Research Article

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Clause chaining and the utterance phrase: Syntax–prosody mapping in Matukar Panau

Abstract: Clause chaining is a form of syntactic dependency holding between a series of clauses, typically expressing temporal or causal relations between events. Prosodic hierarchy theory proposes that syntactic constituents are systematically mapped to prosodic constituents, but most versions of the theory do not account for clause chain syntax. This article presents original data from Matukar Panau, a clause-chaining Oceanic (Austronesian) language of Papua New Guinea. The clause chain is a syntactic constituent in which final-clause TAM scopes over preceding clauses. There are also other types of multi-clausal structures, encompassing subordinate adverbial clauses, and verbless copula clauses, and we analyse all these as instances of the "syntactic sentence." The syntactic sentence maps to a distinct prosodic domain, marked by the scaling of L% boundary tones, and we equate this domain with the "utterance phrase" posited in some versions of prosodic hierarchy theory. The prosodic characteristics of the Matukar Panau utterance phrase are similar to those found in non-chaining languages, but while other languages use this prosody to mark pragmatically related groups of clauses, in Matukar Panau it most commonly maps to a syntactic sentence.

Keywords: clause chaining, prosodic hierarchy, intonation, complex clauses, Oceanic languages

1 Introduction

Clause chaining is a grammatical structure used in some languages to organise events into connected groups (Longacre 1985). In all languages, the flow of discourse involves the organisation of clauses into groups, but in clause chaining languages this organisation is more deeply grammaticalised, with morpho-syntax obligatorily marking clause-group boundaries, typically by means of verbal suffixes. Example (1) shows a clause chain in Matukar Panau, where three sequentially linked events are marked with dependent (D) suffixes on the two verbs in the non-final clauses, with an independent (I) suffix only on the final clause. The English translation encodes the same sequence of events with a series of independent clauses that each have the same type of finite verb.

(1)	*i*	*samer*	*pilau-ma*	*i*	*y-a-ma*	*lul=te*	*i*	*tor-ago*
	3SG	sago.leaf	put.on-D:HAB	3SG	3SG-go-D:HAB	beach=LOC	3SG	walk-I:R:IPFV

"She puts on her sago leaf skirt, she goes down to the beach and she walks around."

(Clara Kusos Darr, "Sik Mun 20130412," line 9)

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In non-chaining languages, the grouping of sequential clauses may be indicated by lexical conjunctions such as *and*, *then* or *so that*, or may be left to pragmatic interpretation rather than overt expression. Thus with respect to English grammar, Huddlestone and Pullum argue that multi-clause syntactic sentences can be identified, but these are not headed syntactic constituents of the same type as clauses, noun phrases and others (Huddlestone and Pullum 2002: 45, 1275; see also Borsley 2005). However, when we look beyond grammatical and lexical form to the prosodic realisation of speech, we find that English clause groups are quite explicitly marked, in particular by the relative height of pitch accents and the relative depth of low boundary tones (Wichmann 2000). This tone-scaling indicates that multiple clauses form a unified prosodic domain. The question investigated in this study is, how are multiclausal prosodic domains deployed in a clause chaining language?

Syntax hierarchically organises words into phrase structures, and prosodic phonology translates these hierarchies into acoustic packages. This packaging allows listeners to recover hierarchical structure from a speech stream distributed in linear time. Prosodic hierarchy theory proposes that syntactic constituents are systematically (though not invariably) mapped to prosodic constituents (Inkelas 1989; Nespor and Vogel 2012 [1986]; Selkirk 2011; Bennett and Elfner 2019). Above the word level, languages have two or more levels of hierarchical organisation, given labels such as "phonological phrase" (φ) and "intonational phrase" (ι). In general, major-category syntactic phrases (NP, VP, etc.) are mapped onto phonological phrases, and clauses are mapped onto intonational phrases. Above the clause level, some versions of prosodic hierarchy theory (e.g. Selkirk 1981; Nespor and Vogel 2012) propose a higher prosodic domain, the "utterance phrase" (υ), which maps to pragmatically determined clause groups rather than a syntactic constituent (Nespor and Vogel 2012: 242–3). But in other recent proposals (e.g. Selkirk 2011; Bennett and Elfner 2019), the highest level of mapping is from the clause to the intonational phrase.

There has so far been little discussion of how clause-chaining languages fit into prosodic hierarchy theory. In this study, we remedy this research gap in two ways: first, we provide the first detailed prosodic description for an Austronesian chaining language; second, we argue for an extension of prosodic hierarchy theory, such that a supra-clausal constituent, which we label the "syntactic sentence," maps to a prosodic utterance phrase (2).

　　　Prosodic mapping with a syntactic sentence constituent
(2)　　Syntactic sentence　　　　　　　　　　→ υ
　　　Clause　　　　　　　　　　　　　　　　→ ι
　　　NP, VP, PP etc.　　　　　　　　　　　→ φ

Compared to the classic accounts of the prosodic hierarchy mentioned above, we propose that clause-chaining languages have a higher level of mapping from a syntactic constituent to a prosodic constituent. This proposal is foreshadowed in some previous studies of clause-chaining languages (Genetti and Slater 2004; Applebaum 2013, discussed in Section 3.3), but we here develop the argument more explicitly, and present new evidence from Matukar Panau, a clause-chaining language of Papua New Guinea. The Matukar Panau clause chain is clearly a syntactic constituent and is also the domain of pitch scaling, which we interpret as a higher prosodic constituent. Matukar clauses usually prosodify as intonational phrases, but non-final clauses in a chain are marked either by H% boundary tones or by "semi-low" ↑L% tones held somewhat above the bottom of the speaker's register. Only the final clause in a chain has a fully L% boundary tone, which we treat as diagnostic of the utterance phrase.

We follow previous work in recognising that there may be language-specific prosodic hierarchies (Schiering et al. 2010; Bennett and Elfner 2019; Mansfield 2021), and thus our claim about syntax–prosody mapping does not necessarily extend to all languages. However, we do propose that a distinct utterance phrase should be used to represent scaling relations among intonational phrases more generally, as opposed to the recursive intonational phrasing posited in some other accounts.

On the more general question of how syntactic constituents map to prosodic constituents, we emphasise the variability noted in much other work (e.g. Ghini 1993; Selkirk 2000; Elordieta 2007; Genetti 2007a).

Prosodic mapping sets out a system of defaults, rather than invariable correspondences. Pragmatics is one major source of variation. Groups of clauses among which one can pragmatically infer strong causal connections may be "prosodically integrated" at a level below their default mapping, for example consecutive clauses prosodified within a single intonational phrase. In Matukar Panau, we will show that the utterance phrase prosodifies not just grammatical clause chains, but also other series of clauses that are pragmatically understood as forming groups. We label these two types "syntactic sentences" and "pragmatic sentences," respectively.

The structure of the article is as follows. Section 2 introduces the Matukar Panau language, which is situated in an area characterised by clause chaining. Section 3 provides background on multiclausal prosodic structures in non-chaining languages and reviews what is already known about the prosody of clause-chaining languages. Section 4 presents a grammatical description of Matukar Panau clauses and multiclausal structures, while Section 5 presents the Matukar Panau prosodicy hierarchy. Section 6 analyses the mapping of the multiclausal structures to the prosodic domains. Section 7 summarises our findings and their implications for prosodic hierarchy theory, while noting the limitations of this study and directions for further research.

2 Matukar Panau and clause chaining

Matukar Panau is a highly endangered Oceanic language in the small Bel family. It is spoken around 45 km north of Madang, Papua New Guinea, in the villages of Matukar and Surumarang, with together around 1,000 people. Most villagers are less than 30 years old and are unlikely to speak more than very basic Matukar Panau. Their first and dominant language is the English-based creole Tok Pisin. Middle-aged people mostly have Matukar Panau as a first language, but many primarily speak Tok Pisin. Older speakers, of which there are few, speak Matukar Panau often and well, although they are also all Tok Pisin speakers. Due to inter-marriage, various other Oceanic and Papuan (non-Austronesian) languages are spoken in the community as well by smaller groups of people.

Clause chaining is an areal feature of New Guinea, found in many Papuan languages of Papua New Guinea (Foley 1986; Foley and Van Valin 1984; Longacre 1972) as well as in a handful Austronesian Oceanic languages. These are primarily some Bel languages including Takia (Bril 2007; Ross 2002) and Matukar Panau, likely acquired through contact-based language change (Ross 2008; Ross 2009), as well as Papuan Tip language Maisin (Ross 1984; Frampton 2015). Clause chains are sequences of any number of clauses with the verbs in the clause marked as "final" or "medial" (i.e. non-final). Final clauses are grammatically independent (i.e. can stand alone), but medial clauses cannot appear without a final clause. Events in clause chains can be immediately sequential, loosely sequential, or partially or completely overlapping, and some languages signal this inter-clausal relationship with the choice of dependent marker. As illustrated in (1) above, the morphosyntactic dependency of verbs in clause chains makes them quite different from the clause coordination equivalents in non-chaining languages. But clause-chain structures may also be grammatically distinct from clause subordination structures in the same languages (Longacre 1985; Roberts 1988; Genetti 2011; Sarvasy 2015). This is the case in Matukar Panau as well, and in this study we distinguish medial and subordinate clauses, both of which are dependent elements in the syntactic sentence.

3 Multiclausal prosody in non-chaining and chaining languages

There is an extensive literature on the prosody of multiclausal constructions, mostly focusing on either sequences of syntactically independent clauses or clause subordination structures. We here briefly review some important findings on multiclausal prosodic structure in non-chaining languages and summarise what is already known about clause-chain prosody.

3.1 Clause sequence prosody

Non-chaining languages often use sequences of independent or coordinated clauses to encode connected events. Typically each clause prosodifies as an intonational phrase, marked by some kind of right-boundary tone, and these intonational phrases are grouped into larger sets by tone scaling. The domain in which such scaling occurs has been labelled a "paratone" (Fox 1973; Brown et al. 1980; Wennerstrom 2001 *inter alia*). Paratone phenomena have been most extensively studied in English, but have also been demonstrated in other Indo-European languages (see Zellers 2011: 67 for references), and in Native American languages (see Beck and Bennett 2007: 13 for references). A particularly clear example is a British English radio news report, in which each distinct news item is prosodified as a paratone (Wichmann 2000: 25ff). Each news item consists of multiple clauses, with pitch accents and boundary tones. The beginning of a news item is marked by a substantially elevated H⋆ accent, a "pitch reset" to the top of the speaker's register, while all subsequent accents within the same item are downstepped in line with register declination. The final boundary of a paratone involves a lower pitch than preceding intonation-phrase boundaries within the paratone (Brown et al. 1980: 30; Wichmann 1993; Wichmann 2000: 58). Prosody thus plays an important role in how speakers communicate discourse structure to their listeners (Wennerstrom 2001).[1]

Some versions of prosodic hierarchy theory propose an "utterance phrase" as the highest prosodic domain, and this is essentially an alternative name for the paratone domain described above. "Prosodic sentence" is another alternative label used for what appear to be the same type of phenomena (Chafe 1994; Palakurthy 2019; Genetti and Slater 2004; see discussion below). Final lowering indicates an utterance phrase that may encompass several clauses in Dutch (Gussenhoven 2005), Bininj Gun-wok (Fletcher and Evans 2002; Bishop and Fletcher 2005), Lushootseed (Beck and Bennett 2007: 11), and arguably in West Greenlandic (Arnhold 2014: 239). Nespor and Vogel (2012 [1986]) propose an utterance phrase in English, though rather than tone scaling, they focus on segmental effects. While phonological and intonational phrases are mapped from syntactic constituents, Nespor and Vogel's utterance phrase is instead mapped from groups of clauses among which causal or logical relations are pragmatically inferred. For example in (3, 4), pairs of clauses are prosodically integrated due to implicit causal connections, and the grouping is also reflected in anaphora or ellipsis in the second clause of each pair (Nespor and Vogel 2012: 242–3). Where the second clause is logically compatible with the first, and the appropriate coordinator would be *and*, clauses are more likely to be prosodically integrated (5). But where the second clause has some implicit contradiction to the first, the more appropriate coordinator would be *but*, and the clauses form separate υ constituents (6).[2]

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(3)   [[Where's Pat?]ι [I need him.]ι]υ
(4)   [[Martha didn't invite Todd.]ι [I did.]ι]υ
(5)   [[You invite Charlotte.]ι (AND) [I'll invite Joan.]ι]υ
(6)   [[It's late.]ι]υ (BUT) [[I'm not leaving though.]ι]υ

(Nespor and Vogel 2012: 242–3)

While the utterance phrase may be proposed as a single prosodic domain above the intonational phrase, recursive nesting is often proposed for higher prosodic domains (e.g. Brown et al. 1980: 71;

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1 Though pitch declination is a natural property of human speech, the harnessing of raised and lowered tones for the communication of discourse structure can be regarded as phonologisation of this articulatory property (Ladd 2008: 76).
2 The utterance phrase in English, and perhaps other non-chaining languages, does not obviously correspond to a syntactic constituent. But it may prosodify some structures at the border of syntax and pragmatics. For example, English "topic chains" have a shared topic that is the grammatical subject of several consecutive clauses, but is expressed only in the first clause (Van Valin & La Polla 1997: 463; Longacre 2007: 386; Torres Cacoullos & Travis 2014; Torres Cacoullos & Travis 2019). An utterance phrase, with scaling of accents and boundary tones, appears to be the natural prosodic realisation of the topic chain (e.g. Van Valin & La Polla 1997: 521).

Wichmann 2000: 28; Cho 2016). One source of evidence for recursive constituents is found in multi-level scaling of pitch accents, for example in English (Ladd 1988) and German (Truckenbrodt and Féry 2015). Ladd constructed an experiment using the clause conjunctions *and* and *but*, where the former indicates a closer pragmatic connection than the latter. Triple-clause sequences with the structure [[A AND B] BUT C] were contrasted with those of the structure [A BUT [B AND C]] (7, 8), showing that there is downstepping of H⋆ accents across all clauses, but with a greater reset at the higher discourse boundary, i.e. the BUT connector. This is interpreted as reflecting one prosodic domain encompassing the AND coordination, and another higher prosodic domain encompassing the BUT coordination. Figure 1 illustrates these prosodic mappings, with horizontal lines representing pitch registers, and circles representing pitch accents.

(7) [[Allen is a stronger campaigner, and Ryan has more popular policies,] but Warren has a lot more money.]

(8) [Ryan has a lot more money, but [Warren is a stronger campaigner, and Allen has more popular policies.]]   (Ladd 1988: 532)

While Ladd (1988) and Truckenbrodt and Féry (2015) interpret this pitch scaling as a hierarchy of recursive intonational phrases, in this study we propose a different approach. In our analysis, if a tone T is the realisation of a prosodic constituent, then scaling of a group of T tones should be interpreted as the realisation of a distinct, higher constituent. For example, if a phonological phrase is the domain of an H⋆ accent, then the scaling of a group of H⋆ accents is the realisation of a higher, intonational phrase. Similarly, if L% boundary tones mark intonational phrases, then the scaling of a group of L% tones is the realisation of a higher, utterance phrase, rather than a recursive intonational phrase. The current study is focused on the application of this approach to Matukar Panau clause chains, but in the discussion below (Section 7.1) we further reflect on the implications for prosodic hierarchy theory more generally.

3.2 Clause subordination prosody

Clause subordination structures are somewhat like clause chains, in that they combine an independent clause with one or more clauses marked as dependent. A subordinate clause and its matrix may either be prosodified as two intonational phrases, or integrated into a single intonational phrase, depending on the language, the particular subordination structure, and speaker variation. For example, English complement clauses are integrated into the same intonational phrase as their matrix (9a), while adverbial clauses may be integrated when they follow their matrix clause (9b), but are usually prosodically separate when they
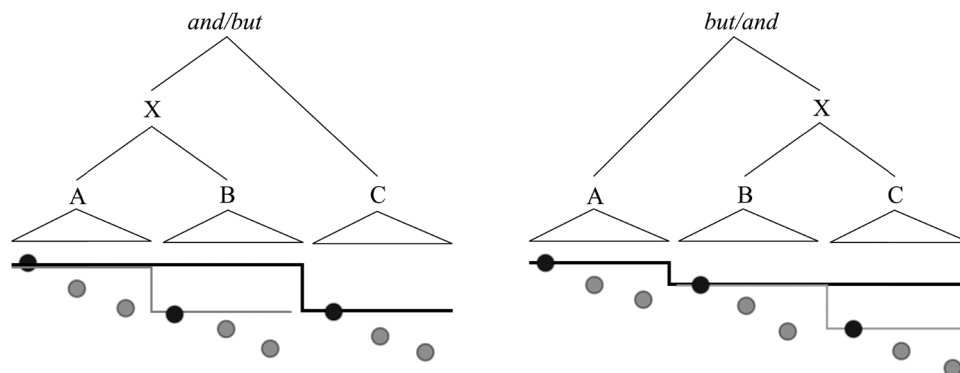

Figure 1: Pitch scaling and reset (drawn after Truckenbrodt and Féry 2015: 22).

precede the matrix (9c) (Chafe 1984; Chafe 1988). Tonal scaling of the sister intonational phrases in (9c) (cf. Cho 2016: 121) shows that these are encompassed by a higher prosodic domain.

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(9) a. [[Jim claims that he is the Lizard King.]ι]υ
     b. [[Wake me up before you go.]ι]υ
     c. [[Before you go]ι [wake me up.]ι]υ

Illocutionary force has been shown to be an important factor in clause prosody: clauses which carry their own illocutionary force, i.e. "speech acts," are more likely to produce intonational phrases (Downing 1970; Selkirk 2005; Truckenbrodt 2015 *inter alia*). Thus, a clause complementation structure, such as (9a) above, does not assert that Jim is in fact the Lizard King, but only that he claims to be so. Only the matrix clause has illocutionary force (as a declarative), while the complement clause has no force, and thus does not produce its own intonational phrase.[3]

In Matukar Panau and other clause-chaining languages (e.g. Korafe: Farr 1999), illocutionary force scopes over the clause chain, which we will argue forms a single prosodic domain. Alongside illocutionary force the related dimension of information structure (e.g. topics, new vs given information) is also known to play a major role in prosodic organisation (Féry and Ishihara 2010; Büring 2016). Below we will illustrate some uses of prosody in Matukar Panau topic-comment structures, though a comprehensive treatment of information structure is beyond the scope of this study.[4]

3.3 Prosody of clause chains in Dolakhā Newar

Grammatical descriptions of clause chaining often observe that clause chains form an intonational unit, without analysing how this might reflect a hierarchy of prosodic constituents. Observations of pitch movement sometimes attest level or rising tone in medial clauses and falling tone in final clauses (e.g. Manam: Lichtenberk 1983: 103; Nungon: Sarvasy 2015). A more detailed account of clause-chain prosody is for the Tibeto-Burman language Dolakhā Newar (Genetti and Slater 2004; Genetti 2007a), with similar findings also reported for Kabardian (Applebaum 2013: 204). Newar has clause chains in which medial clauses have non-finite verbs, and only the final clause has a finite verb. While the notion of the "paragraph" is evoked in both the paratone literature and in some studies of clause chaining (e.g. Longacre 1985), Genetti instead evokes the notion of the "sentence," defining the Newar "syntactic sentence" as either a simple independent clause or a clause chain (Genetti 2007b: 485). Syntactic sentences usually prosodify as "prosodic sentences," marked by distinctive final boundary tones that appear at the end of syntactic sentences but not medial clauses.

Genetti and Slater (2004) annotated 243 clauses from a monologic narration of the *Mahābhārata* as having either "final" or "continuing" boundary tones. The most common final boundary tone is low, while continuing tones are high, though more nuanced final and continuing tone types are also discussed (Genetti and Slater 2004: 6–13). Finite clauses most frequently prosodify using a final boundary tone (n = 116), though some do prosodify with continuing tones (n = 28). Non-finite clauses have a more tightly constrained mapping, with almost all instances exhibiting continuing tones (n = 98), and just a single example found where a non-finite clause exhibits a final boundary tone. Thus, a complete syntactic sentence is predictably required to form a prosodic sentence. On the other hand, there is some flexibility

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3 The same principle can be adduced from sentences with different types of relative clauses (Potts 2004: 133; Selkirk 2005: 13). A sentence with a restrictive relative clause constitutes a single declarative statement and prosodifies as a single intonational phrase. But a sentence with a non-restrictive relative clause contains two declarative statements and two intonational phrases.
4 The narrative texts we annotated are either all-new sentences or have a topic-comment structure in which the topic domain is sometimes marked by an H% boundary tone. The question–answer text we annotated presents some instances of narrow focus, which appears to be marked by placing the head H* accent on the focused element, but does not affect prosodic phrasing.

in the possibility of integrating multiple syntactic sentences into a single prosodic sentence, perhaps reflecting the same type of pragmatically driven multiclausal groupings as are found in non-chaining languages.

Genetti (2007a) thus argues that the Dolakhā Newar syntactic sentence maps to a higher prosodic constituent above the intonational phrase. This implies an extension to prosodic hierarchy theory, which we further articulate in this study.[5] As we will see below, Matukar Panau clause-chain prosody is quite similar to Newar clause-chain prosody. We will argue that both datasets motivate an extension of prosodic hierarchy theory above the clause level.

4 Matukar Panau clauses and multiclausal structures

The grammatical analysis of Matukar Panau is based on fieldwork conducted by Barth between 2010 and 2020, drawing on a relatively large corpus (approx. 35 h of material). Matukar Panau is a verb-final language, with clause chains characterised by morphological dependency marking in medial clauses. Main clause operators such as illocutionary force, aspect, and mood have scope over all clauses in a chain, but there is only local scope for negation in each clause (cf. Bickel 2010). Matukar Panau clause chains are symmetrical in the sense of Haiman (1980): each clause has person marking for subject, object, and recipient arguments. The arguments can differ between the linked clauses, and there is no same-subject or different-subject marking to indicate this. There is frequent use of multiple medial clauses in sequence (i.e. the "chain") before the final clause. Both basic clause structure and clause chaining are further described in other studies (Barth and Anderson 2015; Barth and Ross forthcoming).

As mentioned above, Matukar Panau has two types of dependent clauses – medial and subordinate adverbial – both of which require an independent final clause. Table 1 illustrates the verbal suffixes that mark these clause types. A syntactic sentence is formed by a final clause, together with any preceding dependent clauses, be they either medials, subordinate adverbials, or a combination of both. Thus, the clause chain (i.e. a sequence of medials followed by a final) is an instance of the syntactic sentence, but there are also simple sentences and subordinate–matrix sentences.

Full TAM specification occurs only with final (independent) clauses, while adverbial and medial clauses predicate events with some dimensions of TAM under the scope of the final clause. Thus, Matukar Panau has a high-level "TAM phrase," with scope over one or more clauses. We identify this TAM phrase as the syntactic sentence, in line with a similar constituent identified in Dolakhā Newar (Genetti 2007b). Figure 2 illustrates this schematically, where the solid line indicates that TAM is fully marked on the independent clause, while dashed lines indicate dependent clauses that agree for TAM, but are in some respects underspecified.

4.1 Conditional sentences

Matukar Panau has two flavours of conditional subordinate adverbial clauses, a when-conditional and an if-conditional.[6] When-conditionals are marked with -*dope* on the protasis clause verb, and a final or medial verb in the apodosis clause. These are used primarily when an event is expected to occur, but it is not

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Table 1: Matukar Panau TAM verbal suffixes

Clause type	Suffix	Gloss	Meaning	Mood agreement
Independent	Ø	I:R, I:IRR:IMP	Realis unmarked events, imperative	—
	-e (∼ -nge ∼ -we)†	I:R:PFV	Perfective	—
	-go	I:R:IPFV	Imperfective	—
	-gokai	I:R:IPFV:HAB	Habitual	—
	-ba	I:IRR	Irrealis	—
	-bawai	I:IRR:DESID	Desiderative or near future	—
Subordinate adverbial	*-dope*	D:COND1	*When* conditional	Realis
	-tape	D:COND2	*If* conditional	Irrealis
	-kai	D:ADVS	Adversative	Realis
Medial	*-do*	D:R	Additive/conjunctive (simultaneous, overlapping)	Realis
	-e	D:SEQ	Realis (sequential)	Realis
	-ma	D:HAB	Habitual	Realis
	-p ∼ -dop	D:IRR	Irrealis (sequential, simultaneous, overlapping)	Irrealis

†The verbal suffixes in this table vary in form due to the following morphophonological rules: (1) glide /w/ epenthesis if the suffix begins with a vowel (only /e/ here) and the verbal stem (including stem and optional object or aspect suffixes) ends in /a, au, u/; (2) nasal epenthesis if the suffix begins with a vowel or non-nasal voiced consonant and the verbal stem ends in /ai, e, i, o/, the nasal inserted is /m/ before bilabials (only /b/ here), /n/ before alveolars (only /d/ here) and /ŋ/ elsewhere (here /e, g/); and (3) vowel /a/ epenthesis if the suffix begins with a consonant and the verbal stem ends in a consonant.
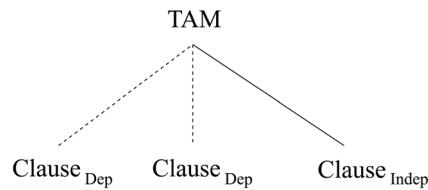

Figure 2: TAM scope over clause dependency structure.

happening in the moment, or for outcomes that necessarily follow a condition. The final clause is normally inflected with a realis imperfective suffix (*-go* or *-gokai*). In example (10), every time the speaker has her period (Conditional), she goes down to the beach (Final). The vast majority of conditional sentences consist of one subordinate adverbial clause before the final clause, but multiple adverbial clauses are possible (11). An example of an adverbial clause followed by a medial clause can be seen in Section 6.2.

(10) [*nga-ha-u*   *nal-dope*]c   [*ngau*   *lul=te*   *ng-a-gokai*]F
    1SG-CLF-1SG   time-D:COND1   1SG   beach=LOC   1SG-go-I:R:IPFV:HAB
    "When it's my time, I go down to the beach."

                                                                    (Clara Kusos Darr, "Sik Mun 20130412," line 13)

(11) [*garib*   *bal-eng*]NP   [*waiwaik*   *suwe-k-eng*]NP   [*ngam-mado-ndope*]c
    mat   throw-NMLZ   cava   stab-NMLZ-FOC   1PL-sit-D:COND1
    [*garib-alo*   *ngam-gamuk-adope*]c   [*awa-u*   *di-nong-go*]F
    mat-LOC   1PL-talk-D:COND1   mouth-1SG   3PL-hear-I:R:IPFV
    [In the context of customary meetings] "(My job is) throwing the mat, stabbing (preparing) the cava, when we sit, when we talk at the mat, they follow my advice."

                                                                    (Tomas Taleo Kreno, "DGB1-intro06-pk_tk," line 7)

If-conditionals are used in hypothetical situations, where it is not presumed that the event in the protasis will occur. Should it occur, however, the consequence will be the event expressed in the apodosis. The verb in the protasis clause is marked with the conditional suffix *-tape* and the verb in the apodosis clause has a final or medial TAM suffix. In (12, bold text), the speaker quotes herself explaining to Francis that if he doesn't talk to Josef, then Josef will be confused. She is trying to prevent the event in the protasis from happening. She then goes on to explain how Francis should tell Josef how to harvest the yams. Because of the hypothetical nature of the protasis, the apodosis is normally inflected with an irrealis suffix (Ø, *-ba* or *-bawai*).

(12)	[*Francis*	*nga-tuli*	*pan-i-nggo*			
	Francis	1SG-tell	give-3S-I:R:IPFV			
	"[***ong***	***ti***	***gamuk***	***pan-i-tape***]c	[***i***	***gadagad-aba***]F
	2SG	**NEG**	**talk**	**give-3SG-D:COND2**	**3**	**confuse-I:IRR**
	[*mainwai*	*ong*	*gamuk*	*pan-i-ndo-p*]M		
	therefore	2SG	talk	give-3SG-ADD-D:IRR		
	' [*manig*	*suwe-p*]F	[*w-abi-sa-ndop*]M'	[*i*	*te-mba.*]F"]F	
	like.this	stab-D:IRR	2SG-hold-up-D:IRR	3	see-I:IRR	

'I am telling Francis, "if you don't talk to him, he will be confused. Talk to him like this, 'stab like this, pull it up' and he will see."'

(Kadagoi Rawad Forepiso, "Yam Harvest Video Narration 2 20110802," line 5)

4.2 Clause chains

In Matukar Panau clause chains, the verbal suffixes in medial clauses encode temporal and causal relations between the event in one clause and its following clause. Medials (M) agree with the final clause (F) for realis or irrealis mood, and in some cases for aspect. While some other chaining languages allow for dependent clauses to occasionally form complete utterances (e.g. Nungon, see Sarvasy 2015), we have not observed any clear instances of this in Matukar Panau.

The irrealis medial suffix *-dop ~ -p* D:IRR co-occurs with final verbs inflected with either the general irrealis independent suffix (13), the desiderative irrealis independent suffix (14), or verbs in the imperative mood.[7] Example (13) shows an overlapping relationship between clauses. Examples (14, 15) show events that are sequential and pragmatically purposive.

(13)	...	[*mainwai-mi*	*ong*	*tuli-tap*]M	
	...	therefore-only	2SG	tell-D:COND2	
	[*ngau*	*nga-tuli*	*pan-o-p*]M	[*nong-aba*]F	
	1SG	1SG-tell	give-2SG-D:IRR	hear-I:IRR	

"That is why if you talk about this legend, I will tell you and you will listen"

(Peter Ratan Barui, Snake Mythology Story, line 90)

(14)	[*malal = te*	*ng-a-p*]M	[*bor*	*nga-dad-abawai*]F
	village = LOC	1SG-go-D:IRR	pig	1SG-buy-I:IRR:DESID

"I will go to the village and/to buy a pig."

(Kadagoi Rawad Forepiso, Elicitation CS34)

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7 As presented in Table 4, there is a realis medial suffix *-do* D:R. The *-dop* D:IRR suffix may be related and might have at one time been distinguished from *-p* D:IRR. However, there is no longer any clear difference in meaning between the two.

(15) [*kokoten*   *sisi-ndop*]ₘ   [*lumi-mba*]ꜰ
     young.coconut   husk-D:IRR   drink-I:IRR
     "He will husk the young coconut and/to drink it."
                                                    (Bruce Kainor Kaluk, "Niu do Mariu 20130422," line 145)

In the realis mood, there are three different medial suffixes, distinguished by aspect and the semantic connections between events. The medial *-do* D:R is primarily used for simultaneous or overlapping events (16), the medial *-e* is used for sequential events (17), and *-ma* D:HAB is used in habitual aspect (cf. Figure 4 in Section 6.2). All of these medial types co-occur with a final clause with realis mood marking. Note that the sequential realis medial *-e* D:SEQ is homophonous with *-e* I:R:PFV, the realis perfective suffix used in final clauses. This suffix therefore does not disambiguate medial/final clauses when looking at transcribed clauses in isolation. Contextual and pragmatic interpretation play a role in identifying the boundaries of some syntactic sentences, and as we will see below (Section 6.2), utterance-phrase prosody provides an important cue to this interpretation.

(16) [*i*   *di-fun-i-ndo*]ₘ   [*ngai-te-nggo*]ꜰ
     3SG   3SG-hit-3SG-D:R   1SG-see-I:R:IPFV
     "They are fighting and I am watching."
                                                    (Kadagoi Rawad Forepiso, Elicitation SS628)

(17) [*garang-anen*   *pain*   *tamat*   *bom*   *di-duni-nge*]ₘ
     jungle-P.POSS   woman   man   sago   3PL-wrap-D:SEQ
     [*bom*   *du*   *dabok*   *yasman*   *do*   *di-nale-nge*]ₘ   [*di-si-nge*]ₘ
     sago   basket   big   INTSF   and   3PL-take-D:SEQ   3PL-descend-D:SEQ
     [*lul-nen*   *di-pan-din-e*]ꜰ
     beach-P.POSS   3PL-give-3PL-I:R:PFV
     "People from the bush put sago in a basket, a really big basket of sago and they took it down to the people from the beach and gave it to them."
                                                    (Kadagoi Rawad Forepiso, "Kudas Sago Custom Introduction," line 1)

We have seen above that aspect and mood specification from the final clause has scope over medial clauses. Illocutionary force also has scope over the entire clause linkage (18), as has been reported for some other chaining languages (e.g. Korafe: Farr 1999).

(18) [*numa-n*   *nage-so-nge*]ₘ   [*aim*   *main*   *y-abi-nggo*]ꜰ   *o?*
     hand-3SG   put-VEN-D:SEQ   boy   PROX   3SG-hold-IPVF:I   Q
     "Is she putting down her hand and holding the boy?"
                                                    (Kadagoi Rawad Forepiso, "SocCog-mjk01-krf_spw_1," line 94)

Negative scope is local, with negation in final clauses only having scope for that particular clause (19). In this example, events in the medial clauses transpire and only the event in the final clause does not. This example shows a kind of event relation that is encoded with a complement clause in English, while in Matukar Panau there is no formal basis for distinguishing clause complementation from medial/final structures.

(19) [*ngau*   *ng-aip-e*]ₘ   [*ngai-te-nge*]ₘ   [*ti*   *gam*   *y-a-we*]ꜰ
     1SG   1SG-search-D:SEQ 1SG-see-D:SEQ   NEG   already   3SG-go-I:R:PFV
     "I looked and saw he didn't go yet."
                                                    (Kadgoi Rawad Forepiso, Elicitation CS154)

4.3 Verbless copula clauses (nominal predication)

Matukar also has verbless copula clauses (CP), where predication is expressed by juxtaposition of two nominal expressions. Because TAM is marked on verbs, verbless clauses are unspecified for TAM. In example (20), the past stative meaning is inferred from context, while in (21) present tense is inferred. We extend our notion of syntactic sentence to include verbless copula clauses, since they are not dependent on a subsequent clause for TAM agreement. Thus, the Matukar syntactic sentence, defined as a TAM phrase, may consist of one or more finite clauses in which the non-final clauses agree with the final clause for TAM; or it may consist of a single verbless clause where TAM is contextually interpreted.

(20) [*ngahau*   *mam*   *Matukar*   *tamat*]$_{CP}$
      1SG-CLF-1SG   father   Matukar   man
      "My father (was) a Matukar man" [elicitation from an adult whose father has passed away].

(21) [*main*   *bom*]$_{CP}$
      PROX   sago
      "This (is) sago" [elicitation while looking at sago about to be eaten].

As we will see below (Section 6.4), sequences of multiple copula clauses may be pragmatically integrated into a sentence, where the contextually interpreted TAM is shared across the sequence and the whole prosodifies as an utterance phrase.

5 Matukar Panau prosodic hierarchy

5.1 Data and method

The prosodic analysis of Matukar Panau requires more intensive annotation than the grammatical description, and is therefore based on a smaller dataset. We use three of the corpus texts, each of which is accessible with audio and prosodic annotations via the PARADISEC archive.[8] The three texts are spoken by different speakers (two women, one man). Two texts are monologic narratives. In "Sik Mun,"[9] the Tok Pisin for a women's time of menstruation, Clara Kusos Darr recounts how women dealt with their periods in her mother's time, in her own time, and now in her daughter's time. Tomas Taleo Kreno, a clan leader, recounts his life story in second text.[10] The third text, from a picture elicitation task (San Roque et al. 2012), has Kadagoi Rawad Forepiso asking her sister Sel Pain Wadom questions about several picture task cards.[11] In this third text, we annotate solely the declarative answers given by Sel Pain, as question prosody is outside the scope of this study. We selected this third text to include data representing a different speech genre, though we did not find any major difference between this dialogic speech and the monological narratives, suggesting that the utterance phrase is a general phenomenon, not specific to monologues. Table 2 lists the three texts used for prosodic analysis and gives the number of intonational phrases annotated. Prosodic annotation was done by Mansfield, based on listening and inspection of pitch traces in Praat (Boersma and Weenink 2021).

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8 https://catalog.paradisec.org.au/collections/DGB1/, https://catalog.paradisec.org.au/collections/SocCog/
9 Clara Kusos Darr Sik Mun DOI: 10.4225/72/5989e01da4865
10 Life Story of Tomas Taleo Kreno: DOI: 10.4225/72/570A813474DEC
11 Matukar Panau_Kadagoi_Sel Pain_Silam Pain DOI: 10.4225/72/570BD04894D0E

Table 2: Intonational phrases annotated in our corpus

Recording	Duration	Intonational phrases	Type
Sik Mun	3:20	54	Monologic narrative
Tomas Taleo Kreno Life Story	2:35	62	Monologic narrative
Family Problems	7:34 (1:30 annotated)	28	Dialogic answers (*questions not annotated*)
Total		**144**	

5.2 The prosodic constituents

Our main focus in this study is on higher prosodic constituents, but we begin by providing a preliminary analysis of lower prosodic domains.

Matukar Panau appears to have word stress, falling on the stem-final syllable of content words. Thus, for simple words we hear word-final stress, e.g. *kalám* "moon," while for suffixed verbs we hear a word-internal stress, e.g. *di-nagé-nggo* "3P.S-put-I:R:IPFV." While phonetic analysis of word stress is outside the scope of this study, its identification is facilitated by H⋆ pitch accents that are anchored to these syllables, usually one per phonological phrase (see below). We tentatively analyse the stress domain, encompassing prefix and stem, as a "prosodic word" (ω). As is common for prosodic words (McCarthy and Prince 1993), this domain requires bimoraic minimal weight, evidenced by phonetic vowel lengthening in prosodic words that consist of a single open syllable. This can be observed both in simple words such as *ti:* "not," and in verbs where the stem and prefix together consist of a single open syllable, e.g. *ng-a:-gokai* "1s.s-go-I:R:IPFV:HAB."

One or more prosodic words are encompassed by a "phonological phrase" (φ), in which one main content word has an H⋆ pitch accent aligned to its stressed syllable. Phonological phrases may be followed by pauses.[12] The Matukar Panau phonological phrase prosodifies syntactic phrases such as NPs, AdvPs, PPs, and verbs. However, we also find sequences of two or three such syntactic phrases prosodifying with a single pitch accent; this could be interpreted either as prosodic integration into a single φ constituent or as de-accentuation in some φ constituents (Cruttenden 2006). Example (22) shows a sentence annotated for ω and φ prosody (subsequent examples will instead be annotated for intonational and utterance phrases).

(22) [[ngáu]ω]φ   [[nga-há-u]ω   [nen]ω]φ   [[matugár]ω   [pain]ω]φ
      I   1SG-CLF-1SG   mother   Matukar   Woman
      "Me, my mother was a Matukar woman."

                                                   (Clara Kusos Darr, "Sik Mun 20130412," line 1)

The intonational phrase (ι) is marked by a right boundary tone: L%, H%, or HL%. It is also sometimes referenced for the scaling of H⋆ accents. These show a general pattern of declination over the utterance phrase, but in some examples there are minor resets at ι boundaries, while in others there appear to be distinct accentual registers in different ι constituents. We annotate H⋆ declination as [H⋆ ↓H⋆ …], but also note some instances of accentual upstep (e.g. in topic-comment structures) as [H⋆ ↑H⋆ ↓H⋆ …].

The utterance phrase (υ) does not produce tones as such, but rather involves scaling of tones in daughter ι constituents. This is clearest for low right-boundary tones, which are "semi-low" on all non-final ι daughters (annotated ↑L%, though we discuss alternative analyses below), while only the final ι daughter drops to the bottom of the register and is "fully low" (annotated L%). There is not necessarily a consecutive scaling of ↑L% tones within the υ constituent: often multiple ↑L% tones are of a similar pitch,

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12 Interestingly, this prosodic unit is quite different from the "intermediate phrase" proposed for Austronesian languages of Indonesia and East Timor, where the H tone is at the right edge, and there is rarely a following pause (Himmelmann 2018).

while the L% tone is markedly lower. When the speaker is already in the lower part of their register, the ↑L% tone may be produced as a lengthened ending without clear pitch lowering. This results in some phrases where the presence of a ↑L% tone is not altogether clear-cut (see examples below), though in most cases its presence is fairly obvious.[13] H* pitch accents usually show declination across the υ domain, with a major pitch reset at the beginning of a new υ, but we also sometimes observe partial H* resets at ι boundaries. Substantial pauses occur reliably between υ constituents in our data, whereas ι constituents may be either followed by a pause or run on immediately to the next ι constituent.

The following section will illustrate several examples of higher-level prosody, analysed in terms of prosodic mapping from clauses and sentences.

6 Prosodic mapping of Matukar syntactic sentences

The Matukar Panau syntactic sentence is by default mapped onto a prosodic utterance phrase (υ), within which each clause is mapped onto an intonational phrase (ι). Adverbial clauses map to intonational phrases with H% or HL% boundaries, while medial and final clauses have L% boundaries. As mentioned above, the L% on a final clause is noticeably lower than any medial L% boundaries. A simple sentence (i.e. a single independent clause) prosodifies as an intonational phrase with a fully low L% boundary, indicating that it is a complete utterance phrase in itself.

The Matukar Panau data also exhibit flexibility in prosodic mapping, especially where prosodic integration (Booij 1996; Bishop 2002: 390), also known as "restructuring" (Nespor and Vogel 2012: 172), causes a syntactic constituent to be prosodified lower than its default level. This may be associated with speech style, phrase length, or with pragmatically motivated groupings as found in non-chaining languages (Section 3.1). If a syntactic constituent S is observed to prosodify variably at levels n and $n-1$, and the $S \rightarrow P_{n-1}$ mappings are associated with factors known to cause prosodic integration, we can treat $S \rightarrow P_n$ as the default syntax-prosody mapping. Where prosodic integration occurs on the sentence level, multiple syntactic sentences prosodify as a single utterance phrase. We label this grouping a "pragmatic sentence."

Table 3 shows how syntactic structures map onto υ, ι, and φ constituents in three Matukar Panau narrative and dialogic texts (see Section 5.1). Shading highlights the mappings that never occur, while bold figures highlight what we analyse as default mappings: medial and subordinate adverbial clauses prosodify as an ι which is non-final in its parent υ, while final clauses prosodify as the final ι in υ. Medial and subordinate adverbial clauses never prosodify as υ-final,[14] indicating that a syntactic sentence, with a final clause, is required to produce an utterance phrase. There are 35 instances of final clauses in the υ-final position, reflecting the default mapping of syntactic sentence → utterance phrase, and 11 instances of final clauses in the υ-medial position, reflecting prosodic integration into pragmatic sentences. Verbless copula clauses, which we also consider to be syntactic sentences, show a similar pattern of more frequently prosodifying as utterance phrases (17 instances), and less frequently as utterance-internal intonational phrases (6 instances). All clause types may also prosodify as φ, integrating into the following ι constituent rather than forming their own ι constituent; this occurs most often with medial clauses. The Adjunct category is a diverse set of non-clausal units for which we do not propose any default mapping. Eight prosodic phrases were excluded as having unidentifiable syntactic type, leaving 167 prosodic phrases.

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13 Out of 51 ↑L% tones in our data, we noted 44 instances as obvious (i.e. clear lowering on phrase-final syllable) and 7 instances as ambiguous (without clear lowering, but already in the lower part of the register and with phrase-final lengthening). Reinterpretation of the ambiguous cases as lacking any boundary tone would suggest more extensive prosodic integration of consecutive medial clauses into a single ι constituent.
14 This is true both of our prosodically annotated dataset, and our wider impressions based on our experience with the language.
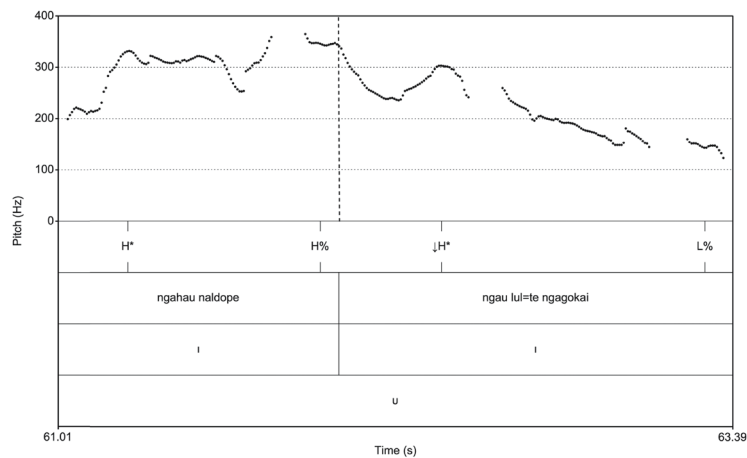
Table 3: Prosodic mappings annotated in our corpus (see Section 3)

	υ-final ι	υ-medial ι	φ	Total
Medial	0	**34**	15	49
Subordinate adverbial	0	**13**	2	15
Final	**35**	11	1	47
Copula clause	**17**	6	1	24
Adjunct NP, AdvP	8	21	3	32
Total	**60**	**85**	**22**	**167**

Bold figures highlight those prosodic mappings that we consider to be default mappings. Shaded cells highlight prosodic mappings that never occur in our data.

6.1 Conditional sentences

In conditional sentences, the conditional (subordinate) protasis clause usually prosodifies as an ι constituent with an H% or HL% boundary tone. The (final) apodosis clause prosodifies as a second ι constituent, this time with an L% boundary, as illustrated in Figure 3. This prosodic pattern is exhibited for 13/15 adverbial clauses in our data. The remaining two instances involve prosodic integration, where the adverbial clause is prosodically integrated into the same ι as the apodosis (Figure 8).

[*nga-ha-u   nal-dope*]꜀   [*ngau   lul=te   ng-a-gokai*]ꜰ
1SG-CLF-1SG   time-D:COND1 1SG   beach=LOC 1SG-go-I:R:IPFV:HAB
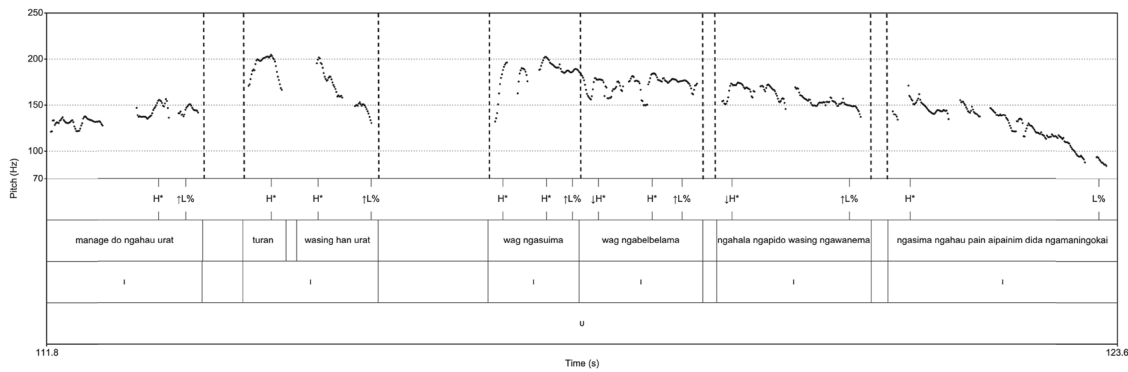'When it's my time, I go down to the beach'

(Clara Kusos Darr, 'Sik Mun 20130412', line 13)

Figure 3: Adverbial clause with H* protasis.

6.2 Clause chains

Medial clauses in our data either form non-final ι constituents or are prosodically integrated into the following clause's ι constituent. Only a final clause can be the final ι constituent in the υ domain. The primary evidence for this is relative pitch of L% boundaries. Chains may also contain conditional adverbial clauses, with H% or HL% boundaries as mentioned above.

Figure 4 shows an υ embracing two copula clauses (CP), five medial clauses (M), and a final clause (F). Each of the first two copula clauses prosodifies as an ι constituent with a ↑L% boundary (for more on copulas see Section 6.4). The medial clauses are all either prosodically integrated or have ↑L% boundaries.

[Manage   do   nga-ha-u   urat]_CP [tura-n   wasing   ha-n   urat]_CP
like.that and   1SG-CLF-1SG   work   other-3SG   fish   CLF-3SG   work

[wag   nga-sui-ma]_M   [wag   nga-belbel-ama]_M
canoe   1SG-shoot-D:HAB   canoe   1SG-tie.with.ropes.to.float.of.outrigger.canoe-D:HAB

[nga-hala   nga-pid-do]_M
1SG-ascend   1SG-descend-D:ADD

[wasing   nga-wane-ma]_M   [nga-si-ma]_M
fish   1SG-catch-D:HAB   1SG-descend-D:R

[nga-ha-u   pain   aipain-im   di-da   ngam-ani-ngokai]_F
1SG-CLF-1SG   woman   child-PL   3PL-COM   1PL.EXCL-eat-I:RPFV:HAB
'This is my work, the other one is the work of fishing, I hollow out canoes, I tie the canoes
with ropes to their floats, I go out, I catch fish, I come back, and I eat with my wife and
children.'   (Tomas Taleo Kreno, 'Life Story 20130407', lines 32-36)

Figure 4: Clause chain with medial ↑L% tones and final L% tone.

Only the final clause has L% indicating the end of the υ constituent. For this male speaker, the L% tone is around 90 Hz and ↑L% tones are 130 Hz or above. This example also suggests distinct tonal registers for ι constituents: the first ι is at a lower level around 130–150 Hz; the second has an ↑H* upstep to 200 Hz but returns to 150 Hz at its ↑L% boundary; the third ι moves up to a higher register around 190 Hz; and the remaining ι constituents occupy successively lower registers, accompanied by successively lower ↑L% boundaries. Other patterns of register shift and associated relative ↑L% levels are found in other examples (compare Figure 7).

There are potential alternative analyses of ↑L%. On the one hand, the failure to descend to the bottom of the register could be analysed as a targetless boundary, "%" (Gordon 2005: 316; Gussenhoven 2005: 125). However, we prefer the ↑L% analysis to this, since in those instances where the preceding pitch level is fairly high, as in the second intonational phrase of Figure 5, there does appear to be a "targeted" downward pitch movement to ↑L%. Another alternative analysis is that these are downstepped ↓H% boundaries (Arvaniti and Baltazini 2005), which might be seen as parsimonious given our analysis of downstepped ↓H* accents. However, the disadvantage of this analysis would be that it conflates different types of pitch movements: our ↓H* accents often involve upwards movement, albeit to a lower level than the preceding accent (as in the fourth intonational phrase of Figure 4). But the ↑L% boundary involves either downwards movement, or level tone where the register is already fairly low, but never movement towards a high target.

Figure 5 illustrates the prosody for a habitual aspect clause chain. Again the chain prosodifies as a υ constituent, but here the first medial clause has an HL% boundary tone. Medial clauses with H% or HL% tones are less common (11 instances) compared to medial clauses with ↑L% tones (23 instances). While our current data are insufficient to conclusively interpret this tonal variation, it is notable that the HL% medial clause in this instance forms a tail-head linkage with the final clause of the preceding chain. This example
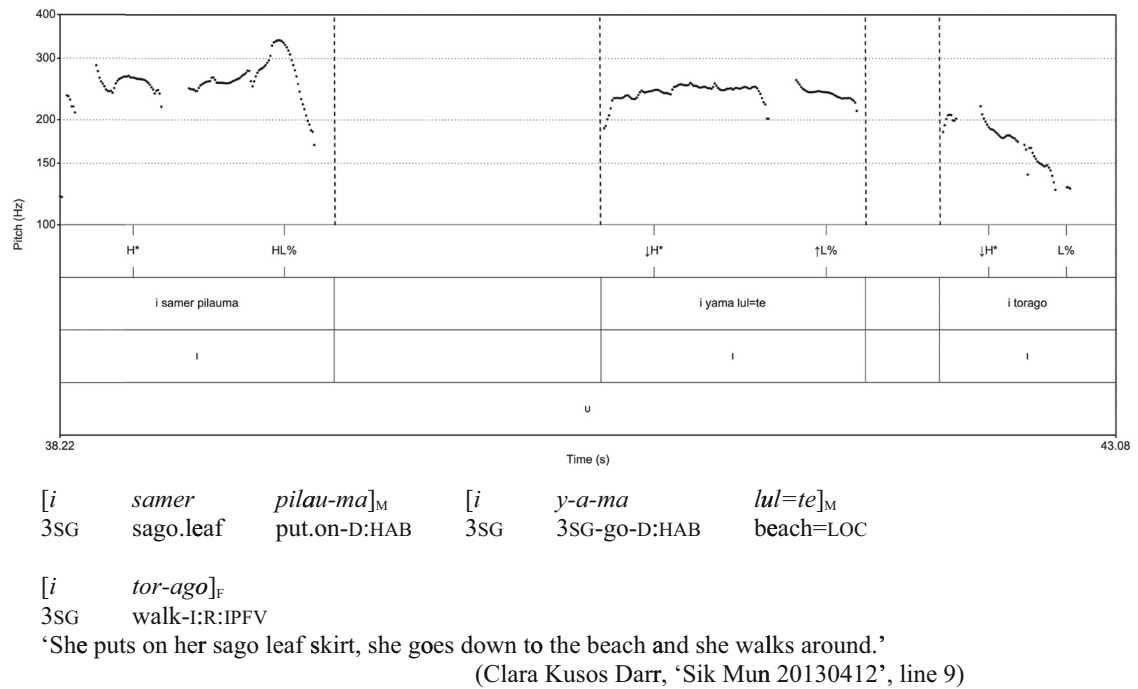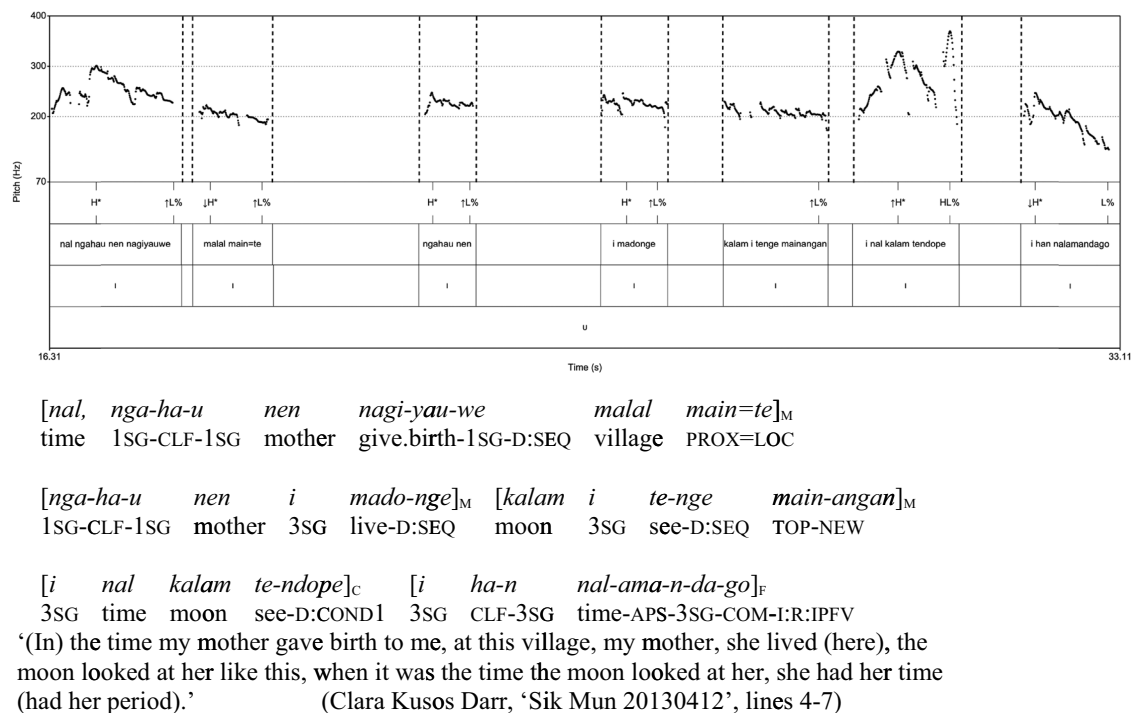
[i   samer   pilau-ma]ₘ   [i   y-a-ma   lul=te]ₘ
3SG   sago.leaf put.on-D:HAB   3SG   3SG-go-D:HAB beach=LOC

[i   tor-ago]ꜰ
3SG   walk-I:R:IPFV
'She puts on her sago leaf skirt, she goes down to the beach and she walks around.'
(Clara Kusos Darr, 'Sik Mun 20130412', line 9)

Figure 5: Clause chain with HL% on the first medial clause.

also shows H★ declination across the whole υ constituent, without any H★ resets at the ι boundaries (see also Figure 11).

Figure 6 illustrates a sequence where three clauses have the *-e* suffix that is potentially ambiguous between two interpretations: medial realis sequential and final realis perfective. The interpretation of these

[nal, nga-ha-u   nen   nagi-yau-we   malal   main=te]ₘ
time   1SG-CLF-1SG mother give.birth-1SG-D:SEQ village PROX=LOC

[nga-ha-u   nen   i   mado-nge]ₘ [kalam i   te-nge   main-angan]ₘ
1SG-CLF-1SG   mother 3SG live-D:SEQ   moon   3SG see-D:SEQ   TOP-NEW

[i   nal   kalam te-ndope]ᴄ   [i   ha-n   nal-ama-n-da-go]ꜰ
3SG   time   moon   see-D:COND1   3SG   CLF-3SG   time-APS-3SG-COM-I:R:IPFV
'(In) the time my mother gave birth to me, at this village, my mother, she lived (here), the moon looked at her like this, when it was the time the moon looked at her, she had her time (had her period).'   (Clara Kusos Darr, 'Sik Mun 20130412', lines 4-7)

Figure 6: Clause chain with medial ↑L% tones and final L% tone.

as medial unspecified clauses is suggested by the imperfective marking on the final clause in the sequence, together with pragmatics and prosody. The three -*e* D:SEQ clauses all have ↑L% tones, indicating that they form a sentence with the final -*go* I:R:PFV clause. The sentence status of this example thus involves the interaction of syntax, pragmatics, and prosody. This υ constituent is produced with several pauses, and ι constituents prosodify not just for clauses but also lower phrases such as the locative NP *malal main=te*. The example also shows a minor reset between the second and third ι constituents (perhaps indicating a partial restart of the sentence). There is a larger accentual upstep in the penultimate clause, which may be due to the role of high pitch in topic-comment structures (see also Figure 9). The previous clause has introduced "the moon looked at her" as new information, and the upstepped clause repeats this as the first part of a topic-comment sequence: "when it was the time the moon looked at her/she had her time (had her period)." For this female speaker, the L% tone is around 130 Hz, while ↑L% tones are around 200 Hz (see also Figure 5), and when she is already in that pitch range the ↑L% tone may be realised as a level, long final syllable.

Figure 7 illustrates prosodic integration of the first two medial clauses into the ι of the following conditional adverbial clause, which has the typical H% boundary. The next medial clause, *ngasa ngapi-dama ab=ate*, is an example of somewhat ambiguous prosody. It is followed by a pause, but it does not exhibit either the ~200 Hz pitch or lengthening characteristic of a ↑L% tone, and we therefore annotate it as toneless, i.e. prosodically integrated. On the other hand, two NPs denoting beneficiaries in the final clause have gently descending, lengthened final syllables which we do annotate as ↑L% tones.

[*ng-a-ma*]M   [*nga-tor-la-p*]M   [*nga-ha-u   nal   ti-dope*]C
1SG-go-D:HAB   1SG-walk-ALL-D:IRR   1SG-CLF-1SG   time   finish-D:COND1

[*nga-sa   nga-pid-ama   ab=ate*]M
1SG-ascend   1SG-descend-D:HAB   house=LOC
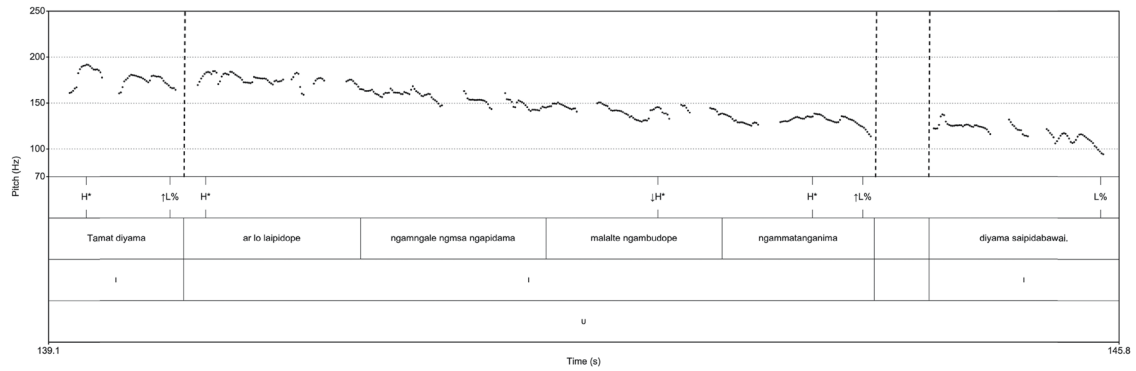
[*nga-ha-u   tamat   ng-ha-u   aipain-im   andi   bad   nga-nage*]F
1SG-CLF-1SG   man   1SG-CLF-1SG   child-PL   BEN   pot   1SG-put
'I go, I walk around, when my time is finished, I come back up to the house, I put the pot (cook food) for my husband and my children.'
                                        (Clara Kusos Darr, 'Sik Mun 20130412', lines 14-15)

Figure 7: Clause chain with medials lacking boundary tones.

Figure 8 illustrates a seven-clause chain with more extensive prosodic integration. Four clauses in the middle of the sentence (two adverbial and two medial) are integrated into a single long ι constituent, which also has few distinguishable H* accents. The last medial clause, *diyama*, is prosodically integrated with the final clause.

[tamat   di-ya-ma]_M   [ar=lo   lai-pid-dope]_C
man   3PL-go-D:HAB   fence=LOC   go-descend-D:COND

[ngam-ngale   ngam-sa   ngam-pid-ama]_M
1PL.EXCL-take   1PL.EXCL-ascend   1PL.EXCL-descend-D:HAB

[malal=te   ngam-bud-dope]_C   [ngam-matangani-ma]_M
village=LOC   1PL.EXCL-meet-D:COND   1PL.EXCL-straighten-D:HAB

[diy-a-ma]_M   [sai-pid-abawai]_F
3PL-go-D:HAB   ascend-descend-I:IRR:DESID
'Men go, when they go down to jail, we get them and come up, when we meet at the village,
we fix (things), they go and it will be good.'   (Tomas Taleo Kreno, 'Life story', line 43)

Figure 8: Clause chain both medial and adverbial integration.

6.3 Final clauses that are prosodically non-final

There is also prosodic integration of final (i.e. independent) clauses, which are sometimes non-final within υ. Note that the opposite situation, i.e. a medial clause being final within υ, never occurs in our data. Figure 9 illustrates a υ constituent where the first clause is syntactically independent (ending in the verb *di-tor-ago* 3PL-walk-I:R:IPFV), but prosodically integrates with the following ι constituent, as indicated by a ↑L% boundary (which here is essentially level with the preceding unaccented syllables). In this instance, the relationship between the first clause and those that follow is not of the temporally sequential type that would induce syntactic chaining. However, the first statement ("children with their own thoughts") has an implied causal relationship with the second statement ("they don't do it right"). The grouping of clauses is also reinforced by pronominal anaphora. This shows that connected events are not always syntactically chained in Matukar Panau, but may nonetheless be prosodically integrated as a υ constituent. The υ constituent is the default prosody for a syntactic sentence, but may also prosodify pragmatically grouped sentences, as in non-chaining languages.

Figure 9 also illustrates two instances of a topicalisation structure in which *main-angan* TOP-NEW marks a topic upon which the speaker is about to comment (see also Figure 3). Each topicalised phrase in this example prosodifies as an ι constituent with an H% boundary, though the rise is somewhat suppressed in the first instance. The association of H% boundaries with topics is also reflected in adverbial clauses, which usually have H% or HL% boundaries, and often function to present a topic upon which the apodosis provides a comment. The use of H boundaries for topicalisation has also been reported for Austronesian languages of Indonesia and East Timor (Himmelmann 2018).

Figure 10 illustrates another example of final clauses with non-final prosody. In this instance, three clauses form a list, each using the verb *pan* "give" with an independent TAM suffix. The first two independent clauses are part of a larger rhetorical structure, i.e. a pragmatic sentence, and integration into a single

[*manage,   aipain-im   gauni   main-angan   hibe-di   ilo-di   hona-mi*
like.that   child-PL   today   TOP-NEW   self-3PL inside-3PL with-only
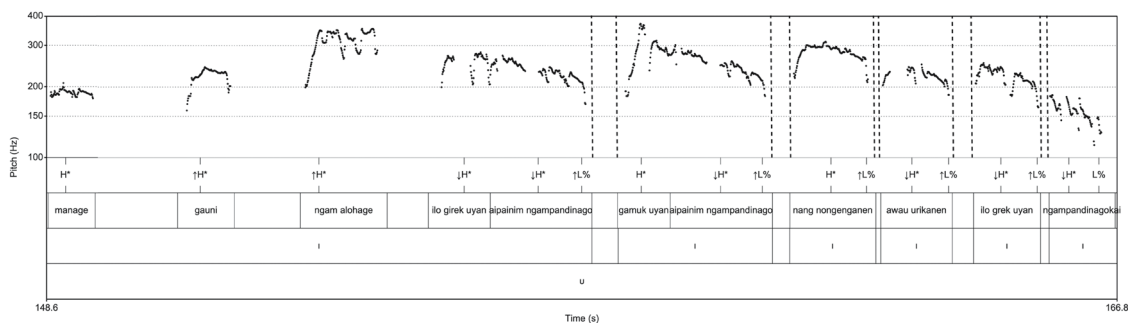
di-tor-ago]F   [*i   nen-ad   mam-ad   wagam-ami i   milo   o*
3PL-walk-I:R:IPFV 3SG mother-COLL father-COLL before-only 3SG something or

di-nage-nge   main-angan]M [*ti   di-matangani   di-uri-nggo*]F
3PL-make-D:SEQ TOP-NEW   NEG 3PL-straighten 3PL-follow-I:R:IPFV
'Like that, these children now, walk around with their own thoughts. (How) all the mothers,
all the fathers used to do something, they don't do it right (lit:SVC follow straight).'

(Clara Kusos Darr, 'Sik Mun 20130412', lines 21–22)

Figure 9: Final clause that is not prosodically final.

[*manage,   gauni   ngam   alohage   ilo   gire-k   uyan*
like.that   today   1PL.EXCL later   inside think-NMLZ good

aipain-im   ngam-pan-din-ago]F   [*gamuk   uyan   aipain-im*
child-PL   1PL.EXCL-give-3PL-I:R:IPFV talk   good   child-PL

ngam-pan-din-ago]F
1PL.EXCL-give-3PL-I:R:IPFV

[*nang   nong-eng-anen   awa-u   uri-k-anen,*
talk   hear-NMLZ-P.POSS mouth-1SG follow-NMLZ-P.POSS

ilo   gire-k   uyan ngam-pan-din-agokai]F
inside think-NMLZ good   1PL.EXCL-give-3PL-I:R:IPFV:HAB
'Like that, today, we since then give the children advice (lit: good thinking), we give the
children good talk, the hearing of talk, the following of my advice (lit. my mouth), advice (lit:
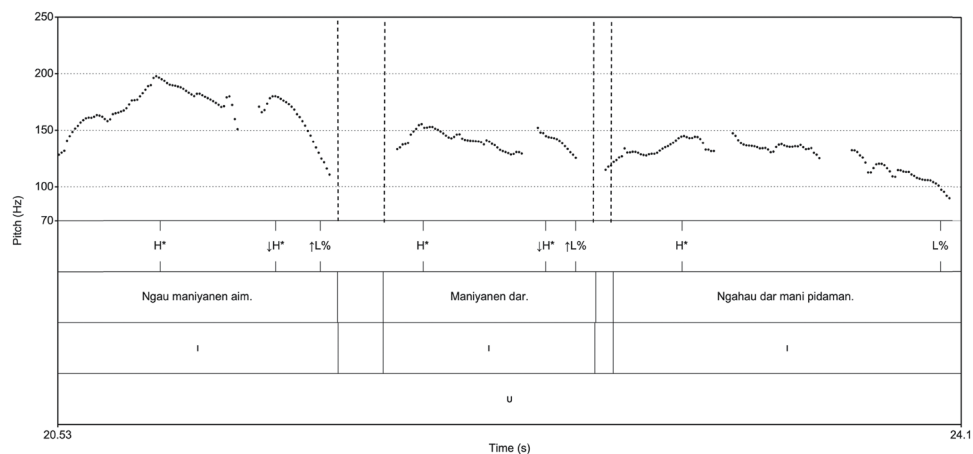good thinking), we always give them (this).'

(Clara Kusos Darr, 'Sik Mun 20130412', lines 26-27)

Figure 10: Final clause that is not prosodically final.

υ group provides a prosodic cue for this. The final clause of this example contains three nominalised clauses, which could be regarded as another type of clause subordination. These three form a kind of list and prosodify as non-final ι constituents with ↑L% boundaries. However, nominalised clauses do not always prosodify as ι constituents (e.g. *ilo girek uyan* in the first line of this example), and we suspect that the insertion of ι boundaries here may be due to the list structure. This example also illustrates partial H⋆ reset at ι boundaries, in particular between the second and third, and fourth and fifth, ι constituents.

6.4 Copula clause sequence

Most of the copula clauses in our data prosodify as an ι forming its own υ group, which is consistent with our proposal that copula clauses are syntactic sentences. However, pragmatically grouped copula clauses, with a shared TAM interpretation, may be prosodically integrated into a υ group. Figure 11 illustrates the prosody of the three copula clauses integrated into a single υ constituent, as evidenced by the ↑L% and L% boundaries. The three clauses share TAM interpretation and form a rhetorical unit using word repetition to develop a single idea of belonging.

[*ngau* *mani-yanen* *aim*]CP [*mani-yanen* *dar*]CP
1SG   here-P.POSS   boy   here-P.POSS   blood

[*nga-ha-u*   *dar*   *mani* *pid-ama-n*]CP
1SG-CL-1SG   blood   here   descend-APS-3SG
'I am a boy from here, (I have) blood from here, my blood has here its fall (i.e. my blood falls here).'   (Tomas Taleo Kreno, 'Life Story 20130407', lines 6-9)

Figure 11: Three verbless clauses prosodically integrated into an utterance phrase.

7 Summary and discussion

In this study, we have presented the grammar of clause chaining and clause subordination in Matukar Panau. Final clauses are fully independent and can stand as simple sentences on their own, but medial and subordinate clauses depend upon a following final clause, with which they may agree for modality or aspect. A syntactic sentence is thus made up of a final clause, and any number of preceding medial and subordinate clauses. Verbless copula clauses, with unspecified TAM, are an additional type of syntactic sentence.

We have shown that clauses prosodify as intonational phrases, which are marked by right boundary tones and are also sometimes referenced for H* accentual scaling. Medial and final clauses usually have an L% boundary, while subordinate adverbial clauses usually have an H% or HL% boundary (though medial clauses also sometimes have H% or HL% boundaries). The syntactic sentence prosodifies as an utterance phrase, whether it is a simple sentence, a subordination structure, or a clause chain. The utterance phrase is a tonal scaling group in which the final L% boundary is markedly lower than any non-final ↑L% boundaries. Accentual declination is usually observed across the entire utterance phrase, though there are sometimes minor H* resets at intonational-phrase boundaries.

Matukar Panau has prosodic mapping of clause to intonational phrase, as in standard prosodic hierarchy theory, but additionally maps a higher syntactic constituent, the sentence, to a higher prosodic constituent, the utterance phrase. These are default syntax–prosody mappings, from which utterances may deviate in various ways, especially prosodic integration where syntactic constituents prosodify at a level lower than their default. Pragmatic links between independent clauses may lead to their prosodic integration as a single utterance phrase, a phenomenon which we have characterised as a "pragmatic sentence," in contrast to the "syntactic sentence" of clause chains. Matukar Panau pragmatic sentences mirror the type of pragmatic units that prosodify as utterance phrases (or "paratones") in non-chaining languages such as English. But what distinguishes Matukar Panau, and perhaps other clause chaining languages, is that there is also a clearly defined syntactic constituent that maps to the utterance phrase.

Our analysis of Matukar Panau echoes the earlier study of clause chains in Dolakhā Newar, where a similar syntactic sentence uses H% boundary tones to mark medial clauses and L% tones to mark final clauses (Genetti and Slater 2004; Genetti 2007a). Although Genetti does not link this explicitly to the labels used in prosodic hierarchy theory, an intonational phrase/utterance phrase analysis also seems applicable to Dolakhā Newar. The main difference between Matukar Panau and Newar is that the Matukar Panau utterance phrase is marked by the scaling of boundary tones, while the Newar utterance phrase is marked by a different selection of boundary tones. It is notable that previous descriptions of clause chain prosody observe H% boundaries on medial clauses (see also Manam: Lichtenberk 1983: 103; Nungon: Sarvasy 2015), whereas Matukar Panau instead uses scaled L% tones, as well as medial H% and HL% tones. This suggests that mapping of syntactic sentences to utterance phrases may be generalisable to some other clause-chaining languages, though the details can vary in both the syntactic and prosodic domains.

7.1 Utterance phrase or recursive intonational phrases?

In other work, H* scaling has been used to argue for recursive embedding of phonological phrases (Itô and Mester 2012) or intonational phrases (Ladd 1988; Truckenbrodt and Féry 2015), rather than a distinctly labelled prosodic constituent. Therefore, we may consider recursive intonational phrases as an alternative interpretation of the Matukar Panau data. However, there are a number of reasons to prefer the analysis with a distinct υ constituent determining pitch scaling among groups of ι constituents.

Ladd (1988) focuses on H* pitch accent scaling. Since intonational phrases have internal downstep of pitch accents, and the multi-clause group shows a higher level of nested accentual downstep, the higher level may be regarded as a parent intonational phrase encompassing daughter intonational phrases. However, this does not take into account the downstep among L% boundary tones, which has also been observed in English multi-clause sequences (Brown et al. 1980: 30; Wichmann 2000: 58). Boundary tones show that the higher constituent has a type of scaling not found in intonational phrases. On our interpretation, intonational phrases are marked by the *presence* of boundary tones, while the utterance phrase is marked by the *scaling* of boundary tones, and sometimes additional scaling of pitch accents.

Some analyses propose minimal and maximal sub-types of a recursive constituent, e.g. φ_{min} vs φ_{max} (Selkirk 2011; Itô and Mester 2012; Elfner 2015). But while this may be motivated where the same syntactic phrase type is recursively nested, in Matukar Panau the clause and the clause chain are clearly different constituents. Indeed, the lack of any clear syntactic constituent above the clause in non-chaining languages has arguably been one

reason not to include a higher prosodic constituent in some versions of prosodic hierarchy theory. But in a theory that encompasses the clause-chain as a syntactic constituent, present in some languages but not others, there is a stronger motivation to posit a distinct prosodic constituent above the clause level.

We propose that in general, where there is a prosodic constituent that bears tonal marking, and multiple instances of the constituent are gathered into a scaling group, the scaling group should be treated as a distinct constituent unless the lower and higher domains can be shown to be equivalent, syntactically, and/or phonologically (cf. Bickel et al. 2009: 51). This approach still allows for prosodic recursion where it is well-motivated, but overall may result in a larger number of distinct prosodic levels than have been proposed in some recursion analyses.[15]

7.2 Limitations and further research

Finally, we would like to emphasise that this study is one of the first forays into prosodic hierarchy analysis of clause chaining. There are several limitations of this study, each of which implies directions for further research. Like many studies of the prosodic hierarchy, our work is based on impressionistic observations of prosodic cues, namely pitch accents and boundary markers. While our annotations were produced by careful audition and visual inspection of pitch traces, we have not attempted to systematically measure and statistically test the phonetic cues of Matukar Panau prosody. Furthermore, this study has been deliberately constrained to particular sentence types, annotating declarative sentences in monological narrative and dialogic discussion. Analysis of other sentence types would be required to describe the range of pitch and boundary tones used in the language. The role of information structure has also remained largely outside the scope of this study. Finally, our findings represent just one clause chaining language. Although the syntactic types of clause linkage has been a rich area of study (e.g. Bril 2010; Genetti 2005; Longacre 2007), and although authors acknowledge a prosodic component to clause linkage, the prosodic aspect of clause linkage is under-studied. It is difficult to know if our observations of Matukar Panau are similar for other languages of Papua New Guinea. Further research is required to show whether the prosodic constituency we propose can be supported in other clause chaining languages, either in Papua New Guinea or in other chaining regions such as the Amazon.

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15 An example is Japanese prosodic phrasing, where the "minor phrase" is the domain of at most one H*L pitch accent, and pitch accents are downstepped in scaling groups. Itô and Mester (2012) analyse the scaling groups as recursive instantiations of the minor phrase. This compels them to distinguish φ_{min} and φ_{max} subtypes, where only φ_{min} is constrained to contain a single pitch accent. In our analysis, the purported "min" and "max" subtypes are simply different prosodic constituents. The former is marked by tones and is not recursive. The latter is a scaling domain, and it is this domain that can be recursive (as evidenced by multiple levels of nested scaling).

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