Flexible syntax-prosody mapping of intonational phrases in the context of varying verb height

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Abstract

This paper provides new evidence in support of the hypothesis that the syntax-prosody mapping of Intonational Phrases is flexible (Hamlaoui & Szendrői 2015; 2017). In the traditional 'rigid' approaches, Intonational Phrases are taken to map onto particular syntactic projections: e.g., TP, CP, or the complement of Force^0 and C^0. In contrast, in Hamlaoui and Szendrői's (2015; 2017) approach, the Intonational Phrase corresponds to the highest projection of the verb (HVP). Accordingly, it predicts that the HVP should also determine the size of Intonational Phrases in a language where verb height is variable and depends on the utterance type. Our evidence comes from a language of this type, Iron Ossetic (East Iranian). First, we demonstrate that the verb in Iron Ossetic, in different contexts, occupies T^0, Neg^0, W^0, or Foc^0. Then, based on experimental prosodic data, we show that the HVP indeed determines the size of the Intonational Phrase. Specifically, in clauses with narrow foci and negative indefinites, the size of the Intonational Phrase corresponds directly to HVP. In wh-questions, additionally, language-specific eurhythmic constraints come into play.

Keywords: Iron Ossetic, Iranian, wh-questions, focus, intonational phrase, syntax-prosody interface

1. Introduction

The nature of the Intonational Phrase (*ι*) and its mapping onto syntactic constituents has long been debated. Traditionally, *ι* is assumed to map onto a clause, but a 'clause' in the syntax-prosody literature has been defined e.g., as a TP (Zerbian 2006), CP (Truckenbrodt 2005; Henderson 2012), or the complement of Force^0 and C^0 (Selkirk 2011), to name just a few approaches. The difficulty in *ι*-size identification lies in wide cross-linguistic variation with respect to higher-level mapping of prosodic and syntactic phrases. In a novel type of approach, Hamlaoui & Szendrői (2015; 2017) propose that *ι*-size is flexible and corresponds to the highest projection that hosts verbal material in a given language, together with its specifier (HVP, "highest verbal projection"). The evidence comes mainly from the prosodic properties of Hungarian narrow focus and Bàsàá (Bantu) zero-coded passives. The advantage of this approach is in that it provides a unified, syntax-based account of cross-linguistic variation in *ι*-size.

A prediction that the flexible *ι*-mapping hypothesis makes is that the HVP should also determine *ι*-size in a language where the height of the verb varies with utterance type. We show that, in Iron Ossetic (East Iranian), several projections are available for verb raising, depending on context, which makes it a uniquely suitable testing ground for this prediction. Specifically, we demonstrate that Iron Ossetic has several discourse projections above the TP that host narrow foci, wh-phrases, and negative indefinites, respectively: [FocP [WhP [NegP]]]. If these projections are merged, the verb raises to the lowest one with a filled specifier. This analysis correctly derives the fact that, in the surface linear word order, each of (single) narrow foci, wh-phrases, and negative indefinites must appear immediately preverbally; if co-occurring, they must appear in the order *focus* > *wh-phrase(s)* > *negative indefinite(s)*.

Using experimental prosodic data, we develop a prosodic analysis of Iron Ossetic, and show that there are two layers of prosodic constituents above the level of the prosodic word, Phonological Phrase (*φ*) and Intonational Phrase (*ι*). *φ* is the domain of pitch-accent assignment and corresponds to smaller constituents that do not include the clausal spine, DPs and PPs. Each *φ* is assigned a pitch accent, which may take the shape of H*, L*+H or L+H*. The pitch accent is anchored to the stressed syllable in the leftmost prosodic word in φ, which may be either the initial or the second one, based on vowel quality. The size of ι, we show, is determined by the position of the verb, in accordance with the flexible ι-mapping approach. Within an ι, the realization of a pitch accent on all φ's other than the leftmost one is suppressed, which serves as the main diagnostic of ι-size.

This paper, therefore, provides further support to flexible ι-mapping, based on a new language type, while also showing that more rigid syntax-prosody mapping approaches cannot account for the same set of data. At the same time, we show that not all utterance types in Iron Ossetic can be accounted for with the flexible ι-mapping approach alone. Specifically, while flexible ι-mapping correctly derives the prosodic realization of utterances with narrow foci and negative indefinites, in wh-questions the syntax-prosody mapping constraints are overridden by independent eurhythmic constraints that target wh-phrases. This means that the surface prosodic facts of Iron Ossetic result from the interaction of prosodic factors both rooted in interaction with syntax and independent from it.

This paper is structured as follows. Section 2 discusses the approaches to mapping of ι onto syntactic constituents, starting with an overview of the available literature (2.1) and proceeding to the flexible ι-mapping hypothesis as proposed by Hamlaoui & Szendrői (2015; 2017) (2.2) Section 3 outlines the relevant aspects of Iron Ossetic grammar: the basic clause structure (3.1), the presence of discourse projections (3.2), the traditional descriptions of Iron Ossetic prosody (3.3), and the recent instrumental findings (3.4). Section 4 provides a preview of the analysis of Iron Ossetic prosody based on the flexible ι-mapping hypothesis. Section 5 discusses the experimental materials and methods. Section 6 discusses the results of a production study: the contexts that are directly accounted for by the flexible ι-mapping hypothesis (6.1), and those that require additional theoretical assumptions, motivated by the particularities of Iron Ossetic prosody (6.2). Due to the number of individual contexts investigated, the discussion of the results, including the connection with the syntactic structure and an Optimality Theory (OT) analysis, is also provided in the individual subsections in Section 6. Section 7 concludes.

2. Existing approaches to ι-mapping

2.1 Overview

It is an accepted view in the syntax-prosody literature that prosodic constituents are organised into hierarchical units that, on the one hand, systematically reflect syntactic structure, and, on the other, are subject to phonological requirements/constraints that are independent from syntax (Selkirk 1978; 1986; Nespor, Vogel, Hulst, et al. 1982; 1986, a.o.). Depending on a language, two or three levels of prosodic constituency above the level of a prosodic word are recognised. The smaller one(s) are typically labelled Minor/Major Phrases, or, if there is a single one, Phonological/Prosodic Phrases (φ). The larger ones are Intonational Phrases (ι) (see Shattuck-Hufnagel & Turk 1996; Selkirk 2011 for an overview). Phonological Phrases are taken to correspond to smaller XPs (Truckenbrodt 1999; Selkirk 2011), or, alternatively, to spell-out domains (Dobashi 2003; Ishihara 2003; Kratzer & Selkirk 2007). There is more variability with respect to the mapping between Intonational Phrases and syntactic constituents: while there is a common understanding that Intonational Phrases correspond to 'clauses', different implementations are available, with syntactic, semantic and/or information-structural factors considered primary.

In the earliest syntax-prosody literature, ι was taken to correspond to the syntactic node S, the highest one in the syntactic clause. To account for the prosodic properties of different types of embedded clauses, S was specified as not dominated by a node other than S (Downing 1970; Emonds 1970; Bing 1979; Nespor & Vogel 1986). According to a less syntax-centered view, ι was a semantic/information-structural unit larger than a prosodic word and variable in its extent, not necessarily isomorphic to any syntactic constituent; accordingly, a single clause could contain one or more *ι* (Selkirk 1984). Later, *ι* was proposed to correspond to the Comma Phrase in syntax, roughly equivalent to a speech act (Selkirk 2005; based on Potts 2005), or more directly to a speech act itself, without addressing its syntactic implementation (Truckenbrodt 2015). In more recent and more syntax-centered work, *ι* is often taken to correspond to CP (Cheng & Kula 2006; Truckenbrodt 2005; 2007; Pak 2008; Henderson 2012), or, less commonly, TP (Zerbian 2006; 2007; based on Northern Sotho, where matrix clauses are thought to be CP-less). In another attempt to account for the prosodic properties of both matrix and embedded clauses, it was suggested that *ι* corresponds to the complement of C^0 in embedded clauses and the complement of $Force^0$ ('illocutionary clause'; Rizzi 1997) in matrix clauses (Selkirk 2009; 2011). This means that the category of *ι*, in complex clauses, was established as a recursive one. In a similar vein, it has been argued that *ι* corresponds to syntactic phases (CP and vP), with the caveat that only non-complement embedded CPs form phases (e.g., non-restrictive relative clauses) (Cheng & Downing 2007; 2009).

In addition to the difficulty in establishing the syntactic counterpart of *ι*, it has been recognised that *ι*-formation can be affected by phonological factors, known as eurhythmic constraints (see Elfner 2018 for an overview). The most obvious non-syntactic factor in *ι*-formation is phonological weight: heavy constituents can form higher-level prosodic constituents even if they are not clausal (e.g. Gussenhoven 2004). *ι*-formation can also be subject to a constraint STRONGSTART, according to which the leftmost prosodic constituent cannot be lower on the prosodic hierarchy than the following one. Specifically, Selkirk (2011) showed that in Xitsonga *ι* routinely corresponds to a clause, but left-dislocated constituents also form *ι*s; cf. also Elfner (2011; 2012), Bennett, Elfner & McCloskey (2017). Syntactic and phonological factors in *ι*-formation are known to interact. For instance, Elordieta, Frota & Vigário (2005) show that Spanish has a preference for (S)(VO) phrasing and European Portuguese prefers (SVO), but both languages allow for the other phrasing pattern as well. These facts stem from two sources, a syntactic one and a phonological one. Syntactically, Spanish subjects are higher than Portuguese subjects, which is why by default, Spanish subjects are phrased separately from the verb, while Portuguese subjects are phrased together with it. At the same time, phonological considerations (weight calculation based on the number of syllables or words) can override both patterns. In Spanish, if the subject and object are non-branching, (SVO) may be attested; in Portuguese, if the subject is at least 8 syllables long, (S)(VO) is obtained.

Despite definitional discrepancies, the notion of *ι* has proved useful in linguistic theorizing, both with respect to phonological and morphosyntactic processes: it has been argued to be the domain of low tone insertion in Slave (Na-Dené; Rice 1987) and morphological alternations in K'ichee' (Mayan; Henderson 2012), to name a few. This, in turn, means that a cross-linguistically valid approach to determining *ι*-size is called for.

2.2 The flexible *ι*-mapping approach

Hamlaoui & Szendrői (2015; 2017) propose that accounting for the cross-linguistic variability in mapping of *ι* onto syntactic constituents is possible if this mapping is not assumed to target a particular syntactic projection. Instead, they argue that *ι* 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). That is, the size of *ι* is relative and does not rigidly correspond to any syntactic projection (e.g., CP, TP and/or vP), but is determined by the height of the verb in a particular language.

The proposal in Hamlaoui & Szendrői (2015) is based on the prosodic properties of Hungarian narrow focus construction, English wh-questions/German V2 clauses, and Bàsàá (Bantu) zero-coded passives. In each of these languages, *ι* corresponds to the HVP: FocP, CP, and TP, respectively, as schematised in (1). There is no restriction on the kind of material that can occupy the specifier of the HVP – e.g., it does not have to have a particular information-structural status.

(1) a. $[_{\text{TopP}}\ \iota\boldsymbol{(}[_{\text{FocP}}$ Focus V $[_{\text{PredP}} \ldots]]]\boldsymbol{)}$ Hungarian

b. $\iota\boldsymbol{(}[_{\text{CP}}$ Wh-phrase/Topic V $[_{\text{TP}} \ldots]]\boldsymbol{)}$ English/German

c. $[_{\text{TopP}}$ Object $\iota\boldsymbol{(}[_{\text{TP}}$ Subject V $[_{\text{vP}} \ldots]]]\boldsymbol{)}$ Bàsàá

These facts are derived with the help of ALIGN constraints, shown in (2).[1] The left and right edges of the HVP are aligned with the left and right edges of ι by ALIGN-R/L(HVP, ι). Additionally, the edges of the full 'illocutionary' clause (i.e., the speech act) are mapped onto the respective edges of the larger ι by ALIGN-R/L(SA, ι); the iterativity of ι results from ALIGN-L(SA, ι) > ALIGN-L(HVP, ι) ranking (Selkirk 2011).[2] The corresponding prosody-syntax mapping constraints are provided in (3).

(2) *Syntax-prosody mapping constraints:*

(i) ALIGN-L(HVP, ι): 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.

(ii) ALIGN-R(HVP, ι): 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.

(iii) ALIGN-L(SA, ι): Align the left edge of a syntactic constituent expressing illocutionary force (speech act) with the left edge of an ι.

(iv) ALIGN-R(SA, ι): Align the right edge of a syntactic constituent expressing illocutionary force (speech act) with the right edge of an ι.

(3) *Prosody-syntax mapping constraints:*

(i) ALIGN-L(ι, HVP): Align the left edge of an ι with the left edge of the highest projection whose head is overtly filled by the verb, or verbal material.

(ii) ALIGN-R(ι, HVP): Align the right edge of an ι with the right edge of the highest projection whose head is overtly filled by the verb, or verbal material.

To illustrate, let us consider the prosodic properties of narrow focus constructions in Hungarian, as compared to those of topics. In Hungarian, narrow (identificational, exhaustive) foci appear immediately preverbally. Syntactically, focus-verb adjacency is derived by movement: the narrowly focused constituent moves to Spec, FocP, and the verb is raised to Foc^0, as manifested by the fact that detachable preverbs in focus constructions are left behind (Horvath 1986; Bródy 1995; É. Kiss 1998). Prosodically, the narrowly focused constituent receives sentential stress, which has been analyzed as targeting the leftmost constituent of an ι (Szendrői 2001; 2003). This means that, in the presence of a narrowly focused constituent, the ι in Hungarian corresponds to FocP, the projection that also houses the verb, which is in accordance with the flexible ι-mapping hypothesis. This is illustrated in (4):

[1] Nothing in Hamlaoui & Szendrői's (2015; 2017) account hinges on whether the constraints are formalized as ALIGN or MATCH constraints (Selkirk 2011). The same applies to the current analysis, which also uses ALIGN constraints, for the sake of uniformity.

[2] 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, recursion in prosodic phrasing has been shown to be possible in numerous languages. The Strict Layer Hypothesis, therefore, is best thought of as a violable constraint. On recursive prosodic constituents, see Peperkamp (1997), Truckenbrodt (1999), Szendrői (2001), Vigário (2003), Gussenhoven (2004), Elordieta (2015); on recursive ι, see Ladd (1986), Frota (2000), and Selkirk (2009), a.o.

(4) **ι(**[$_{\text{TopP}}$ *Péter*$_{\text{S}}$ **ι(**[$_{\text{FocP}}$ *MARI-T*$_{\text{O}}$ *szerette*$_{\text{V}}$ [$_{\text{PredP}}$ ***meg*** t$_{\text{V}}$ [$_{\text{vP}}$ t$_{\text{S}}$ t$_{\text{V}}$ t$_{\text{O}}$]]]]**))**
Peter Mary-ACC love.PST PRT
'Peter fell in love with MARY.'

In contrast with foci, the movement of topics to left-peripheral positions is not accompanied by verb movement, which can be shown by lack of preverb detachment. The prediction of the flexible *ι*-mapping hypothesis, then, is that topics should not be part of the *ι*. This is borne out: in utterances with topics but not foci, sentential stress targets the preverb + verb complex (Ladd 1996; Kálmán 2001; Szendrői 2001; 2003).[3] Accordingly, topics in Hungarian are not part of the core *ι*, as illustrated in (5).

(5) **ι(**[$_{\text{TopP}}$ *A* *postás-t*$_{\text{O}}$ [$_{\text{TopP}}$ *a* *kutya*$_{\text{S}}$ **ι(**[$_{\text{PredP}}$ *meg-harapta*$_{\text{V}}$ [$_{\text{vP}}$ t$_{\text{S}}$ t$_{\text{V}}$ t$_{\text{O}}$]]]**))**
the postman-ACC the dog.NOM PRT-bite.PST
'The dog bit the postman.'

Hamlaoui & Szendrői (2015: 6) take multiple topics, if present, to be part of the 'maximal' *ι*, not separated from each other by *ι*-boundaries, because "there does not seem to be any evidence for the presence of intonational phrase boundaries between the topics".[4]

3. Iron Ossetic

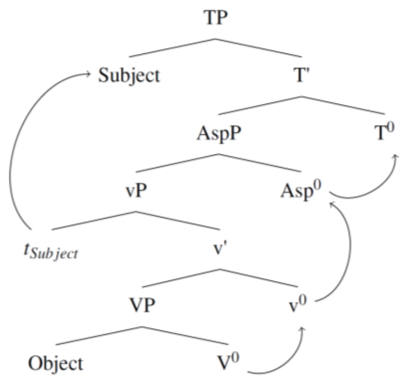
Iron Ossetic is an East Iranian language spoken in the Central Caucasus, mainly in the Republic of North Ossetia – Alania in Russia (where it has an official status) and in Georgia. In Russia, two closely related varieties of Ossetic are spoken, Iron and Digor. Iron speakers are considerably more numerous than Digor speakers, but no precise numbers are available. According to the 2002 census, there were 515,000 Ossetians in Russia. All Ossetic speakers in North Ossetia also speak Russian.

3.1 Basic clause structure

The neutral word order in Iron Ossetic is SOV, but, in a discourse context, the word order is largely determined by information structure. Smaller phrases are mostly head-final. Iron Ossetic is morphologically complex, mostly suffixing, with a rich case system, an inventory of aspectual prefixes, and a sophisticated system of second-position clitics (pronominal and adverbial).

Structurally, we take the clausal spine to be left-branching up to the level of TP, as shown in (6). The finite verb is assembled via head movement through a series of functional heads (v^0, Asp^0) and raised to T^0. Aspectual prefixes are merged in Asp^0; their linearization on the left is achieved by means of a diacritic [+prefix].[5] The subject is generated in Spec, vP and raises to Spec, TP.

(6)



[3] There are also alternative views on the existence/location of sentential stress in Hungarian utterances that include topics (Kálmán 1985; Surányi, Ishihara & Schuboe 2012; Genzel, Ishihara & Surányi 2015).
[4] See Szendrői (2001) for an alternative analysis.
[5] Alternatively, a derivation by a series of local dislocations in the sense of Embick & Noyer (2001) may be postulated. Nothing in the current analysis hinges on this choice.

3.2 Discourse projections

Ossetic has a well-articulated left periphery, which houses several types of constituents, including topics, narrow foci, wh-phrases, and negative indefinites. The latter three constituent types share the following property: descriptively, each of them must appear in the immediately preverbal position (in the absence of another element with the same requirement). Details of the distribution and co-occurrence requirements of the left-peripheral constituents are provided below.

Negative indefinites in Iron Ossetic must appear immediately preverbally, as shown in (7a-b); if there are several, all surface, as a cluster, left-adjacent to the verb, as in (7c). No material can intervene between the negative indefinites and the verb, or between adjacent negative indefinites, as in (7d). Note that the exponent of sentential negation is in complementary distribution with negative indefinites.

(7) a. *ʃoʃlan-ə* **ni-ʧi** (***nɐ**) *warʒ-ə.*
Soslan-ACC NEG-who NEG love-PRS.3SG
'No-one loves Soslan.'

b. ****ni-ʧi*** *ʃoʃlan-ə* (**nɐ**) *warʒ-ə.*
NEG-who Soslan-ACC NEG love-PRS.3SG

c. *abon* *mɐdinɐ-jɐn* ***ni-ʧi*** ***ni-sə*** ***nikɐm*** (***nɐ**) *ra-zur-ə.*
today Madina-DAT NEG-who NEG-what nowhere NEG PV-say-PRS.3SG
'Today, no-one tells anything anywhere to Madina.'

d. **mɐdinɐ-jɐn* ***ni-ʧi*** *<abon>* ***ni-sə*** *<abon>* ***nikɐm*** *<abon>* *ra-zur-ə.*
Madina-DAT NEG-who today NEG-what today nowhere today PV-say-PRS.3SG

In a similar fashion, a wh-phrase in a wh-question must surface immediately preverbally. If there are several wh-phrases, they form a unit that is left-adjacent to the verb (8a). No material can separate the wh-phrases from each other or from the verb (8b-c).

(8) a. *abon* *mɐdinɐ-jɐn* ***ʧi*** ***sə*** *ra-zur-ə*?
today Madina-DAT who what PV-say-PRS.3SG
'Who is telling what to Madina today?'

b. **abon* ***ʧi*** ***sə*** *mɐdinɐ-jɐn* *ra-zur-ə*?
today who what Madina-DAT PV-say-PRS.3SG

c. **mɐdinɐ-jɐn* ***ʧi*** < *abon*> ***sə*** < *abon*> *ra-zur-ə?*
Madina-DAT who today what today PV-say-PRS.3SG

Finally, narrowly focused constituents also appear immediately preverbally. This applies to constituents modified by *only* (9a-c), or, in responses to wh-questions, the constituents corresponding to the wh-phrase in the preceding wh-question (9d-f).[6]

(9) a. *abon* *alan-əl* **[*ɐrmɐʃt* *mɐdinɐ*]$_F$** *ɐwwɐnd-ə.*
today Alan-SUP only Madina believe-PRS.3SG
'Today, only Madina believes Alan.'

b. **abon* **[*ɐrmɐʃt*** ***mɐdinɐ*]$_F$** *alan-əl* *ɐwwɐnd-ə.*
today only Madina Alan-SUP believe-PRS.3SG

[6] Iron Ossetic also allows for postverbal focus, not discussed here. Preverbal and postverbal foci have similar semantic profiles: both may but do not have to be interpreted exhaustively or contrastively. Wh-phrases and negative indefinites in Iron Ossetic are not allowed postverbally.

c. **alan-əl* [***ɐrmɐʃt*** ***mɐdinɐ***]$_F$ *abon* *ɐwwɐnd-ə.*
Alan-SUP only Madina today believe-PRS.3SG

d. (‘Who believes Alan today?’)
abon *alan-əl* [***mɐdinɐ***]$_F$ *ɐwwɐnd-ə.*
today Alan-SUP Madina believe-PRS.3SG
‘[Madina]$_F$ believes Alan today.’

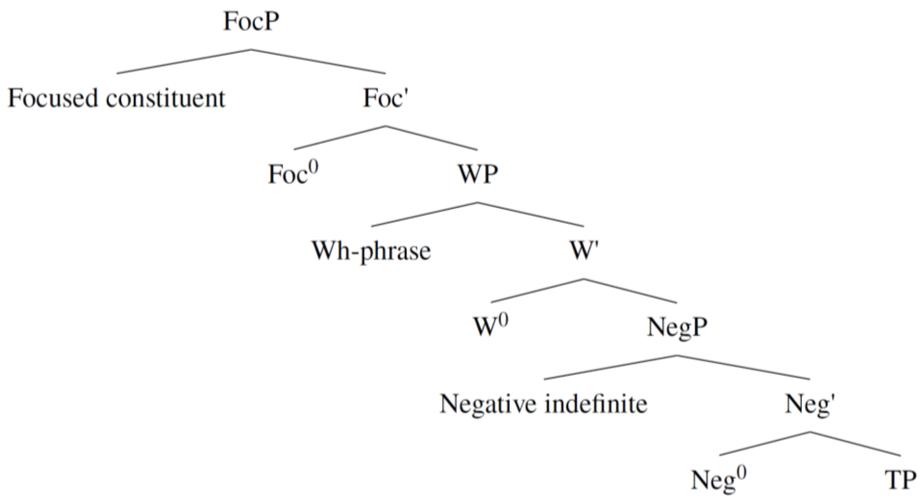
e. (‘Who believes Alan today?’)
abon* [*mɐdinɐ***]$_F$ *alan-əl* *ɐwwɐnd-ə.*
today Madina Alan-SUP believe-PRS.3SG

f. (‘Who believes Alan today?’)
alan-əl* [*mɐdinɐ***]$_F$ *abon* *ɐwwɐnd-ə.*
Alan-SUP Madina today believe-PRS.3SG

If elements that require immediately preverbal placement co-occur, their order is strictly *focus* > *wh-phrase(s)* > *negative indefinite(s)*. Topicalised constituents precede the resulting preverbal complex; non-topical material may also follow the verb.

To account for the order of the preverbal elements and their properties, we propose that the clausal architecture switches from head-final to head-initial in the discourse projections above the TP, as shown in (10). Here, foci, wh-phrases, and negative indefinites are housed in a sequence of dedicated discourse projections.

(10)



If these projections are merged, we propose that the verb raises to the head of the lowest discourse projection with a filled specifier.[7] This is illustrated in the examples in (11); cf. a somewhat similar treatment of Turkish by Akan & Hartmann (2019). In accordance with the Bare Phrase Structure approach (Chomsky 1994; 1995), we assume that discourse projections that house no overt material are not projected.

(11) a. [$_{CP}$ *ʃɐ=χɐzar-ə* [$_{WP}$ ***tʃi*** [$_{WP}$ ***kɐmɐn*** [$_{NegP}$ ***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?’

[7] This system contrasts with what is obtained in V2 languages, where the verb raises to the highest projection with a filled specifier, as opposed to the lowest one. We leave the exploration of this contrast for further research.

b. [$_{CP}$ *nɐ=χɐzar-ə* [$_{FocP}$ ***ɐrmɐʃt alan-əl*** [$_{NegP}$ ***ni-tʃi*** [$_{NegP}$ ***nikʷə*** [$_{Neg'}$ *ɐwwɐnd-ə*]]]]].
our=house-LOC only Alan-SUP NEG-who never trust-PRS.3SG
'In our family, it is only Alan that no-one ever trusts.

We assume that NegP and WP have identical structures, with a single head and the possibility for multiple specifiers, if multiple wh-phrases or negative indefinites are present. This assumption is based on the fact that neg-phrases and wh-phrases are subject to identical ordering restrictions: no superiority constraints are attested, but animate arguments must precede inanimate ones:

(12) a. ***kɐj*** ***sə*** *qəgdar-ə*?
who.ACC what annoy-PRS.3SG?
'What annoys who?'

b. ****sə*** ***kɐj*** *qəgdar-ə?*
what who.ACC annoy-PRS.3SG

(13) a. ***ni-kɐj*** ***ni-sə*** *qəgdar-ə.*
NEG-who.ACC NEG-what annoy-PRS.3SG
'Nothing annoys anyone.'

b. *****ni-sə*** ***ni-kɐj*** *qəgdar-ə.*
NEG-what NEG-who.ACC annoy-PRS.3SG

Furthermore, it has been shown that the exponent of sentential negation *nɐ* is a phrase rather than a head (Erschler & Volk 2011). The complementary distribution of the negative marker with negative indefinites, as illustrated in (7), is accounted for if we assume that sentential negation is spelled out as a last resort when the specifiers of a NegP are empty. If, under the alternative assumption, negative indefinites occupied the specifiers of separate (iterated) negative projections, the complementary distribution between negative indefinites and sentential negation becomes much harder to explain. Based on this, and the overall parallelism between the distribution and behavior of negative indefinites and wh-phrases, we conclude that multiple wh-phrases are also merged in multiple specifiers of a single functional head.

Finally, evidence for the verb raising to the head of the lowest discourse projection with a filled specifier comes from word order: no adverbs can intervene between a constituent in the specifier of the lowest discourse projection and the verb, as was shown in (7d), (8c), and (9c, f). If the verb had stayed in TP after the merger of the discourse projections, we would expect TP-level adverbials to intervene between the verb and the constituents in the discourse projections, given that T^0 is on the right side of the clausal spine. This does not take place.[8]

3.3 Prosody: traditional descriptions

Traditional literature on Iron Ossetic describes the prominent role of prosodic phrasing in the language, which is closely connected with word stress and the way it is rendered intonationally. In a lexical word, stress targets the first or second syllable – which, together, comprise the 'stress window'. The exact location of stress depends on vowel quality (Bagaev 1965; Isaev 1959; Dzakhova 2010). Iron Ossetic has 'strong' (S) and 'weak' (W) vowels: /*a, e, i, o, u*/ and /*ɐ, ə*/, respectively. Stress targets the initial syllable if the first vowel is 'strong' (ŚS, ŚW: *rálizən* 'to run away', *χábar* 'news'; *ráʒmɐ* 'forward', *sólpə* 'ladle'), and the second syllable if the first vowel is 'weak' (WẂ, WŚ: *kɐʃtɐ́r* 'young', *ʃɐnə́kk*

[8] There is a heterogenous group of adverbs that, according to our data, can intervene between the wh-phrase/narrowly focused constituent and the verb, but not between negative indefinites or a negation marker and the verb. These include only adverbs in the superlative grade and the manner adverb *aftɐ* 'so, in this way'. We leave the derivation of this kind of utterances for further research.

'lamb'; *bɐláʃ* 'tree', *χɐdón* 'shirt').[9] Personal names, regardless of vowel quality, are stressed on the second syllable.

In connected speech, stress is described as assigned within a larger prosodic constituent: a so-called 'prosodic group', as opposed to a prosodic word. Within a 'prosodic group', only the stress on the leftmost word is intonationally expressed; other words are described as 'stressless'. (Abaev 1924; 1939; Bagaev 1965; Isaev 1959; Testen 1997).[10] The nature and the intonational expression of what is described as 'stress' in a 'prosodic group' have not been discussed in the grammars, but the important insight that comes from the traditional literature is that the distribution of 'stresses' allows for identifying 'prosodic groups'.

'Prosodic grouping' and the corresponding assignment of the intonational expression of stress applies to a number of contexts, which may be divided into 'nominal' and 'verbal' ones. The 'nominal' ones include combinations of nouns and their modifiers, and nouns and postpositions (DPs and PPs). The 'verbal' ones include combinations of sentential negation/negative indefinites and verbs, wh-phrases and verbs, and narrowly focused immediately preverbal constituents and verbs (Abaev 1939). The 'verbal' contexts may include second position clitics and certain particles, which surface between the preverbal constituent and the verb and are included into the 'prosodic group' too. In contrast, 'nominal' contexts are impenetrable for clitics.

3.4 Stress, *φ*-formation, and pitch accent distribution

In an OT-analysis of stress placement in Iron Ossetic, Borise & Erschler (2021) propose that prosodic words in Iron Ossetic have binary iambic moraic feet; unfooted vowels are non-moraic (Crosswhite 2001). This is enforced by FT-FORM=I and FT-BIN constraints (Prince 1980; Kager 1989; Prince & Smolensky 1993), ranked FT-FORM=I >> FT-BIN. Feet are left-aligned in a prosodic word; syllables further to the right remain unfooted. This is derived via ALIGN-FT-L >> PARSE-SYLL (Hayes 1980; Halle & Vergnaud 1987; McCarthy & Prince 1993; Prince & Smolensky 1993). PARSE-SYLL is also ranked below FT-FORM=I and FT-BIN. The constraint ranking deriving word stress placement in the four types of stress windows is provided in (14)-(17). Note that syllables with 'strong vowels' are taken to be heavy/bimoraic (H/*μμ*), and syllables with weak vowels are taken to be light/monomoraic (L/*μ*).

(14) *Stress placement in* ŚS *stress windows*

SS	FT-FORM=I	ALIGN-FT-L	FT-BIN	PARSE-SYLL
☞(Ś)S				*
(SŚ)			*!	
(ŚS)	*!		*	
S(Ś)		*!		*

(15) *Stress placement in* ŚW *stress windows*

SW	FT-FORM=I	ALIGN-FT-L	FT-BIN	PARSE-SYLL
☞(Ś)W				*
(SẂ)			*!	
(ŚW)	*!		*	
S(Ẃ)		*!	*	*

[9] 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 (Bagaev 1965). Additionally, if the second syllable in a ŚW context is heavy, it may attract stress (Isaev 1959; 1966). Some variability in stress placement in ŚS contexts is discussed in Abaev (1939; 1949).
[10] Depending on the context, the traditional term 'prosodic group' may correspond to either *φ* or *ι*.

(16) *Stress placement in* WẂ *stress windows*

WW	FT-FORM=I	ALIGN-FT-L	FT-BIN	PARSE-SYLL
(Ẃ)W			*!	*
☞ (WẂ)				
(ẂW)	*!			
W(Ẃ)		*!	*	*

(17) *Stress placement in* WŚ *stress windows*

ẂS	FT-FORM=I	ALIGN-FT-L	FT-BIN	PARSE-SYLL
(Ẃ)S			*	*!
☞ (WŚ)			*	
(ẂS)	*!		*	
W(Ś)		!*		*

Next, based on experimental evidence, Borise & Erschler (2021) show that DPs of all sizes in broad-focus declaratives in Iron Ossetic consistently map onto prosodic constituents, *φ*s. This is ensured by ALIGN-L/R(DP/PP, *φ*) and ALIGN-L/R(*φ*, DP/PP) constraints. In a *φ*, stress is only realised on the leftmost prosodic word, regardless of its syntactic category, which is derived by ALIGN(HD-PRWD, L, *φ*, L) (based on Prince & Smolensky 1993). The signature property of a *φ* is a single pitch accent, anchored to the stressed syllable in the leftmost prosodic word. The distribution of pitch accents, therefore, allows for tracking the size of *φ*s; these results provide an instrumental validation to the existing descriptions of Iron Ossetic.

The pitch accents consist of two tonal targets, L and H. With stress windows of all types, the post-tonic syllable is the locus of a rise in F0. If the stressed syllable is final in a prosodic word, the rise is found on the initial syllable of the next prosodic word – unless it is final in a *φ*, in which case the rise does not cross the *φ*-boundary and is contained within the stressed syllable. In ŚS and ŚW stress windows, the stressed syllable also carries a rise – i.e., in ŚS and ŚW, there is a continuous rise throughout the stressed and post-tonic syllables. This is illustrated in Figure 1 with ***bur** bɐlon* ‘a brown pigeon’ (ŚW). Here, the ŚW stress window includes the adjective *bur* ‘brown’ and the first syllable of *bɐlon* ‘pigeon’. The rise towards the F0 peak starts at the left edge of *φ* and is reached on the initial syllable of the noun. Borise & Erschler (2021) propose that the stressed Ś contributes two morae, each of which is associated with a tone, L and H. Following the analysis of similar facts in Romance (Prieto, Van Santen & Hirschberg 1995; Hualde 2002; Prieto, d’Imperio & Fivela 2005, a.o.), they take this pitch accent to be L+H*, and H* to be spread onto the next syllable via secondary association (Prieto, d’Imperio & Fivela 2005). L+H* is also found in WŚ stress windows, where the rise in F0 similarly spans Ś and the post-tonic syllable. This is illustrated in Figure 2 with *jɐ**χi** uʃə madə* ‘his mother-in-law.ACC’ (WŚ). Here, the WŚ stress window is formed by the pronoun *jɐχi* ‘his/her’. The rise in F0 starts on the stressed Ś syllable, -*χi*, and reaches its peak on the post-tonic syllable.

Finally, In WẂ stress windows, the stressed syllable carries a low flat contour, followed by a rise on the post-tonic syllable. Borise & Erschler (2021) propose that Ẃ contributes a single mora, which carries L*, and the post-tonic syllable carries a trailing tone H, which combine into an L*+H pitch accent. This is shown in Figure 3 with *wɐ **bɐ**lon* ‘your (pl.) pigeon’ (WẂ). F0 on the stressed syllable, *bɐ*-, is low and flat, and rises throughout the post-tonic syllable.

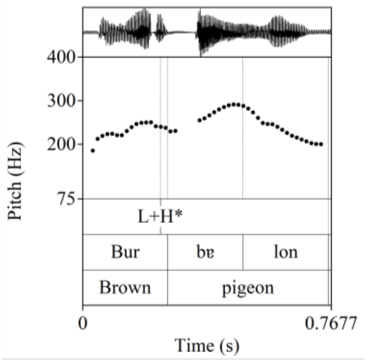


Figure 1. A ŚW stress window

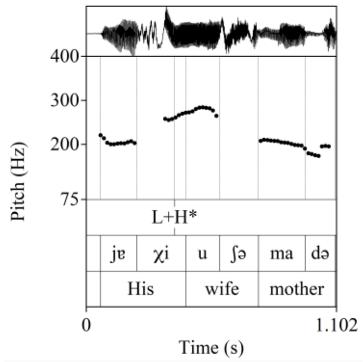


Figure 2. A WŚ stress window

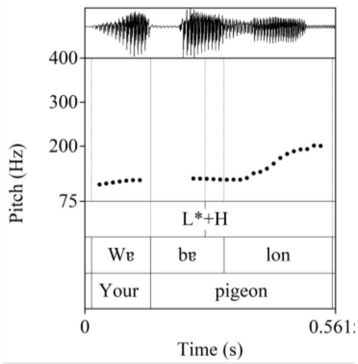


Figure 3. A WẂ stress window

The anchoring of the pitch accent tones, L and H is derived with the help of constraints NoContour(μ) (no mora can be associated with more than one tone) >> $\mu \rightarrow$ T (no mora can be tone-less) >> NoRise(σ) (no syllable can carry an LH tonal contour) (Köhnlein 2016 and references therein). Additional H*s in a φ are also prohibited by Culminativity(φ), a high-ranked constraint that ensures that there is a single stress/prosodic peak per certain domain (based on Selkirk 1995). Finally, because high tones in Iron Ossetic are rises, as opposed to level tones, Borise & Erschler (2021) postulate that a high tone cannot be realised on a single mora, which is enforced by a constraint *H(μ) (based on DOM BIN (HTS), Bickmore 1999), ranked above NoRise(σ). The constraint ranking that derives pitch accent distribution on φs in broad-focus declaratives is provided in (18), for weak (Ẃ) stressed vowels, and (19), for strong (Ś) stressed vowels.

(18) *Pitch accent placement with* ẃ *stressed vowels (w = L/μ).*

μ, LH	NoContour(μ)	$\mu \rightarrow$ T	*H(μ)	NoRise(σ)
☞ L* H μ) σ				
L* H μ) σ	*!		*	*
L* H μ) σ		*!		*

(19) *Pitch accent placement with* ś *stressed vowels (s =H/$\mu\mu$).*

$\mu\mu$, LH	NoContour(μ)	$\mu \rightarrow$ T	*H(μ)	NoRise(σ)
☞ L H* μ μ) σ				*
L H* μ μ) σ			*!	*
L H* μ μ) σ		*!		

The difference between L+H* and L*+H in Iron Ossetic, therefore, is phonetic only, and depends on the quality/mora count of the stressed vowel.[11] The same tonal analysis is applied to the data in the current study – though, as Section 6 shows, in contrast with broad-focus contexts, contexts that involved discourse projections also use a monotonal pitch accent H*.

[11] It should be noted that these phonetic generalizations are statistical rather than absolute. Other factors, such as the information-structural context, the surrounding tonal targets, and the position of a given pitch accent in an utterance can influence tonal alignment.

4. Flexible ι-mapping approach in Iron Ossetic: analysis and preview of the results

The results in Section 6 below show that there are two levels of prosodic constituency above the level of φ in Iron Ossetic: intonational phrases (ι), whose properties are investigated here, and utterance phrases (υ). A υ encompasses a full syntactic sentence (a declarative or a wh-question) and carries a final boundary tone L%. υs are not discussed further here; we take them to be derived by ALIGN-L/R(SA, υ) constraints, based on the constraints in (iii) and (iv) in (2) above. An ι corresponds to the HVP, which is derived by the ALIGN-L/R(HVP, ι) constraints, (i) and (ii) in (2) above. An ι in Iron Ossetic may consist of one or more φs. If there is more than one φ, a pitch accent is realised only within the leftmost φ, and suppressed on all others. The main diagnostic to ι formation, then, is lack of pitch accents on non-initial φs. This is derived with the constraint ALIGN(HD-φ, L, ι, L).

Additionally, φs that are formed by wh-phrases carry another tonal target, a high initial boundary tone %H; illustrations are provided in Section 6.2. We take this to mean that the left edge of a φ that is formed by a wh-phrase (but not those of other φs) is aligned with %H, and derive this with the constraint in (20):

(20) ALIGN(φ_{wh}, L, %H)
Align the left edge of the φ that encompasses a wh-phrase with a high initial boundary tone %H.

Moreover, when %H is present, it overrides ι-formation based on the size of the HVP and becomes the initial boundary tone of ι as well. This does not change the prosodic phrasing facts in simple wh-questions – i.e., those that involve a single wh-phrase and no other discourse projections – but determines the formation of more complex wh-questions: those involving multiple wh-phrases and/or negative indefinites. Aligning %H at the left edge of a filled Spec, WP with the left edge of ι is derived by the eurhythmic constraint in (21), which is ranked above the ALIGN-L(HVP, ι) constraint. This shows that prosodic phrasing in Iron Ossetic is governed by two kinds of factors: those rooted in syntax and those independent from it.

(21) ALIGN(%H, ι, L)
Align %H with the left edge of ι.

The final step of the remapping of ι from the left edge of HVP to that of WP is completed by the constraint in (22), which gets rid of the right ι-boundary that is aligned with the right boundary of HVP.

(22) POST-%H DEPHRASING:
Delete all initial ι-boundaries to the right of %H (other than those also formed by %H).

This analysis that relies on the elimination of prosodic boundaries to the right of another tonal target 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), which is 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, cf. also Ishihara (2002a; 2002b), Hiraiwa and Ishihara (2002), and Deguchi and Kitagawa (2002) for Japanese, and Jun (1998) for Korean, among others.

One of the main differences between the Iron Ossetic and Hungarian facts, as described in Hamlaoui & Szendrői (2015), is that multiple topics in Iron Ossetic behave as separate prosodic constituents, in that each topic in Iron Ossetic carries its own H* (recall that, for Hungarian, Hamlaoui & Szendrői (2015) propose that multiple topics are all part of the 'maximal' ι). Accordingly, we propose that each topic in Iron Ossetic forms its own ι, each of which is a sister to the ι formed by the HVP, as schematised in (23). The pitch accents in (23) are represented as X*, given that their actual value may differ.

X* X* X* L%
| | | |
(23) $_{\upsilon}(_{\iota}([_{\mathrm{TopP}}\ \mathrm{Topic}])\ _{\iota}([_{\mathrm{TopP}}\ \mathrm{Topic}])\ _{\iota}([_{\mathrm{XP}}\ \mathrm{XP}\ \ (\mathrm{XP})\ \ \mathrm{V}]))$

This analysis of the prosody of topics in Iron Ossetic is supported by two kinds of evidence. The first is phonetic: the final syllable of a topic receives a degree of final lengthening that is comparable to that found on the *ι*-final constituent at the right edge of the utterance, and greater than the lengthening received by the focused constituent (*ι*-medial). The second is theoretically motivated: treating topics as *ι*s complies with the Strict Layering Hypothesis and constraints like STRONGSTART (“A prosodic constituent optimally begins with a leftmost daughter constituent which is not lower on the prosodic hierarchy than the constituent that immediately follows.” Selkirk 2011; Elfner 2011; 2012; Bennett, Elfner & McCloskey 2017) and EQUALSISTERS (“Sister nodes in prosodic structure are instantiations of the same prosodic category.” Myrberg 2013). To account for the prosodic behavior of Iron Ossetic topics, we adopt an existing constraint that applies specifically to topics and maps them onto *ι* (Frascarelli 2000; Feldhausen 2010), as in (24).

(24) ALIGNTOPIC:
Align the right edge of a [dislocated] topic constituent to the right edge of a prosodic phrase [*ι*].

Another refinement of the flexible *ι*-mapping that the Iron Ossetic data calls for has to with the relative positions of heads and specifiers. The HVP constituents that the Hamlaoui & Szendrői (2015) proposal is built on are head-initial: both specifiers and heads are on the left side of the clausal spine and linearly adjacent. In contrast, HVPs in certain utterance-types in Iron Ossetic (notably, the TP) are head-final, with the head on the right of the clausal spine and specifier on the left. We show that core *ι*s in the projections of this type do not include Spec, HVP, in contrast with head-initial HVPs. This is discussed in Section 6.3.

To recap, the derivation of prosodic phrasing at clause-level in Iron Ossetic is somewhat more complex than the system proposed in the original Hamlaoui & Szendrői (2015) proposal. Instead of being governed only by the set of constraints in (2), prosodic phrasing at clause-level in Iron Ossetic relies on constraints (i) and (ii) in (2), as well as the constraints in (20)-(24). The right and left edges of smaller constituents are mapped onto the right and left edges of *φ*, respectively, by ALIGN-R/L(XP, *φ*). The right and left edges of the HVP (including its specifier(s)) are mapped onto the corresponding edges of *ι*, governed by the family of ALIGN-L/R(HVP, *ι*) constraints (cf. Selkirk 1986; 1995). The leftmost *φ* in an *ι* carries a stress-aligned pitch accent. Topics to the left of the HVP-formed *ι* form their own *ι*’s. Additionally, in the prosodic realization of wh-phrases, the requirements of the flexible *ι*-mapping hypothesis are overridden by other constraints, ALIGN(SPECWP, L, %H) and ALIGN(*ι*, L, SPECWP, L). Finally, we also show that only head-initial HVPs include Spec, HVP into *ι*.

5. Current study: materials and methods

The motivation for this study stemmed from the idea that the clausal syntax of Iron Ossetic, and especially that of the discourse projections, combined with the available descriptions of Iron Ossetic prosody, may have non-trivial implications for syntax-prosody interface, particularly for *ι*-mapping. The aims of the study were the following: to (i) verify instrumentally the traditional accounts of the formation of ‘verbal’ ‘prosodic groups’ in Iron Ossetic (i.e., those ‘prosodic groups’ that include negative indefinites/wh-phrases/narrowly focused constituents and verbs), (ii) recast them in terms of Autosegmental-Metrical Theory, and (iii) provide an OT-style account of syntax-prosody interaction. To the best of our knowledge, this is the first systematic instrumental investigation of ‘verbal’ ‘prosodic groups’ in Iron Ossetic.

The study targeted the contexts that have been described in the literature as triggering ‘verbal’ ‘prosodic grouping’, as discussed in Section 3.3. The experimental dataset consisted of 90 preconstructed utterances in Iron Ossetic, which fell into the groups in (25). The full list of stimuli is provided in Appendix 1.

(25) *The experimental dataset:*

i. declarative SOV clauses with negative indefinites (n=2);
ii. wh-questions of varying complexity: with one or two wh-phrases, as well as wh-questions with negative indefinites and/or second-position clitics (n=59);
iii. utterances containing narrow foci, of varying syntactic complexity, including utterances with both narrow foci and negative indefinites (n=29).

The utterances were presented one at a time on a computer screen. Participants were instructed to familiarise themselves with the utterance first and then pronounce it using natural intonation. 13 speakers of Iron Ossetic (8M, 5F, 20-60 y.o.) took part in the study. All participants came from North Ossetia and had a complete or in-progress university degree. The recordings were made in Vladikavkaz, Russia, in January 2019. The data were recorded with a head-worn Shure SM10A microphone, at a sampling rate of 44.100 Hz and 16 bits per sample, in a quiet room. The recordings were manually annotated in Praat (Boersma & Weenink 2021). Where applicable, quantitative F0 data was collected with the Praat script *ProsodyPro* (Xu 2013).

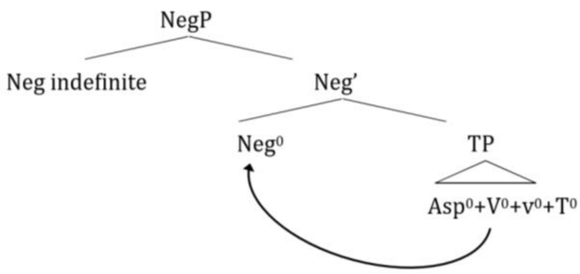
6. Results

6.1 *ι*-formation determined by HVP

6.1.1 Negative indefinites

As described in Section 3.2, negative indefinites in Iron Ossetic are obligatorily left-adjacent to the verb. In there are multiple negative indefinites, they cannot be separated from the verb or from each other by other material. We propose that, syntactically, the presence of negation warrants merger of NegP above TP, and negative indefinites occupy the specifiers of NegP. Obligatory adjacency of the negative indefinite(s) and the verb follows from the fact that the verb complex – that is, the complex head consisting of V^0, v^0, Asp^0, and T^0 – head-moves into Neg^0, as shown in (26):

(26)



Based on this syntactic configuration, the prediction of the flexible *ι*-mapping hypothesis is that the left edge of NegP, which contains the verb and negative indefinites, regardless of their number, corresponds to the left edge of *ι*. This prediction is borne out, as shown in Figure 4 for a single negative indefinite, and in Figure 5 for multiple ones, with the glosses, translations, and prosodic structure provided in (27a) and (27b), respectively:

(27) a. $_{\iota}$($_{\varphi}$(*abon*)) **$_{\iota}$(**$_{\varphi}$(*alan*)) $_{\iota}$($_{\varphi}$([$_{\text{NegP}}$ ***ni-kɐm-ɐj***) $_{\varphi}$([$_{\text{Neg'}}$ *a-ləʁd-i*]])**)**.
today Alan NEG-who-ABL PRV-run.away-PST.3SG
'Today Alan didn't run away from anyone.'

b. $_{\iota}$($_{\varphi}$(*abon*)) **$_{\iota}$(**$_{\varphi}$([$_{\text{NegP}}$ *ni-ʧi*) $_{\varphi}$([$_{\text{NegP}}$ *ni-kɐm-ɐj*) $_{\varphi}$([$_{\text{Neg'}}$ *a-ləʁd-i*]]])**)**.
today NEG-who.NOM NEG-who-ABL PRV-run.away-PST.3SG
'Today no-one run away from anyone.'

In Figure 4, the negative indefinite *nikɐmɐj* ‘from anyone’ carries a pitch accent. Given that the rise does not continue onto the post-tonic syllable, we label it H*; this is a typical pitch accent that negative indefinites carry in our data. There are no other pitch accents further to the right, the only other pitch target being the final boundary tone L%. Lack of further pitch accents is a hallmark of *ι*-formation. Left-peripheral topics, *abon* ‘today’ and *alan* ‘Alan’, carry their own pitch accents, whose shape is determined by the quality of the stressed vowel.

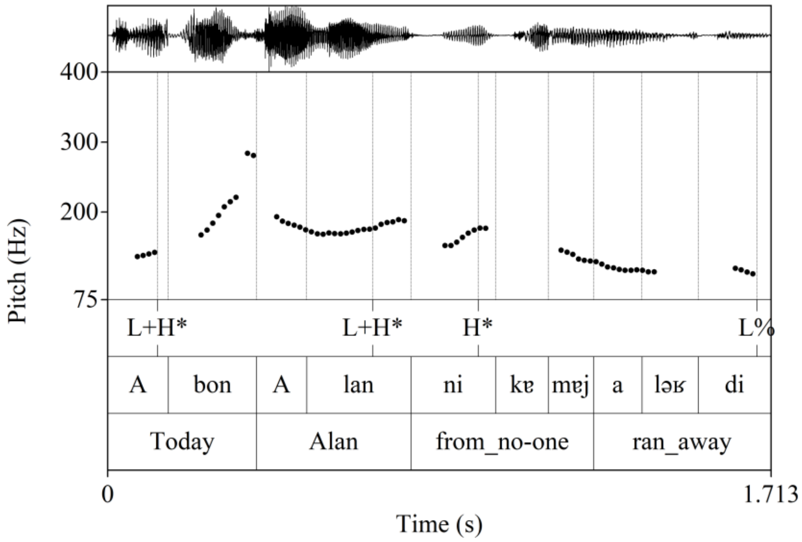


Figure 4. Realization of the utterance in (27a) (M1, pt1_8).

Figure 5 shows that, in a sequence of negative indefinites, only the leftmost one carries a pitch accent. Here, there is an H* on *niʧi* ‘no-one’, the leftmost negative indefinite, but not on *nikɐmɐj* ‘from anyone’ or the verb.

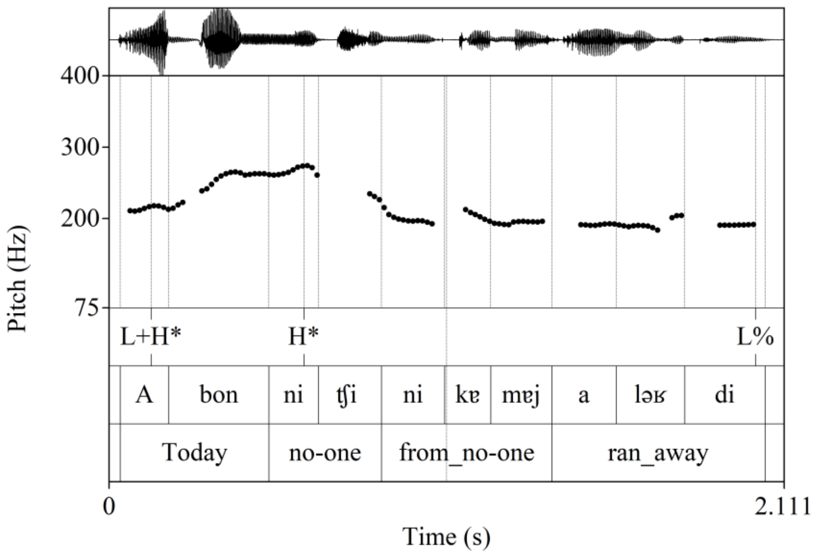


Figure 5. Realization the utterance in (27b) (F3, pt1_9).

The prosodic phrasing facts are predicted by the flexible *ι*-mapping hypothesis, given the syntax of negative indefinites in Iron Ossetic: the negative indefinite(s) occupy(s) the specifier(s) of the NegP projection, with the verb raising to Neg^0, and thus turning it into the HVP. The constraint ranking that derives the attested ι-formation is provided in (28), based on the example in (27b).

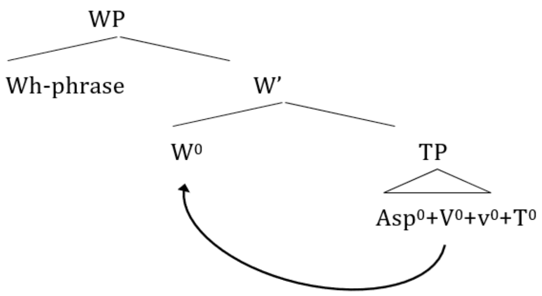
(28) *ι-formation in utterances with negative indefinites*

XP Neg_1 Neg_2 V	ALIGN-L(HVP, *ι*)	ALIGN-R(HVP, *ι*)	ALIGN (HD-*φ*, L, *ι*, L)
H* | ☞ $_{\iota}$(XP) $_{\iota}$(Neg$_1$ Neg$_2$ V)			
H* | $_{\iota}$(XP) $_{\iota}$(Neg$_1$ Neg$_2$ V)			*!
H* | $_{\iota}$(XP Neg$_1$ Neg$_2$ V)	*!		
H* | $_{\iota}$(XP) Neg$_1$ $_{\iota}$(Neg$_2$ V)	*!		

6.1.2 Wh-phrases

Like negative indefinites, wh-phrases in Iron Ossetic appear in the immediately preverbal position, as discussed in Section 3.2.[12] We propose that wh-phrases move to the specifiers of a dedicated projection, WP, which is merged above TP in wh-questions, and the verb complex head-moves into W^0, in a parallel manner to the syntax of negative indefinites.[13]

(29)



The prediction for wh-phrases, then, is the same as it was for negative indefinites: the left edge of WP, which contains the wh-phrase and the verb, should be aligned with the left edge of *ι*. This prediction, too, is borne out, as shown in (30) and Figure 6.

[12] For the prosodic behavior and analysis of multiple wh-questions, see. Section 6.2.2

[13] 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
mɐdinɐ pi∫mo nə-ffə∫-ta.
Madina letter PV-write-PST.3SG
'Madina wrote a letter.'

b. Y/N question
mɐdinɐ pi∫mo nə-ffə∫-ta?
Madina letter PV-write-PST.3SG
'Did Madina write a letter?'

b. Alt-question
mɐdinɐ ɐvi ∫o∫lan pi∫mo nə-ffə∫-ta?
Madina Q.or Soslan letter PV-write-PST.3SG
'Did Madina or Soslan write a letter?'

(30) ${}_{\iota}$(${}_{\varphi}$(*Abon*)) ${}_{\iota}$(${}_{\varphi}$(*indʒən*)) ${}_{\boldsymbol{\iota}}$**(**${}_{\varphi}$([WP *savɐr* *wɐjgɐnɐdʒ-ə* *binojnag*) ${}_{\varphi}$([WP' *ɐlχɐn-ə*]])**)***?*
today cottage_cheese which seller-GEN spouse buy-PRS.3SG
'Which seller's spouse buys cottage cheese today?

As Figure 6 shows, even though the wh-phrase *savɐr wɐjgɐnɐdʒə binojnag* 'which seller's spouse' is quite long, it only carries a single pitch accent, anchored to the wh-word *savɐr* 'which'.[14] There are no further pitch accents until the final boundary tone L%, which shows that the wh-phrase and the verb are combined into an *ι*. Figure 6 also demonstrates that wh-phrases, in contrast to negative indefinites, are the locus of two high pitch targets: in addition to the stress-aligned pitch accent, they also carry an initial high boundary tone %H. In Figure 6, the second, post-tonic syllable in *savɐr* 'which' carries the H* part of the pitch accent, while *sa-* is aligned with another high target, the %H boundary tone, which overrides the L part of the pitch accent. %H appears only on *ι*'s that include wh-phrases. Anticipating the discussion in Section 6.2, the presence of %H contributes to the special prosodic behavior of more complex wh-questions – multiple wh-questions and those that also include negative indefinites – which is unexpected from the point of view of the flexible *ι*-mapping hypothesis.

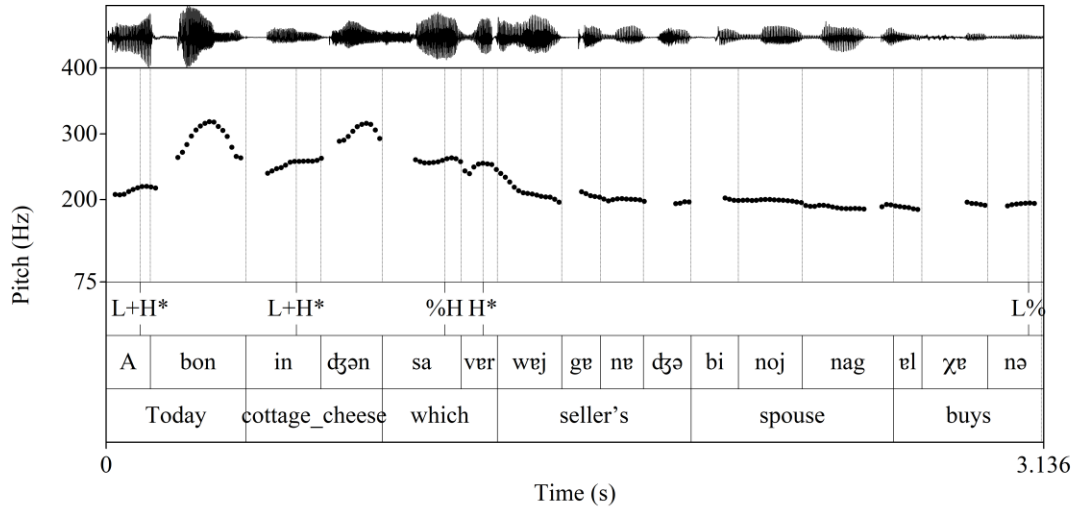


Figure 6. Realization of the wh-question in (30) (F3, pt2_8).

To recap, the left edge of WP, which hosts the wh-phrase and the verb, corresponds to the left edge of *ι*, as predicted by the flexible *ι*-mapping hypothesis. This is shown in the the tableau in (31). The behavior of %H is analyzed in Section 6.2.2.

(31) *ι-formation in simple wh-questions (with one wh-phrase and no other discourse elements.*

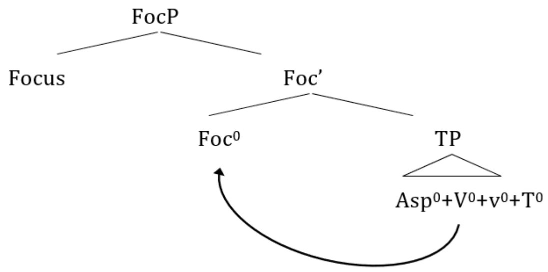
XP Wh V	ALIGN-L(HVP, *ι*)	ALIGN-R(HVP, *ι*)	ALIGN (HD-*φ*, L, *ι*, L)
H* | ☞ ${}_{\iota}$(XP) ${}_{\boldsymbol{\iota}}$**(**Wh V**)**			
H* | ${}_{\iota}$(XP) ${}_{\boldsymbol{\iota}}$**(**Wh V**)**			*!
H* | ${}_{\boldsymbol{\iota}}$**(**XP Wh V**)**	*!		

[14] Wh-phrases have the same prosodic behavior regardless of their phonological weight – both multi- and single-word wh-phrases (even monosyllabic ones) form a single *φ* and form an *ι* together with the following verb.

6.1.3 Preverbal focus

The last constituent type that requires immediately preverbal placement in Iron Ossetic is narrow focus. We propose that, syntactically, the adjacency between the focused constituent and the verb results from movement of the focused phrase into the specifier of FocP, accompanied by movement of the verb to Foc^0, in a similar manner to the derivation of the discourse projections discussed in the previous sections:

(32)



The flexible *ι*-mapping hypothesis makes the same predictions about the prosodic behavior of preverbal foci as it did for negative indefinites and wh-phrases: the left edge of the discourse projection that attracts the verb (in this case, FocP) should align with the left edge of *ι*. This prediction is also borne out, as shown in (33) and in Figure 7-Figure 9.

(33) a. (‘What does Madina like?’)
$_\iota$($_\varphi$(*mɐdinɐ*)) **$_\iota$(**$_\varphi$([$_{\text{FocP}}$ ***lɐgʷən*** ***gɐdə-tə***) $_\varphi$([$_{\text{Foc'}}$ *warʒ-ə*]])**)**.
Madina bald cat-PL.ACC love-PRS.3SG
‘Madina likes [**bald cats**]$_F$.’

b. (‘When does Alan drink beer?’)
$_\iota$($_\varphi$(*alan*)) $_\iota$($_\varphi$(*bɐgɐnə*)) **$_\iota$(**$_\varphi$([$_{\text{FocP}}$ ***majrɐmbon-ə***) $_\varphi$([$_{\text{Foc'}}$ *nwaʒ-ə*]])**)**.
Alan beer Friday-LOC drink-PRS.3SG
‘Alan drinks beer [**on Fridays**]$_F$.’

In Figure 7 and Figure 8, the narrowly focused constituents, *lɐgʷən gɐdətə* ‘bald cats’ and *majrɐmbonə* ‘on Friday’, respectively, carry a pitch accent, with no pitch accents further to the right. This fits with the definition of *ι* in Iron Ossetic. Note that the F0 peaks in pitch accents on focused constituents are reached within the stressed syllable; therefore, we label them H*. The narrowly focused constituent in each of the examples is preceded by topical constituent(s), each of which carries their own pitch accent.

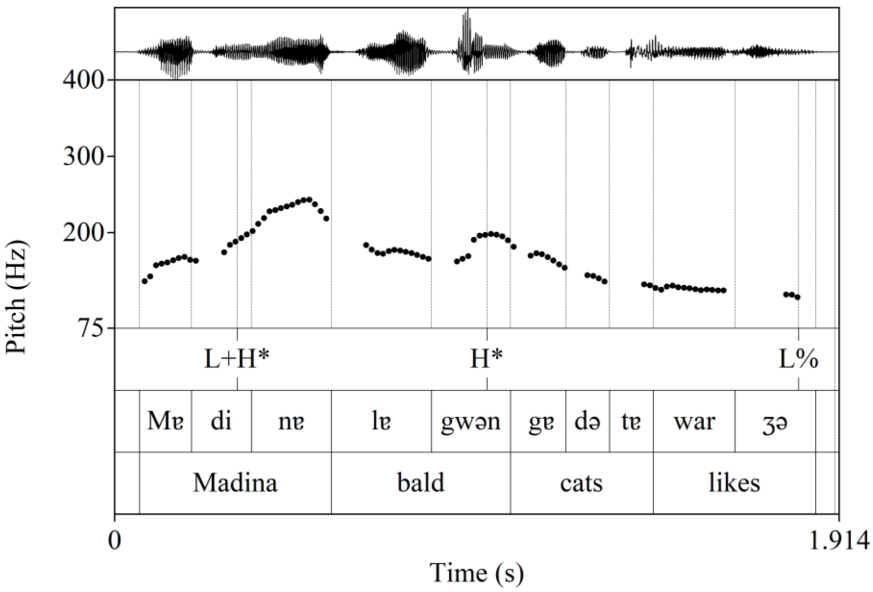


Figure 7. Realization of (33a) (F5, pt3_11)

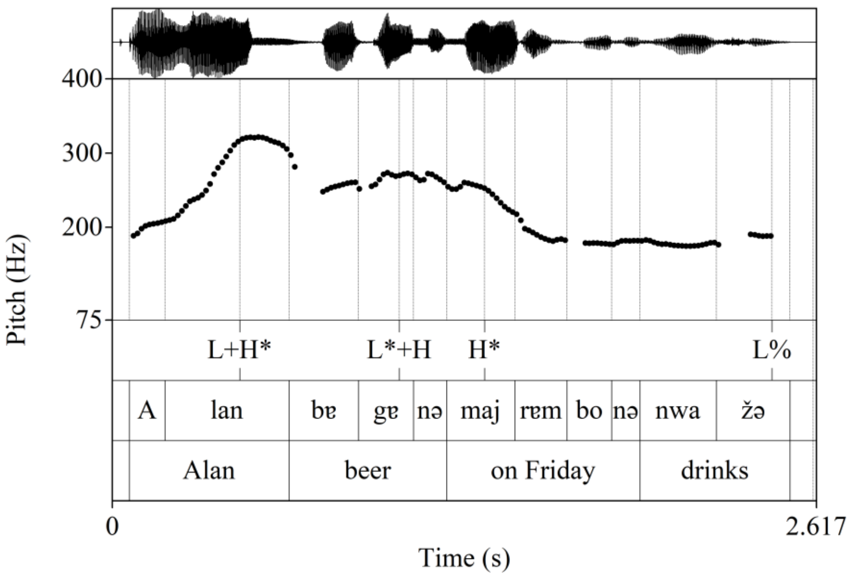


Figure 8. Realization of (33b) (F3, pt3_8)

There is also an alternative realization of narrow focus, shown in Figure 9. Here, the pitch accent on the focused constituent is shaped like a high plateau instead of a tonal peak. This realization of narrow focus is often accompanied by increased duration of the stressed syllable in the focused constituent (*maj-* in Figure 9). We did not find a consistent contextual difference between the two focus realizations and, provisionally, also label the 'plateau' realization H*. The prosodic phrasing in clauses with narrow foci also adheres to the predictions of the flexible *ɩ*-mapping hypothesis, as shown in the tableau in (34):

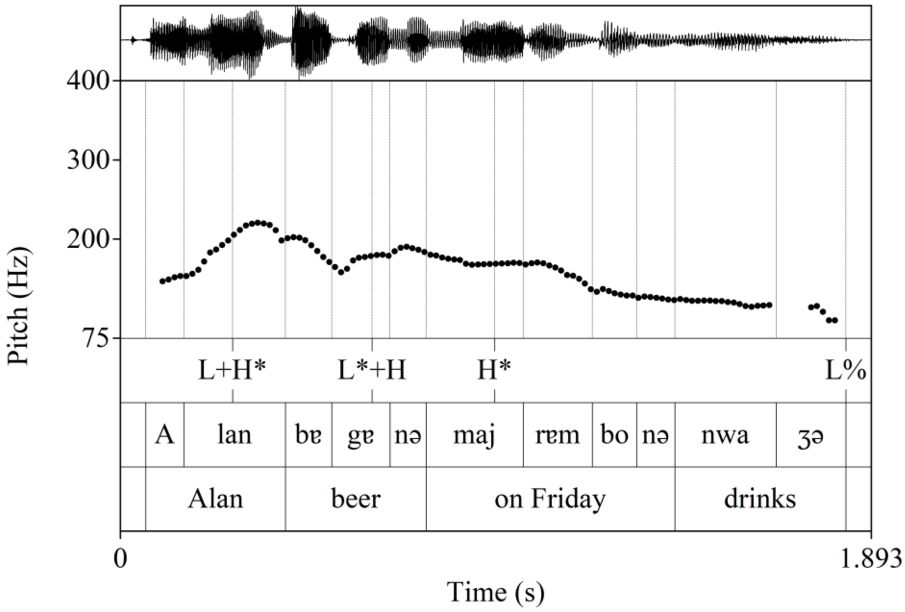


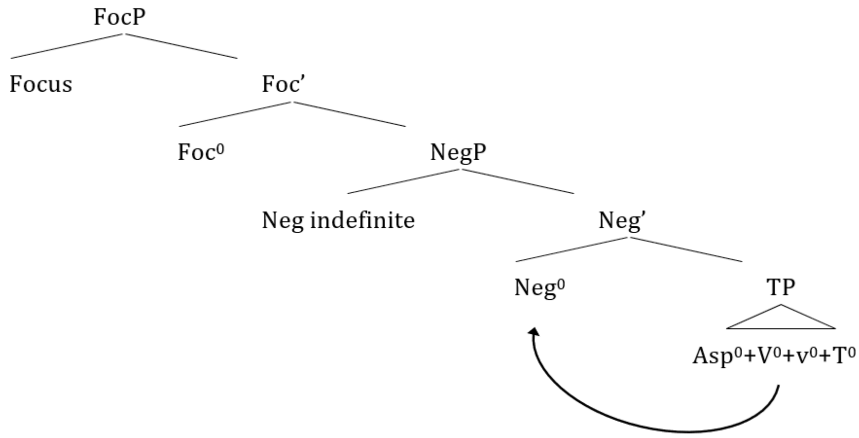
Figure 9. Realization of (33b) (M1, pt3_8)

(34) *ι-formation in utterances with narrow foci*

<table>
<tr><th>XP Foc V</th><th>ALIGN-L(HVP, ι)</th><th>ALIGN-R(HVP, ι)</th><th>ALIGN
(HD-φ, L, ι, L)</th></tr>
<tr><td>H*
|
☞ $_\iota$(XP) $_\iota$(Foc V)</td><td></td><td></td><td></td></tr>
<tr><td>H*
|
$_\iota$(XP) $_\iota$(FocV)</td><td></td><td></td><td>*!</td></tr>
<tr><td>H*
|
$_\iota$(XP FocV)</td><td>*!</td><td></td><td></td></tr>
</table>

Next, let us consider those cases where more than one discourse projection is merged. One of such combinations is FocP and NegP, in those examples where the verb is immediately preceded by a negative indefinite, which is itself preceded by a narrowly focused constituent: *focus* > *negative indefinite(s)* > *verb*; other word order permutations are not allowed. According to the syntactic analysis in Section 3.2, these contexts are derived by movement of the verb to the head of the lowest discourse projection with a filled specifier (here, Neg^0). Accordingly, the prediction of the flexible *ι*-mapping hypothesis is that the left edge of *ι* should be aligned with the left edge of NegP, as the HVP, and the focused constituent should be phrased separately, given that it is not part of the HVP. This is schematised in (35).

(35)



The prediction is borne out, as shown in (36) and Figure 10 for an utterance that contains a narrowly focused constituent and two negative indefinites:

(36) (‘Who does no-one ever trust in your family?’)
$_{\iota}$($_{\varphi}$(*nɐ* *χɐzar-ə*)) $_{\iota}$($_{\varphi}$(*alan-əl*)) **$_{\iota}$(**$_{\varphi}$(*ni-ʧi*) $_{\varphi}$(*nikʷə*) $_{\varphi}$(*ɐwwɐnd-ə*)**)**.
our family-LOC Alan-SUP NEG-who never trust-PRS.3SG
‘In our family, no-one ever trusts [**Alan**]$_{F}$.’

In Figure 10, the first of the two negative indefinites, *niʧi* ‘no-one’, carries at H* pitch accent, and there are no pitch accents further to its right, neither on the second negative indefinite nor on the verb. This means that the negative indefinites and the verb form an *ι*, to the exclusion of the narrowly focused constituent. The focused constituent, *Alanəl,* is phrased separately, which is manifested by a stress-aligned L+H*, with a rise throughout the stressed and post-tonic syllables. The left-peripheral topic carries L*+H, with no rise on the stressed syllable.

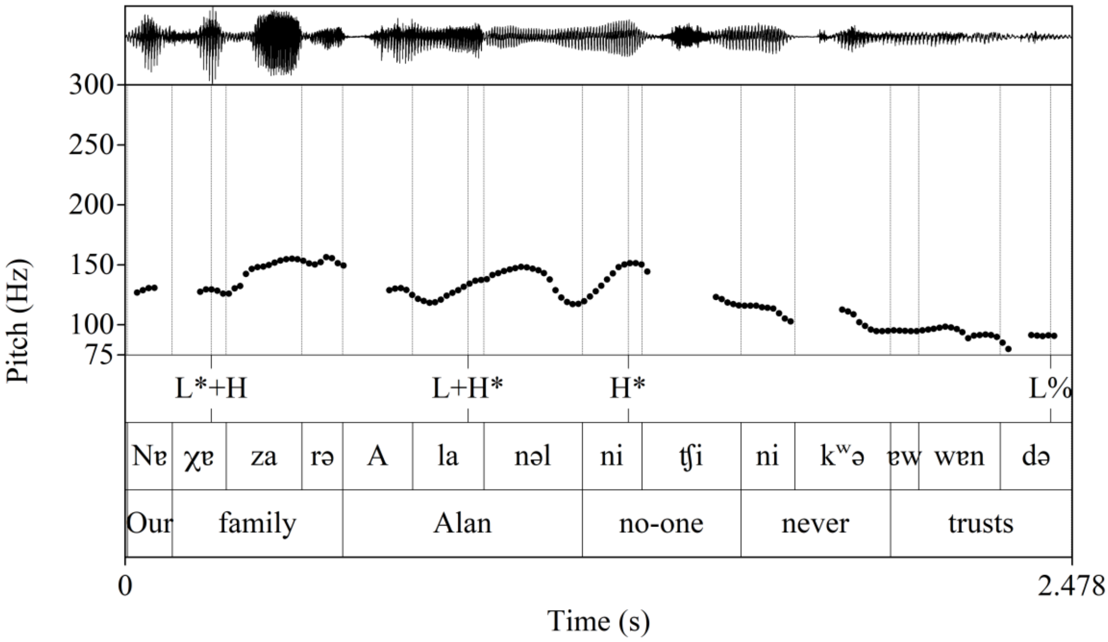


Figure 10. Prosodic realization of (36) (M6, pt3_26)

To recap, the prosodic properties of these more complex contexts, too, straightforwardly follow from the flexible *ι*-mapping hypothesis. The OT analysis is provided in (37).

(37) *ι-formation in utterances with narrow foci and negative indefinites*

<table>
<tr><th>XP Foc NegV</th><th>ALIGN-L(HVP, ι)</th><th>ALIGN-R(HVP, ι)</th><th>ALIGN
(HD-φ, L, ι, L)</th></tr>
<tr><td>H*
|
☞ $_{\iota}$(XP) $_{\iota}$(Foc) $_{\iota}$(Neg V)</td><td></td><td></td><td></td></tr>
<tr><td>H*
|
$_{\iota}$(XP) $_{\iota}$(Foc Neg V)</td><td>*!</td><td></td><td></td></tr>
<tr><td>H*
|
$_{\iota}$(XP) $_{\iota}$(Foc Neg V)</td><td>*!</td><td></td><td>*</td></tr>
<tr><td>H*
|
$_{\iota}$(XP Foc Neg V)</td><td>*!</td><td></td><td></td></tr>
</table>

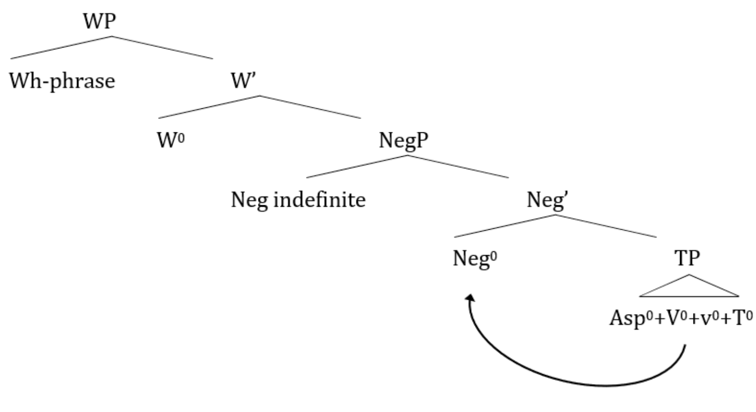
6.2 *ι*-formation determined by language-specific requirements on prosodic phrasing

The flexible *ι*-mapping hypothesis successfully accounts for the behavior of simple wh-questions (i.e., those with a single wh-phrase and no other discourse projections merged). In contrast, the behavior of more complex wh-questions – multiple wh-questions and wh-questions that include negative indefinites – is not explainable by the syntax-prosody mapping constraints we have introduced so far. Instead, the prosodic phrasing in these constructions is rooted in the phonological requirements of wh-phrases of Iron Ossetic that are independent from the flexible *ι*-mapping hypothesis.

6.2.1 Wh-questions with negative indefinites

As discussed in Section 3.2, wh-questions in Iron Ossetic may also include one or more negative indefinites: in such constructions, the word order is strictly *wh-phrase* > *negative indefinite(s)* > *verb*. Syntactically, wh-questions of this shape have a structure parallel to the *focus* > *negative indefinite(s)* > *verb* constructions in (35): the verb raises to Neg^0, the negative indefinites occupy the specifiers of NegP, whereas the wh-phrase is in Spec, WP, as illustrated in (38).

(38)



Accordingly, the flexible *ι*-mapping hypothesis predicts that such constructions should be prosodified in a parallel way to constructions in (35), as schematised in (39):

(39) a. attested, focus: $_{\iota}$($_{\varphi}$(Foc)) $_{\iota}$**(**$_{\varphi}$(Neg) $_{\varphi}$(V)**)**
b. predicted, wh-phrases: $_{\iota}$($_{\varphi}$(Wh)) $_{\iota}$**(**$_{\varphi}$(Neg) $_{\varphi}$(V)**)**

However, the phrasing in (39b) is not attested. Instead, based on the distribution of H*, the ɩ in these constructions includes not only the negative indefinite but also the wh-phrase, as shown in (40). The unexpected left-edge ɩ-boundary is marked as '(!':

(40) a. attested, wh-phrases: **ɩ(**!φ(Wh) φ(Neg) φ(V)**)**

b. ɩ(φ(*mɐdinɐ*)) **ɩ(**!φ(*kɐmɐn*) φ(*nikʷə*) φ(*ni-sə*) φ(*ra-zur-ə*)**)**?
Madina who.DAT never NEG-what PRV-tell-PRS.3SG
'Who does Madina never tell anything?'

Figure 11 illustrates the attested realization of (40b): here, neither of the negative indefinites carries H*s, which means that they are not at the left edge of ɩ. Instead, the wh-word *kɐmɐn* 'to who' carries the H* portion of a pitch accent on the second syllable (as well as %H on the initial syllable, which overrides the L portion of the pitch accent), which means that the ɩ includes the wh-phrase, both negative indefinites, and the verb. This behavior is not predicted by the flexible ɩ-mapping hypothesis.

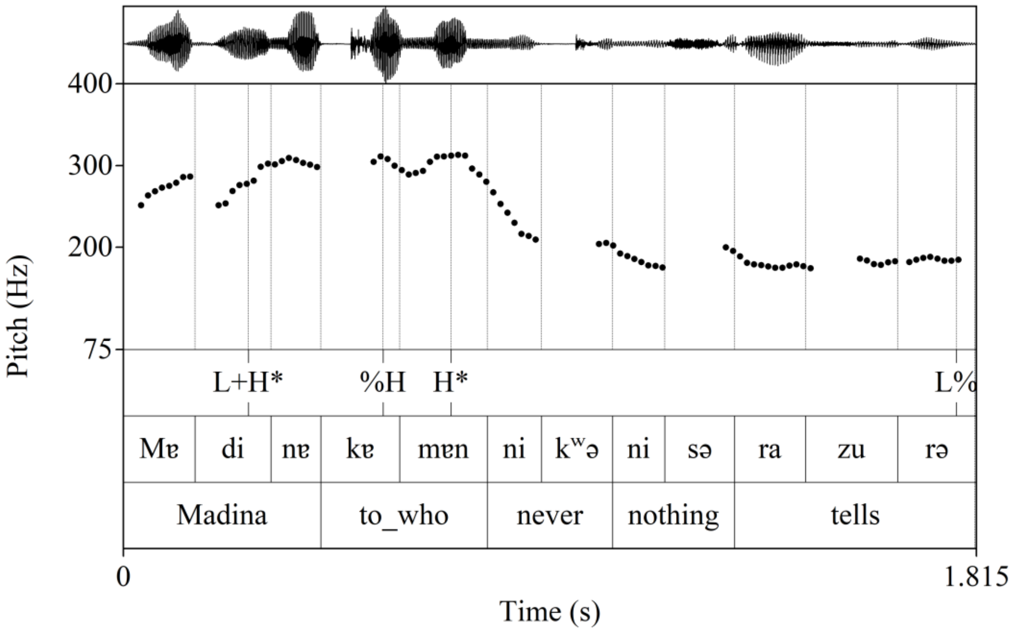


Figure 11. Realization of the wh-question in (38) (F5, pt2_13)

To account for prosodic phrasing in examples like (40b), recall that the formation of prosodic structure is governed by factors that come from two independent sources. One class of constraints is rooted in syntax – these are the syntax-prosody mapping constraints that reflect syntactic structure in prosodic phrasing, while other constraints are prosodic ones – that is to say, they 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).[15]

We propose that the prosodic behavior of wh-phrases, as revealed in wh-questions with negative indefinites, is due to an independent eurhythmic constraint that applies to the prosodic phrasing of wh-phrases in Iron Ossetic. In particular, we observe that the left edge of a φ that is formed by a wh-phrase

[15] Examples of eurhythmic constraints are provided e.g., in Ghini (1993), Selkirk (2000), Prieto (2005; 2014), 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).

carries an initial boundary tone %H. We analyze %H as introduced by the ALIGN(φ_{wh}, L, %H) constraint, introduced in (20) and repeated in (41). Below, we show that it is the presence of %H that sets off a mechanism of ι-formation that is alternative to the HVP-based one discussed so far.

(41) ALIGN(φ_{wh}, L, %H)
Align the left edge of the φ that encompasses a wh-phrase with a high initial boundary tone %H.

There is robust phonetic evidence for a high pitch target aligned with the left edge of wh-phrases. The realization of polysyllabic wh-phrases demonstrates that this target is distinct from H*, which is aligned with the second or third syllable of a wh-phrase, depending on the location of stress. Figure 12 shows averaged results for the F0 contours that span disyllabic wh-phrases in our data, of ŚW and WẂ stress window types (ŚS and WŚ types were not attested). The WẂ dataset includes wh-words *kɐmɐ* 'who', *kɐmɐn* 'to who', and *sɐmɐn* 'why' (n = 91, from all speakers), and the ŚW dataset is based on the realization of the wh-word *savɐr* 'which' (n = 65, from all speakers).[16] Wh-words of both stress types present evidence for a high F0 target on the initial syllable. In the ŚW condition, the H*-part of stress-induced L+H* is realised on the second syllable, and the target on the initial syllable is %H, which overrides L. In the WẂ context, both parts of L*+H are realised on the stressed syllable itself, because the wh-phrases in the dataset are disyllabic and the spread of the high tone is stopped by the right-edge φ-boundary. As a result, like in the ŚW condition, the high tone is realised on the second syllable, and the F0 target on the initial syllable is %H. %H is present both in topic-less wh-questions, in which the wh-phrase is utterance-initial, and wh-questions that include topical constituents to the left of the wh-phrase.[17] %H is unique to wh-phrases in Iron Ossetic.

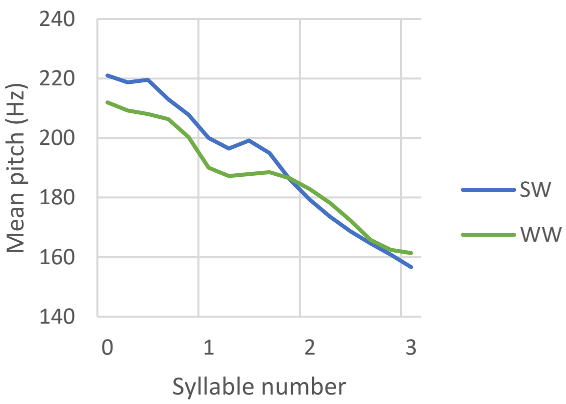


Figure 12. Averaged F0 contours on disyllabic wh-phrases preceded by left-peripheral constituents, according to stress window type.

Once added to the prosodic structure, %H is re-analyzed as an ι-initial boundary tone by the constraint ALIGN(%H, ι, L), introduced in (21) and repeated in (42):

(42) ALIGN(%H, ι, L)
Align %H with the left edge of ι.

Furthermore, we propose that the ι-boundary formed by %H overrides the formation of the ι-boundaries that result from alignment with HVP, by virtue of the constraints in (41) and (42) being ranked higher than the syntax-prosody mapping ALIGN-L/R(HVP, ι) constraints. Finally, the constraint POST-%H DEPHRASING, introduced in (22) and repeated in (43), ensures that the reanalysis of a %H as

[16] There are no other wh-phrases of the ŚW type in our sample. The existing wh-phrases in Iron Ossetic happen to be almost exclusively of the WẂ type.
[17] The latter type is illustrated in Figure 12 because non-utterance-initial wh-phrases are less susceptible to F0 perturbations like initial glottalization.

an *ι*-boundary leads to the deletion of all other initial *ι*-boundaries to its right. As a result, in wh-questions, regardless of the number and type of interveners, the left edge of *ι* aligns with the left edge of the wh-phrase. The provision about %H *ι*-boundaries not affecting other %H *ι*-boundaries becomes relevant in the context of multiple wh-phrases in the next section.

(43) POST-%H DEPHRASING:
Delete all initial *ι*-boundaries to the right of %H (other than those also formed by %H).

The OT-derivation of the phrasing found in (40b) is provided in (44).

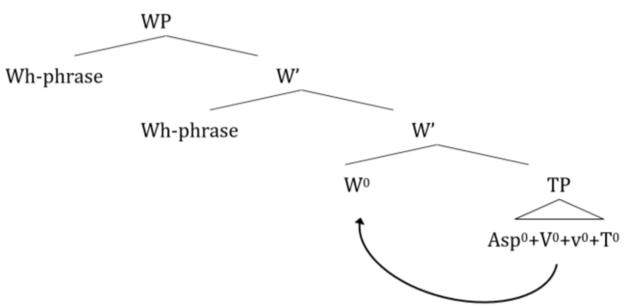
(44) *ι-formation in wh-questions with negative indefinites*

XP Wh Neg V	ALIGN (φ_{wh}, L, %H)	ALIGN (%H, ι, L)	POST-%H DEPHRASING	ALIGN-L(HVP, ι)	ALIGN (HD-φ, L, ι, L)
%H H* | | ☞ $_\iota$(XP) $_\iota$(ꜜWh Neg V)				*	
H* | $_\iota$(XP) $_\iota$(ꜜWh Neg V)	*!			*	
H* | $_\iota$(XP) $_\iota$(Wh) $_\iota$(Neg V)	*!	*			
%H H* | | $_\iota$(XP) $_\iota$(ꜜWh Neg V)				*	*!
H* | $_\iota$(XP Wh Neg V)	*!	*		*	
%H H* | | $_\iota$(XP) $_\iota$(ꜜWh $_\iota$(Neg V))			*!		

6.2.2 Multiple wh-questions

The constraints in (41) and (42), which govern the prosody of wh-phrases, also play a major role in shaping prosodic phrasing in multiple wh-questions. According to the syntactic analysis of wh-questions adopted here, multiple wh-phrases occupy specifiers of WP, as shown in (45). If prosodic phrasing in wh-questions was governed by the syntax-prosody mapping constraints alone, multiple wh-phrases and the verb would form an *ι*, as was shown to be the case for negative indefinites in Section 6.2.1.

(45)



Instead, in multiple wh-questions, the left edge of each wh-phrase is aligned with %H. According to the constraints introduced in the preceding section, this results in each of the wh-phrases being aligned with a left ι-boundary. This is shown in (46) and Figure 13. Figure 13 also demonstrates that each of the wh-words in (46) carries its own %H and H* (the visible portion of L+H*). Furthermore, the wh-phrases that are not immediately preverbal in multiple wh-questions do not receive final lengthening, unlike topics that precede a wh-phrase or another preverbal constituent. Accordingly, we take multiple wh-questions to be prosodified as nested ι's as opposed to sister ι's. This is ensured by the constraint ranking ALIGN-R(ι, HVP) >> ALIGN-L(HVP, ι).

(46) **(**ꜝ $_{\varphi}$(*savɐr gɐdə*) $_{\iota}$**(**ꜝ $_{\varphi}$(*savɐr wəng-mɐ*) $_{\varphi}$(*nikʷə*) $_{\varphi}$(*raliz-ə*)**))***?*
which cat which street-ALL never run-PRS.3SG
'Which cat never runs along which street?'

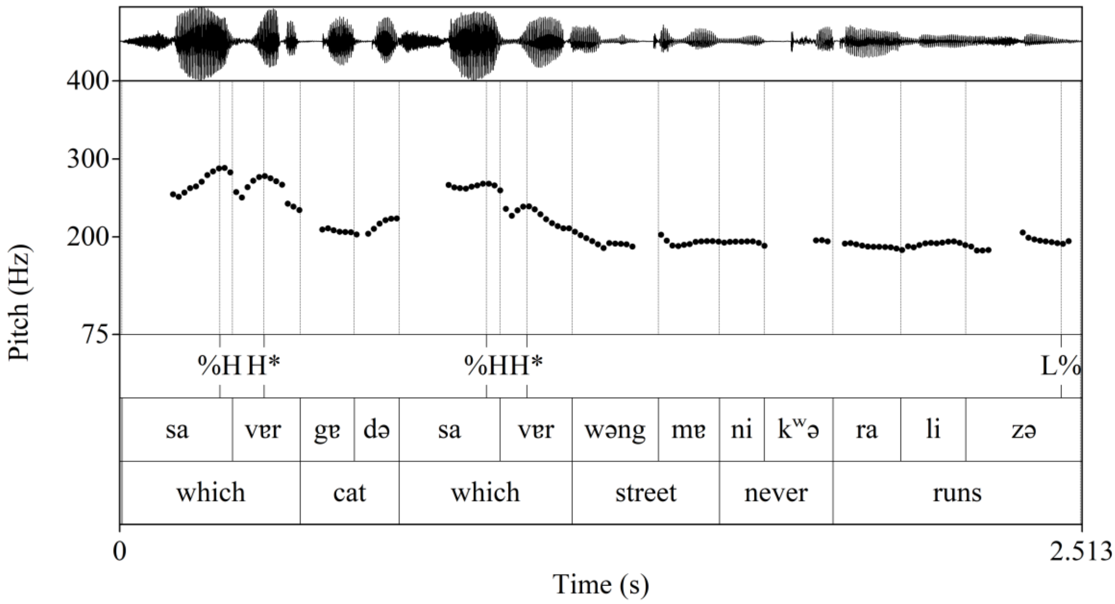


Figure 13. Realization of the wh-question in (46) (F3, pt2_41).

The OT-analysis of multiple wh-questions is provided in (47).

(47) *ι-formation in multiple wh-questions*

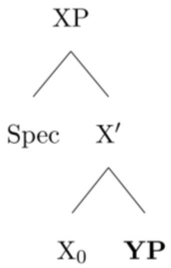
Wh Wh V	ALIGN(SPECWP, L, %H)	ALIGN(ι, L, SPECWP, L)	POST-%H DEPHR.	ALIGN-R(ι, HVP)	ALIGN-L(HVP, ι)	ALIGN(HD-φ, L, ι, L)
%H H* %H H* | | | | ☞ $_{\iota}$(ꜝWh $_{\iota}$(ꜝWh V**))**					*	
%H H* %H H* | | | | $_{\iota}$(ꜝWh Wh V**)**		*!				
%H H* %H H* | | | | $_{\iota}$(ꜝWh) $_{\iota}$(ꜝWh V**)**				*!		

To recap, the prosodic phrasing facts in wh-questions demonstrate that the formation of ι in Iron Ossetic has two sources: in the default scenario, the size of ι is determined by syntax-prosody mapping constraint, while in wh-questions ι-formation is governed by higher-ranked eurhythmic constraints.

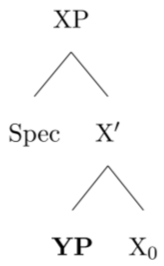
6.3 Broad-focus declaratives

So far, the main insight of the flexible *ι*-mapping hypothesis, that *ι* corresponds to the highest projection that hosts verbal material and includes its specifier, has only been tested on head-initial projections – i.e., those where the specifier of HVP and the verb are both on the left of the clausal spine and are structurally and linearly adjacent. This is schematically illustrated in (48a) with the positions of Spec, XP and X^0. Iron Ossetic, however, presents some contexts in which the adjacency of the specifier of HVP and the verb is linear – but not structural. This is due to the head-final clausal architecture, up to the level of TP, with heads on the right and specifiers on the left of the clausal spine, as was shown in (6). Accordingly, e.g., in an intransitive SV clause, the verb resides in T^0 and the subject in Spec,TP, but these positions are not structurally adjacent. This is schematically illustrated in (48b), where YP intervenes between Spec, XP and X^0. The availability of structures like (48b) raises the question whether headedness and the presence of other projections between the specifier and head of the HVP, even if empty, affect the size of *ι*. As the evidence in this section shows, if the specifier and head of HVP are separated by other projections, such as YP in (48b), this interferes with *ι*-formation.

(48) a.



b.



Let us consider an intransitive SVX clause, illustrated in (49) and Figure 14. Given that it was produced without any prior context, we take it to be a broad-focus declarative. Accordingly, the verb is found in T^0, thus making the TP the HVP, and the subject is in Spec, TP.[18] A constituent like *jɐ=ləmɐn-imɐ* ‘with his friend’, adjoined low on the right, is part of the HVP and, accordingly, is predicted to be part of *ι*. This prediction is borne out, as shown in Figure 14.[19] Another prediction of the flexible *ι*-mapping hypothesis is that the left edge of *ι* should be aligned with the left edge of the subject and include the subject and the verb. In a head-final language like Iron Ossetic, *ι* is then also predicted to include all projections dominated by TP, which are found between Spec, TP and T^0, as was shown in (6). This prediction is not borne out. In intransitive SVX broad-focus declaratives in Iron Ossetic, the verb carries its own pitch accent, L+H*, which means that the subject is not part of the core *ι* – instead, the core *ι* includes the verb (and the postverbal material).[20]

(49) $_{\varphi}$(*Inɐlar*) **$_{ι}$(**$_{\varphi}$(*zur-ə*) $_{\varphi}$(*jɐ= ləmɐn-imɐ*))**.**
general talk-PRS.3SG 3SG= friend-COMIT
‘A/the general is talking with his friend.’

---

[18] Despite there not being any prior context, it is possible that a participant would interpret an example like (49) not as a broad-focus one, but, e.g., involving a topical reading of *inɐlar* ‘general’. This is also made possible by the fact that Iron Ossetic does not mark definiteness grammatically, and *inɐlar* may be interpreted as ‘a general’ or ‘the general’. If *inɐlar* ‘general’ is indeed interpreted as a topic, it does not occupy Spec,TP, is not part of HVP, and, as such, has no bearing on the interaction between *ι*-formation and headedness in the HVP. However, we believe that at least some subjects (e.g., indefinites) in Iron Ossetic are not interpreted as topics, and, as such, occupy the Spec, TP. The discussion in this section applies to these subjects.

[19] According to the traditional accounts, postverbal constituents do not form a ‘prosodic group’ with the verb (Abaev 1939). Our findings do not support this.

[20] Our data does not allow us to conclude whether subjects form their own ιs, like topics, or are part of an larger ι that embeds the core one, as is the case in multiple wh-questions. Because of this, the subject in (49) is only marked as forming a *φ*. Nothing hinges on this, though, because the fact that the subject is excluded from the ι formed by the verb is manifested by the presence of a pitch accent on the verb, and not the prosodic status of the subject.

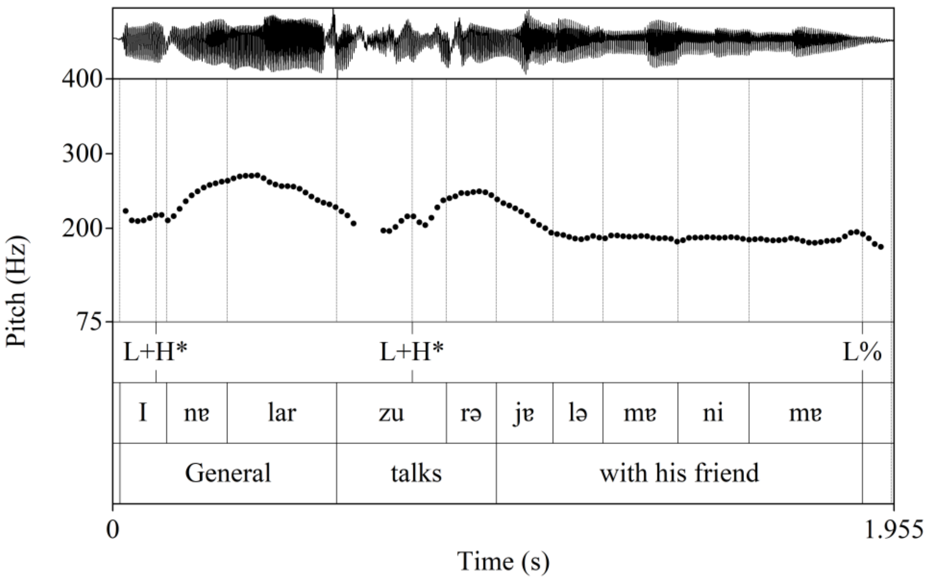


Figure 14. Realization of in (49).

Examples like (49) show that *ι* does not include Spec, HVP in those cases where Spec, HVP and the head of HVP are placed on different sides of the clausal spine and structurally separated by the lower empty projections, as in broad-focus SV(X) declaratives. While it may seem that contexts like this weaken the flexible *ι*-mapping hypothesis, the prosodic structure obtained in (49) aligns well the gist of Hamlaoui & Szendrői's (2015; 2017) proposal. Specifically, it dovetails with the idea that only the specifier of HVP becomes part of *ι*, and not a specifier of a higher projection, even in the absence of overt interfering material, as schematised in (50a). The presence of empty syntactic structure, as in (50b), interferes with *ι*-formation.[21]

(50) a. $_{\iota}$**(**[$_{XP}$ ZP [$_{X'}$ V]]**)**

b. [$_{YP}$ ZP [$_{X'}$ Ø $_{\iota}$**(**[$_{XP}$ Ø [$_{X'}$ V]]]]**)**

Our results show that, additionally, the size of *ι* is sensitive to the syntactic shape of the HVP: the projections between Spec, TP and T^0 in a head-final TP, which do not host overt material in broad-focus SV declaratives, do not allow for the *ι* to include the subject.

7. Conclusions

The flexible *ι*-mapping hypothesis (Hamlaoui & Szendrői 2015; 2017) was originally developed based on a set of languages that vary with respect to the identity of the highest projection that host verbal material (HVP): most notably, Hungarian and Bàsàá, but also English and German. To the best of our knowledge, the flexible *ι*-mapping hypothesis has not so far been tested on a range of constructions within a single language that very with respect to verb height. Iron Ossetic provides a unique testing ground in this sense, given that the HVP in this language varies between TP, NegP, WP and FocP,

[21] There is an ongoing debate in the syntax-prosody literature about whether empty syntactic structure is reflected in prosodic structure. Cf. Nespor & Vogel (1986) and Elfner (2015), among others, for the alternative view that prosodic structure formation ignores empty syntactic projections.

depending on utterance type. This paper showed that the flexible ι-mapping approach can successfully account for the variation in ι-size in Iron Ossetic.

Based on instrumental prosodic data, we showed that the prediction of the flexible ι-mapping approach that the size of ι co-varies with the height of HVP is borne out in Iron Ossetic. This applies to the prosody of utterances that contain negative indefinites, narrow foci, and single wh-phrases. Given that these elements are housed in specifiers of different syntactic projections in Iron Ossetic, and attract the verb to the head of the same projection, more rigid approaches to ι-formation, which equate ι size to a particular XP, would not be able to account for the Iron Ossetic data., In turn, the Iron Ossetic facts provide support for the flexible ι-mapping approach, which has not been tested, until now, on languages of this type.

This paper also demonstrated that the constraints governing flexible ι-mapping may be overridden by independent, language-specific eurhythmic constraints. In Iron Ossetic, these are represented by ALIGN(φ_{wh}, L, %H), ALIGN(%H, ι, L), and POST-%H DEPHRASING, which ensure the placement of the left ι-boundary according to the prosodic properties of wh-phrases, as opposed to the height of the HVP. These constraints apply to the prosody of wh-questions, and their contribution becomes apparent in more complex ones (multiple wh-questions and wh-questions that also include negative indefinites).

Finally, the head-final clausal architecture of Iron Ossetic up to the level of TP (a clausal organization that has not yet been explored from the perspective of flexible ι-mapping) allowed us to conclude that the core ι includes Spec, HVP only in head-initial projections. The presence of empty syntactic structure between the specifier and the head of HVP, as in a head-final projection with a left-hand specifier, leads to Spec, HVP being excluded from the core ι.

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