub> *t<sub>s</sub>* *t<sub>v</sub>* *Mari-t* ]])]  $\iota$   
           Peter PRT-love.PST Mary-ACC  
           ‘Peter fell in love with Mary.’
- (3) [<sub>TopP</sub> A *postás-t<sub>o</sub>* [<sub>TopP</sub> a *kutya<sub>s</sub>*  $\iota$  ([PredP *meg-harapta<sub>v</sub>* [<sub>VP</sub> *t<sub>s</sub>* *t<sub>v</sub>* *t<sub>o</sub>* ]])]  $\iota$ <sup>2</sup>  
           the postman-ACC the dog.NOM PRT-bite.PST  
           ‘The dog bit the postman.’

**Hungarian: focus**

- (4) [<sub>TopP</sub> *Péter<sub>s</sub>*  $\iota$  ([FocP *Mari-t<sub>o</sub>* *szerette<sub>v</sub>* [<sub>PredP</sub> *meg* [<sub>VP</sub> *t<sub>s</sub>* *t<sub>v</sub>* *t<sub>o</sub>* ]]])]  $\iota$   
           Peter Mary-ACC love.PST PRT  
           ‘It is MARY that Peter fell in love with.’

**German: V2**

No evidence for the left edge of  $\iota$  following the finite verb ( $C^0$ ), as would be predicted by approaches that rigidly map TP to  $\iota$ , such as Zerbian (2006, 2007) or Selkirk (2009, 2011).

<sup>1</sup> The availability of recursion in phonological phrasing is a debated issue. On the one hand, according to the Strict Layer Hypothesis (Selkirk 1984; Nespor & Vogel 1986), prosodic constituents of one type should not be embedded in prosodic constituents of the same type. On the other hand, it has been shown, for numerous languages, that recursion in prosodic phrasing is possible. This means that the Strict Layer Hypothesis is best thought of as a violable constraint. On recursive prosodic constituents, cf. Peperkamp (1997), Truckenbrodt (1999), Szendrői (2001), Vigário (2003), Gussenhoven (2004), Elordieta (2015); on recursive  $\iota$ , cf. Ladd (1986), Frota (2000), and Selkirk (2009), among others.

<sup>2</sup> The analysis of multiple topic constructions in Hungarian that is offered in Hamlaoui & Szendrői (2015) takes all topics to be part of the ‘maximal’  $\iota$ ; cf. Szendrői (2001), who analyzed multiple topics as separated by  $\iota$ -boundaries. In Iron Ossetic, multiple topics are not parsed into a single  $\iota$ .

- (5)  $\iota$ [[<sub>CP</sub> *Nächstes Jahr* wird<sub>i</sub> [<sub>TP</sub> *der Hans*  $t_i$  *zum Glück eine reiche Frau* *heiraten*]]]<sub>i</sub>,  
 next year will the Hans with luck a rich woman  
 marry  
 ‘Next year, Hans will luckily marry a rich woman.’ (adapted from Frey 2005)

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### Bàsàá (Bantu):

- unmarked word order: SVO
  - ‘short passives’: those derived with the passive morphology on the verb; cannot include the demoted agent (‘by-phrase’)
  - in order to achieve an information-structural effect similar to a passive with a by-phrase, Bàsàá resorts to object left-dislocation while keeping the verb in the active voice = **zero-coded passive left-dislocation (ZP-LD)**
- (6) *tòlò síngâ ì-ń-dzé ńé*  
 $[\text{CP}[\text{TopP } t_{òlò_o} \iota([\text{TP } s\acute{í}ng\grave{a}_s \quad \grave{ì}\text{-}\acute{ń}\text{-}dz\acute{é}_v \quad [\text{VP } t_s \quad [\text{VP } t_v \quad ń\acute{é}_o ]]]]]]_{\iota}$   
 1.mouse 9.cat 9.AGR-PST1-eat 1.pro  
 ‘The mouse, the cat ate it.’  
 (= the mouse was eaten by the cat)

ZP-LD is different from CLLD in Romance and HTLD in Germanic:

- only one constituent can undergo ZP-LD (e.g., only one of the objects in a clause with a ditransitive verb)
- quantified expressions and non-specific indefinites can undergo ZP-LD
- ZP-LD can take place in non-root contexts (e.g., in restrictive relative clauses)
- ZP-LD is possible in IS-neutral contexts
- ➔ the LD-XP of ZP-LD is syntactically comparable with the subject of a morphological passive, rather than with a dislocated peripheral topic

A clause in Bàsàá is a single  $\iota$ ; in a clause with ZP-LD, the core  $\iota$  excludes the left-dislocated element.

### 3. Iron Ossetic: the basics

#### Linguistic affiliation and context:

- Indo-European, Iranian, East Iranian.
- Two closely related languages: Iron and Digor Ossetic. Iron speakers form a majority but no precise numbers are available.
- According to the 2002 census, in Russia there are 515,000 Ossetians (Iron and Digor), primarily in North Ossetia. Additionally, some 70,000 live in South Ossetia. The number of (potential) Digor speakers can be roughly estimated as 40,000.
- All Ossetic speakers in North Ossetia also speak Russian.



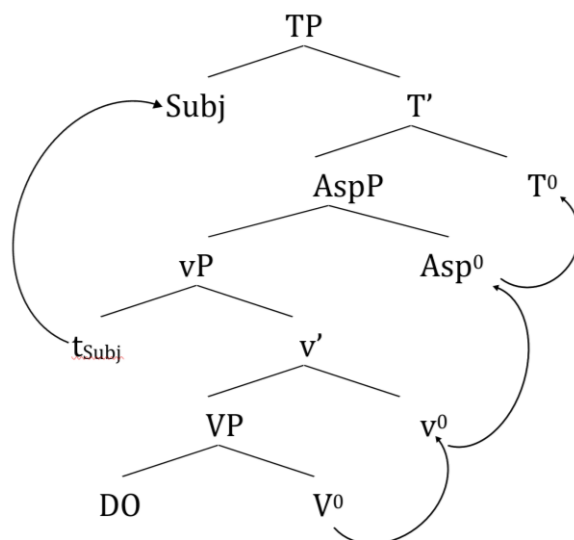
### Highlights of grammar:

- SOV, but the word order is largely determined by information structure
- mostly left-branching/head-final
- rich morphology, mostly suffixing
- rich case system
- complex verbs (nominal + light verb)
- a system of aspectual prefixes
- second-position pronominal and adverbial clitics

### Basic syntactic facts of Iron Ossetic:

- The structure is left-branching up to the level of TP, as in (7).
- The finite verb is assembled by head movement.
- Aspectual prefixes occupy  $\text{Asp}^0$ ; their linearization on the left is achieved either by means of a diacritic [+prefix] or by a series of local dislocations in the sense of Embick & Noyer (2001).
- The subject is generated in Spec, vP and moves to Spec, TP.

(7)



**The preverbal complex:**

If an utterance contains a **negative indefinite**, the negative indefinite must appear **immediately preverbally**; if there are several, all appear, as a cluster, left-adjacent to the verb. The negative marker is in complementary distribution with negative indefinites.

- (8) a. *foʃlan-ə*      *ni-tʃi*      (\**ne*)      *warʒ-ə*.  
          Soslan-ACC   NEG-who   NEG   love-PRS.3SG  
          ‘No-one loves Soslan.’
- b. \**ni-tʃi*      *foʃlan-ə*      (*ne*)      *warʒ-ə*.  
          NEG-who   Soslan-ACC   NEG   love-PRS.3SG  
          (‘No-one loves Soslan.’)
- c. *mədine-jən*      *ni-tʃi*      *ni-sə*      *nikʷə*      (\**ne*)      *ra-zur-ə*.  
          Madina-DAT   NEG-who   NEG-what   never   NEG   PV-say-PRS.3SG  
          ‘No-one ever tells anything to Madina.’

In a wh-question, the **wh-phrase** appears immediately preverbally; if there are several, all appear, as a cluster, left-adjacent to the verb.

- (9) a. *abon*      *mədine-jən*      *tʃi*      *sə*      *ra-zur-ə?*  
          today   Madina-DAT   who   what   PV-say-PRS.3SG  
          ‘Who is telling what to Madina today?’
- b. \**mədine-jən*      *tʃi*      < *abon* >      *sə*      < *abon* >      *ra-zur-ə?*  
          Madina-DAT   who   today   what   today   PV-say-PRS.3SG  
          (‘Who is telling what to Madina today?’)

If an utterance contains a **narrowly focused constituent** (corresponding to the wh-phrase in an answer to a wh-question, or modified by *only*), it also appears immediately preverbally.<sup>3</sup>

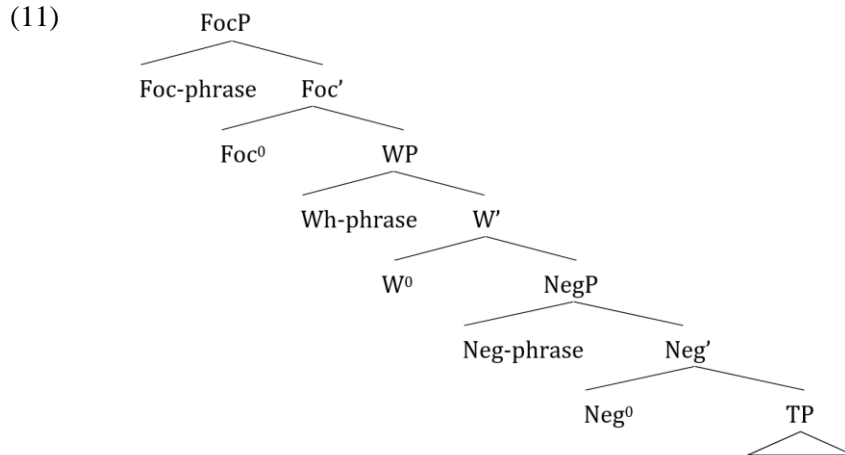
- (10) a. *alan-əl*      *ermest*      *mədine*      *ɛwwənd-ə*.  
          Alan-SUP   only   Madina   believe-PRS.3SG  
          ‘Only Madina believes Alan.’
- b. \**ermest*      *mədine*      *alan-əl*      *ɛwwənd-ə*.  
          only   Madina   Alan-SUP   believe-PRS.3SG  
          (‘Only Madina believes Alan.’)
- c. (‘Who believes Alan?’)  
          *alan-əl*      *mədine*      *ɛwwənd-ə*.  
          Alan-SUP   Madina   believe-PRS.3SG  
          ‘MADINA believes Alan.’

If co-occurring, the order of elements in the preverbal complex is strictly **focus** > **wh-phrase(s)** > **negative indefinites(s)**.

Topicalized constituents precede the preverbal complex; given material may also follow the verb.

<sup>3</sup> Iron Ossetic also allows for postverbal focus, not discussed here.

To account for the word order within the preverbal complex and its properties, we adopt the full clausal architecture above the TP as shown in (11):



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

- (12) a. [CP *ʃɛ=χɛzar-ə* [WP *tʃi* [WP *kɛmɛn* [NegP *nikʷə* [NegP *ni-sə* [Neg' *ra-zur-ə*]]]]]]]?  
 their=house-LOC who who.DAT never NEG-what PV-tell-PRS.3SG  
 ‘In their family, who never tells anything to who?’
- b. [CP *nɛ=χɛzar-ə* [FocP *ɛrmɛʃt alan-əl* [NegP *ni-tʃi* [NegP *nikʷə* [Neg' *ɛwwɛnd-ə*]]]]].  
 our=house-LOC only A.-SUP NEG-who never trust-PRS.3SG  
 ‘In our family, it is ONLY ALAN that no-one ever trusts.’

In accordance with the Bare Phrase Structure approach (Chomsky 1994; 1995), we adopt the view that discourse projections that house no overt material are not projected.

### Evidence for verb movement:

If the verb had stayed in TP after the merger of the discourse projections, we would have expected TP-level adverbials to intervene between the verb and the preverbal complex, which does not happen in actuality:

- (13) \**mɛdinɛ-jɛn tʃi sə abon ra-zur-ə?*  
 Madina-DAT who what today PV-say-PRS.3SG  
 ‘Who is telling what to Madina today?’

### Structure of NegP and WP:

For NegP and WP, we assume identical structures with a single head and multiple specifiers, if multiple wh-phrases or negative indefinites are present.

Neg-phrases and wh-phrases are subject to identical ordering restrictions: no superiority constraints are attested, but animate arguments must precede inanimate ones.

- (14) a. *kɛj sə qəɣdar-ə?*  
 who.ACC what annoy-PRS.3SG?  
 ‘What annoys who?’

- b. \**sə* *kɛj* *qəgdar-ə?*  
 what who.ACC annoy-PRS.3SG
- (15) a. *ni-kɛj* *ni-sə* *qəgdar-ə.*  
 NEG-who.ACC NEG-what annoy-PRS.3SG  
 ‘Nothing annoys anyone.’
- b. \**ni-sə* *ni-kɛj* *qəgdar-ə.*  
 NEG-what NEG-who.ACC annoy-PRS.3SG

Furthermore, as Erschler & Volk (2011) show, the sentential negation marker *nɛ* is a phrase rather than a head. The complementary distribution of the negative marker with neg-phrases is accounted for if we assume that the negative marker is spelled out as a last resort when the specifiers of a (single) NegP are empty. If negative phrases occupy the specifiers of separate? iterated negative projections, the complementary distribution becomes much more difficult to explain.

The parallelism between the behavior of neg-phrases and wh-phrases leads us to the conclusion that wh-phrases also land in multiple specifiers of a single head.

#### 4. Iron Ossetic prosody

Based on the experimental results, we show that there are three levels of prosodic constituency above a prosodic word in Iron Ossetic: **a Phonological phrase** ( $\varphi$ ), **an Intonational phrase** ( $\mathfrak{t}$ ), and a prosodic utterance ( $\upsilon$ ):

- $\varphi$  is the domain of **stress assignment**; it maps onto smaller constituents (e.g. DPs, PPs) and has a single pitch accent  $H^*$ .
- The alignment of  $H^*$  is determined by stress placement within the stress window in a  $\varphi$ :  $H^*$  is realized on the post-tonic syllable, or the juncture between the stressed and post-tonic syllables (=  **$H^*$ -delay**).
- $H^*$ -delay to the post-tonic syllable may happen across a word boundary within a  $\varphi$ , but never across a  **$\varphi$ -boundary** (or  **$\mathfrak{t}$ -boundary**).
- $\mathfrak{t}$  consists of one or more  $\varphi$ s;  $H^*$  on non-initial  $\varphi$ s is suppressed.<sup>4</sup>
- $\mathfrak{t}$ s in wh-questions, additionally, carry a high initial boundary tone **%H**.
- $\upsilon$  encompasses the whole utterance (not discussed here).

The left boundary of  $\mathfrak{t}$  is determined by verb movement: it aligns with the projection that hosts the verb (**HVP**) and includes the specifier of that projection, in accordance with the flexible  $\mathfrak{t}$ -mapping hypothesis.

<sup>4</sup> An  $\mathfrak{t}$  that consists of the verb alone does not carry  $H^*$  but is characterized by a steeper and lower drop in F0 and intensity, as compared to verbs that are part of a larger  $\mathfrak{t}$  (in an HVP configuration); cf. Section 4.3.6.



At the same time, the prosody of **wh-phrases** shows that the flexible  $\iota$ -mapping hypothesis cannot account for the full range of the Iron Ossetic data. We show that the prosody of wh-phrases is determined by **phonological requirements/eurhythmic constraints**. The resulting prosodic picture, therefore, is governed by two kinds of factors: those rooted in syntax and those independent from it.

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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’ and ‘weak’ vowels:

- S: *a, e, i, o, u*
- W: *ɐ, ə*

The four possible stress window types: WW, SS, WS, and SW. **Stress placement:**<sup>5</sup>

- WW: **second** syllable: *kɛʃ'tɛr* ‘young’, *məʃ'tətɐ* ‘mice’, *ʃɐ'nəkk* ‘lamb’.
- SS: **first** syllable (predominantly): *'ralizən* ‘to run away’, *'χabar* ‘news’, *'suron* ‘flatterer’
- WS and SW: the syllable with the **strong vowel**: *'razmɐ* ‘forward’, *'solpə* ‘ladle’, *'bazərtɐ* ‘wings’, *bɐ'laf* ‘tree’, *χɐ'don* ‘shirt’

Personal names, regardless of vowel quality, are stressed on the second syllable.

**Acoustic cues** for stress:

- mean duration of stressed vowels is slightly greater than that of unstressed vowels (1.2:1), and so is intensity (1.01:1) (Dzakhova 2010).
- the stressed syllable is not necessarily marked by greater F0 than the surrounding ones: in 52% of cases F0 is higher on the post-tonic syllable than the stressed one (Dzakhova 2014);

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Following Hamlaoui & Szendrői (2015; 2017), we propose that the correspondence between  $\iota$  and syntactic projections in Iron Ossetic adheres to the flexible  $\iota$ -mapping principle, governed by the family of ALIGN-R/L(HVP,  $\iota$ ) constraints:

- the right and left edges of the HVP are mapped onto the corresponding edges of  $\iota$ , respectively;
- 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  $\phi$ , respectively, by ALIGN-R/L(XP,  $\phi$ );
- the edges of the full (‘illocutionary’) clause are mapped onto the respective edges of  $\upsilon$  by ALIGN-R/L(CP,  $\upsilon$ ).

<sup>5</sup> 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 not rendered in orthography but still influences stress placement (Bagaev 1965: 58).

#### 4.1 Traditional descriptions

In connected speech, stress is assigned within a so-called *prosodic group* (as opposed to a prosodic word) (Abaev 1924; 1939: 96; Bagaev 1965: 62; Isaev 1959: 65; Testen 1997: 728).<sup>6</sup> Prosodic groups are determined in the context of a larger utterance. Within a prosodic group, the stress window is formed by the first two syllables.

(16) Prosodic grouping applies to the following elements (Abaev 1939: 116):

- i. Nouns and their modifiers;
- ii. Nouns and postpositions;
- iii. Verbal negation/negative indefinites and verbs;
- iv. Wh-phrases and verbs;
- v. A preverbal constituent (subject, object, or adverbial) and the verb (when the preverbal constituent is focused).

Second position clitics and certain particles can surface between the elements in (iii) and (iv) and be part of the prosodic group too.

#### 4.2 Current study

##### Materials and methods:

- 13 speakers of Iron Ossetic (8M, 5F, 20-60 y.o.)
- all speakers came from North Ossetia and had a complete or in-progress university degree;
- the recordings were made in Vladikavkaz, Russia, in 2019;
- all data were recorded with a head-worn mic, at a sampling rate of 44.100 Hz and 16 bits per sample, in a quiet university classroom.

The dataset consisted of 118 utterances:

- a) declarative clauses with verbal arguments of varying syntactic complexity, including negative indefinites (n=16),
- b) wh-questions of varying complexity: with one or two wh-phrases, as well as negative indefinites (n=59)
- c) utterances containing narrow foci, of varying syntactic complexity (n=43).

The recordings were analyzed in Praat (Boersma & Weenink 2019). F0 was measured at five fixed points per syllable (Xu 2013) and the resulting F0 contours were analyzed in R (R Core Team 2017).

#### 4.3 Results

##### 4.3.1 stress and H\*-delay

Noun phrases from part (a) of the experiment (n=196) were divided into three groups, according to stress window type: SS (n =14), WW (n =124), and SW (n=58); WS was not represented in the stimuli.

As Figure 1 shows, the exact alignment of the F0 peak is conditioned by stress placement (based on vowel quality) and H\*-delay. When the first vowel is stressed (in SW and SS stress

<sup>6</sup> This term is used pretheoretically here. As shown below, depending on the context, the traditional ‘prosodic group’ may correspond to either  $\varphi$  or  $\iota$ .

windows), H\* is realized on the second syllable; when the second vowel is stressed, as in WW stress windows, H\* is found on the third syllable or the boundary between the second and third syllables.<sup>7</sup>

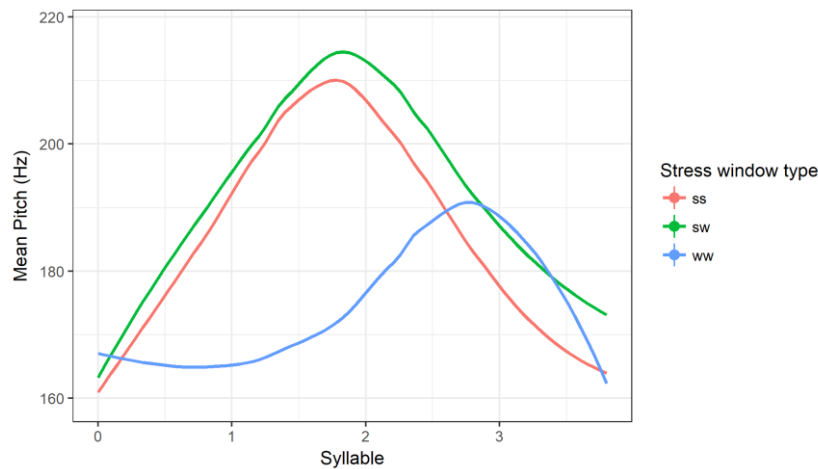


Figure 1. F0 contours over different types of stress windows (time-normalized); smoothed at 0.3. '1', '2' and '3' on the x-axis correspond to the right edges of respective syllables.

| stress window | mean F0 peak location | SD   |
|---------------|-----------------------|------|
| SS            | 1.62                  | 0.29 |
| SW            | 1.77                  | 0.24 |
| WW            | 2.2                   | 0.88 |

Table 1. F0 peak location in time-normalized stress window types

H\*-delay plays a significant role in cuing prosodic phrasing in Iron Ossetic: the availability of H\*-delay to the posttonic syllable is a  $\phi$ -internal process and may take place across word boundaries within a  $\phi$ . This is shown in (17) and Figure 2.

- (17)  $\phi$ ([NP *bur* *bɛlon*]) $\phi$   $\phi$ ([NP *lɛgʷən* *gɛdɔjə*]) $\phi$  *wən-ə*.  
           brown      pigeon            mangy      cat-ACC    see-PRS.3SG  
           ‘A brown pigeon sees a mangy cat.’

In the first  $\phi$  in Figure 2, *bur bɛlon* ‘brown pigeon’, the SW stress window is formed across a word boundary and includes the monosyllabic adjective *bur* ‘brown’ and the first syllable of *bɛlon* ‘pigeon’, *bɛ*. The strong vowel *u* is stressed, and the F0 peak is delayed until the post-tonic syllable, the second one within the  $\phi$ . If a word boundary interfered with the formation of the stress window, this alignment of H\* would have been left unexplained.

Within the second  $\phi$ , *lɛgʷən gɛdɔjə* ‘mangy cat’, the stress window is formed by the disyllabic adjective *lɛgʷən* ‘mangy, shabby’. Within the WW stress window, the second syllable is stressed, but the F0 peak is realized on the first syllable of *gɛdɔjə* ‘cat’, due to H\*-delay. This means that a word boundary does not interfere with  $\phi$ -formation either.

H\*-delay does not cross  $\phi$ - or  $\iota$ -boundaries, as the data in subsequent sections show.

<sup>7</sup> The size of the sample does not allow for it to be tested with a statistical model, but clear F0-peak alignment trends are, nevertheless, recognizable in the available data.

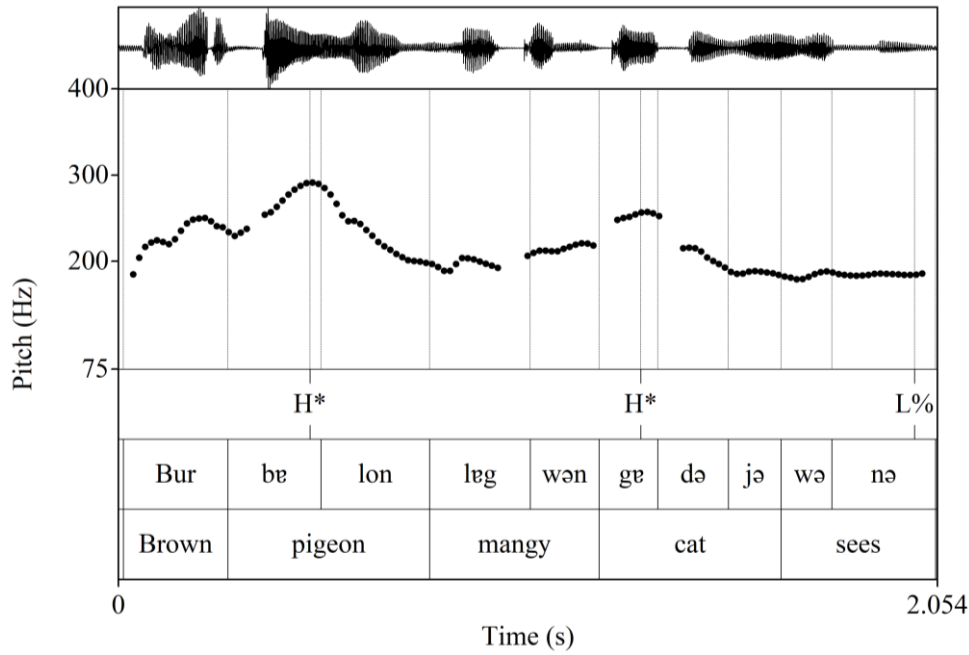


Figure 2. Realization of a broad focus declarative in (17) (speaker F3, ex. pt1\_2)

#### 4.3.2 Negative indefinites

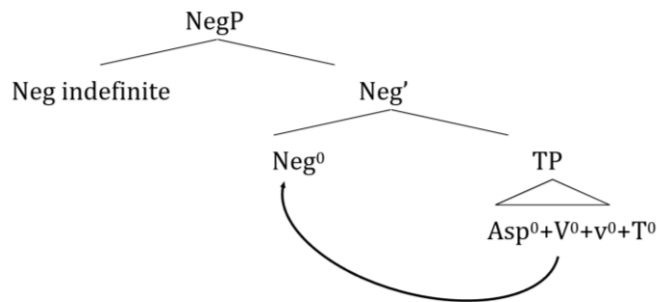
Negative indefinites are obligatorily left-adjacent to the verb. Any number of negative indefinites may occur preverbally:<sup>8</sup>

- (18) a.  $\varphi(\text{abon})_{\varphi} \varphi(\text{alan})_{\varphi} \iota(\varphi([\text{NegP } \textit{ni-kəm-əj}]_{\varphi} \varphi([\text{Neg'} \textit{a-ləʔd-i}]))_{\iota}$ .  
 today Alan NEG-who-ABL PRV-run.away-PST.3SG  
 ‘Today Alan didn’t run away from anyone.’
- b.  $\varphi(\text{abon})_{\varphi} \iota(\varphi([\text{NegP } \textit{ni-tʃi}]_{\varphi} \varphi([\text{NegP } \textit{ni-kəm-əj}]_{\varphi} \varphi([\text{Neg'} \textit{a-ləʔd-i}]]))_{\iota}$ .  
 today NEG-who.NOM NEG-who-ABL PRV-run.away-PST.3SG  
 ‘Today no-one run away from anyone.’

Syntactically, in the presence of negation, NegP is merged above the TP. Negative indefinites occupy the specifiers of NegP. We take the obligatory adjacency of the negative indefinite(s) and the verb to follow from the fact that the verb complex, that is, the complex head consisting of  $V^0$ ,  $v^0$ ,  $\text{Asp}^0$ , and  $T^0$ , head-moves into  $\text{Neg}^0$ , as shown in (19):

<sup>8</sup> The prosodic structure in (18) includes a  $\varphi$  and an  $\iota$  as sisters. As such, this structure violates STRONGSTART (Selkirk 2011, Elfner 2011, 2012, Bennett, Elfner & McCloskey 2016), a constraint against prosodic structures in which the initial sister is lower on the prosodic hierarchy than the following one. There are several possible solutions to this. First, the initial  $\varphi$  may be embedded into its own  $\iota$ :  $\iota(\varphi(\varphi))_{\iota} \iota(\varphi(\varphi \varphi \varphi \varphi \varphi))_{\iota}$ . Second, it may instead be recursive:  $\iota(\varphi(\varphi) \varphi(\varphi(\varphi \varphi \varphi \varphi \varphi))_{\iota})_{\iota}$ . However, there is no prosodic evidence for the initial constituent being part of another  $\iota$ , in either fashion. Therefore, we remain agnostic as to whether left-peripheral constituents are part of an  $\iota$ . It is also possible that left-peripheral constituents do not form separate  $\iota$ s but are, nonetheless, prosodically separated from the rest of the clause; see e.g. Hamlaoui & Szendrői (2015) for a tentative proposal that topics align with an edge of  $\iota$  (with no reference to the right edges).

(19)



Based on this syntactic configuration, the prediction is that negative indefinites, no matter how many, always form an  $\iota$  with the following verb. This prediction is borne out.

Figure 3 shows the F0 contour that spans (18a). Both left-peripheral topics, *abon* ‘today’ and *alan* ‘Alan’, carry their own H\*s, and so does *nikəmɛj* ‘from anyone’. After the H\* on *nikəmɛj* ‘from anyone’, there is a sharp fall in F0. Lack of further H\* pitch accents is a hallmark of  $\iota$ -formation.

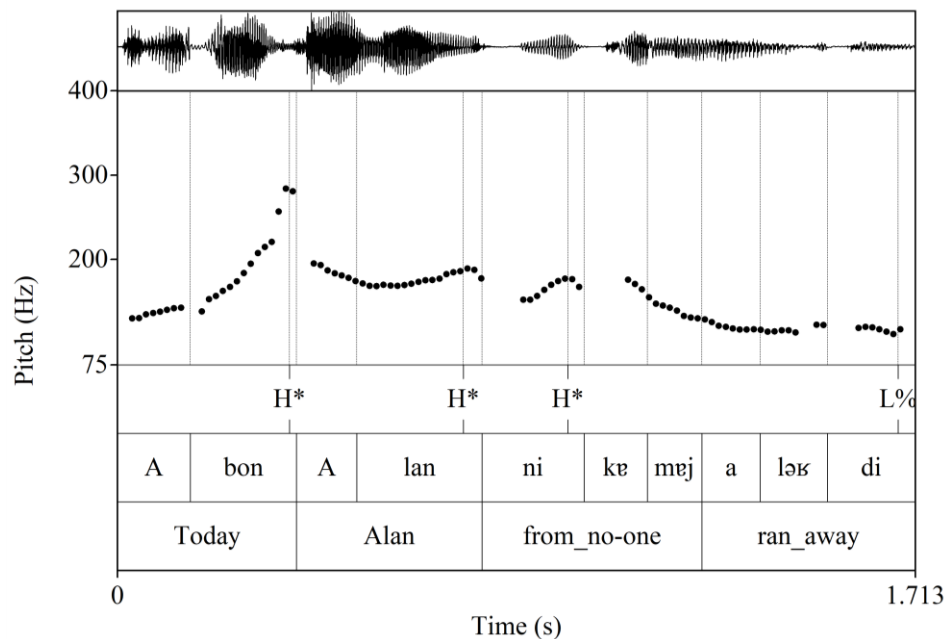


Figure 3. Realization of the utterance in (18a) (M1, pt1\_8).

In a sequence of negative indefinites, only the leftmost one carries an H\*. This is shown in Figure 4. Here, there is a pronounced H\* on *nifɪ* ‘no-one’ but not on *nikəmɛj* ‘from anyone’ or the verb. The H\* is realized on the second syllable of *nifɪ* ‘no-one’, delayed from the initial, stressed syllable in a SS stress window.

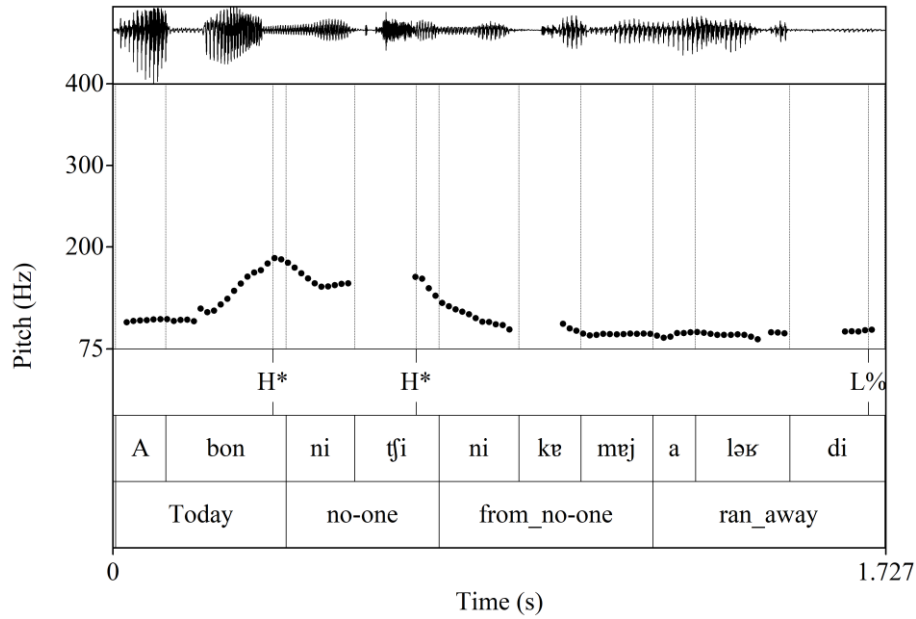


Figure 4. Realization of the utterance in (18b) (M4, pt1\_9).

Such prosodic grouping is **expected** from the point of view of flexible  $\iota$ -mapping hypothesis, given the syntax of negative indefinites in Iron Ossetic: the negative indefinite(s) occupy(ies) the specifier(s) of the NegP projection, with the verb raising to Neg<sup>0</sup> if a specifier is filled. This is exactly the HVP configuration that is required for  $\iota$ -formation.

### 4.3.3 Wh-questions

Wh-phrases in Iron Ossetic appear in the immediately preverbal position.<sup>9</sup>

- (20)  $\varphi(\text{mədinə})_{\varphi}$   $\varphi(\text{indʒən})_{\varphi}$   $\iota(\varphi([\text{WP } \text{kem}])_{\varphi}$   $\varphi([\text{WP } \text{balχən-ə}])_{\varphi})_{\iota}?$   
 Madina cottage.cheese where buy-PRS.3SG  
 ‘Where does Madina buy cottage cheese?’

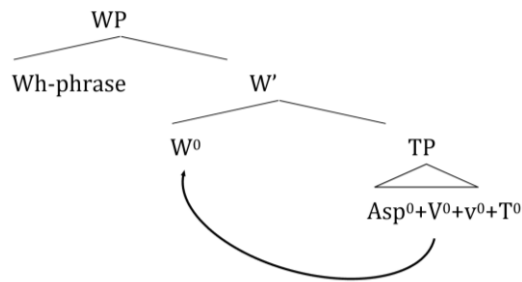
We propose that wh-phrases move to the specifiers of a dedicated projection, WP, that dominates TP, and the verb complex head-moves into W<sup>0</sup>, in the same manner as with negative indefinites.<sup>10</sup>

<sup>9</sup> For the prosodic behavior and analysis of multiple wh-questions, cf. Section 4.3.6.

<sup>10</sup> We remain agnostic as to the location of the interrogative operator in the structure. The word order in Ossetic Y/N questions is no different from that in declaratives (ia-b); nor is the word order in alternative questions any special (ic). Accordingly, we assume that the WP projection is only present in wh-questions.

- (i) a. Declarative  
 mədinə piʃmo nə-ffəʃ-ta.  
 Madina letter PV-write-PST.3SG  
 ‘Madina wrote a letter.’  
 b. Y/N question  
 mədinə piʃmo nə-ffəʃ-ta?  
 Madina letter PV-write-PST.3SG  
 ‘Did Madina write a letter?’  
 b. Alt-question  
 mədinə ɐvi ʃoflan piʃmo nə-ffəʃ-ta?  
 Madina Q.or Soslan letter PV-write-PST.3SG  
 ‘Did Madina or Soslan write a letter?’

(21)



The prediction for wh-phrases, then, is the same as it was for negative indefinites: a wh-phrase should form an  $\iota$  with the following verb. This prediction, too, is borne out.

At the same time, the phonological shape of wh-words (monosyllabic or with WS or WW stress window) also allows to show that all wh-phrases, regardless of the quality of the vowel, form a  $\phi$  to the exclusion of the verb.

The  $H^*$  associated with a wh-phrase is never realized outside of the wh-phrase itself. This is illustrated in Figure 5 for a monosyllabic wh-word with a weak vowel from (20). Had wh-words formed a  $\phi$  with the following verb,  $H^*$  would have been realized on the second syllable of the verb or between the first and the second syllables (after  $H^*$ -delay applies).

Lack of  $H^*$ s further to the right indicates that the wh-phrase forms an  $\iota$  with the following verb.

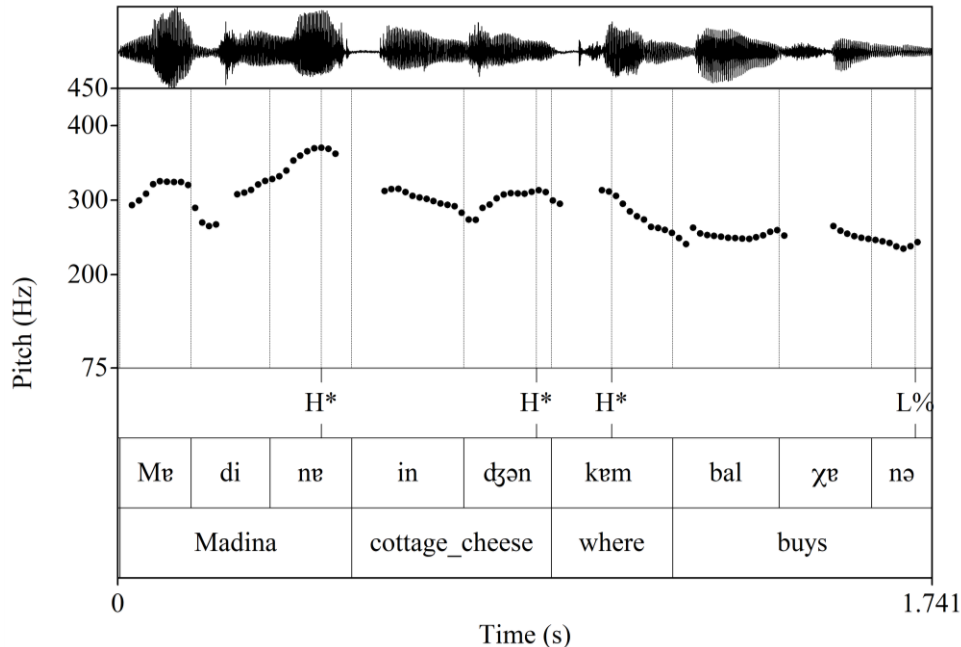


Figure 5. Average  $F_0$  contours on a wh-question in (20) ( $F_2$ , pt2\_5).

The behavior of polysyllabic wh-phrases shows that wh-phrases, in fact, carry two high pitch targets (in monosyllabic ones they coincide):

- a stress-induced  $H^*$ ,
- an initial high boundary tone  $\%H$ .

This is shown in (22) and Figure 6. Here, H\* in *saver* ‘which’ is on the second, post-tonic syllable -*vər*, while *sa-* carries another high target, the %H boundary tone.

- (22)  $\varphi(Abon)\varphi \varphi(indʒən)\varphi \iota(\varphi([WP \text{ *saver* *wejʒenədʒə* *binojnag*)]\varphi)_{\iota}?$   
 today cottage.cheese which seller’s spouse  
 $\varphi([WP' \text{ *əlχən-ə*]])\varphi)_{\iota}?$   
 buy-PRS.3SG  
 ‘Which seller’s spouse buys cottage cheese today?’

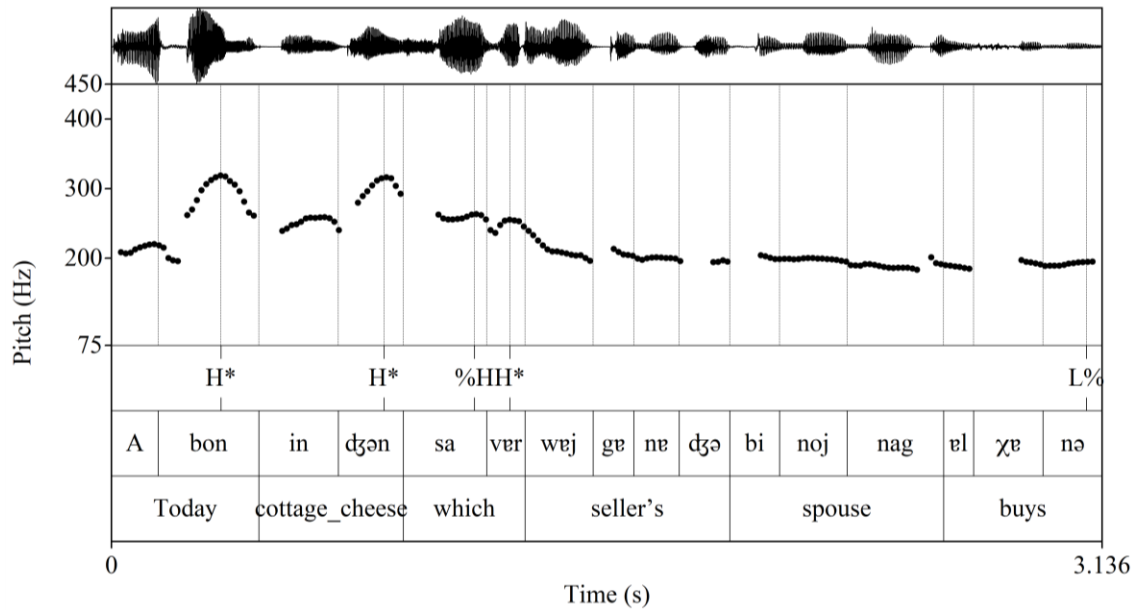


Figure 6. Realization of the wh-question in (22) (F3, pt2\_8)

The fact that is formed by wh-phrases also carry initial boundary tones %H explains some prosodic ‘anomalies’ of these is in multiple wh-questions and when accompanied by negative indefinites – more on this in Section 4.3.6.

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Second position clitics can intervene between the wh-phrase and the verb. They encliticize to the preceding wh-phrase and form a  $\varphi$  with it, which is manifested by the fact that clitics become part of the stress window and allow for H\*-delay. This is illustrated in (23) and in Figure 7.

In (23), the wh-word and the first clitic form a SW stress window. The wh-word carries the initial H%, and the H\* is delayed and realized on the first clitic.

- (23)  $\iota(\varphi(\text{*ʃi* = dən = ɐj})\varphi \varphi(\text{*radta*})\varphi)_{\iota}?$   
 who you.DAT it gave  
 ‘Who gave it to you?’



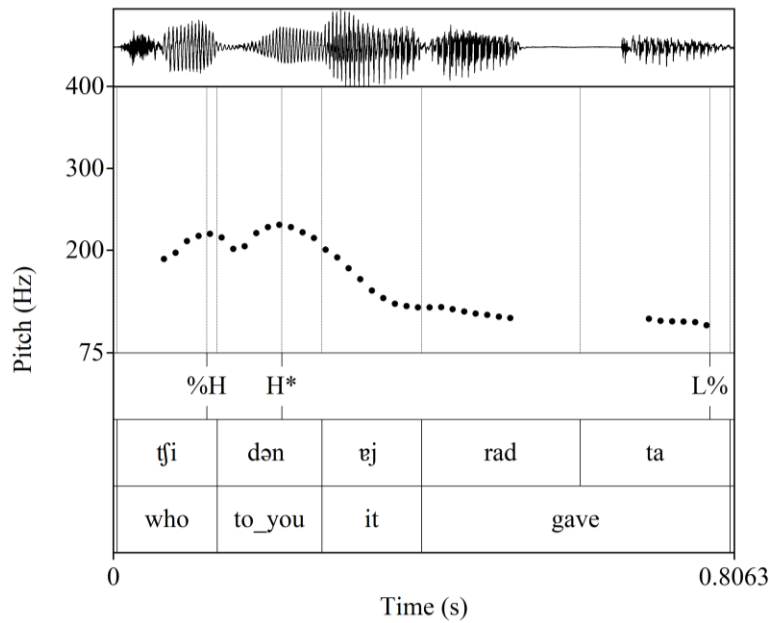


Figure 7. Realization of (23) (M1, pt2\_10)

To recap: as predicted by the flexible  $\iota$ -mapping hypothesis, because the wh-phrase and the verb are in the HVP configuration, they form a single  $\iota$  (regardless of the phonological weight of the wh-constituent). Additionally, wh-phrases form a  $\phi$  that excludes the verb but includes enclitics, if present.

#### 4.3.4 Preverbal focus

A focused XP, if present, is immediately preverbal.<sup>11</sup>

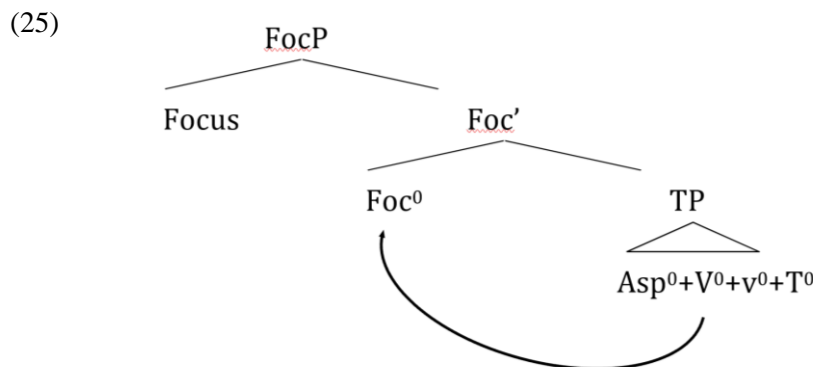
(24) a. ('Who trusts Alan?')

$\phi([alan\partial])\phi$      $\iota(\phi([FocP \text{ *medine*])\phi$      $\phi([Foc' \text{ *ɛwwend-\partial*]])\phi)\iota$ .  
 Alan.SUP                      Madina                      trust-PRS.3SG  
 'MADINA trusts Alan.'

b. ('What is Alan drinking?')

$\phi([alan])\phi$      $\iota(\phi([FocP \text{ *begenə*])\phi$      $\phi([Foc' \text{ *nwaʒ-\partial*]])\phi)\iota$ .  
 Alan                      beer                      drink-PRS.3SG  
 'Alan is drinking BEER.'

We adopt the view that focused phrases move into Spec, FocP:



<sup>11</sup> Foci can also be placed postverbally. Postverbal focus constructions are not considered here.

The prosodic behavior of preverbal foci also follows from their syntax. Cf. Figure 8 and Figure 9: in both examples, there is a prominent H\* on the clause-initial topical constituent, followed by a somewhat smaller and shallower F0 peak on the narrow focus.

The shallow shape of H\* on the narrowly focused constituent, accompanied by a continuous fall in F0 on the verb, seen especially clearly in Figure 8, is a typical prosodic feature of preverbal focus contexts in Iron Ossetic.

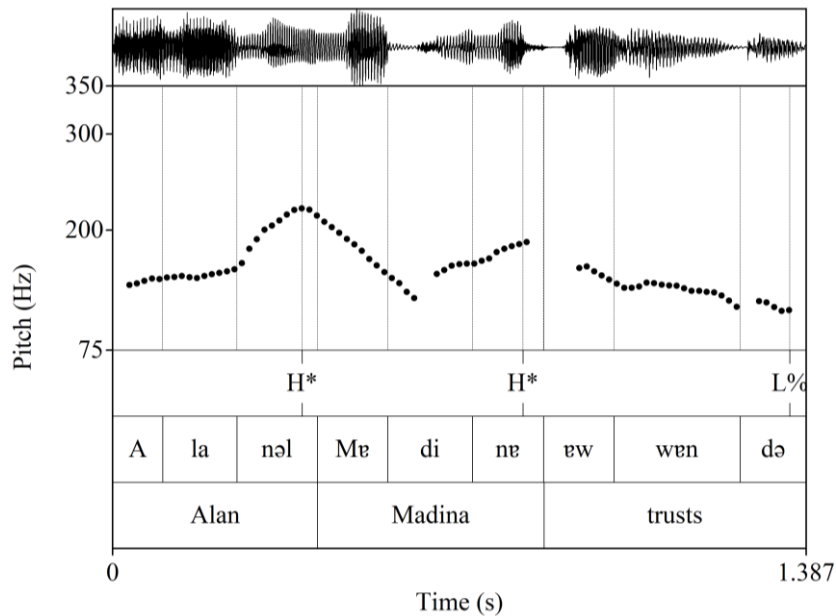


Figure 8. Realization of (24a) (M1, pt3\_3)

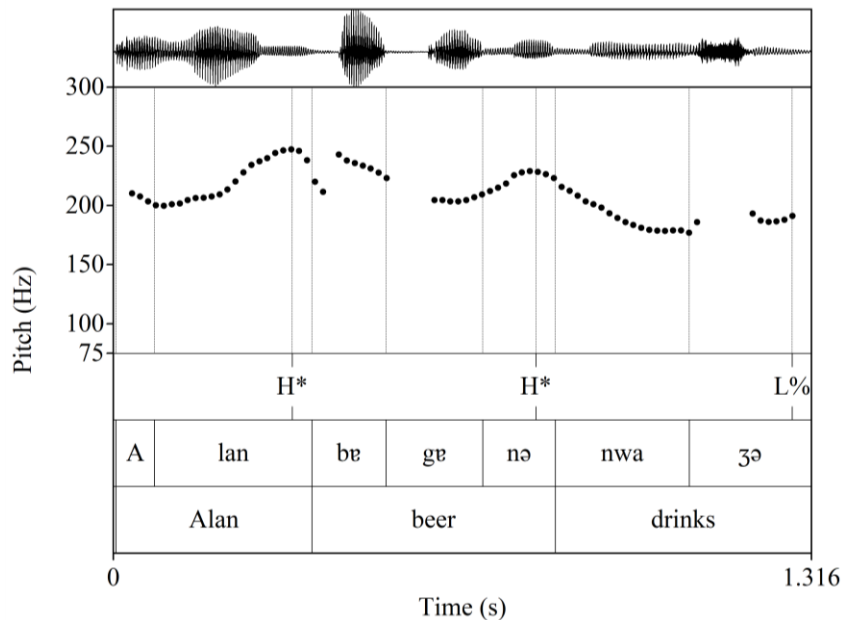


Figure 9. Realization of (24b) (F3, pt3\_4)

Preverbal foci may not be separated from the verb by any constituents other than negative indefinites (or wh-phrases). When an utterance contains both a narrowly focused constituent and a negative indefinite, the word order is strictly *focus* > *negative indefinite(s)* > *verb*, as in (26):

(26) a. ('Who does no-one trust in your family?')

$\varphi(n\bar{e} \quad \chi\bar{e}zar\bar{a})_{\varphi} \quad \varphi(alan\bar{a}l)_{\varphi} \quad \iota(\varphi([NegP \quad ni-t\bar{f}i])_{\varphi} \quad \varphi([Neg' \quad \bar{e}ww\bar{e}nd-\bar{a}])_{\varphi})_{\iota}$   
 our family.in Alan.SUP NEG-who trust-PRS.3SG  
 'In our family, no-one trusts ALAN.'

b. ('Who does no-one ever trust in your family?')

$\varphi(n\bar{e} \quad \chi\bar{e}zar\bar{a})_{\varphi} \quad \varphi(alan\bar{a}l)_{\varphi} \quad \iota(\varphi(ni-t\bar{f}i)_{\varphi} \quad \varphi(nik^w\bar{a})_{\varphi} \quad \varphi(\bar{e}ww\bar{e}nd-\bar{a})_{\varphi})_{\iota}$   
 our family.in Alan.SUP NEG-who never trust-PRS.3SG  
 'In our family, no-one ever trusts ALAN.'

Prosodically, negative indefinites in such contexts form an  $\iota$  with the following verb, to the exclusion of the narrowly focused constituent. The leftmost negative indefinite keeps its H\*.

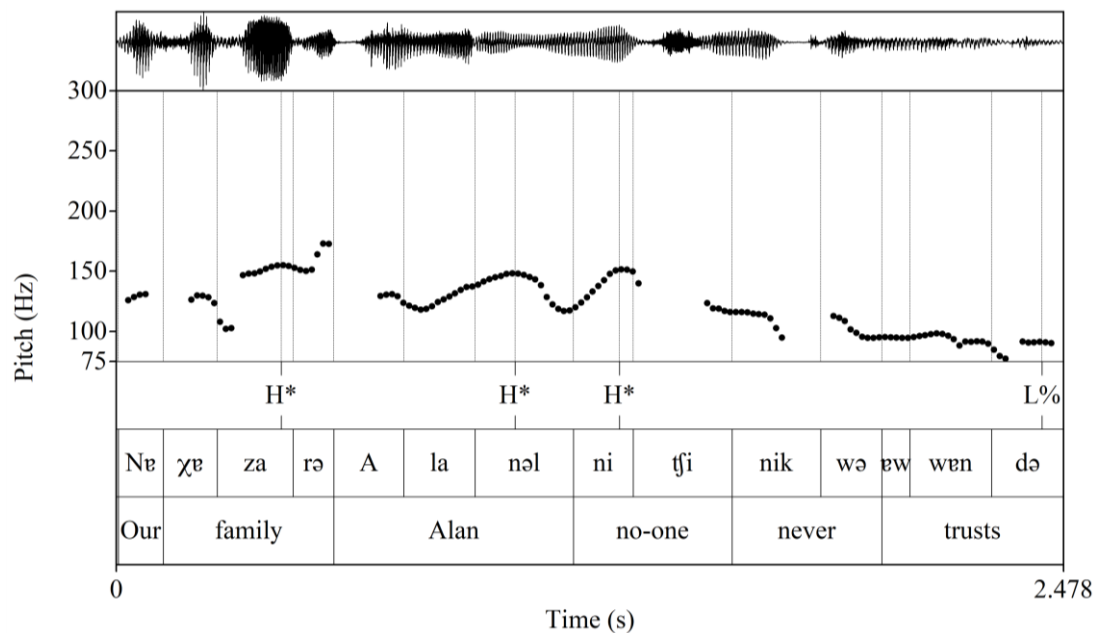


Figure 10. Prosodic realization of (b) in (26) (M6, pt3\_26)

This prosodic picture, too, follows from the syntactic properties of these constructions: here, the negative indefinite(s) and the verb are housed by the same projection, NegP. This is the HVP configuration that ensures  $\iota$ -formation. In contrast, the focused constituent is in Spec, FocP, a different projection. The flexible  $\iota$ -mapping hypothesis predicts that the focused constituent should be external to  $\iota$ .

#### 4.3.5 More complex cases

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 syntax alone. Their properties are rooted in prosodic requirements of Iron Ossetic, which are independent from the syntax of the flexible  $\iota$ -mapping hypothesis.

A wh-word 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**, as in (27).

(27) *mədinə kəmen nik^wə ni-sə ra-zur-ə?*  
 Madina who.DAT never NEG-what PRV-tell-PRS.3SG  
 'Who does Madina never tell anything?'

The flexible  $\iota$ -mapping hypothesis predicts that such constructions should be prosodified in a parallel way to *focus* > *negative indefinite(s)* > *verb* constructions:

- (28) a.  $\varphi(\text{Foc})_{\varphi} \iota(\varphi(\text{Neg})_{\varphi} \varphi(\text{V})_{\varphi})_{\iota}$   
 b.  $\varphi(\text{Wh})_{\varphi} \iota(\varphi(\text{Neg})_{\varphi} \varphi(\text{V})_{\varphi})_{\iota} \leftarrow$  predicted by the flexible  $\iota$ -mapping hypothesis

However, *wh-phrase* > *negative indefinite(s)* > *verb* constructions instead have the prosody of the following shape, one in which  $\iota$  includes not only the negative indefinite but also the wh-phrase to its left. We will mark this unexpected left-edge  $\iota$ -boundary as ‘ $\iota$ ’, in contrast with ‘ $\iota$ ’:

- (29)  $\varphi(\text{mədi}nə)_{\varphi} \quad \iota(\iota(\text{kəmən})_{\varphi} \varphi(\text{nik}^wə)_{\varphi} \varphi(\text{ni-sə})_{\varphi})_{\iota} \quad \varphi(\text{ra-zur-ə})_{\varphi})_{\iota}?$   
 Madina who.DAT never NEG-what PRV-tell-PRS.3SG  
 ‘Who does Madina never tell anything?’

- (30) a.  $\varphi(\text{Foc})_{\varphi} \iota(\varphi(\text{Neg})_{\varphi} \varphi(\text{V})_{\varphi})_{\iota}$   
 b.  $\iota(\iota(\text{Wh})_{\varphi} \varphi(\text{Neg})_{\varphi} \varphi(\text{V})_{\varphi})_{\iota} \leftarrow$  actually attested

Cf. Figure 11: here, the negative indefinites do not carry their own H\*s – i.e., they belong to the same  $\iota$  as the wh-word and the verb that they are sandwiched between. Only the wh-word *kəmən* ‘to who’ carries a H\* on the second syllable (and also a %H on the initial one). This behavior is not predicted by the flexible  $\iota$ -mapping hypothesis. How do we account for this?

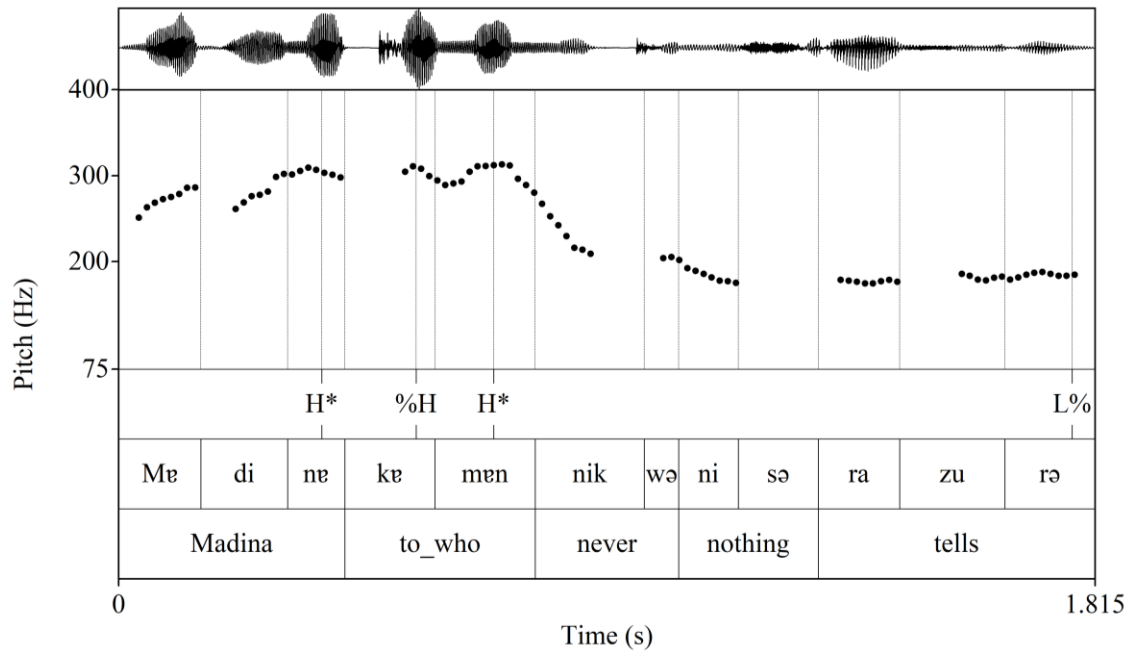


Figure 11. Realization of the wh-question in (27) (F5, pt2\_13)

Prosodic structure formation is governed by factors that come from **two independent sources**:

- those **rooted in syntax** (i.e., those that prosodically reflect the syntactic structure)
- **purely prosodic ones** (i.e., those that are independent of syntax and reflect the language-specific phonological markedness constraints on prosodic structure, also known as eurhythmic constraints).

Eurhythmic constraints, if high ranked, “produce instances of **non-isomorphism** between syntactic constituency and phonological domain structure” (Selkirk, 2011).<sup>12</sup>

What is the prosodic requirement that is responsible for the behavior of wh-phrases? The *is* 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 *is* formed by wh-questions.

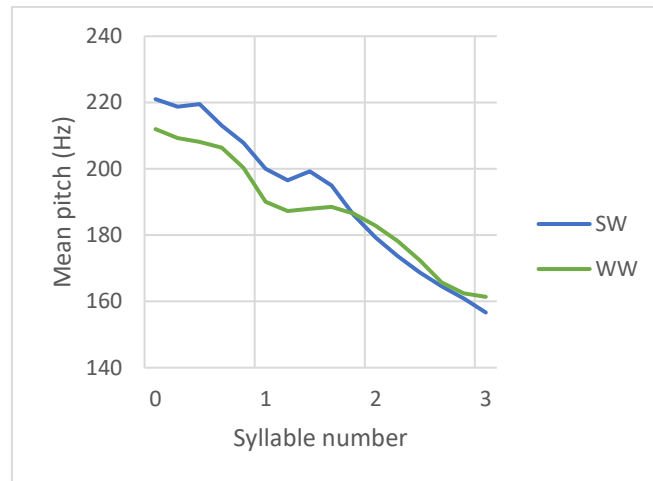


Figure 12. Averaged *F0* contours on *is* formed by wh-phrases preceded by left-peripheral constituents, according to stress window type

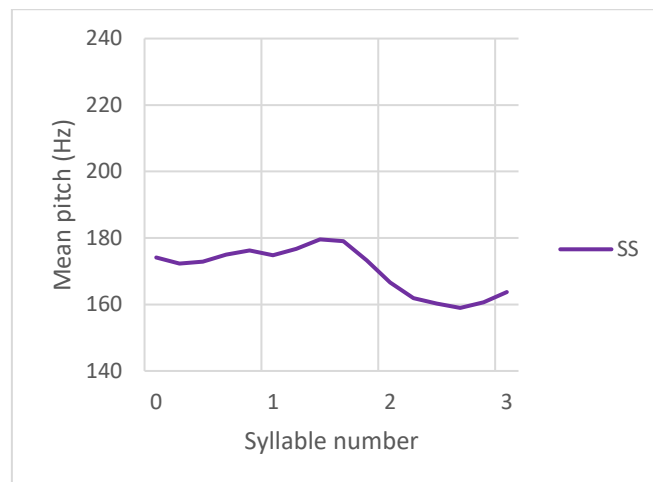


Figure 13. Averaged *F0* contour on *an* formed by a negative indefinite preceded by left-peripheral constituents

We propose that the presence of %H is responsible for the special behavior of wh-phrases with respect to prosodic phrasing. The  $\iota$ -boundary formed by %H is more ‘aggressive’ than  $\iota$ -boundaries that result from HVP: an insertion of a %H  $\iota$ -boundary leads to the deletion of all other initial  $\iota$ -boundaries to its right, other than those also formed by %H.<sup>13</sup>

<sup>12</sup> Further examples are provided in Ghini (1993), Selkirk (2000), Elordieta (2007), Myrberg (2013), and Elfner (2012; 2015). For an overview of the architecture of the syntax-prosody interface, including syntax-prosody mismatches, see Elfner (2018) and Bennett and Elfner (2019).

<sup>13</sup> This analysis is reminiscent of Pierrehumbert and Beckman’s (1988) approach to the prosody of focus in Japanese: they suggested that a left edge of a Major Phrase is inserted at the left edge of the focused constituent (MaP Boundary Insertion Rule), followed by the deletion of all Major Phrase boundaries to the right of focus

(31) **POST-%H DEPHRASING**

delete all initial  $\iota$ -boundaries to the right of %H, other than those also formed by %H  
(= no ' $\iota$ ' to the right of ' $\iota$ ').

POST-%H DEPHRASING is ranked higher than ALIGNHVP-L/R; as a result, in wh-questions, regardless of the number and type of interveners, the left edge of  $\iota$  aligns with the left edge of the wh-phrase.

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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  $\iota$ -boundary. Figure 14 and Figure 15 show that each of the wh-words in (32), indeed, carries its own H\*.

- (32) a.  $\varphi$ (  $f\bar{v}$ = $\chi\bar{v}zar$ - $\partial$ ) $\varphi$   $\iota$ ' $\varphi$ (  $t\bar{f}i$ ) $\varphi$   $\iota$ ' $\varphi$ (  $k\bar{e}j$   $\varphi$ (  $nik^w\partial$ ) $\varphi$   $\varphi$ (  $agur$ - $\partial$ ) $\iota$ ?<sup>14</sup>  
           their=house-LOC           who           who.GEN   never           look\_for-PRS.3SG  
           ‘In their family, who never looks for anyone?’
- b.  $\iota$ ' $\varphi$ (  $s\bar{e}v\bar{e}r$   $g\bar{e}d\partial$ ) $\varphi$   $\iota$ ' $\varphi$ (  $s\bar{e}v\bar{e}r$   $w\bar{a}ng$ - $m\bar{e}$ ) $\varphi$   $\varphi$ (  $nik^w\partial$ ) $\varphi$   $\varphi$ (  $raliz$ - $\partial$ ) $\iota$ ?  
           which   cat           which   street-ALL   never           run-PRS.3SG  
           ‘Which cat never runs along which street?’

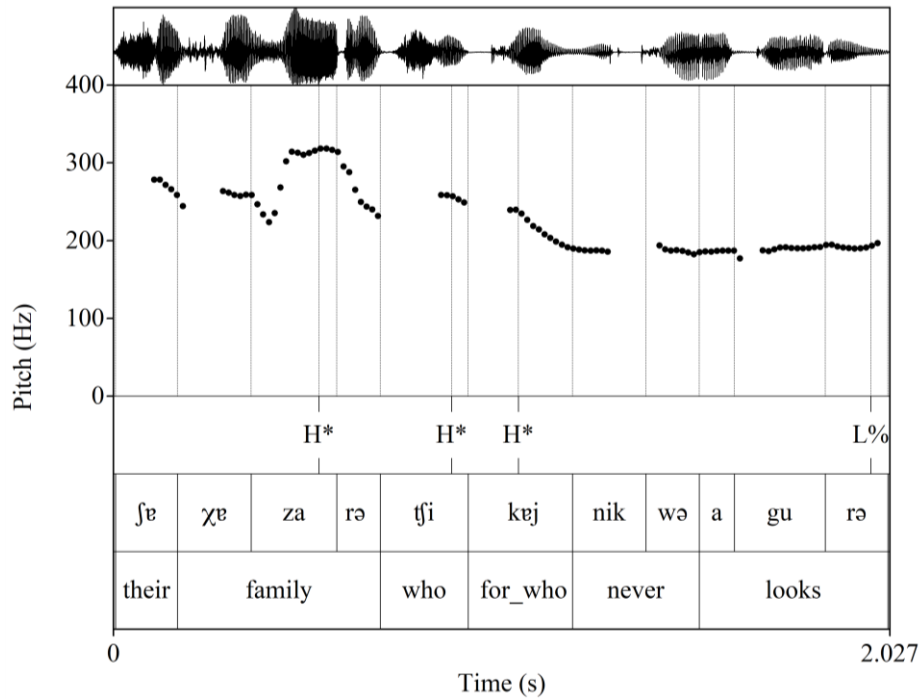


Figure 14. Realization of the wh-question in (a) in (32) (F3, pt2\_45)

(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, cf. also Ishihara (2002a; 2002b), Hiraiwa and Ishihara (2002), and Deguchi and Kitagawa (2002) for Japanese, and Jun (1998) for Korean, among others.

<sup>14</sup>There is no prosodic evidence as to whether multiple wh-questions form nested  $\iota$ s or sister  $\iota$ s. For this reason, only one of the right edges of  $\iota$  is marked in (32).

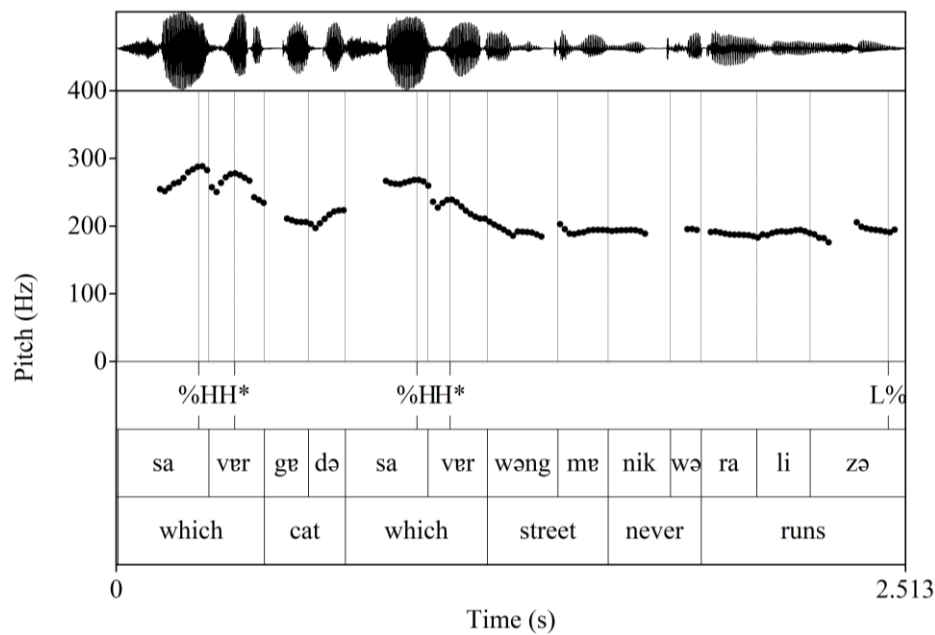


Figure 15. . Realization of the *wh*-question in (b) in (32) (F3, pt2\_41).

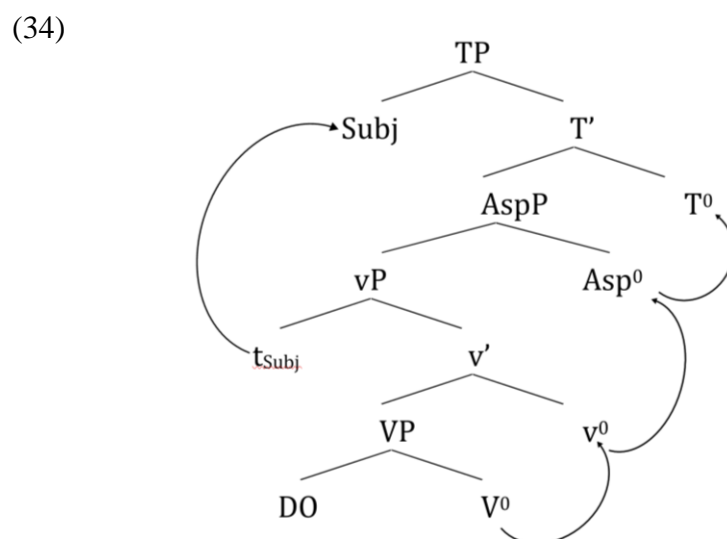
To recap, the formation of  $\iota$  in Iron Ossetic has two sources: the syntactic one, represented by the HVP configuration, and the prosodic one, triggered by the special properties of %H.

#### 4.3.6 Broad-focus declaratives

Finally, we should consider the simplest utterance type: a declarative SOV clause, as in (33), repeated from (17):

- (33)  $\varphi$ ([NP *Bur* *bɛlon*]) $\varphi$   $\varphi$ ([NP *lɛgʷən* *gɛdɔ-jɔ*]) $\varphi$  *wən-ə*.  
 brown pigeon mangy cat-ACC see-PRS.3SG  
 ‘A brown pigeon sees a mangy cat.’

It has the following syntax, as was shown in (7) and repeated in (34):



Given this syntactic configuration, the prediction is that neither of the arguments should form an  $\iota$  with the verb, since neither form a canonical HVP configuration with it:<sup>15</sup>

(35)  $\varphi(S)\varphi\varphi(O)\varphi\iota(\varphi(V)\varphi)\iota$

In other words, the prediction for SOV declaratives is that the preverbal constituent and the verb should not form an  $\iota$ .

How would that manifest prosodically? A separate H\* peak on the verb is unlikely: verbs in broad-focus transitive clauses are not predicted to carry a pitch accent.

The realization of (33) is provided in Figure 16, repeated from Figure 2:

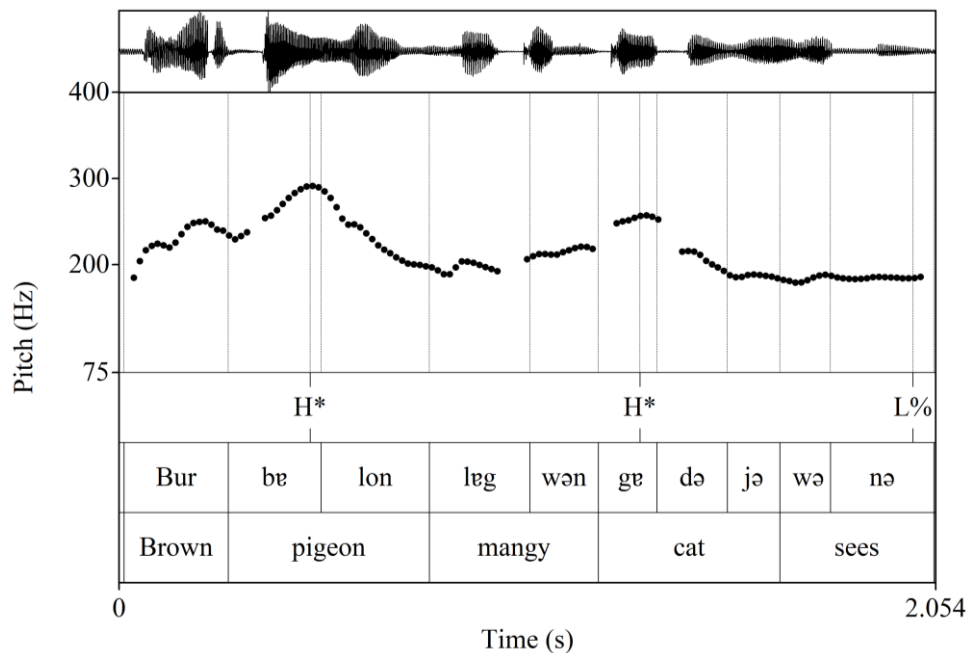


Figure 16. Realization of the utterance in (33) (F3, pt1\_2).

The F0 contour on the verb is low and flat, seemingly as it was in the case of  $\iota$ -formation with wh-phrases, negative indefinites, and narrow foci. The verb does not carry its own H\*. However, there is a consistent difference in the way that verbs that are part of a larger  $\iota$  and those that form an  $\iota$  themselves are pronounced.

We compared the realization of verbs *wənə* ‘sees’ and *radavta* ‘ate’ in broad focus declaratives with that of verbs *lɛwwə* ‘stands’ and *ravʒɛrfta* ‘chose’, respectively, in utterances with preverbal narrow foci. The F0 contour on verbs in the latter context reaches considerably lower (controlling for syllable count). Similarly, intensity values on the verbs in these contexts decline considerably more sharply. Verbs in broad-focus SOV declaratives, in contrast, sustain their F0 and intensity values. The (averaged) F0 values for di- and trisyllabic verbs are provided in Figure 17 and Figure 18. Averaged intensity values are shown in Figure 19 and Figure 20.

<sup>15</sup> In an intransitive SV clause, the subject and the verb would technically be in an HVP configuration, but, with T<sup>0</sup> on the right, they would not be structurally adjacent to each other. We follow the gist of the Hamlaoui & Szendrői (2015; 2017) proposal in that empty syntactic structure between overt constituents interferes with  $\iota$ -formation. If it did not, the current definition of the HVP would be meaningless, since a specifier separated from the verb by multiple projections would be predicted to form an  $\iota$  with the verb. Cf. Nespor & Vogel (1986), Elfner (2015) for the alternative view that prosodic structure formation ignores empty syntactic projections.



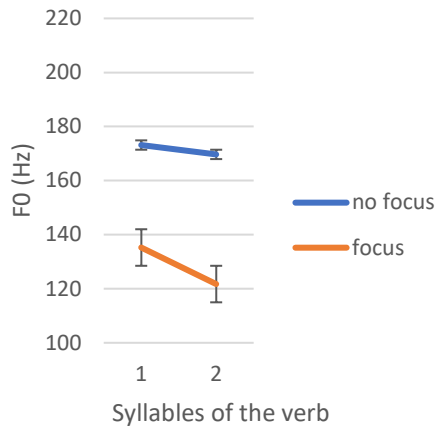


Figure 17. F0 contour on disyllabic verbs

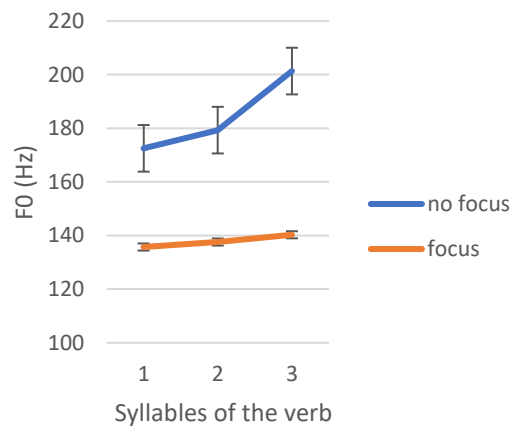


Figure 18. F0 contour on trisyllabic verbs

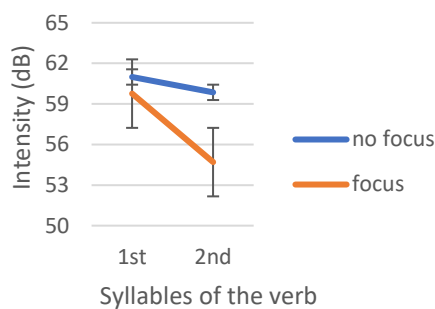


Figure 19. Intensity values on disyllabic verbs

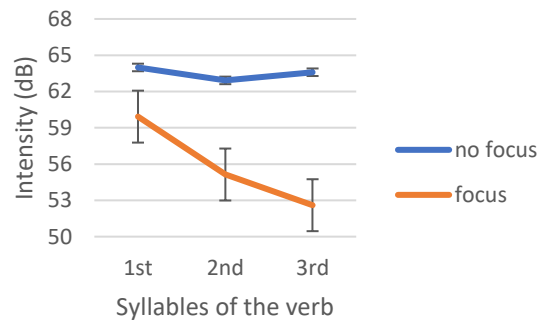


Figure 20. Intensity values on trisyllabic verbs

These results, therefore, show that, in addition to H\* alignment, other prosodic means, such as the realization of verbs, are employed in signaling prosodic structure in Iron Ossetic.

## 5. Summary and conclusions

- The **flexible  $\iota$ -mapping approach** – but not more rigid approaches to  $\iota$ -formation can account for the properties of  $\iota$  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  $\iota$ -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  $\iota$ -mapping approach interacts with eurhythmic constraints – specifically, ALIGNHVP-L/R is ranked lower than **POST- $\%H$  DEPHRASING**.
- In addition to the alignment of H\*, the size of  $\iota$  is signaled by the realization of the verb.

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