Ixpantepec Nieves Mixtec Word Prosody

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Objective

Mixtec (Tu'un Savi) languages are usually described as having:

- complex lexical tone systems
- word-level stress accent

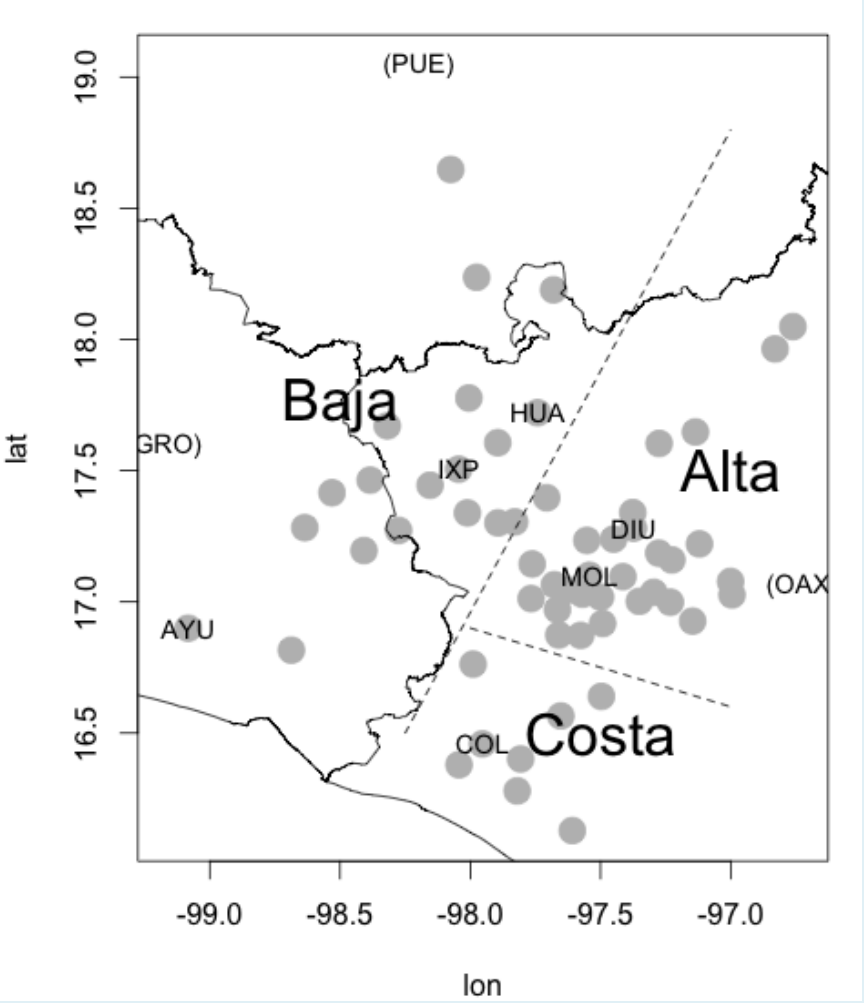
But lack of acoustic data has left descriptions open to interpretation:

- Tone-dependent (mobile) stress is reported in many varieties
  - Essential in de Lacy's (1999, 2002) analysis of tone-dependent stress systems
  - But Hyman (2006) suggests these are misperception
- Lexically contrastive secondary stress also reported
  - But Daly (1978) analyzes this as a tonal phenomenon
- Josserand (1983) describes fixed single stress across Mixtec

This paper: a phonological description and acoustic study of word prosody of Mixtec from Ixpantepec Nieves (MIN)

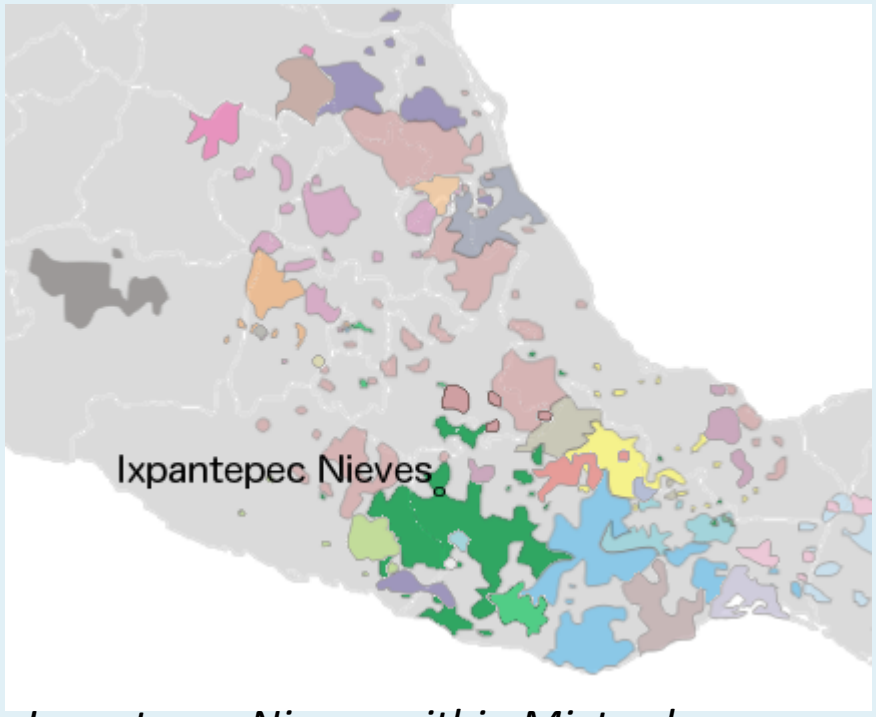
Mixtec Geography

- Language continuum in southern Mexico, split into Baja, Alta and Costa regions
- Ixpantepec Nieves (IXP in map): in NW corner of Oaxaca state, on the northern edge of Josserand's (1983) Southern Mixteca Baja dialect group.
- Mixtec varieties with tone-dependent stress: Ayutla (AYU), Huajuapan (HUA), Molinos (MOL)
- Mixtec languages with unpredictable final secondary stress: Diuxi (DIU), San Juan Colorado (COL)



Ixpantepec Nieves

- Previous work on MIN describes discourse (Villas-Boas 2010) and syntax (Caponigro et al 2012)
- Other current work on intonation (Ritchart and Chung 2014)
- No systematic phonological description is yet available
- This data collected with five native speakers living in or visiting San Diego, California



Ixpantepec Nieves within Mixtec language area (green) and surrounding indigenous language groups
(adapted from wikimedia images from user: yavidaxiu)

Roadmap

Here I show that:

1. MIN has both stress and tone contrasts (H, M, L)
2. These contrasts are acoustically independent
3. Tone distribution and tone processes are sensitive to stress

Stress

MIN word prominence involves demarcative stress-accent:

1. Meets the phonological diagnostics:
   one and only one prominence per word
2. Is aligned to the word root
3. Has segmental duration and intensity profile as acoustic correlates

Diagnostics of Stress

- Obligatory: every open-class word has a stressed syllable
  - Function words tend to be mono-moraic and stressless
- Culminative: only one syllable has primary stress
  - Some evidence of secondary stress in compounds, but single primary stress is on last root

Distribution of Stress

- Determined by a trochaic foot aligned to the root
  - In minimal word (bimoraic), stress the first syllable

(1) a. [(ˈsí.ká)]
/síkâ /
'far'

b. [(ˈxàʔ.ʒī)]
/xàʔʒi/
'child'

c. [(ˈlù.ⁿdʲù)]
/lùⁿdʲù/
'stump'

  - With CVV roots, a single heavy stressed syllable

(2) a. [(ˈʒáá)]
/ʒáâ /
tongue

b. [(ˈɲíˀį)]
/ɲíˀį /
hen

c. [(ˈnūų̄)]
/nų̀ų́ /
face

- Bound morphemes do not affect stress placement

(3) a. [nì.sì.kù(ˈⁿdʲī.ʧī)ɾā]
/nì = sì-kuⁿdʲiʧi = ɾa/
PFV = HAB-stand = 3MS
'he was standing'

b. [kò.ní(ˈnānā)ɾā]
/kò́ = nì = nana = ɾa/
NEG.RE = PFV = rise = 3MS
'he didn't go up'

Loanword Stress

Stress position kept in loanwords <Spanish

- Penultimate stress with open final syllable

(4) a. [(ˈlóɾó)] ‘parrot’ (<loro) b. [(ˈpátó)] ‘duck’ (<pato)
c. [lā(ˈmétá)] ‘bottle’ (<limeta) d. [pī(ˈrátó)] ‘device’ (<aparato)
e. [kōpūntā(ˈdóɾá)] ‘computer’ (<computadora)

- Antepenultimate stress with open final syllable

(5) a. [(ˈnúmé)ɾò] ‘number’ (<número)
b. [tē(ˈléfó)nò] ‘telephone’ (<teléfono)
c. [(ˈsáβá)ðò] ‘Saturday’ (<sábado)

- Closed final syllable: may epenthesize V to avoid coda

(6) a. [(ˈxúvè)ʃè] ‘Thursday’ (<jueves)
b. [(ˈmjéɾkò)lèʃè] ‘Wednesday’ (<miércoles)

Loanword stress

- Final stress with open final syllable

(7) a. [xō(ˈséè)] ‘José’ b. [kā(ˈféè)] ‘coffee’ (< café)

- Final stress with closed final syllable
  - Add final vowel

(8) a. [lī(ˈstónî)] ‘ribbon’ (< listón) b. [mī(ˈʒélè)] ‘Miguel’
c. [(ˈnélè)] ‘Daniel’ d. [(ˈmáʃi)] ‘Tomás’

  - OR lengthen the stressed vowel

(9) a. [sa(ˈðǫ́ǫ̀)] ‘hoe’ (< azadón) b. [mē(ˈlǫ́ǫ̀)] ‘melon’ (< melón)
c. [dā(ˈɲéèl)] ‘Daniel’ d. [tō(ˈmáàs)] ‘Tomás’
e. [gɾā(ˈβáàɾ)] ‘record’ (< grabar)

➢ Bimoraic trochee required for stress

Acoustic Characteristics

Acoustic correlates investigated by comparison of:

- Pre-tonic, tonic, and post-tonic syllables

(10) a. [**ká**(ˈsīkā)ɾā] b. [sì(ˈ**ká**sī)ɾā] c. [(ˈkʷą̀ʔą̀) (ˈsì**ká**)sī]

/H**ka**-sika=ɾa/ /sì=H**kà**si=ɾa/ /kʷą̀ʔą̀ sí**ká**=si/

IPF\PL-RE:walk=3M now=IPF\choose=3M IPF:go far=3S.FRM

- With matched segmental and tonal properties
  - 4 onsets (/k,s,n,ⁿd/) and 2 vowel qualities (/a,i/)
  - 3 following consonants (/k,s,n/)
  - Mix of H, M, and L tone
- In declarative utterances via translation elicitation (<Spanish)
- Duration of 3-syllable context as additional control variable
- Data here: one speaker (M, 54 y.o.) who lives in Nieves

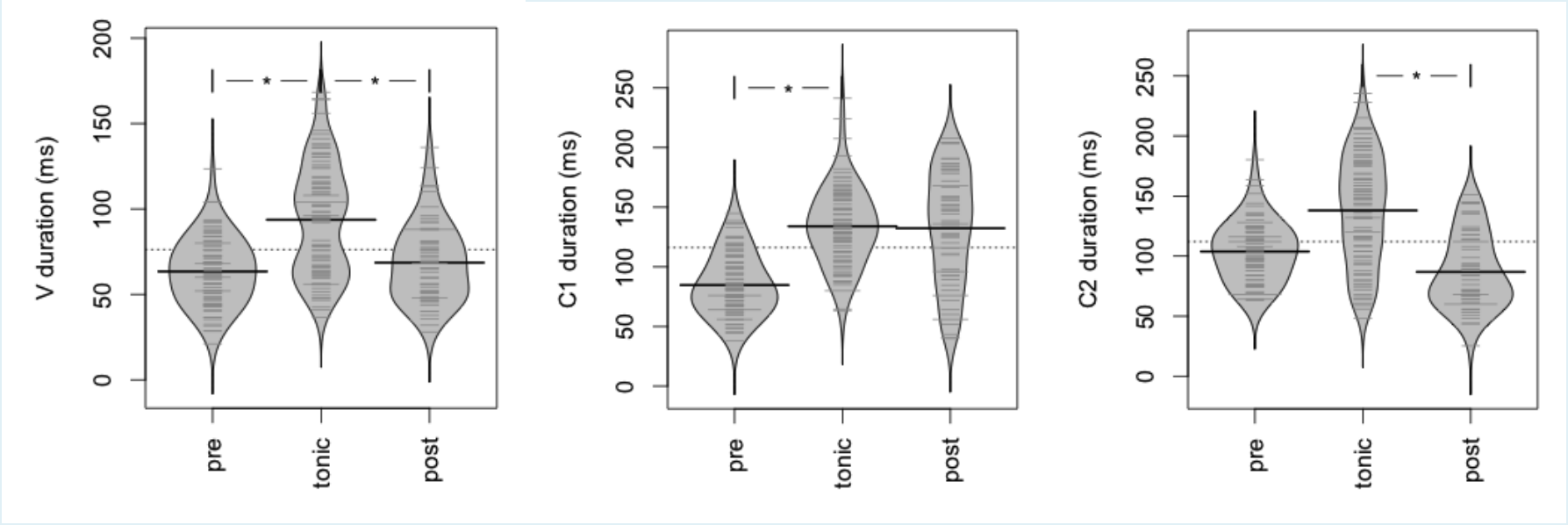
Acoustic Characteristics: Duration

Considered durations of vowel, preceding C and following C:

- Vowel (V): Tonic Vs longer than other Vs
- Onset (C1): Pre-tonic C1 shorter than Tonic C1
- Following C (C2): C2 of Post-tonic shorter than C2 of Tonic

e.g. [s] of /nì=ˈsīkā=[s]ī/

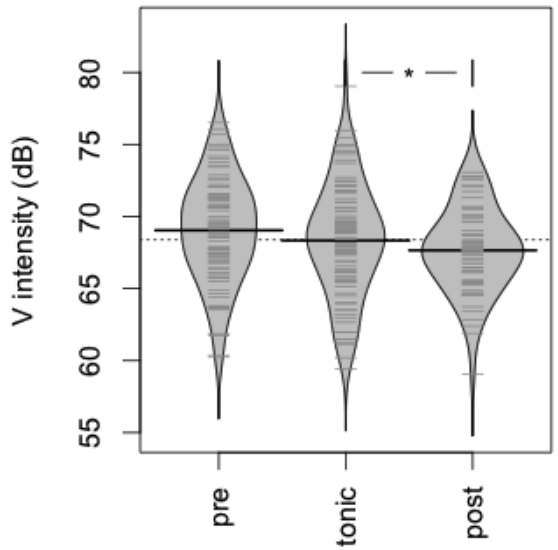
vs. [s] of /nì=ˈkā[s]í=sì/

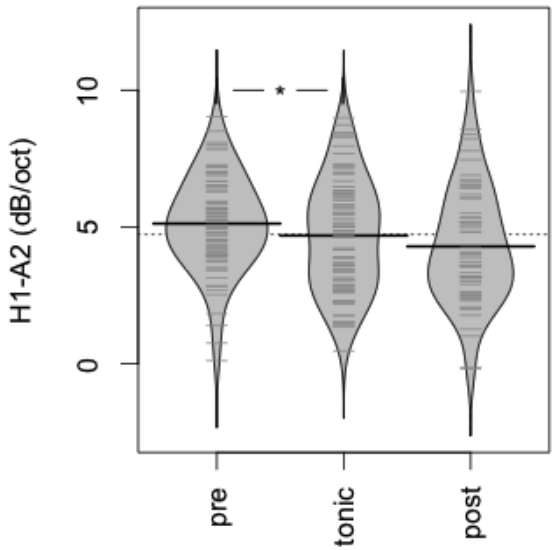


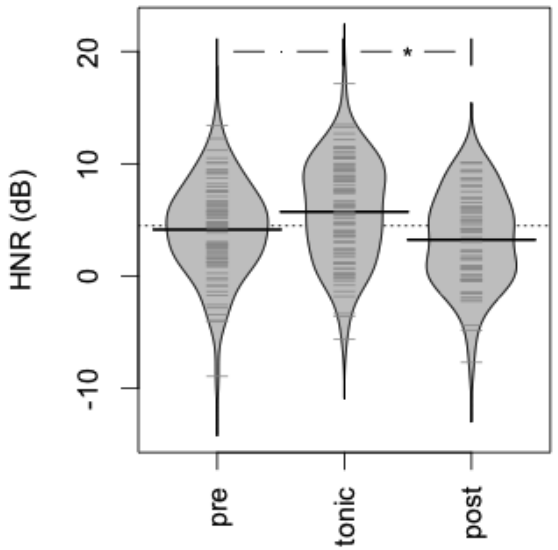
Acoustic Characteristics: Vowel Spectrum

Considered intensity, spectral tilt, HNR and CPP of vowel:

- Intensity: Post-tonic has lower intensity (weaker)
- Mid-band spectral tilt: Pre-tonic higher H1-A2 (weaker)
- HNR: Pre-tonic marginally lower; Post-tonic lower (weaker)
- CPP: like HNR but marginal - tonic narrowly stronger than post-tonic
- Low-band spectral tilt (H1-H2) n.s.

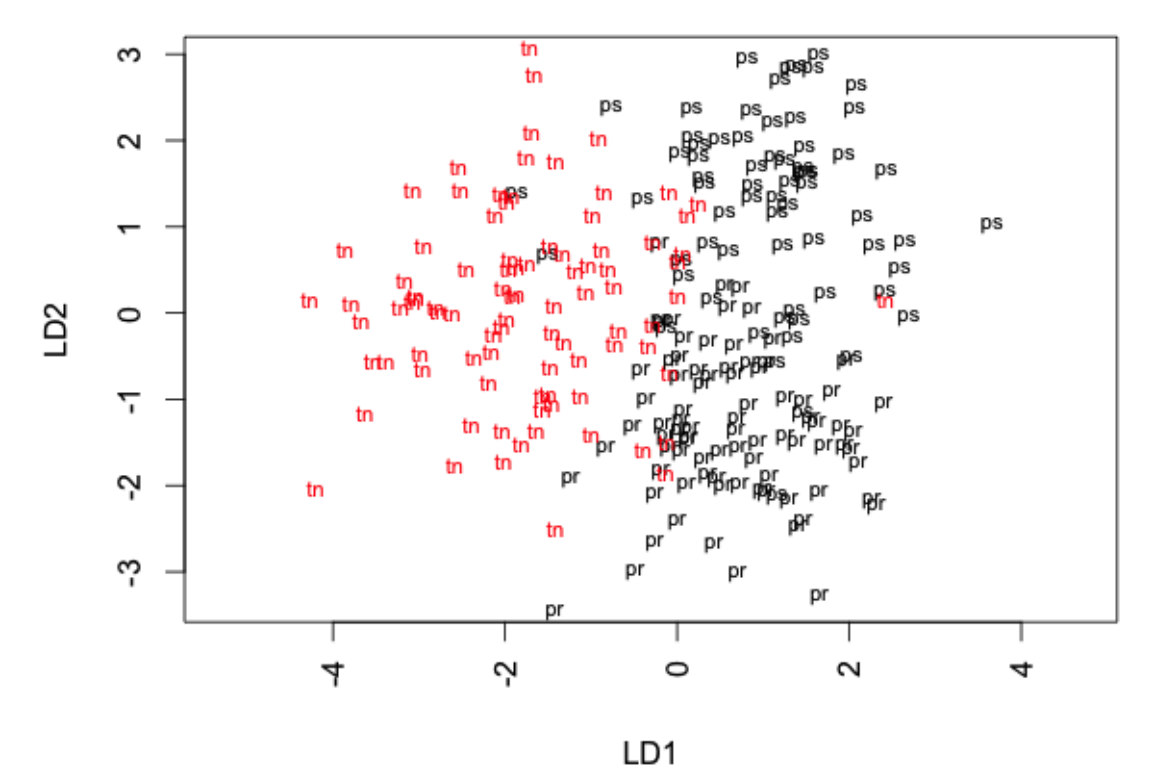






Acoustic Characteristics: Summary

- Linear Discriminants Accuracy: 81%



LD1
(Tonic vs unstressed):
-VDur, -C2Dur, -C1Dur
(and +H1A2, -HNR, …)

LD2
(Pre- vs Post-tonic):
-C2Dur, -Int, +C1Dur
(and +VDur, -H1H2, -H1A2, -CPP, …)

Interim Summary

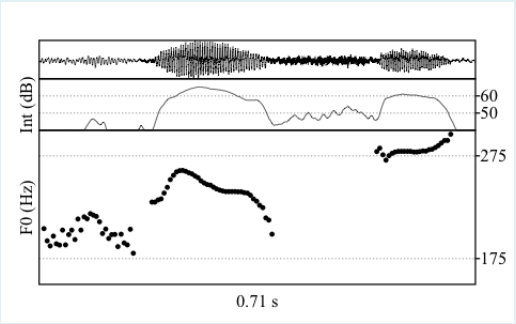
- Phonologically and acoustically, MIN word prominence looks like stress
- The stress has fixed position, aligned to the root by a moraic trochee
- The acoustic correlates of stress are:
  - Greater segmental durations of onset, vowel and following consonant
  - More resonant vowel spectra

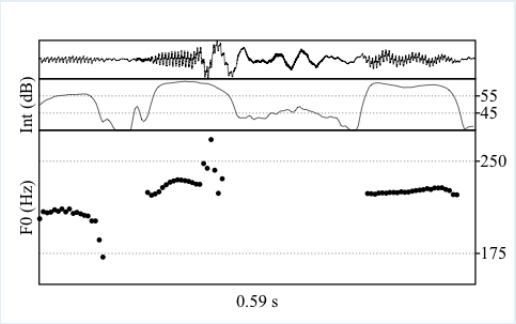
Tone

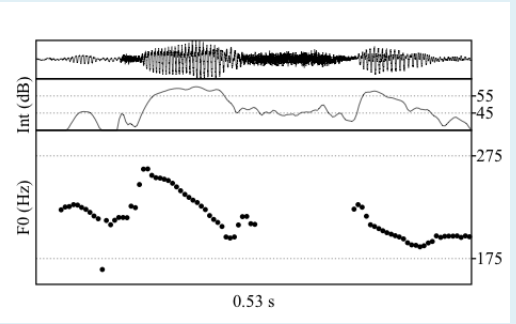
- Tone is lexically determined as one of low, mid or high, with mora as TBU

(12)

a. HH: [kíʃ́i]	b. MM: [kīʃī]	c. LL: [kìʃi]
‘sleepyhead’	‘RE.make’	‘RE.sleep’
d. MH: [ⁿdʲīʃ́i]	e. MM: [ⁿdʲīʃ̄i]	f. ML: [ⁿdʲīʃi]
‘blue’	‘pulque’	‘corn cob’



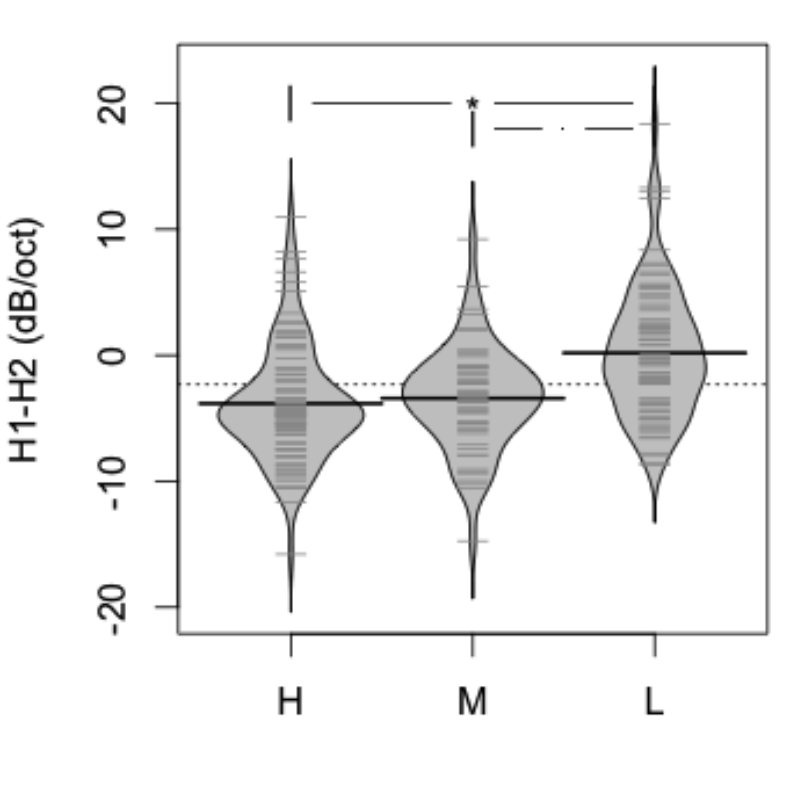




Tone

- It is cued primarily by pitch
- But also associated with low-band spectral tilt (H1-H2)

➢ L is breathy



Distribution of tone

- The minimal word and maximal (native) root are bimoraic, so we focus on bimoraic stems
- Underlying tone in bimoraic stems includes all (3×3=9) pairs of simplex tones, in both CVV and CVCV stems

(13) HH: kʷéé 'slow'
xíkó 'tall'
HM: xi̱i̱ 'different'
sákō 'opossum'
HL: kʷîi 'green'
lékà 'bag'
MH: vīí 'clean'
īxá 'overmorrow'
MM: ɲu̱u̱ 'town'
tʲuku 'again'
ML: nī̱ì 'skin'
ʃīkò 'smell'
LH: tʲi̱í 'mouse'
tʃìkí 'cactus pear'
LM: vèē 'heavy'
kìkī 'sew'
LL: ɟi̱ì 'nine'
ʒùkù 'grass'

- In addition, 5 tone patterns with final floating tone attested

(14) HH(L): léêˆ 'baby'
síkâˆ 'far'
MH(L): ɲu̱ú̱ˆ 'night'
kāsíˆ 'eat (sweet)'
MM(L): tʲi̱i̱ˆ 'grab'
ⁿdʲīkōˆ 'grind'
ML(H): nu̱ù̱´ 'face'
ʒūkù´ 'mountain'
LL(H): nɟ̀i̱´ 'blood'
xìkò´ 'neck'

Distribution of tone

- Floating tones may replace the tone of the target

(15) a. [kótʃí vàlí] /kótʃî válî / 'piglets'
b. [nūù véʔē] /nuù́ veʔe/ 'on the house'

- Or create an LH or HL monomoraic contour

(16) a. [ʒīvǐ tʲìnā] /ʒivì́ tʲìnā/ 'dog's mat'
b. [nánáɲă] /nánâ =ɲá/ 'her mother'

- Surface contour tones are:
  - Permitted on long (bimoraic) vowels:
    variety of simple and complex contours as in (13, 14)
  - Not permitted on stressed short vowels:
    only simplex L, M or H
  - Permitted on post-tonic short vowels:
    monomoraic HL or LH as in (16)

Stress-Sensitive Tone Processes

- Stressed roots resist tone changes:
  - L tone spreads onto stressless M-tone vowels in bound morphemes (17a)
  - But blocked when vowel is stressed (17b)

(17) a. [nìⁿdàkāʔàɾà]

/nì = ⁿda-kąʔą = ɾa/

PFV = REP-talk = 3MS.FAM

b. [nì(ˡⁿdāsī)ɾā]

/nì = ⁿdasi = ɾa/

PFV = wet = 3MS.FAM

Areal context

- MIN has fixed stress and stress-sensitive tone
  - Unlike the tone-dependent stress of Ayutla, Huajuapan, Molinos, etc.
  - Consistent with Josserand's (1983) generalization about fixed stress throughout Mixtec varieties
- No evidence of additional final stress
  - Cf. the final stress reported in Diuxi:
    - cognate to MIN HL and LH monomoraic contours
    - i.e. a tonal property (Daly 1978)

Cross-linguistic typology

Restricting stressed low tone:

- De Lacy's (1999, 2002) analysis of tone-sensitive stress argued for fixed preference of
  1. H over M over L in prominent positions
  2. L over M over H in non-prominent positions
- MIN tone process shows limited (M > L) of (1):
  - Stress is not tone-sensitive in MIN, but the restriction on /L/ spreading may be functionally related

Restricting contour tones:

- Zhang's (2004) survey of contour tones
  - showed preference for stressed V over unstressed V
- MIN stressed V are phonetically longer
  - But contour tones are found in unstressed V

Conclusion

- MIN has word-level stress
- The stress is fixed, aligned to the root by a moraic trochee
- The acoustic correlates of stress are:
  - Greater segmental durations of
    onset C, V, and following C
  - More resonant vowel spectra
- MIN has tone, with high tone density
  - Acoustic correlates are pitch and low-band spectral tilt

Parallel phonological & phonetic description

- advance phonetic typology and
- feed reliable data to phonological typology

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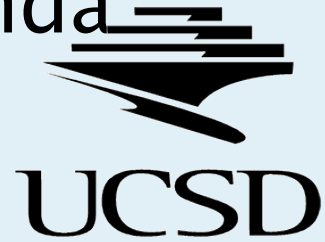

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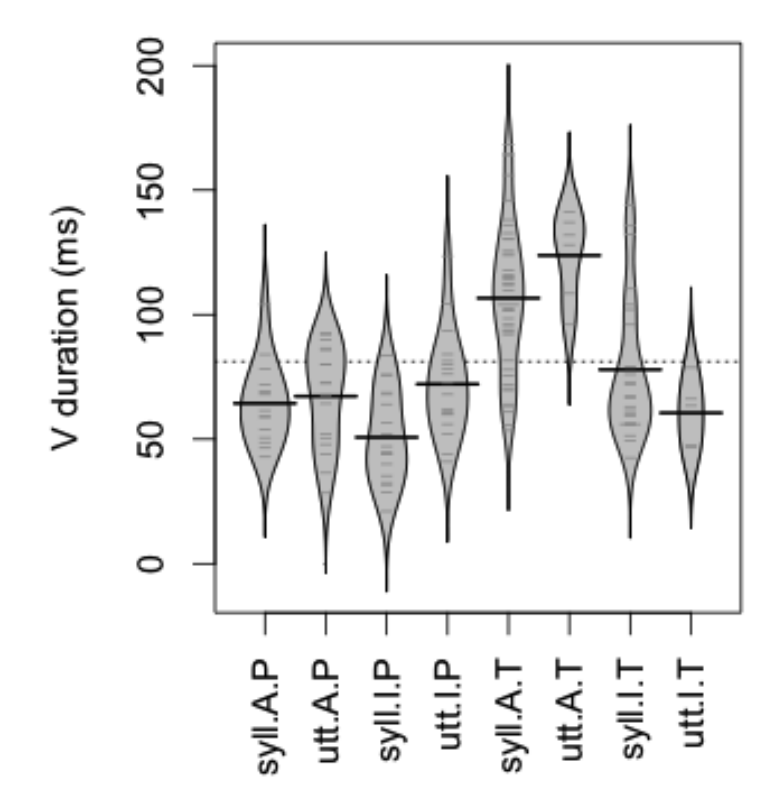
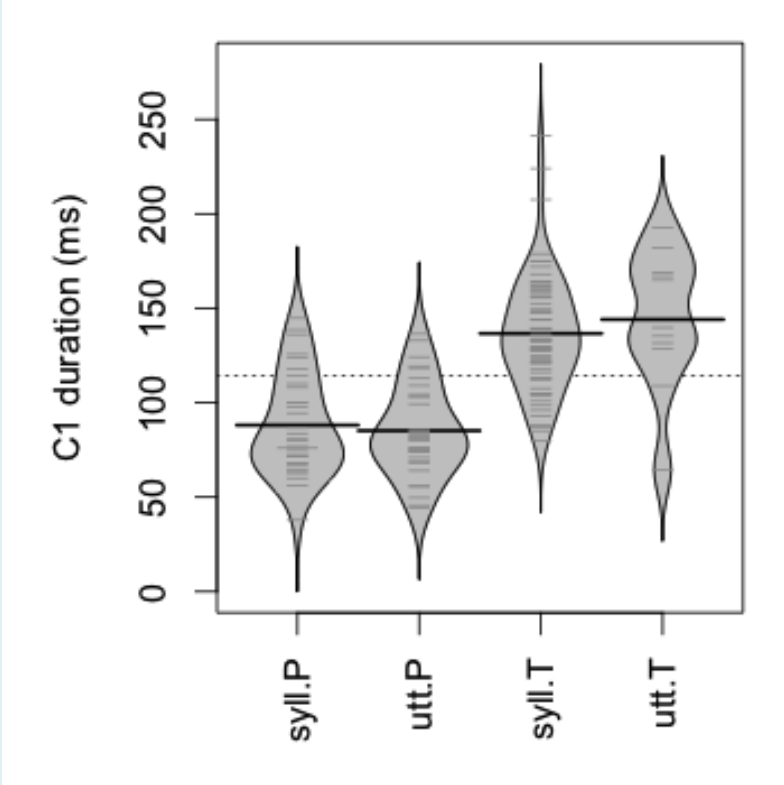
Effect of Prosodic Boundary

- Effect of prosodic boundaries not in design, but relevant data:
  - "syll": word-internal; "utt": utterance-initial
  - "P": pretonic; "T": tonic





Spectral Tilt