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Voicing alternations in Lezgi clusters and Articulatory Phonology

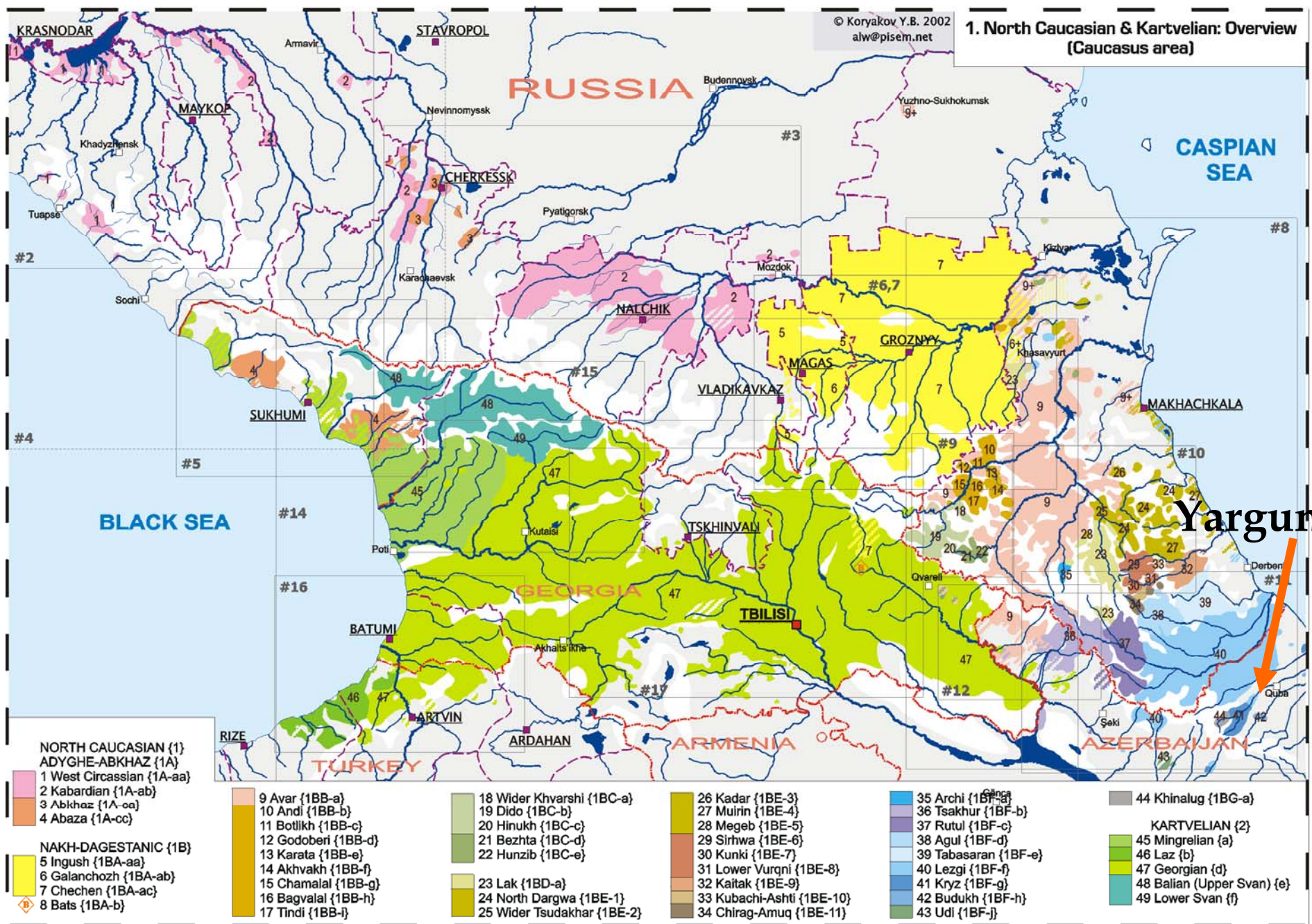
Ioana Chitoran
Dartmouth College

Lezgi

- NE Caucasian family – Daghestanian – Lezgic
- Spoken in Daghestan and N Azerbaijan
- Present data from **Yargun** dialect (**N Az**)

Daghestan Lezgi – *Uslar 1896, Talibov 1980, Mejlanova & Talibov 1987, Kodzasov 1990, Haspelmath 1993, Yu 2004*

AZ Lezgi syntax, morphology – *Babaliyeva 2007*



Goal

- Relate two phenomena so far described independently:
 - High V syncope (*Haspelmath 1993, most recently*)
 - C voicing alternations (*Yu 2004, most recently*)
- Can be captured in Articulatory Phonology model (*Browman & Goldstein 1986, 1992, Goldstein & Fowler 2003*)
 - Representation units – articulatory gestures
 - Gestural overlap
 - Laryngeal-oral coordination
- Analysis based on hypotheses that can be empirically tested

Proposal

- V syncope is the result of gestural overlap
(*not deletion*)
 - Consequences of overlap:
 - Vowel devoicing
 - C voicing alternations
 - Analysis relies on:
 - The relative timing of laryngeal and oral gestures
 - Blending / deletion of laryngeal gestures
- Supported by acoustic analysis of data from 7 native speakers from Yargun

Relevant details of the system

- 4-way laryngeal contrast in stop system:

voiced [b, d, g]

vcls aspirated [p^h, t^h, ts^h, tʃ^h, k^h, q^h]

vcls unaspirated [p, t, ts, tʃ, k, q]

ejective [p', t', ts', tʃ', k', q']

- High vowel syncope in word-initial syllable
- C voicing alternations

High vowel syncope

- Pretonic high vowels (*i, y, u*) in a word-initial syllable are lost after a voiceless obstruent (*Haspelmath 1993*)
- Impressionistically – vowel audible as secondary articulation on C1

Monosyllabic roots – *morphological alternations*:

absolute singular

(*stress, full vowel*)

sⁱk'

tʃ^húf

t^húp^h

tʃ^hýk^h

absolute plural

(*no stress, syncopated vowel*)

sⁱk' - ár

tʃ^hu^f - ár

t^hu^p-ár

tʃ^hy^k^w-ér

‘fox’

‘cloud’

‘cannon’

‘flower’

Disyllabic roots – *no alternations*:

singular

k^{hi}táb

t^{hy}k^wén

ts^{hu}p'úr

plural

k^{hi}táb - ar

t^{hy}k^wén - ar

ts^{hu}p'úr - ar

‘book’

‘shop’

‘feather’

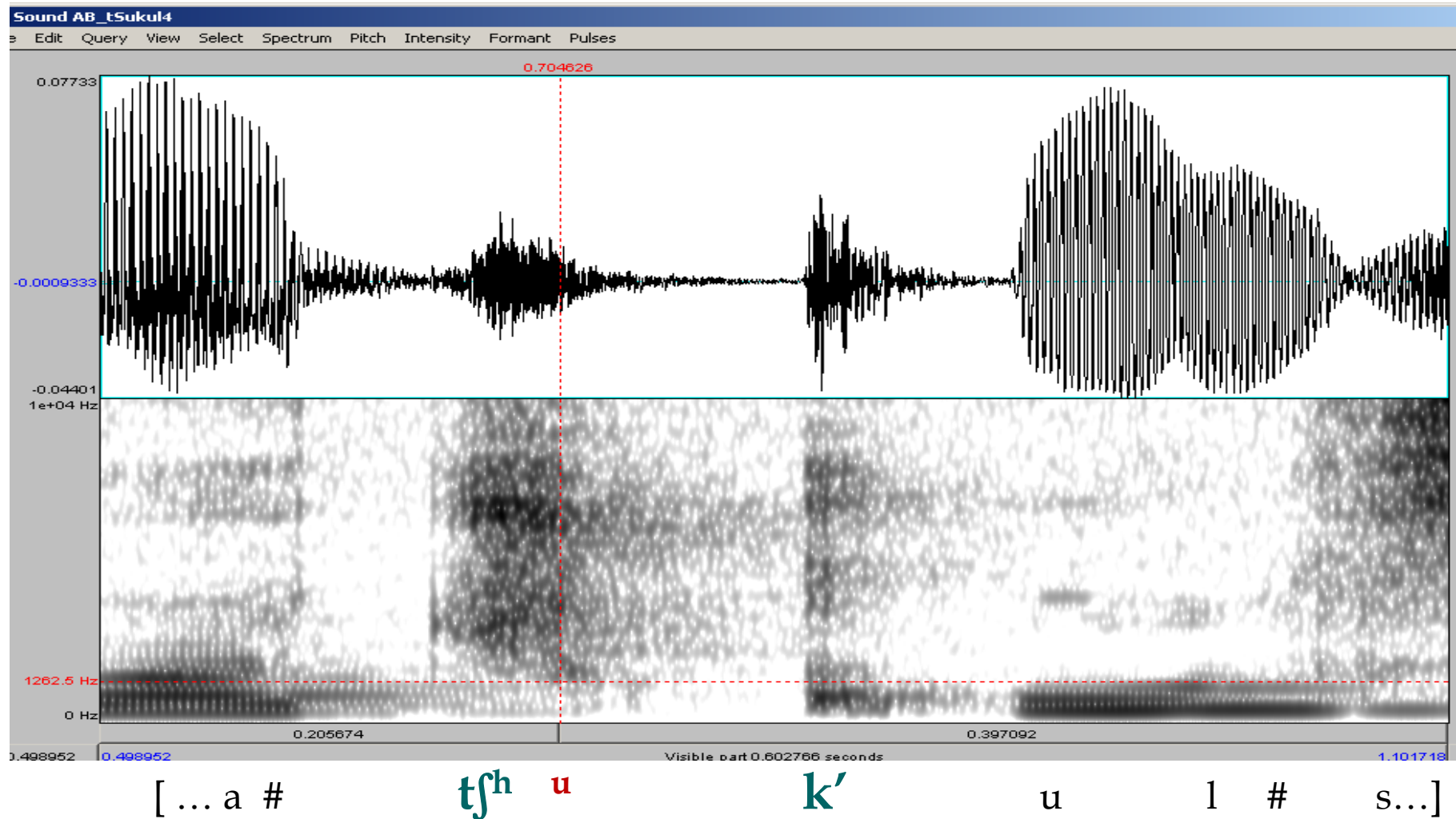
- Stress – left edge iamb
- Orthography ?
- Phonetic description (*Chitoran & Babaliyeva 2007*) :
 - No periodicity
 - Weak formant structure in frication noise

- Compare:

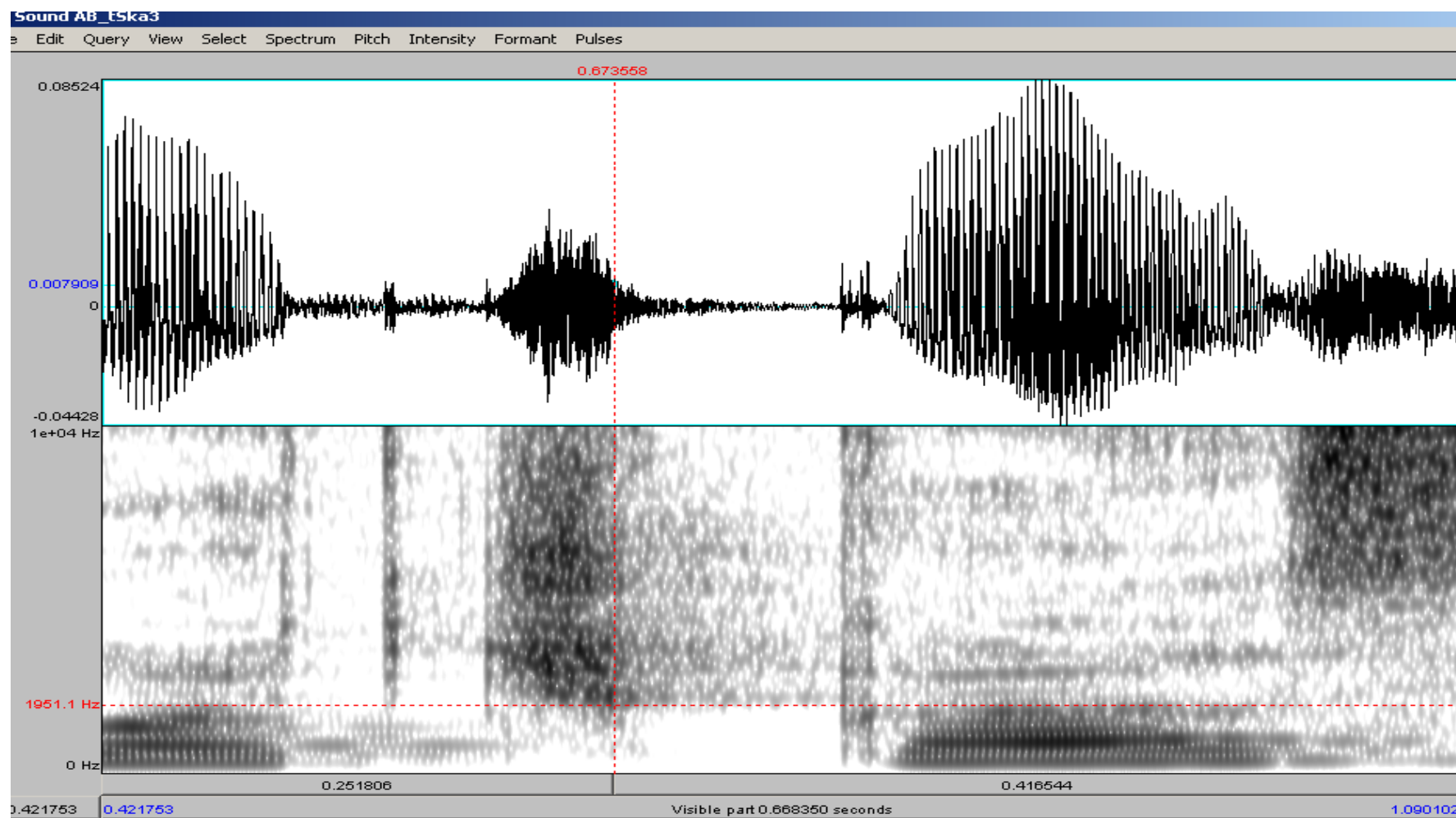
tʃ^{hu}k'úl ‘knife’

tʃ^hka ‘place’

[tʃ^hu k'úl] 'knife'



[tʃ^hk'a] 'place' (no /V/)



[... a # tʃ^h k' a # s ...]

Non-high vowels

Syncope not reported for non-high vowels

But in many monosyllabic roots:

q ^h e ^l	q ^h i ^l – ér	‘anger’
χe ^l	χi ^l – ér	‘branch’
ts ^h a ^l	ts ^h i ^l – ár	‘wall’
xar	xir – ár	‘oven’
jo ^b	ju ^p – ár	‘ear’
po ^b	pu ^p – ár	‘woman’
χe ^b	χi ^p – er ~ χ ⁱ p – er	‘sheep’
k ^h e ^f	k ^h i ^f – er ~ k ^h i ^f – er	‘braid’

Articulatory analysis – outline

C_1VC_2

$C_1^vC_2$ -ér/ -ár

- Stress shift away from V increases C_1V overlap, bringing C_1 and C_2 closer together.
- If V is sufficiently overlapped it is only variably perceived.
- If variably perceived, then variably produced

Possible sound change: onset clusters may develop *in disyllabic roots*

- If C_1 has a glottal opening gesture, at increased overlap it will extend over a short, highly constricted V gesture (*overlapped V is devoiced*). Same reorganization for non-high Vs.

Acoustic evidence for an overlapped vowel gesture

Chitoran & Iskarous 2008

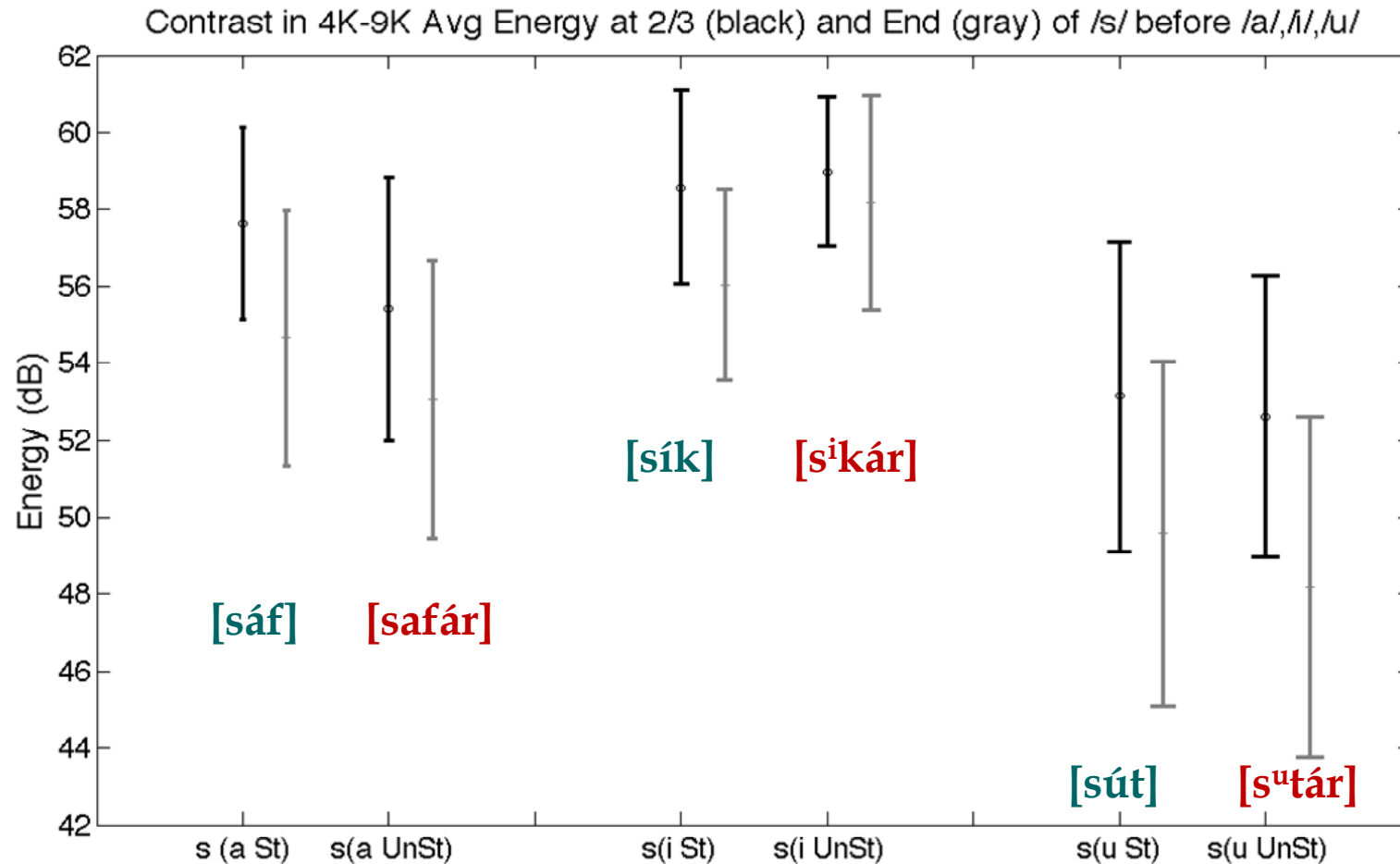
- Comparison – spectral energy of **[s]** averaged across frequency:

sík' – **s**ⁱk' ár vs. **s**áf – **s**afár
sút^h – **s**^utár

At fricative end, between 4-9 kHz:

- Same [sV] coproduction in both stressed and unstressed (syncope) conditions.
- Different coproduction in [si, su] vs. [sa]

Energy between 4 - 9 kHz, averaged across frequency



Syllable positions as specific modes of gestural coordination (*Browman & Goldstein 1995, 2000; Goldstein et al. 2006*)

$$C_1 - V . C_2 > C_1 \overset{v}{-} C_2$$

Onset C is coupled *in phase* with V → gestures begin *synchronously*

- When V gesture is longer (**non-high stressed V**), full CV sequence can still be perceived, even at high overlap.
- When V gesture is shorter (**high unstressed V**), more of V is hidden (C_1 - C_2 coordination across V) → “*syncope*” is reported

Coda C is *anti phase* with V → gestures begin *sequentially*

Complex onset → C_1 and C_2 each in phase with V, anti-phase with each other

C voicing alternations

Restricted to monosyllabic roots:

- C_1VC_2 *singular*
- $C_1^VC_2$ -ár / -ér *plural*

Proposal:

Temporal re-organization of C1 and C2 also implies re-organizing their respective glottal gestures, such that:

- only one glottal gesture is present per onset cluster (*Browman & Goldstein 1986*)
- associated with C1 release, or centered between C1 and C2

Experimental evidence for single glottal gesture in clusters: Georgian stops – *PGG data - Hoole & Fuchs*; [s-stop] Germanic lgs. – Löfqvist, Yoshioka.

Lezgi: *blending* of identical gestures, but also *deletion* of C2 laryngeal gesture.

Representation of laryngeal contrasts

[b, d, g]

vocal fold vibration during closure

GLO(nar) in-phase with oral closure

Contra Lisker & Abramson 1964, Browman & Goldstein 1986, Goldstein & Browman 1986

[p^h, t^h, ts^h, tʃ^h, k^h, q^h]

glottal opening gesture associated with oral release

GLO(open)

[p', t', ts', tʃ', k', q']

complete closing gesture with glottal release following oral release

GLO(rel) anti-phase with oral release

[p, t, ts, tʃ, k, q]

default (*no active glottal gesture*)

(Based on Kingston 1990 – Articulatory binding)

Pattern #1

C2 aspirated / plain voiceless

If C1 and C2 have the same laryngeal gestures (plural syncope) –
blending

One glottal opening gesture associated with C1 release.

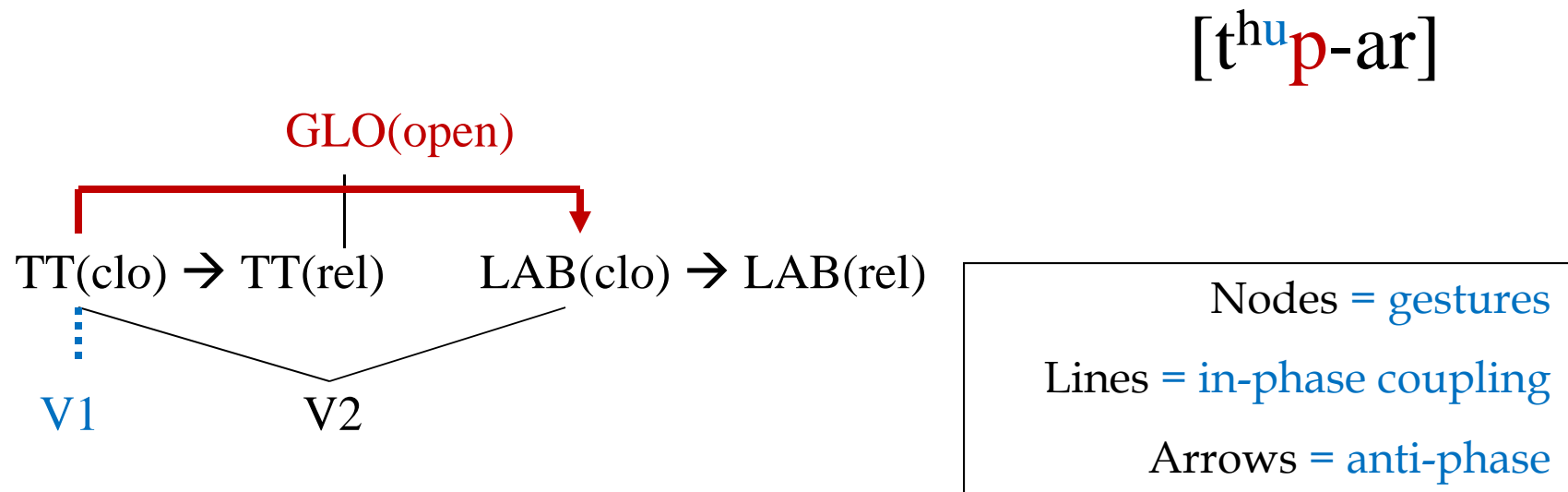
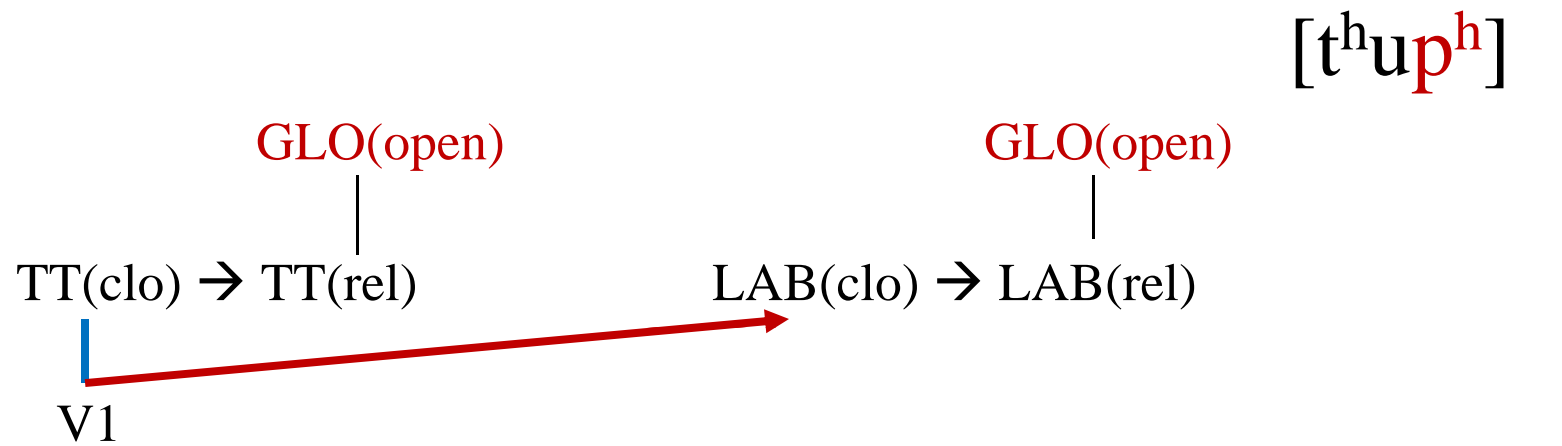
t ^h up ^h	t ^h u ^h p-ar	‘cannon’
fi ^t ^h	fi ^t -er	‘manure’
k ^h e ^k ^h	k ^{hi} k ^h -er	‘fingernail’

Gestures still closer, even if no syncope.

When different from C1, C2 laryngeal gesture is *deleted*

ni ^k ^h	ni ^k -ar	‘field’
ne ^k ^h	ni ^k -er	‘milk’

Coupling graph



Pattern #2

C2 voiced / plain voiceless

- C2 gesture, GLO(nar), is deleted

ty^d t^hy^t^w-er ‘throat’

pa^d pa^t-ar ‘side’

po^b pu^p-ar ‘woman’

- blending if glottal gestures are the same – GLO(nar)

mu^g mu^k-ar ‘nest’

Coda voiced C confirmed (Yu 2004). Historically – *root-final voiced stop becomes geminate (and devoices) in intervocalic pretonic position.*

Pattern #3

C2 voiced / ejective

- Glottal release timed late – reinterpreted as coordinated with C2.
- Why C1 aspiration? *Frication* at C1 release into narrow constriction.

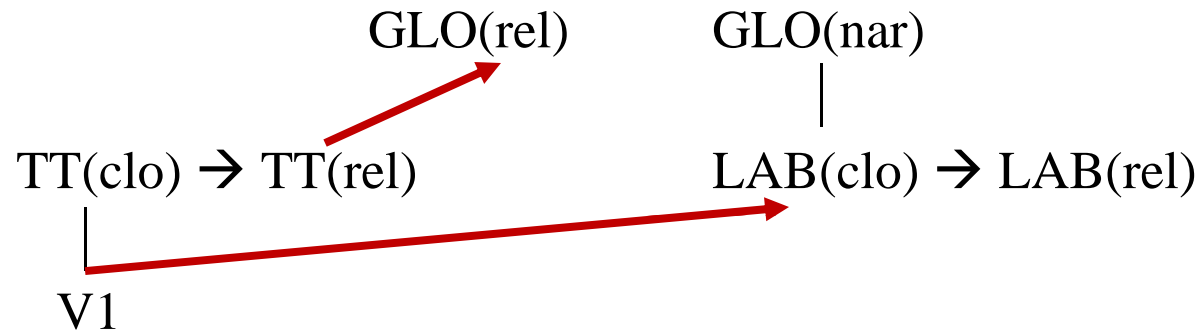
t'u**b** t^{hu}**p'**-ar 'finger'

t'i**b** t^{hi}**p'**-ar 'owl'

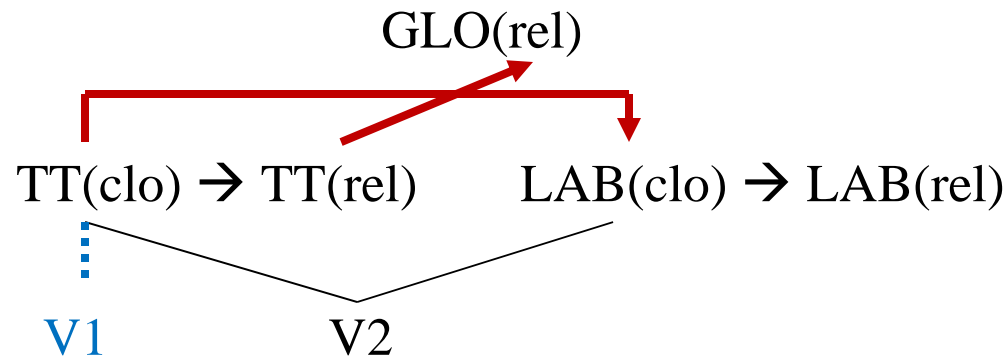
q'e**b** q'e**p'**-er 'cradle'

Coupling graph

[t'u^b]



[t^{hu}p'-ar]



Predictions of AP analysis

/t^h-p^h/ t^hu^par ‘cannon’ VS. /t’-b/ t^hu^p’ar ‘finger’

- Difference between outcomes of C2 is predicted by timing of glottal gestures relative to C1 release (in-phase vs. anti-phase).
- Final C alternations not predicted to occur in longer roots:

k ^h ymék ^h	k ^h ymék ^h – ar	‘help’
kylég	kylég – ar	‘door lock’
k ^h itáb	k ^h itáb – ar	‘book’

Increased gestural overlap *in word-initial position* leads to temporal reorganization of C1 and C2

Earlier attempted analyses have focused on *word-final C*. 23

Summary and conclusions

Patterns of voicing alternations in Lezgi may be best captured in a gestural model such as *Articulatory Phonology*.

Relies crucially on:

- connection to high V syncope
- reference to timing of glottal gestures relative to oral *closure* and *release*
- aspects of proposed analysis can be verified instrumentally

Can be verified instrumentally:

- Presence of high V gesture
- Temporal reorganization in word-initial position
 - Coupling of oral gestures
 - Coupling of laryngeal and oral gestures
- Voiceless unaspirated stops have no active laryngeal gesture

Thank you