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Lezgi in the typological context of vowel devoicing

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Goal of today's talk

- To examine a well-documented process of vowel loss in Lezgi
- To propose vowel devoicing (VDev), based on acoustic and perceptual evidence

Outline

1. A typology of Vdev phenomena
2. The relevant data in Lezgi
3. The interpretation of acoustic evidence
4. The interpretation of perceptual evidence
5. Implications for sound change

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Most common conditions for VDev

In a C_1VC_2 sequence

a. Predominantly high vowel
b. At least one voiceless consonant (especially voiceless fricatives and aspirated stops)
c. Unstressed/unaccented vowel
d. Unrounded vowel

Cho 1993, Gordon 1998, Chitoran & Marsico 2010

Some examples:

Quebec French

tisse ['tis] ‘s/he weaves’

tissu [t**i**'sy] ‘fabric’

Turkish

tüfek [t**y**'fek] ‘rifle’

Japanese

[ɕ**i**kíso] ‘pigment’

[s**ɯ**térú́] ‘to throw’

Properties

- VDev is phonetically common
- Highly variable: within and across languages and speakers
- Distinguish positional (word-, phrase-, utterance-final) vs. non-positional devoicing *(Chitoran & Marsico 2010)*
- Often reported as a particular manifestation of vowel *reduction* or *deletion*.

Vowel devoicing database

(Chitoran & Marsico 2010)

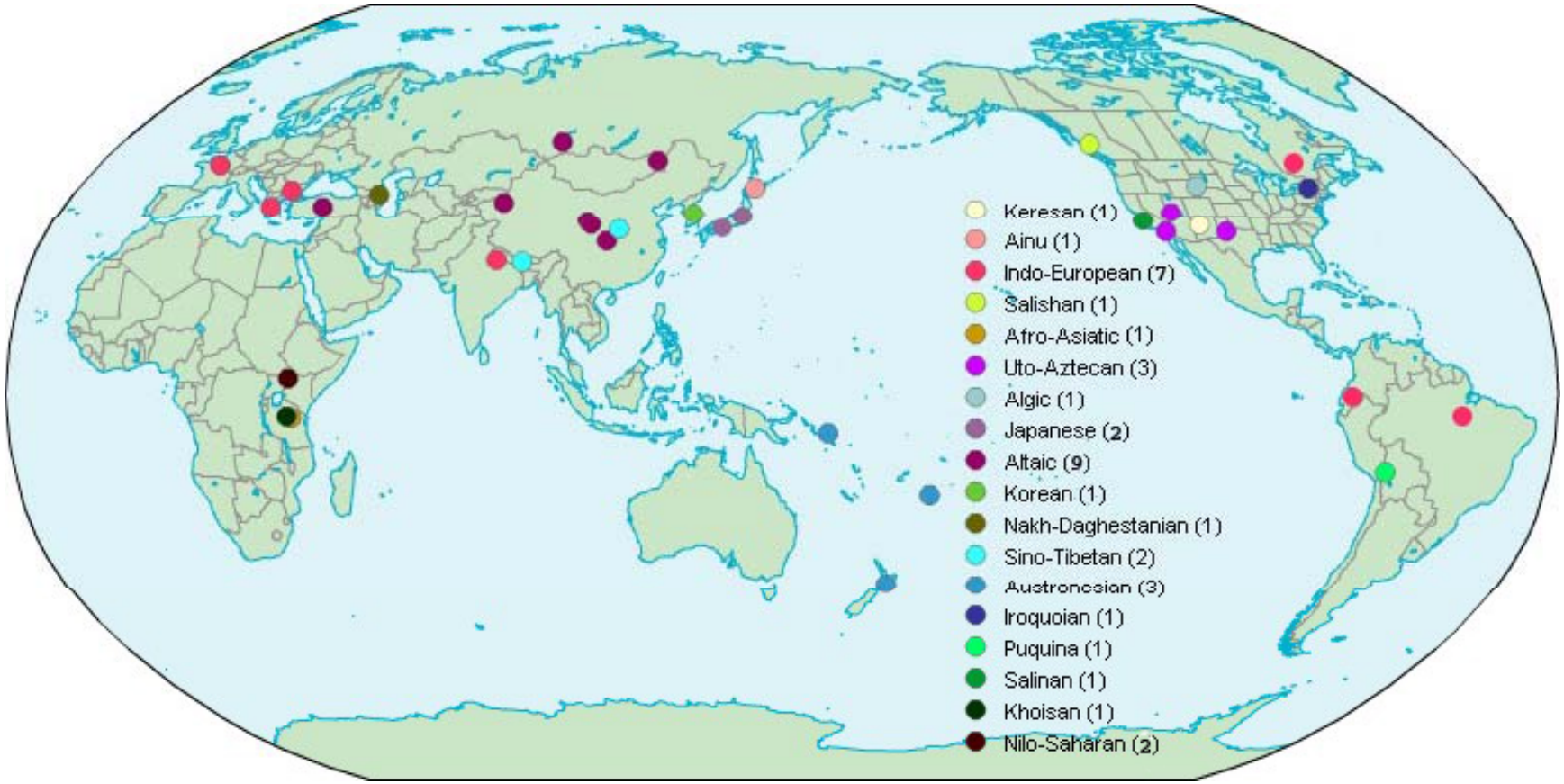
Three main sources:

1. Gordon 1998 (55 languages)
2. UPSID 451 (*Maddieson 1984; Maddieson & Precoda 1990)*
3. Additional data from approximately 100 languages

(grammars and articles)

We retained 39 languages with devoicing.

Genetic and geographic distribution of the sample



Non-positional devoicing is more common

Of the 39 languages:

- Positional devoicing only 12
- Non-positional devoicing only 22
- Both types of devoicing 5

Phonetic accounts

Non-positional VDev is understood as an assimilatory process

- Aerodynamic voicing constraint (Ohala 1983)
  - Insufficient transglottal pressure differential
  - Narrow constriction of high V impedes air flow
- Glottal gesture overlap (e.g., Jun & Beckman 1993)
  - Absence of stress shortens V, increasing overlap between C_1 and C_2
  - Glottal opening gesture of C may extend over the V gesture

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The Lezgi facts

- High vowels *[i, y, u]* disappear in pre-stress position, after a voiceless obstruent – *"syncope / reduction / deletion"*
- May be perceived as secondary articulations on C1

Uslar 1896, Talibov 1980, Kodzasov 1990, Haspelmath 1993 - Daghestan dialect

Babaliyeva 2007 - Azerbaijan dialect

Morphological alternations

Monosyllabic roots

absolutive singular (root stress)	*absolutive plural (no root stress)*	
sík’	s**i**k’ - ár	*‘fox’*
tʃʰúf	tʃʰ**u**f - ár	*‘cloud’*
tʰúpʰ	tʰ**u**p - ár	*‘cannon’*
tʃʰýkʰ	tʃʰ**y**kʷ - ér	*‘flower’*

All data from Azerbaijan dialect

Disyllabic roots

No stress alternation

kʰitáb	kʰitáb - ar	*'book'*
tʰykʷén	tʰykʷén - ar	*'shop'*
tʰup'ál	tʰup' ál - ar	*'ring'*
tʃʰuk'úl	tʃʰuk'úl - ar	*'knife'*

Can be reflected in orthography: *ktab, ktabar, Qsar (Qusar)*

(for more examples see Haspelmath 1993: 36)

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Qualitative acoustic description

Data from 7 speakers recorded in Azerbaijan

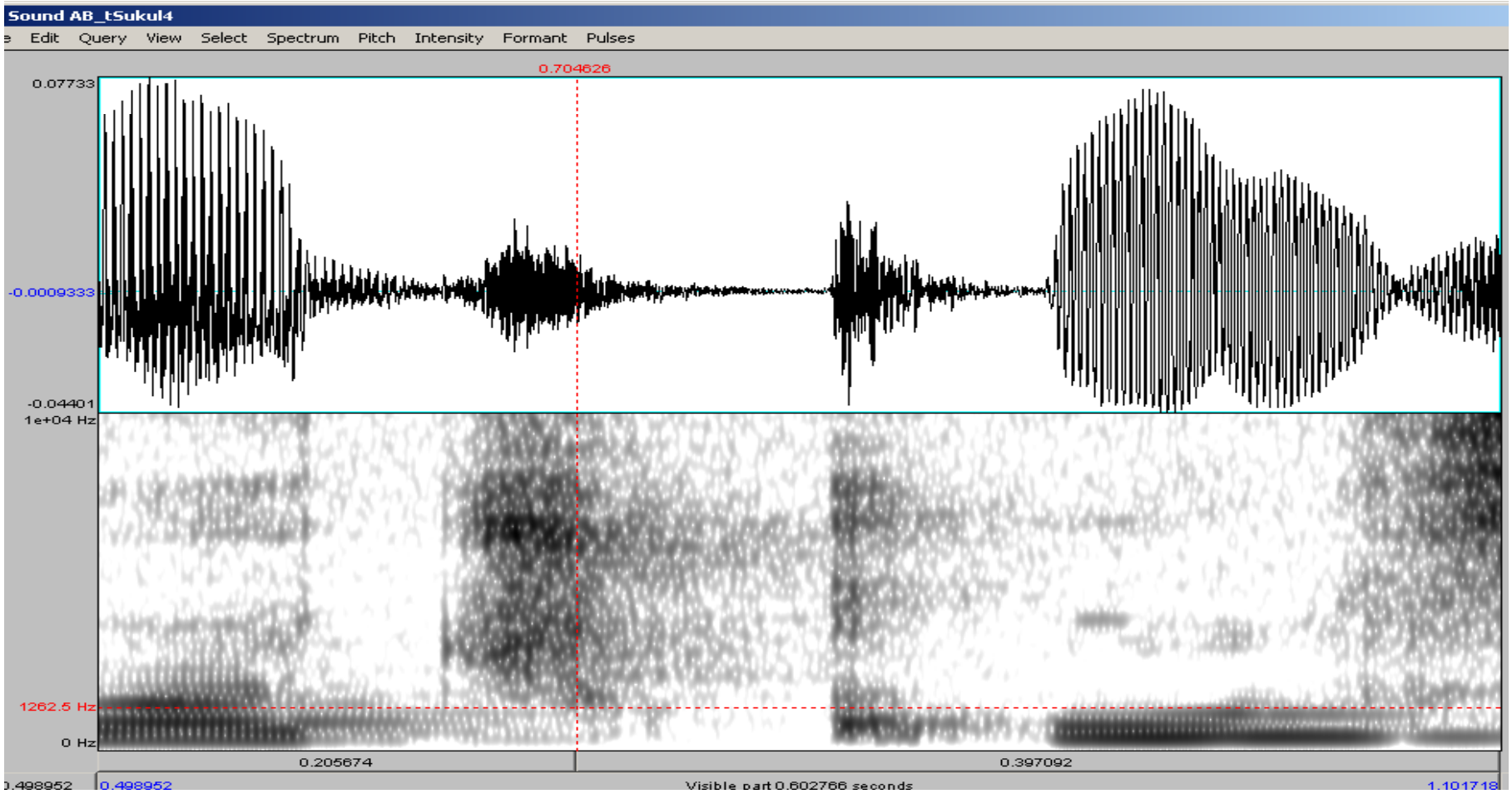
During the vowel portion:

– No periodic voicing
– Unclear formant structure
– Strong frication noise

Examples: tʃʰ**u**k’úl *‘knife’*

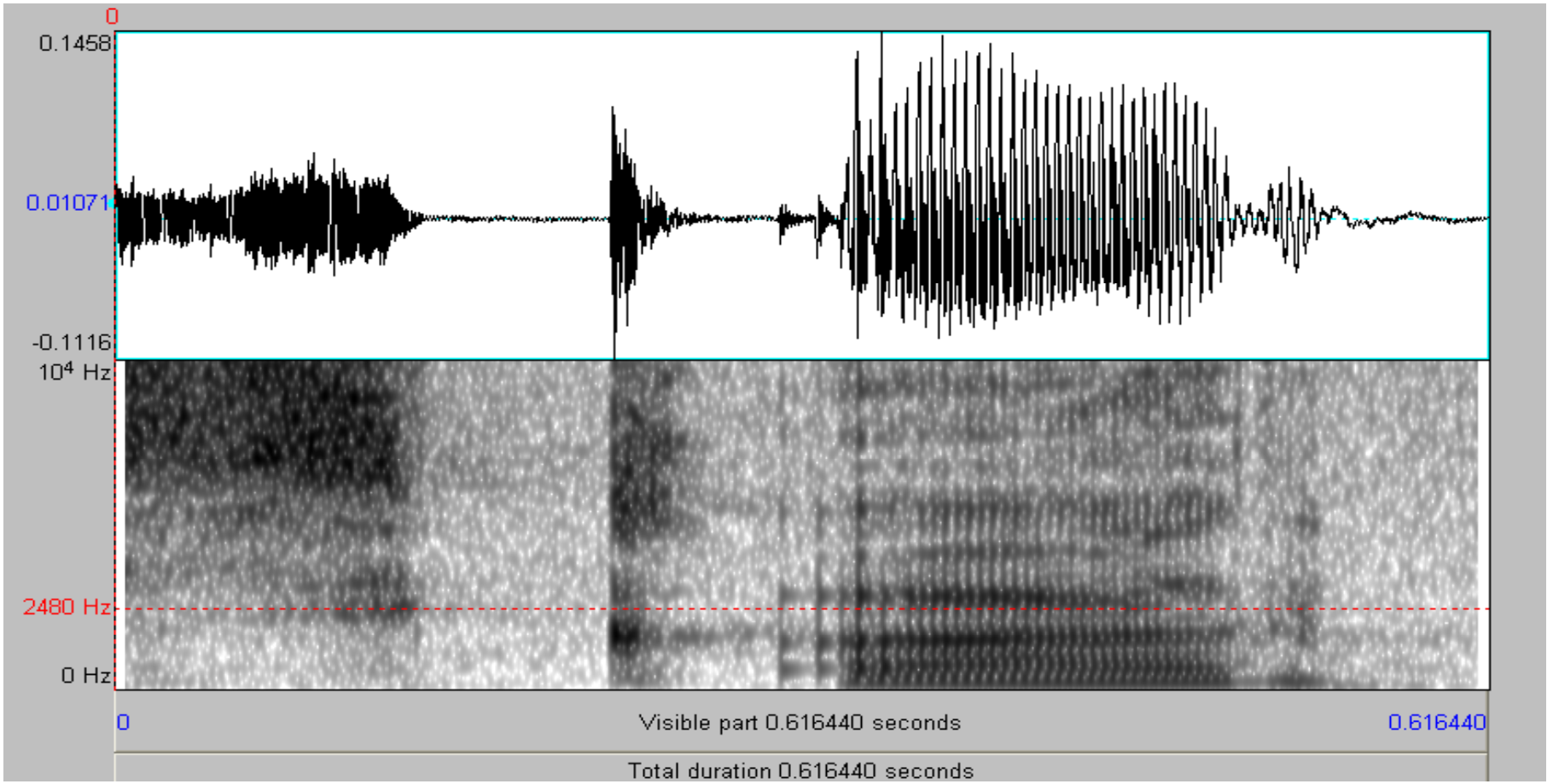
s**i**k’-ar *‘fox’ pl.*

[tʃʰuk’úl] *‘knife’*



[… a # **tʃʰ** **u** **k’** u l # s…]

[sⁱk’-ar] *‘fox’ pl.*



[s i k’ a r]

Presence of a vocalic gesture

Evidence from secondary labialization of *(non-labial)* C2

- Voiced C1 – variable labialization

	lytkʰe ~ lytkʰʷe	*'boat'*
ʁud	ʁut – ar ~ ʁutʷ – ar	*'fist'*

- Voiceless C1 – more systematic labialization

singular	***plural****(more regular)*	
k'uk'	kʰuk'ʷ – ar	*'peak'*
tyd	tʰytʷ – er	*'throat'*
tʃʰykʰ	tʃʰykʷ – er	*'flower'*

Acoustic evidence *(Chitoran & Iskarous 2008)*

- Hypothesis:
  If V gesture is still present → similar fricative-V coarticulation patterns will be found in both stress contexts.

  Comparison of DFT spectra of [s] preceding stressed and unstressed V

  síkʼ – sⁱkʼár *vs.* sútʰ – sᵘtár *vs.* sáf – safár

  'fox' *'measure of land'* *'sieve'*

Local spectral properties

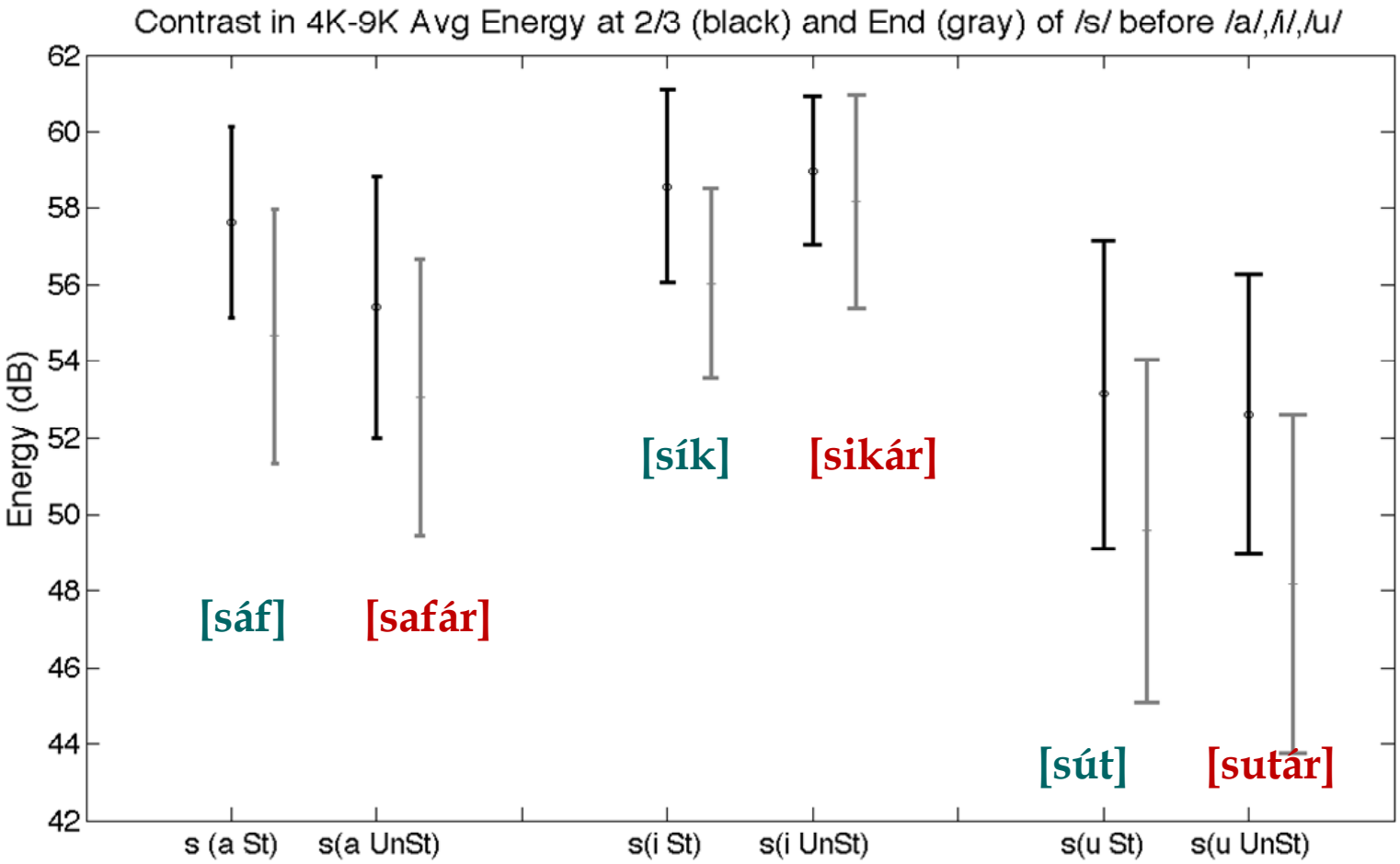
- Data from 7 speakers
- Two windows extracted from each fricative:

  - 2/3 into [s] (40 ms)

  - last 1/3 of [s] (40 ms)

Differences among *[i,y,u]* are visible in the energy between 4 and 9 kHz

Energy between 4 - 9 kHz, averaged across frequency



Results

- Coarticulation patterns in [sik’, sut^{h}] *(full V)* are similar to those in [s^{i}k’ar, s^{u}tar] *(non-full V)*
- Suggests presence of V gesture in both stressed and unstressed contexts

Acoustic duration of [s]

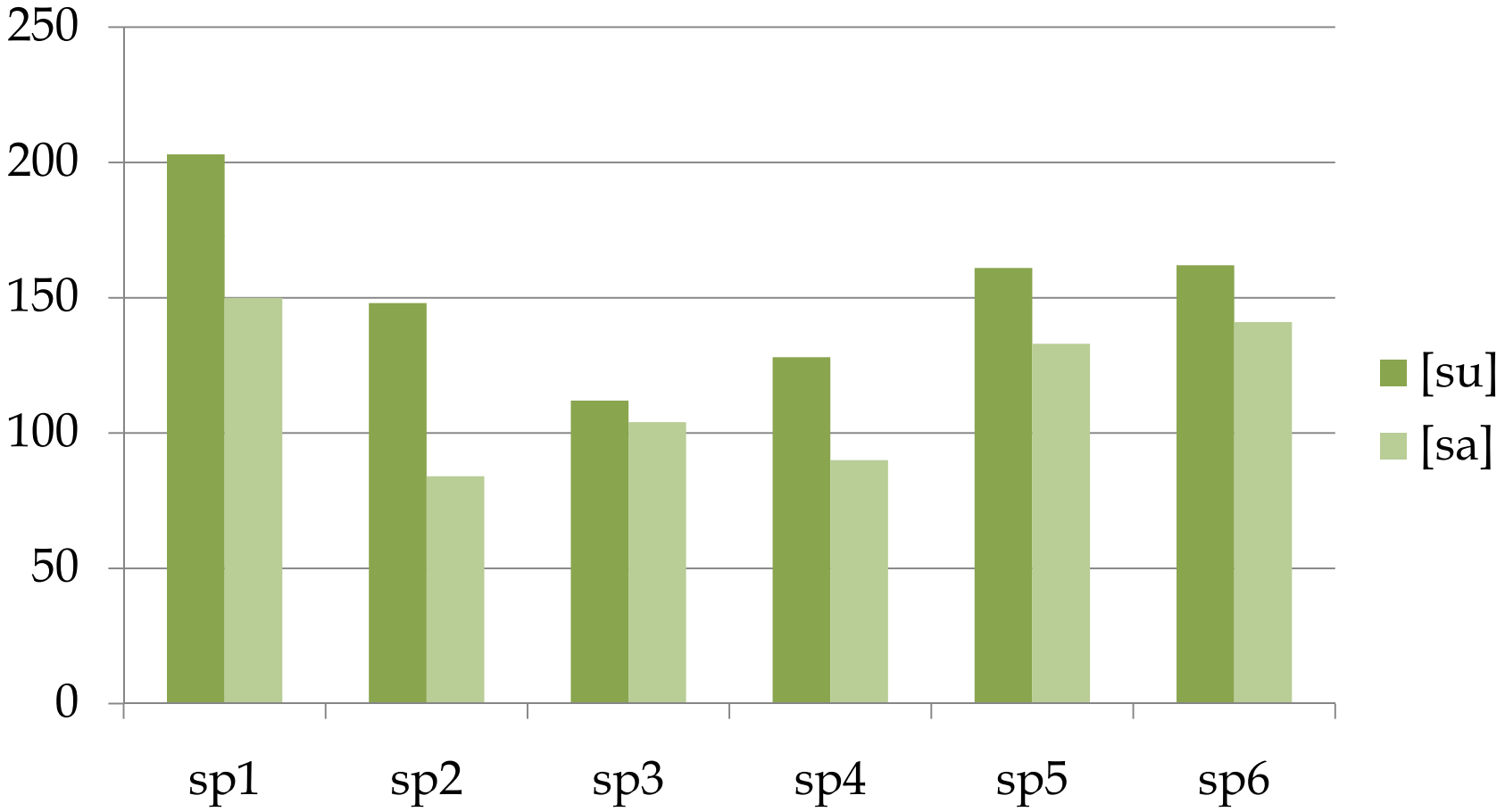
- Hypothesis:

  If V is present but devoiced, [s] will be longer before non-full Vs *(s^up-ar, s^ut-ar)* than before full Vs *(saf-ar, sal-ar, sam-ar)*

- Interpretation:

  The longer [s] duration corresponds to the devoiced vocalic portion, visible as increased frication due to a highly constricted V gesture

[s] duration *(ms)* is longer before [u] *(non-full V)* than before [a] *(full V)*



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Perception

Hypothesis:

- If the V gesture is present in the stressed environment only:
  - coarticulation effects on the fricative should be present only in that environment
  - the identification rate for the V should be higher in the stressed environment

(cf. Beckman & Shoji 1984 for Japanese)

Experiment
Forced choice identification

- Stimuli – [s] excised from real Lezgi words, in stressed and unstressed context

  s(*ík'*), ***s***(*út^{h}*), ***s***(*áf*) ***s***(*^{i}k'ár*), ***s***(*^{u}tár*), ***s***(*afár*)

- Three response choices:

  "si", "su", "sa"

- Participants: Native speakers of French (11), Japanese (9), Lezgi (2)

Stimuli

For each fricative, **6 portions** were presented, randomized:

1 - first third of [s]

2 - second (middle)

3 - third (end)

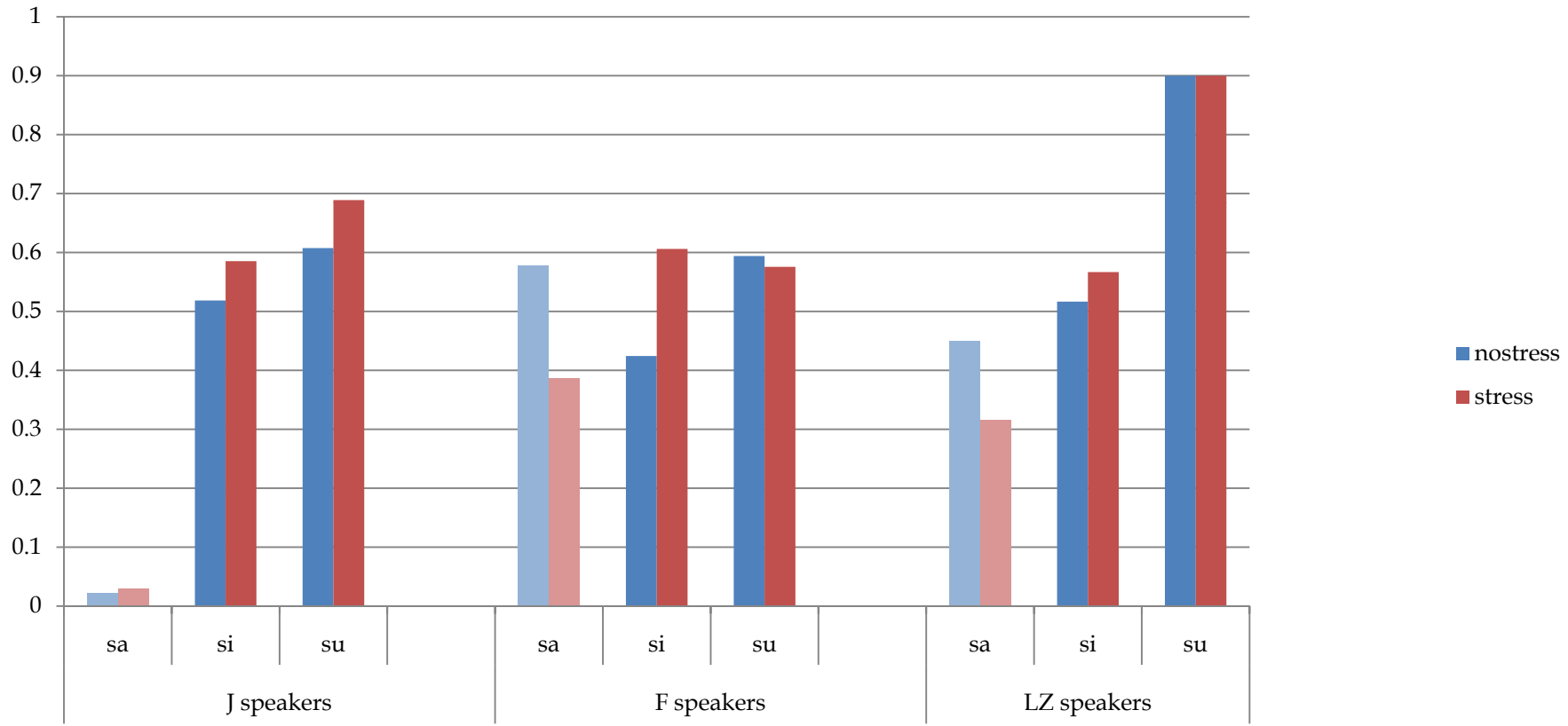
4 - first + second third

5 - second + third

6 - full fricative

5 repetitions of each, all randomized

Identification rate of Lezgi Vs as a function of stress



9 Japanese listeners 11 French listeners 2 Lezgi listeners

Results

- Different identification patterns for [sa] vs. [si, su]
- [si, su] have comparable (relatively high) identification rates *in both stressed and unstressed environments*
- Identification of [u] is the least affected by stress → *robust acoustic effects of labiality*

Support for the presence of a vowel gesture

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- The speech production system seen as a dynamical system
- A change in progress is a transition state
- From instability to stability:
  - of categories, allophonic variation
  - gradient, phonetic variation is not necessarily eliminated *("stable variation")*

- VDev is phonetically common but phonologically rare
  (allophonic variation in Japanese, Korean)

Relevant properties

- The variation in Lezgi is gradient, quantitative variation resulting from variable overlap.
- The role of morphology
- Evidence from orthography
- Initial C clusters – very few *(ʧka 'place' < ʧi'ka)*
- Very slow progress *(by comparing Uslar 1896 and Haspelmath 1993)*

Predictions

- V loss for polysyllabic roots only, except for:
  - Secondary labialization in the case of [u]
- No loss for monosyllabic roots, protected by morphological alternation
  - Possibly maintain VDev or phonemic secondary articulations (especially labialization)

Conclusions

- Some evidence from production and perception: vowel devoicing may be present in Lezgi.
- The interaction of phonetic and morphological factors predicts that the language may reach a stage of allophonic variation, rather than complete vowel loss.

Thank you

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