A PRELIMINARY DOCUMENTATION OF KIOWA INTONATION AND PROSODY

by (redacted)

This paper provides a preliminary documentation of the sentential intonation and prosody of the Kiowa language (kio), which is the heritage of the Kiowa Tribe of Oklahoma, indigenous to the United States. Relying on archived recordings and recent elicitation, we focus on the interaction of intonation with tone.[1] We observe that peak pitch generally aligns with the left edge either of the entire intonational phrase or one of its prosodic phrase constituents. From this peak a downdrift can be observed.

1. Background. The Kiowa language is fairly well documented and analyzed, so we can start with a solid basis for understanding prosodic phrasing. This section will introduce readers to the relevant aspects of Kiowa morphosyntax and phonology so they will share this basis, and discuss the previous research touching upon Kiowa prosody.

1.1. Situational background of the Kiowa language. Kiowa is a member of the Kiowa-Tanoan language family (Harrington 1910, Hale 1967, Sutton 2014). The Kiowa Tribe was historically a nomadic Plains tribe, moving along the Rocky Mountains until being put into a reservation in modern-day Oklahoma after 1867. Sustained language transmission continued until the early 20th century, where the effects of assimilation took root to some extent. By the 1930s many Kiowa children were acquiring English as a unique first language, and by the 1950s virtually all of them were. Today the remaining L1 speakers are all elderly, numbering optimistically in the lower dozens (Linn 2011). Some promise has appeared recently, as heritage speakers number in the several hundreds (Neely 2015), and we observe an increasing number of L2 learners of Kiowa, in schools, colleges, and dedicated tribal language programs.

[1] Parts of this work were funded by NSF grant #BCS-xxxx, and by NSF/NEH grant #BCS-xxxx. Fieldwork was conducted at various times around southwest Oklahoma between 2007 and 2018 (consultants listed in Table 2). We thank our consultants for sharing their time and knowledge with us, and permitting us to share it with you. Archived recordings can be found in various locations discussed in the text. Special thanks to XX and YY for providing some of the recordings and transcriptions. Thanks also to Amie Tahbone at the Kiowa Tribe Museum in Carnegie, OK, for providing Kiowa Culture Program recordings.

1.2. Sentence structures. Kiowa can roughly be described as an SOV language, though it fits Hale's (1983) criteria for non-configurationality (Adger et al. 2009). Consequently, most sentences in actual speech are just V, or Adv V. However, every verb must begin with an agreement proclitic that expresses up to three arguments in a portmanteau with one or two syllables (Harrington 1928, Watkins 1984).

(1)

SUBJECT	OBJECT	AGR=VERB
kûy	gṷ̣ː+kʰɔ́pʰêttɔ̀	én=áttɔ̀
wolf	horn+flat:INV	3DUA:3INVO=chase:IPFV

'A couple of wolves are chasing the moose.' (D. Delaune, p.c.)[2]

Polysynthesis and compounding are common in Kiowa. Verbs carry inflection for aspect, negation (which neutralizes aspect marking), modality, and evidentiality after the verb stem. The example in (2) reflects this, building from the stem meaning 'seize'.

(2)

ADV	NEG	AGR=INC+INC+**VERB**–NEG–MODAL–EVID
hègɔ́	hɔ́n	bɔ́=tʰǫ́ː+pʰą́ː★+**tę̀**ː–mɔ̀ː–tʼɔ̀ː–dèː
then	NEG	1EXCLA:2PLO=leg+tie+**seize**–NEG–MODAL.VI–HSY

'You are not to be arrested (I am told).' (McKenzie ms. 1949)

1.3. Sound structures and tone. The segmental phonology of Kiowa is very well documented (Sivertsen 1956, Watkins 1984), and some prosodic research has been carried out up to the word level (Miller 2018). Kiowa has three phonemic tones, high (˝), low (ˋ), and falling (ˆ). We analyze falling tone as a single tone, rather than a HL contour. However, falling tone behaves like a high tone for intonational purposes. There are no observed sandhi effects, but there is pervasive tone-lowering. Many stems and morphemes trigger low tone for the rest of the prosodic word (2), and so does falling tone in general. A number of minimal pairs involve emerge from compounding, because only one of the pair of

[2] Standard IPA transcription is used, except that y is used for palatal approximants, the ogonek for nasality, and ★ for signaling tone-lowering. Glossing conventions of note: '+' marks stem combining (compounding or incorporation), ':' marks portmanteaux, '=' marks cliticization. A: transitive agent, D: dative/applicative argument, O: transitive object; S: intransitive subject. BAS: basic number (non-inverse), DETR: detransitive/anticausative, DF: different subject, EPIS.MIR: epistemic mirative, HAB: habitual, HORT: (ex)hortative, HSY: hearsay evidential, IMPER: imperative, INV: inverse number (animate plural, inanimate singular), MOD.VI: intransitive modal, MOD.VT: transitive modal, NEG: negative, REFL: reflexive, SA: same subject, UNEXP: culturally unexpected.

identical triggers tone lowering (3), (4). In the glosses, we will mark tone lowering with (★).

(3)	a.	/p’ɔ́:+hɛ́:/	moon+without	[p’ɔ́:hɛ́:]	‘moonless’
	b.	/p’ɔ́:★+hɛ́:/	watercourse+without	[p’ɔ́:hɛ̀:]	‘waterless
(4)	a.	/dɔ́:+k’í:/	sing+male	[dɔ́:k’í:]	‘(male) singer’
	b.	/dɔ́:★+k’í:/	kill+male	[dɔ́:k’ì:]	‘(male) killer’

Speakers can readily distinguish these tones, which along with phonemic nasality and vowel length lead to a number of minimal tuples. For instance, the string *dɔdɔ* can have up to 100 distinct forms based on combinatorics of tone, nasality, or length of each vowel. As it happens, only six actually occur (5), and none are lexical roots.

(5)

a. dɔ́dɔ́:	b. dɔ́:dɔ́:	c. dɔ́:dɔ̀:
dɔ́=dɔ́:	∅=dɔ́:+dɔ́:	∅=dɔ́:★+dɔ́:
1NSGD:3INVS=be	3SGS=holy.power+be	3SGS=kill+be
‘It belongs to us’	‘he has medicine powers’	‘he has been killed’
d. dɔ̨́:dɔ̀:	e. dɔ̨̂:dɔ̀:	f. dɔ̨́:dɔ̀
∅=dɔ̨́:★+dɔ́:	∅=dɔ̨̂:★+dɔ́:	dɔ̨́:dɔ̀
3SGS=wound+be	3SGS=depression+be	chuck:INV
‘he is wounded’	‘it is depressed, it dips’	‘shoulder of bison’

In contrast, very little work has focused on the tone and intonation patterns. Sivertsen (1956) observes a downdrift effect on sequences of high tones. This is a good start, but her study only examines a small number of elicited sentences and phrases.

2. Methodology. The current study relies on archived recordings of naturalistic speech, bolstered by modern elicitations. We ran the recordings through Praat’s automatic pitch tracking and manually tabulated the results.

2.1. Sources of Data. The current study relies on two main kinds of sources, archived recordings and current elicitations. The archived recordings were made between 1942 and 1986, and all but one (Hunting Horse’s speech) was transcribed independently for an upcoming collection of texts (A. McKenzie et al. 2022). All the transcriptions have been verified by modern L1 speakers of Kiowa.

(Insert table 1 here)

Three of the recordings were made for linguistic documentation, by the Summer Institute of Linguistics in the 1950s and by Laurel Watkins in the 1980s. The others were made by Kiowas as cultural artifacts for younger generations. Hunting Horse ([tsę̂ːtǫ̀kʼìː] 'horse seeker') made a speech on one episode of the weekly radio program *Indians for Indians Radio Show*, which was broadcast from the University of Oklahoma for several decades. That institution has helpfully put the surviving recordings of these broadcasts online for the public (Hunting Horse 1942). The recordings by Mr. Tainpeah and Reverend Botone were made by the Kiowa Culture Program, a roundtable of Kiowa speakers who made over 200 separate recordings in Kiowa about various issues of history and culture. The Tainpeah and Botone recordings were part of a discussion of the life of Satanta ([sétt'ą́ydé] 'white bear'), a warrior and leader of the late pre-reservation period. These recordings are now the possession of the Kiowa Tribe of Oklahoma, whose museum has generously supplied us with copies.

Speaker		**lifespan**	**time**	**date**	**recording**
Hunting Horse	M	1846–1953	1:11	1942	Hunting Horse's speech (HH) *Indians for Indians Hour*
Alma Ahote	F	1884–1961	2:58	1957	Sende Tricks a White Man (SW) Summer Institute of Linguistics
Guy Tainpeah	M	1894–1984	2:01	1978	Life of Satanta (LS-T) Kiowa Culture Program
Dr. Parker McKenzie	M	1897–1999	1:35	1986	Grandmother & the Oranges (GO) Laurel Watkins
William Wolf	M	1898–1974	1:18	1957	Running Away from School (RA) Summer Institute of Linguistics
Rev. Hazel Botone	F	1898–1986	1:29	1978	Life of Satanta (LS-B) Kiowa Culture Program

Table 1: Archived Recordings and their Speakers

The speakers of these recordings cover multiple generations, genders, and speaking styles. Notable among them is Hunting Horse, who was born in 1846. He was a member of the last Kiowa generation to come of age in the pre-reservation era (pre-1867), and later served as an Indian Scout in the U.S. Army. He never learned English or any other language, so his recording in 1942 is a marvelous rare example of monolingual Kiowa speech from a very early era. The other speakers were born in the late 1800s during the

transition toward modern life, but were all L1 speakers who routinely kept speaking Kiowa throughout their lives.

In addition to these recordings, we considered some elicited sentences from modern L1 speakers for comparison (Table 2). These were born between 20-40 years after the second generation of narrative speakers. While retaining fluency in Kiowa, these speakers had moved away for long periods of their lives and no longer spoke much Kiowa in day-to-day interactions. We chose snippets at random from field recordings conducted over the previous 14 years. While this is not a sample for statistical generalizations, it is still informative.

Speaker	gender	lifespan	recording date
Christina Simmons	F	1919–2014	2007–08
George Tahbone	M	1925–2010	2008–09
Marjorie Tahbone	F	1927–2012	2008–09
Dorothy Delaune	F	1935–	2017–19
Delores Harragarra	F	1933–	2015–18

Table 2: Speakers of elicited recordings

2.2 Process of Analysis. Once we had selected this data, we analyzed it using Praat. We made a TextGrid for each sentence, down to the syllabic level, and ran this through Prosogram, a pitch analysis script for Praat. The result was a chart giving the F0 of each vowel in Hz. In (6), we see an example of this, from Hunting Horse's speech.

(6) Hz: 271 245 (237) 163 257 221\144
hɔ́n ál. tsép gʸà= dǫ́:. mɔ̂:
NEG trick 3PL= be.NEG
'This isn't a trick.' (HH 0:44)

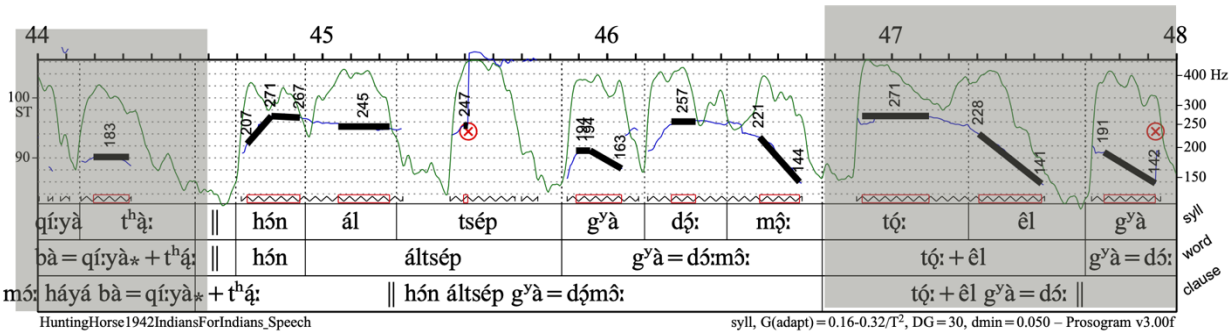


Figure 1: Prosogram of a Kiowa sentence (6)

As we can see in (6), the pitches in Kiowa are not very flat. High tones generally rise to a peak target, while low tones dip to a target. Falling tones start higher than low tones and then plunge to a target. Consequently, we list the pitch of each H or L tone as its target. In the gloss of (6) we place the F0 of each syllable in Hz above it. We exceptionally separate each syllable of a multisyllabic morpheme to line up the syllables with F0 values, by adding a syllable boundary marker (.) in the absence of a morpheme boundary. Falling tones are marked with two values, a high target and a low target, separated by an indicator (\). If underlying segments are deleted, as often happens in rapid Kiowa speech, they are placed in parentheses in the gloss.

On the vowels that have not undergone tone-lowering, the tone marking reflects their underlying tone as ascertained by various sources, though the bulk of the recognition was done by Parker McKenzie (1897–1999). A first-language speaker who became a self-trained linguist, McKenzie worked for decades on fine-tuning the phonetics of Kiowa, and his expertise on the matter has no peer. His commentary and correspondence greatly aided the work of Harrington (1928), Watkins (1984), and others. Harrington went so far as listing McKenzie as first author of a publication about the Kiowa language (McKenzie & Harrington 1948), in an era where crediting native speaker consultants was usually an afterthought at best. McKenzie was recognized with an honorary doctorate for his efforts from the University of Colorado in 1990, and the orthography he developed (McKenzie & Meadows 2001, Watkins & Harbour 2010) has been adapted for use by the tribe's language revitalization program. In this paper we employ the IPA, since our audience here is the linguistic community. Our marking of tones follows his, and is confirmed by elicitation with modern L1 speakers, so we are extremely confident in its phonemic accuracy.

Prosogram was not able to analyze all the tones automatically. For instance, the tone in /tsép/ in (6) is marked with a red x in the prosogram, signaling a failure to analyze properly. In cases where Prosogram failed, we were usually still able to use Praat manually to ascertain the pitch of the syllable. In such cases we write the value in parentheses. In cases were no pitch can be measured at all, an (x) is marked above that syllable in the gloss.

3. Observations. This section relates the basic documentary findings, which focus on the relative heights of the high and falling tones. In concordance with Sivertsen (1956) and Watkins (1984), we find that prominence in Kiowa is tied to pitch rather than intensity. Hence the discussion focuses almost exclusively on pitch.

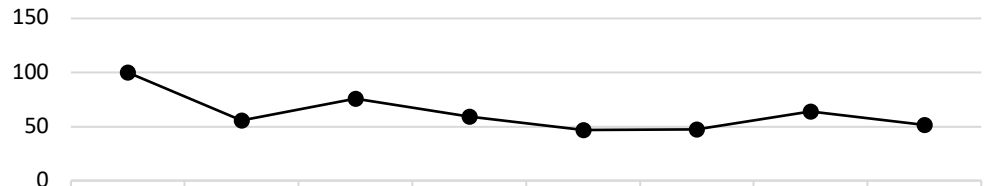
3.1. Initial peak and downdrift. We observe a peak pitch at the first high or falling tone of the sentence, occuring in 73.6% of the naturalistic archival sentences (n=239). From there, we see declination: The high or falling (high-low) tones downdrift towards the sentence end. This trend is exemplified in (7), where the initial peak high tone (in boldface) is 31% higher in pitch than the next. Including this shift, the downdrifts are 24%, 16%, and 19% from the previous high tone. The final falling tone has a starting pitch that is lower in pitch (138) than some of the low tones. The low tones stay relatively flat, and are affected by the height of a preceding high tone.

(7)	**267**	148	203	158	125	127	171	138\(x)
	hɔ́n	àn	dɔ́y★	+hę̀:	dè=	ts'àn	+hó:.	gû:
	NEG	HAB	medicine	+without	1SG›3INV=	trick	+kill.NEG	

'I can't play tricks without my medicine'. (SW 1:00)

Further analysis using the protocol from Cantero & Font (2009) shows the downdrift trend very clearly (Figure 2), taking the initial tone as the baseline (% = 100), with each subsequent syllable showing the relative change in pitch in Hz from the preceding one. The standardized curve (S.C.) indicates the percentage of each pitch relative to the initial one.

(insert Figure 2 here)



	hɔ́n	àn	dɔ́y★	+hę̀:	dè=	ts'àn	+hó:.	gû:
%	100	-44.57	37.16	-22.17	-20.89	1.6	34.65	-19.3
Hz	267	148	203	158	125	127	171	138
S. C.	100	55	76	59	47	48	64	52

Figure 2. Relative pitches of tones in a Kiowa sentence (7)

The trend of initial peaks was robust in all the naturalistic data, across speakers (Table 3).

(Insert table 3 here)

		main			embedded			total		
speaker	text	init	not	.pct	init	not	.pct	init	not	.pct
Hunting Horse	HH	11	5	.688	5	0	1.000	16	5	.762
Alma Ahote	SW	49	17	.742	0	0	—	49	17	.742
Guy Tainpeah	LS-T	36	14	.720	8	2	.800	44	16	.733
Parker McKenzie	GO	21	7	.750	7	0	1.000	28	7	.800
William Wolf	RA	14	8	.636	4	2	.667	18	10	.643
Hazel Botone	LS-B	14	10	.583	4	1	.800	18	11	.621
totals	**239**	**145**	**61**	**.704**	**28**	**5**	**.848**	**173**	**66**	**.736**
medians		28.5	9	.704	4.5	0.5	.800	23	10.5	.738

Table 3: Incidence of initial and non-initial peaks in main and embedded clauses in narratives

The trend is observable in elicitations as well. In (8), given as a standalone translation, the first high tone is the highest and the tones drift downward, by 0.8%, 11.5%, and 21%.

(8) 228 226\166 200 135 131 158
k'ʸą́:. hį̂: á:⋆+ dǫ̀: –bà ∅=dé:
man tree+ under –against 3SGS=be.standing
'The man is standing under the tree' (Dorothy Delaune, p.c.)

(insert Figure 3 here)

	k'ʸą́:.	hį̂:	\	á:⋆+	dǫ́:	–bá	Ø=dé:
%	100	-0.88	-26.55	20.48	-28.51	-2.96	20.61
Hz	228	226	166	200	135	131	158
S. C.	100	99	73	88	59	57	69

Figure 3. Relative pitches of tones in a Kiowa sentence (8)

3.2. Peaks target phonemic high or falling tone. Low tones never bear the peak, even if they are intial. The peak assignment will skip words with low tones, like in (9) where initial *hàgʸà* 'maybe' does not bear a peak. Likewise, peak placement will skip parts of words. In (10), it skips all the way to the second linear stem of the verb before it finds a high tone.

(9) 107 107 **142** 139 136 130 130
hà. gʸà mɔ́:. sɔ́: ę́= sá:. yí:
maybe six 1SGD:3SGS= winter.pass:PFV
'I was maybe six years old'. (RA 0:09)

(10) 144 147 145 **167** 134
k'ɔ̀t dè= ts'à:n+ hót. tɔ̀
and:UNEXP.SA 1SGA:3INVO= trick+ kill.IPFV
'I fool people.' (SW 2:35)

There are no verbs in Kiowa that have only low tones, and since a verb is required in every sentence, there will always be a high or falling tone for the peak to land on.

3.3 Initial peaks in questions and exclamations. So far we have discussed assertions, but the initial-peak pattern is also the norm in other illocutionary acts. Yes/no questions (11), wh-questions (12), and exclamations all have initial peaks followed by declination. Exclamations are represented here by (13), with the indefinite quantifier *hɔ́ndé* 'something' being used for extent exclamations.

(11) **232** 224 149 192 141 156 150 176 150\136
hɔ́ ám èm=dɔ́: àn bè= t͡s'àn+hó:. lê:
Q you 2SGS=be HAB 2SGA:3INVO=trick+kill:IPFV:HSY
'Are you the one who tricks people?' (SW 0:24)

(12) (**157**) 132 95 120 (x)
nɔ̂n. dó bàt=t'óm★+ą̀y?
and:DF:why:WH 2SGA:3PLO=furtive+start.off:PFV
'What did you run away for?' (RA 0:51)

(13) **248** 234 180 222 175 171
hɔ́n.dé gʸà=t'ó:. lɔ̀:★+sę̀:
something 3PLS=tasty+smell

‘It smells really good!’ (Christina Simmons, p.c.)

4. Analysis. In addition to straightforward ‘surface’ documentation, we analyze the ways in which the intonation patterns interact with phrase structure, using an Optimality Theoretic approach.

4.1 Intonational phrases and peaks. The intonational phrase (ιP) is typically associated with clause-level syntactic structure (Selkirk 2011; Féry 2017). Recalling (8), we can analyze the finite clause prosodically as an ιP.[3]

(8)

	228	226\166	200	135	131	158
[ιP	k’ʸą́:.	hį̂:	á:★+	dǫ́:	–bá	∅=dé:]
	man		tree+	under	–against	3SGS=be.standing

‘The man is standing under the tree’ (Dorothy Delaune, p.c.)

We propose several diagnostics for intonational phrases in Kiowa. In measured speech and elicitation, pauses are a clear signal of an intonational phrase. Sivertsen (1956: 124) notes this trend, but also points out that her data was elicited and that connected speech might differ. We find that it does. In natural fluent speech in Kiowa, there are usually no pauses to signal clause boundaries. The sentences seem to run together. With initial peaks, though, the tone marks a crucial pitch reset for listeners. Example (14) exemplifies this reset well. It contains four distinct sentences, some of them part of a quote. However, the prosogram shows there are no pauses at all between them (Figure 4). Instead, we see that the initial peak resets at each intonational phrase boundary. Notably, despite this constant resetting, once the quote starts, each successive initial peak is lower than the previous one.

(14)

93 110	**155** 149	**192**\172 186	145\125
gì. gǒ	∅=tǫ́:. nê:	hǒn. dó	bâ:=[4] ×
and.then:SA	3SGS=say:IPFV:HSY	why.WH	1INCLA:3SGD:3SGO=

[3] We assume that Kiowa has TP and DP projections, despite lacking overt tense or definiteness, due to findings in previous literature (Harbour 2007, A. McKenzie 2012, A. McKenzie 2021)

[4] This word was corrected by the speaker (hence the ×), and does not figure into the meaning of the sentence.

145	112 120	**(185)**	137\105
bát∗=	pèt. tɔ̀	bét=	têl
1INCLA:3SGO=	fear:IPFV	2PLA:3INVO=	tell.PFV.IMPER
132	92	121	
nɔ́:	à=	dɔ́:	
me	1SGS=	be	

‘Then he said, “Why are we afraid of him? Tell them, ‘It was me.’”’(LS-T 9:17)

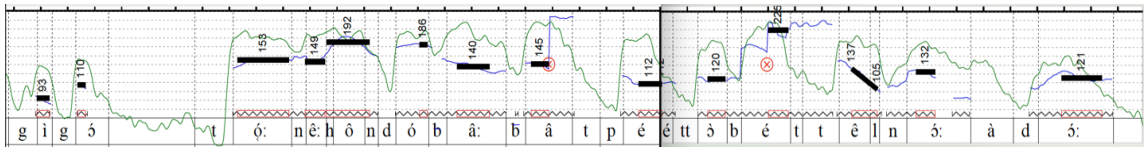


Figure 4: Prosogram of (14)

These resets are bound to be useful because word order is only partially indicative, as Kiowa is typically but not always verb-final.

A second indicator of intonational phrase boundaries is that toward the end, the final tones lower as well. Low tones are fairly even or equal in pitch throughout the clause, until the end of the clause. Frequently, a final high tone will be lower in pitch than a low tone earlier in the sentence ((14) shows this, as does (15)). However, this effect usually is more pronounced at the end of a multi-clause utterance.

A third diagnostic is near-final creakiness. Many intonational phrases exhibit non-phonemic creakiness toward their end, though not necessarily limited to the boundary. Creakiness often correlates to a lowering in F0, and also to a softening of the pitch, often to the point of no clear pitch at all. We did not investigate whether the lowering of pitch itself leads to creakiness, as Kuang (2018) shows for Mandarin, or if the correlation has some other cause.

(15) **192** 164 **167** 141 136 **152** (x) 132 162 (**164**) 127

tsé.	gùn	∅=tsán=ę̀:		àn	bá:.	tsę̀.	yò	é= ą́t. tǫ̀
dog		3SGS=arrive:PFV=when:DF		HAB	cat			3SGS:3INVO=chase:IPFV

‘Whenever the dog comes by, he chases the cats.’ (Delores Harragarra, p.c.)

Creakiness is also apparent at the end of some embedded clauses, further cementing the observation that they are prosodically like main clauses. In (12), it occurs at the end of the if-clause, bleeding into the main clause, which also ends with creakiness.

(16) 154 122 **163** 133 152 142 (x) (x)(x)(x)
tsé. gùn són gʸà=pɔ́l★–tɔ̰ː=gɔ̰ hą́yą́ttò ‖
dog grass 3SGA:3PLO=eat:PFV–MOD.VT=if:SA possibly ‖

180 160 174 171 (x)
há. yá ∅=ɔ́mdé★–t'ɔ̰ː
somehow 3SGS=make:DETR:PFV–MOD.VI
'If a dog eats grass, something might happen to it.' (Christina Simmons, p.c)

4.2 Intonational phrases in embedded clauses. Cross-linguistically, embedded clauses tend to have distinct prosodic patterns from main ones (Nespor & Vogel 1986). Exceptions have been observed, such as Truckenbrodt (2005)'s work on some German embedded clauses that have patterns similar to the main ones.

What we find in Kiowa is that embedded clauses do not show any difference from main clauses. They generally have the same initial peak+downdrift pattern that main clauses have. This is the case in elicitation (15), and in natural text, where initial peaks occur 80% of the time (Table 2). We thus propose they correspond to their own intonational phrase. This proposal in turn requires nesting ɪPs.

One might ask whether the initial peak pattern is not simply proof that these are not embedded clauses, but rather are only considered as such because of what they correspond to in the languages spoken by researchers. However, research has long confirmed, with syntactic and semantic tests, that these are embedded (Watkins 1984, Harbour 2008, Adger et al. 2009, A. McKenzie 2012). Moreover, impressions by native speakers, including detailed notes by Parker McKenzie (n.d.), indicate that embedded clauses are not "complete" sentences.

Sometimes the embedded clause's peak is also the entire clause's peak. This is visible in some earlier examples (e.g., (15)) and also in (17), where the peak is the first high tone of the embedded clause.

(17) **226** 145 225\137 145 140 141 195 145 148 169 (x)
tsé. gùn ∅=hôl★+ ɔ̀m. gʸà=tsɛ̀ː, són àn gʸà=pɔ́ʔ. tɔ̀
dog 3SGS=sick+become:PFV=when:DF grass HAB 3SGA:3PLO=eat:IPFV
'When a dog is sick it eats grass.' (Christina Simmons, p.c.)

Other times, the embedded peak is not the full sentence's peak. In (18), the relative clause subject has its own peak, but it is not as high as that of the main clause. It may be the case that the relative clause's ɪP is outside that of the main clause (perhaps by extraposition).

(18) **221** 162 137 130 207 192\165 163
[ɪP á★= ì: –tè ǫ̀: ∅= dǫ́ːmêː =dè]
3.POSS= son –BAS um 3SGS= be.HSY =BAS

228 208 173 (x)
tǫ́ː +hɛ́ː ∅= dǫ́ːmêː
speak +without 3SGS= be.HSY
'His son who was there wasn't speaking.' (LS-B 12:50)

4.3. Optimal alignment of prosodic peaks. We analyze the initial peak pattern with an Optimality approach based on Gussenhoven (2004). We can define $H_ɪ$ as a prosodic peak supplied by GEN, which gets pronounced as a raise in pitch. This peak will land on a tone bearing unit, which we take to be the syllable. At this point, an interaction of constraints determines which syllable the peak will land on. A left-alignment constraint (ALIGN-L($H_ɪ$, ɪP)) pushes the peak toward the left-edge of the ɪP, but a markedness constraint (*ASSOC($H_ɪ$, L)) bars the placement of a peak on a low tone syllable. Other constraints ensure that tones do not change to bear a peak, or delete to ensure alignment.

(19) **Constraints affecting tone peak placement**

1. ALIGN-L($H_ɪ$, ɪP): The prosodic peak falls on the leftmost TBU of the intonational phrase.
2. *ASSOC($H_ɪ$,L)): Do not associate a prosodic peak to a low tone.
3. IDENT(T): Every output tone of a TBU matches its input tone.
4. MAX(T): Every input tone is in the output.

The markedness constraint *ASSOC(H_{ι}L)) outranks the alignment constraint, so the tone will be on the leftmost high or falling tone. This is exemplified in (20) repeated from (9).

(20) a.

107 107	**142** 139	136	130 130
hà. g^{y}à	mɔ́:. sɔ́:	ę́=	sá:. yí:
maybe	six	1SGD:3SGS=	winter.pass:PFV

'I was maybe six years old'. (RA 0:09)

b.

/ hàg^{y}à mɔ́:sɔ́:/, H_{ι}		IDENT(T)	MAX(T)	*ASSOC(H_{ι}L))	ALIGN-L(H_{ι}, ιP)
☞	a. [$_{\iota P}$ hà.g^{y}à [mɔ́:]$_{H\iota}$ sɔ́:				**
	b. [$_{\iota P}$ [hà]$_{H\iota}$ g^{y}à mɔ́:.sɔ́:			*!	
	c. [$_{\iota P}$ hà[g^{y}á]$_{H\iota}$ mɔ́:.sɔ́:			*!	*
	d. [$_{\iota P}$ [há]$_{H\iota}$ g^{y}à mɔ́:.sɔ́:	*!			
	e. [$_{\iota P}$ ha.g^{y}a [mɔ́:]$_{H\iota}$ sɔ́:		**!		**
	f. [$_{\iota P}$ hà.g^{y}à mɔ́:[sɔ́:]$_{H\iota}$				***!

We exclude conjunctions from intonational phrases, since they correspond to the finite clause (IP/TP structure). Consequently we see similar alignment effects there. In (21), for instance, the conjunction *né* 'but' carries a high tone, but is ignored by the alignment.

(21)

	211 193	167 178. 155	160	**175** 152	140	145 150
[$_{\iota P}$	pį́: -g^{y}á	g^{y}àt=hɔ́t. tɔ̀]	**né** [$_{\iota P}$	ɔ́:. lɔ̀★	+hę̀:	à= dɔ́:]
	eat-BAS	1SGA:3PLO=get:IPFV	**but**	money+lacking		1SGS=be

'I was going to get some groceries, but I have no money.' (Delores Harragarra, p.c.)

The alignment constraints derive the initial peak placement straightforwardly. However, nearly a quarter of phrases in narratives have non-initial peak placement. Assuming the alignment account is accurate, we conclude that some other constraint must be able to override it.

5. Non-initial peaks. It is not altogether uncommon for peaks to land away from the initial high or falling tone of the intonational phrase, around 23% of all instances in our

sample. In such cases, the peak still lands on a high or falling tone. In (22), the peak lands on the first high tone of the verbal complex, which forms the VP, rather than on the falling tone of the IP-level adverb *kʰòdêːdè* 'suddenly'.

(22) 168 180\157 155 **195** 185 180 180 159 135
[TP kʰò. dêː. dè [VP **án**= tǫ́ː. gʸá+kʰút. téˊ–hèl]]
suddenly 3SGD:3PLS=word+yank.out:DETR:PFV-HSY
'and (he) suddenly managed to get a few words out.' (LS-B 13:01)

5.1. Peaks targeting any constituent. Besides VPs, we observe peaks landing on several other constituents, including AdvP (23), NegP (24), and DP. We conclude that the peak is targeting these constituents, driven by non-prosodic factors.

(23) 173 150\118 **179** 174 166 120 129 138 129
[TP háː. gôː [AdvP **mɔ̀n**] á= kǫ́ː. tòˊ +bàː óy– gò]
some.of:INV **probably** 3EMPS=buy+go:PFV yon–PRS
'Some of them went there perchance to trade' (GO 0:27)

(24) (x) 111 118 **180** 172 174 159 140 116
nè. gó hèg(ɔ́) [NegP **(h)ɔ́n** (h)áyá ę́= ǫ́ː. mô:]
and.then:DF then **NEG** in.some.way 3SGA:1SGO=do.NEG
'but then he didn't do anything to me' (RA 1:00)

5.2. Peaks within Determiner Phrases. Determiner Phrase (DP) peaks are common, and may involve information structure. Harbour et al. (2012) documented Kiowa information structure, finding that we cannot map out fixed syntactic projections for particular discourse functions. Instead, we can divide the clause into three broad domains associated with broad functions, as seen in Figure 5.

(insert Figure 5 here)

Preparticular Domain	**Fixed Particles**	Postparticular Domain	**Verb**	Postverbal Domain
information structure				*discourse structure*
contrast, topic/focus	*hét, béthɔ̀ː, hɔ́n, àn,* etc.			salience, discourse transition

Figure 5: Discourse domains of Kiowa clauses (after Harbour et al. 2012)

Peak-bearing DPs can occur in any of these domains. In (25), the peak-bearing DP precedes the particle *béthɔ̀*, which signals here that the protagonist was unaware of the fact being described. In (26), the peak-bearing DP comes between the fixed position particle *hét*, which denotes an exhortation or suggestion, and the verb. In (27), it is postverbal.

(25)

	preparticular		
140	**250** 245 221	172 144	168 153\(x)
ǫ̀:	[DP tʰǫ́:+ɔ́lkʰɔ́y]	béthɔ̀	∅=dǫ́:mə̂:
um	water+wicked	EPIS.MIR	3SGS=be:HSY

'Little did he know, it was alcohol' (LS 13:25)

(26)

		postparticular	
173	232	**234**/165	192
nɔ̀	hét	[DP tsə̂:]	gʸá= ɔ́:★+ ɔ́:-tɔ̀:
and:DF	HORT	horse	1SGA:2SGD:3SGO=awhile+give:PFV-MOD.VT

'Let me just go ahead and lend you my horse' (SW 1:05)

(27)

			postverbal
109	188 173\132	104	**209** 149 109 117
gɔ̀	ét= kồn★	-hèl	[DP tʰǫ́:+t'ó. lǫ̀: -gɔ̀]
and:SA	3INVA:3INVO=bring.PFV-HSY		juice+sweet-INV

'and they brought back oranges' (GO 0:35)

5.3. Prosodic phrases. We can analyze these peaks similarly to the intonational phrases, but with prosodic phrase (φP) hierarchically between the prosodic word and ιP.

(28)

173	232	234/165	192	191 136 137	
nɔ̀	[ιP hét	[φP tsə̂:	gʸá= ɔ́:★+ ɔ́:	-tɔ̀:]]	
and:DF	HORT	horse	1SGA:2SGD:3SGO=awhile+give:PFV-MOD.VT		

'Let me just go ahead and lend you my horse' (SW 1:05)

The φPs correspond to syntactic constituents, and are the domains for tone-lowering and cliticization. They are larger than prosodic words, which are domains for narrower phonological processes like dental-velar switching (Miller 2018).

While we have not fully investigated why these constituents are targeted for bearing the pitch peak, it is likely due to discourse functions. In any case, we observe that within prosodic phrases, the first high or falling tone bears the peak, just as it does within an intonational phrase. This fits the analysis of intonational peaks (section 6.2), with the

addition of a similar alignment constraint for prosodic phrases. If we assume that the emphasized constituent bears some discourse-related feature that is visible to the phonology, a special constraint forces the peak $H_ι$ toward the left edge of the φP with that feature. This constraint outranks the general alignment constraint.

(29) a. [DISC] is a discourse feature or set of features that remains to be investigated. [DISC] is visible to the phonology
b. ALIGN-L($H_ι$, φP/[DISC]): The prosodic peak falls on the leftmost TBU of the prosodic phrase bearing the /[DISC] feature.

In the case of a [DISC] feature landing on a final DP (7x), the peak will target that DP precisely, because the special alignment constraint outranks the general one.

(30)

(26) = /gɔ̀ [$_{ιP}$ ét=kɔ̂n⋆-hêl [$_{φP[DISC].}$ tʰǫ́:t'ólǫ̀:⋆-gɔ́]]/, $H_ι$		ALIGN-L($H_ι$, φP/[DISC])	*ASSOC($H_ι$,L)	ALIGN-L($H_ι$,ιP)
☞	a. gɔ̀ éʔ.kɔ̨̂n.hèl [tʰǫ́:]$_{Hι}$t'ólǫ̀:gɔ̀			****
	b. gɔ̀ [éʔ]$_{Hι}$.kɔ̨̂n.hèl tʰǫ́:t'ólǫ̀:gɔ̀	*!**		
	c. gɔ̀ éʔ.[kɔ̨̂n] $_{Hι}$.hèl tʰǫ́:t'ólǫ̀:gɔ̀	*!*		***
	d. gɔ̀ éʔ.kɔ̨̂n.[hèl]$_{Hι}$ tʰǫ́:t'ólǫ̀:gɔ̀	*!	*	***

When the DP is part of a larger constituent, we analyze the prosodic phrase as containing that DP and its sister, forming the larger constituent (31), but the special alignment still outranks the general.

(31)

(28) = /nɔ̀ [$_{ιP}$ hét [$_{φP[DISC]}$ tsɛ̨̂: gʸá= ɔ́:⋆+ ɔ́:-tɔ́:]]/, $H_ι$		ALIGN-L($H_ι$, φP/[DISC])	*ASSOC($H_ι$,L)	ALIGN-L($H_ι$,ιP)
☞	a. nɔ̀ hét [tsɛ̨̂:]$_{Hι}$ gʸá.ɔ́:ɔ̀:tɔ̀:			**
	b. nɔ̀ [hét]$_{Hι}$ tsɛ̨̂: gʸá.ɔ́:ɔ̀:tɔ̀:	*!		*
	c. nɔ̀ hét tsɛ̨̂: [gʸá]$_{Hι}$.ɔ́:ɔ̀:tɔ̀:	*!		***

5.4 Skipping vocatives. We can predict that DPs outside the intonational phrase will not bear its peak, and this is visible with vocatives. Apart from kin terms, nouns do not have special vocative forms in Kiowa, but their use is easily ascertained. For instance, Hunting Horse exhorts the youth of his day to keep the faith and persevere in the face of life's troubles (32), and the peak is on the verbal command. In fact, we can analyze each vocative noun as constituting its own intonational phrase, each with an initial peak.

(32) **224** 218 207 **220** 210 165 **269** 252\153 197
[IP yɔ́. kɔ́y-gúꭓ] [IP tó. gú:. dɔ̀] [IP bé= pê:. tè]
young.woman-INV young.man:INV 2PLA:REFLO=persevere:PFV:IMPER
'Young women, young men, keep the faith!' (HH 0:18)

329

330 **5.5 Exceptional *hègɔ́*.** One morpheme that is regularly associated with non-initial
331 peaks is the adverbial *hègɔ́*, which is translated variously as 'then', 'already', 'so', and
332 more. This variety reflects its wide usage in Kiowa narratives and ordinary speech to
333 indicate progress in time. *Hègɔ́* is common enough that it is routinely contracted, and some
334 of these contractions, notably those with conjunctions, are often considered by speakers to
335 be distinct words.

336

(33)

	uncontracted	contraction	gloss
a.	*gɔ̀ hègɔ́*	*gìgɔ́*	and:SA then
b.	*nɔ̀ hègɔ́*	*nègɔ́*	and:DF then
c.	*k'ɔ̀t hègɔ́*	*k'ɔ̀règɔ́*	and:UNEXP:SA then
d.	*ɔ̀t hègɔ́*	*tègɔ́*	and:UNEXP:DF then

337 Interestingly, even though *hègɔ́* has a high tone, it is often skipped in narratives ((14),
338 (24)). Out of the 60 clause-initial uses of *hègɔ́* in the six archived narratives, only 20 of
339 them (33%) bore the peak. We are not certain why *hègɔ́* is skipped, but it may be a heavily
340 deaccented element. Clause-initially, it might be outside of the intonational clause
341 altogether. Some speakers use *hègɔ́* as a filler particle throughout clauses, so it ends up
342 repeated a lot (24). We can perhaps interpret this use as a signal of the loss of a prominence
343 that might bear a prosodic peak.

344 **5.6 Section summary.** While most intonational peaks land on the first high or falling
345 tone of the intonational phrase, up to a quarter do not. These non-initial peaks can land on
346 any of the constituents in the clause, perhaps for discourse related reasons. These
347 constituents are linked to the edge of prosodic phrases, so we can analyze the pattern in
348 terms of alignment to these smaller constituents. Certain types of constituents that are
349 routinely skipped are probably best analyzed as not being part of the main clause's
350 intonational phrase.

6. Conclusion. This paper has offered a preliminary documentation of the sentence-level intotnation and prosody of the Kiowa language, so there are a number of findings and consequences, which we will summarize in this section.

6.1. Outcomes. The key finding is that the primary intonation pattern of Kiowa involves the leftmost high or falling tone bearing a peak F0, with declination or downdrift from there towards the end of the intonational phrase. At the end there is often a drop in pitch associated with creakiness. The key exceptions to this pattern involve the peak landing on a particular constituent inside the clause. We analyze these peak placement patterns with alignment constraints that prevent tones from changing or deleting rather than placing the peak on the leftmost high or falling tone. Other exceptions include clause-initial conjunctions and vocatives, which are not part of the intonational phrase, and the adverbial *hègɔ́*, whose commonality leads to it behaving exceptionally.

6.2 Comparison across generations. Our recordings cover speakers born from 1846 to 1933, so we are able to draw comparisons across generations to see what may have changed. As we might expect, certain aspects of the language changed between the generation of Hunting Horse (born 1846) and the 'youngsters' in our narrative sample born 40-50 years later. For instance, in older Kiowa, final /uː/ was usually pronounced with an offglide as [uɔ̯]. Harrington (1928) noted this so prominently that he wrote all /u/'s this way, as 'uα' in his inimitable phonetic orthography. However, this offglide largely disappeared in the younger speakers in our sample, and the change was complete in the speech of modern speakers born in the early-to-mid 20th century.

However, in terms of prosodic intonation, there is no appreciable change between Hunting Horse and the later generations. The continuity is quite enlightening. Some speakers have flatter tones than others (viz. with less contouring), some show less range in F0 values, but they all show a typical initial peak landing on the first high or falling tone in main and embedded clauses. From that peak, the high tones downdrift progressively, and often drop significantly at the end of the intonational phrase. This near-final lowering is often accompanied by creakiness that neutralizes pitch.

6.3 Outlooks for research. This preliminary documentation reveals questions for further investigation, as well as a means to answer them. First off, this provides a starting point for phoneticians and phonologists to expand their empirical basis for deeper studies that inform theoretical or typological questions about tone and intonation.

It can also help linguists understand the discourse structure of Kiowa. For instance, it may be the case that Kiowa phrases always have a targeted constituent bearing some discourse feature (like [DISC] in section 6.3). What we observe as typical trend for initial peaks may thus actually be the result of separate processes in Kiowa ensuring that this constituent ends up at the left edge in most cases. This may in turn be linked to the fact that Kiowa exhibits placement of wh-words at the front of the clause rather than *in situ*.

Alternately, we might find that non-initial peaks are the result of other discourse processes. For instance, A. McKenzie (2015) proposes that some topic effects in Kiowa do not trigger movement but instead are derived from it. He argues that some DP displacement is triggered by the speaker's desire to disambiguate a DP to ensure a 'transparent' interpretation by putting it outside an adverbial quantifier. The DP itself is not topic-marked. However, the speaker sends a signal that the DP is noteworthy, by virtue of having taken the trouble to disambiguate it. Speakers (and linguists) can interpret this signal as a kind of topicalization. In (34), for instance, the placement of the DPs to the left (outside) of the habitual adverbial *àn* signals that these were part of the situation the interlocutors were already talking about (a farm), and not merely part of what usually happens.

(34) *preparticular*

tsə̂ː⋆-gɔ̀	són	àn	ét=kòːdó⋆+pɔ̀t.tɔ̀
horse-INV	grass	HAB	3INVA:3PLO=much+eat:IPFV

`The horses eat a lot of (the) grass' (George Tahbone, p.c.)

For our purposes, we can now explore whether this kind of displacement has an effect on the peak placement. We hypothesize that fronted topics and frame adverbials do not bear the prosodic peaks (and may not be inside the intonational phrase), while fronted

404 focused DPs and adverbials do bear peaks. Building upon our preliminary documentation,
405 we can test this hypothesis for various types of topics and focus values, and gain a clearer
406 sense of how information structure works in Kiowa and languages like it in this regard.
407 This study can also serve as another baseline for tracking how the language has been
408 shifting toward what linguists call 'heritage' speech. Neely (2015) finds that speakers born
409 after World War II exhibit several differences from older generations of speakers, some of
410 which are not ordinary language change and instead reflect a heritage form. Investigation
411 may find that the prosodic patterns discussed in this paper is another element undergoing
412 change. Also, in the event of a solid, sustained revitalization, documentation of the 'classic'
413 prosodic patterns could serve as a basis of comparison to see where new generations of
414 speakers take the language.
415 **6.4 Outlooks for learners.** The broader impact of this survey can be seen in how it can
416 help L2 learners of Kiowa, both in production and comprehension. Intonation patterns are
417 a crucial component of speaking a language, and having an idea of the basic patterns allows
418 for students to ensure they are not using English-style intonation.
419 Knowing intonation patterns is also useful for listening. As we pointed out, fluent
420 Kiowa speech relies on resetting the F0 peak to mark a sentence boundary, rather than a
421 pause. Knowing this helps learners engage with recordings, of which there remain dozens
422 of hours of speech that have yet to be transcribed or analyzed. If we hope one day to see a
423 cadre of community linguists tackle this massive corpus, this intonational knowledge will
424 prove vital to their success.
425 ⸸ ⸸ ⸸
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