The sound systems of the Rift Valley languages

New perspectives on their form and evolution

Didier Demolin
Laboratoire de phonétique et phonologie, CNRS & Sorbonne nouvelle

ROOTS, BRANCHES & lheaf: multidisciplinary perspectives on east africa's early history
Leiden 6-8 june 2024

- The African Rift and its languages
- The open nature of the language sound system
- Sound systems and their complexity
- What is a possible speech sound?
- Links between clicks and ejectives
- Links between implosives and labio-dorsals

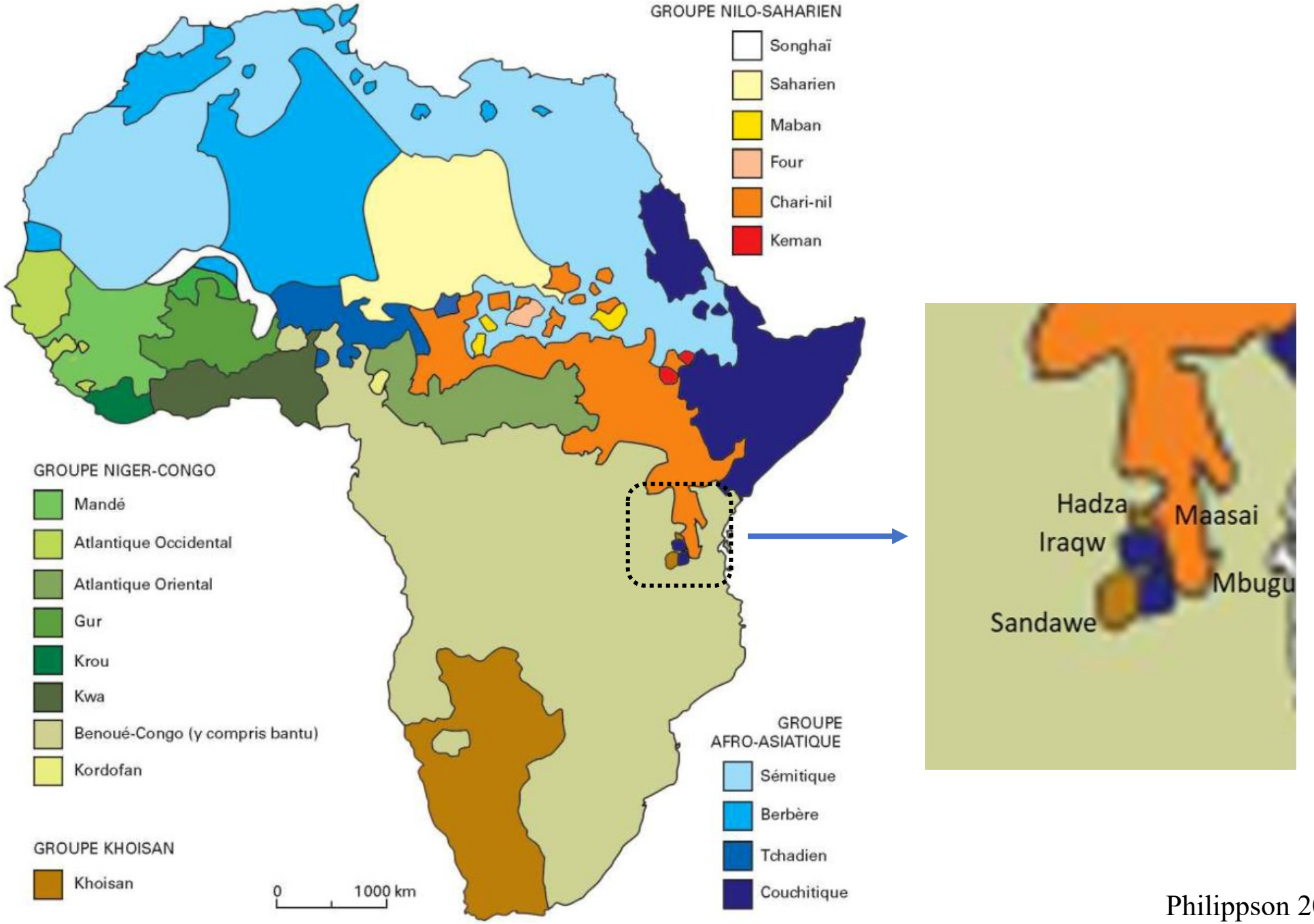
As such the African Rift is not a linguistic area but

It is a geographical and ecological area that played a role in the evolution of the sound systems of several linguistic families of African languages.

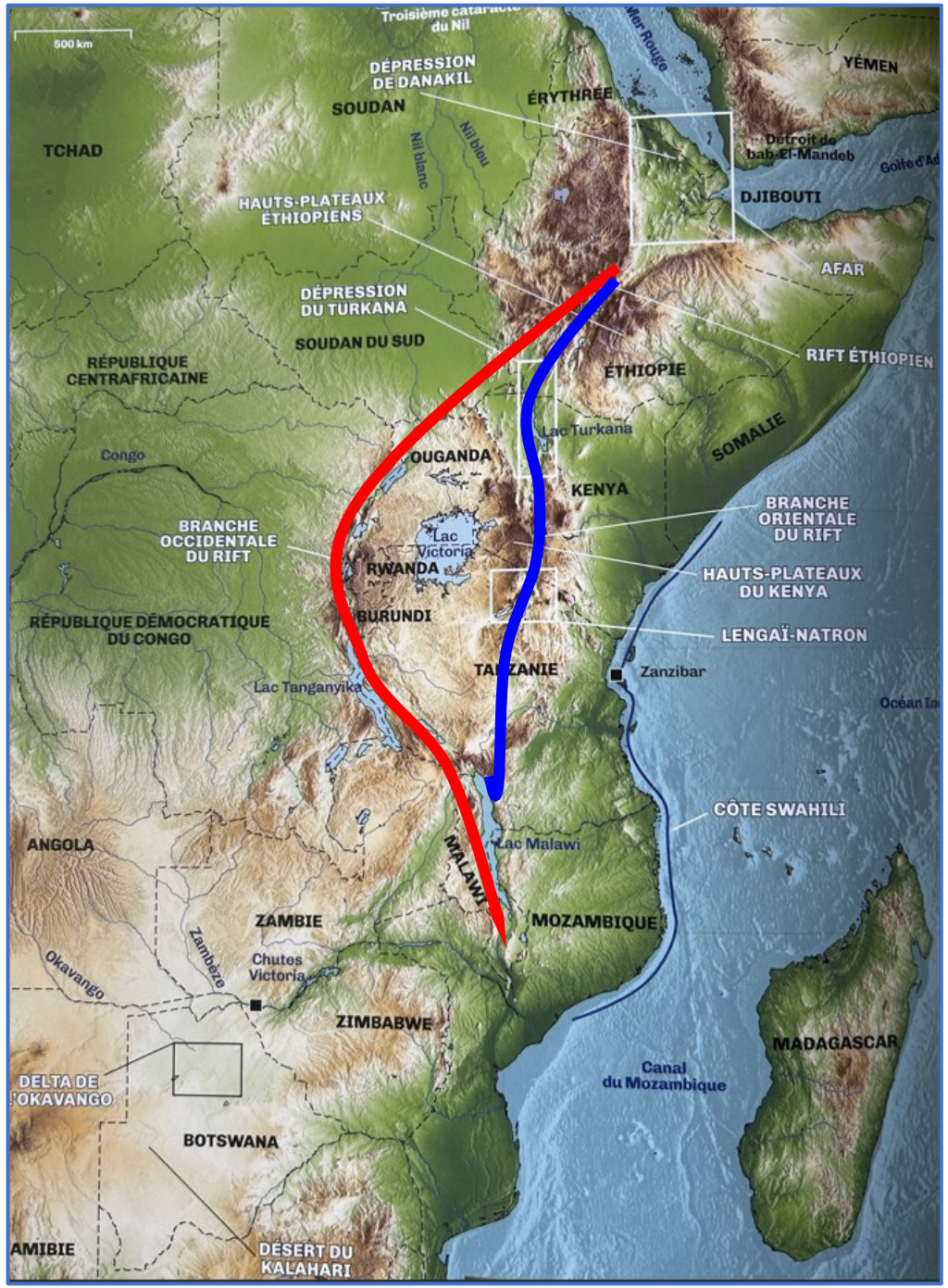
The rift triggered contacts of hunter-gatherers, pastoralists and agriculturalists.

What are the consequences of these contacts in linguistics, anthropology, archeology and genetics?

The study of contacts and long-term comparisons of the sound systems of the Rift Valley languages, when viewed through a biomechanical lens, provides new perspectives on the origin and development of these sound systems.



Philippson 2004


500 km
Troisième cataracte du Nil
DÉPRESSION DE DANAKIL
SOUDAN
ÉRYTHRÉE
Mer Rouge
YÉMEN
TCHAD
Nil blanc
Nil bleu
Détroit de bab-El-Mandeb
Golfe d'Aden
DJIBOUTI
HAUTS-PLATEAUX ÉTHIOPIENS
AFAR
DÉPRESSION DU TURKANA
SOUDAN DU SUD
RIFT ÉTHIOPIEN
RÉPUBLIQUE CENTRAFRICAINE
ÉTHIOPIE
Lac Turkana
SOMALIE
Congo
OUGANDA
KENYA
BRANCHE ORIENTALE DU RIFT
BRANCHE OCCIDENTALE DU RIFT
Lac Victoria
RWANDA
HAUTS-PLATEAUX DU KENYA
BURUNDI
RÉPUBLIQUE DÉMOCRATIQUE DU CONGO
LENGAÏ-NATRON
TANZANIE
Zanzibar
Lac Tanganyika
Océan Indien
CÔTE SWAHILI
ANGOLA
Lac Malawi
MALAWI
ZAMBIE
MOZAMBIQUE
Zambèze
Chutes Victoria
Okavango
ZIMBABWE
MADAGASCAR
Canal du Mozambique
DELTA DE L'OKAVANGO
BOTSWANA
AMIBIE
DÉSERT DU KALAHARI

The Eastern Rift

The Eastern Rift, in Tanzania, is a place where the major language families (Khoesan?, Niger-Congo, Afro-Asiatic and Nilo-Saharan) are in contact.

These languages are spoken by hunter gatherers, pastoralists and farmers.

The current linguistic diversity masks an older variety whose remnants are isolates not related to the major linguistic phylla → e.g. *Hadza* & *Southern Omotic* in Ethiopia.

It is likely that other languages with clicks were once spoken in East Africa. *Dahalo*, the Cushitic language of a group of hunter-gatherers from Kenya, shows that they probably once spoke a click language.

In East Africa, there are small groups of (former) hunter-gatherers *(Okiek, Akie)* who have words that could relate to these early inhabitants.

The Western Rift

The Western Rift geographical area shows contacts between 2 of the major language families but not Khoesan and Afroasiatic.

These languages are spoken along the great lakes to the Great Rift Fault in Malawi.

Labio-dorsal [kp, gb, gɓ, kʙ̥, qɓ, ɢɓ] and implosives consonants [ɓ, ɓ̥, ɗ, ɗ̥, ʄ, ʄ̥, ɠ, ɠ̊] are found in this area and show that their initiation mechanism is partly similar to clicks or non-pulmonic consonants. Some Bantu languages in the south of the Western Rift have clicks.

Origin of clicks in Bantu languages: contact? innovation? sound change?

The sound system of language is an open system.

What are the theoretical and practical consequences of this claim?
⇒ open systems evolve towards the complexification of their structures.

What are the limits of languages sound systems?

- Take into account auditory and perceptual constraints.
- What is the origin of non-pulmonic consonants, clicks, ejectives and implosives?
- Origin of labio-dorsals?

Sound system structures and their complexity

Basic > complex > elaborate (Lindblom & Maddieson 1988)

Complexification of structures and speech sound production

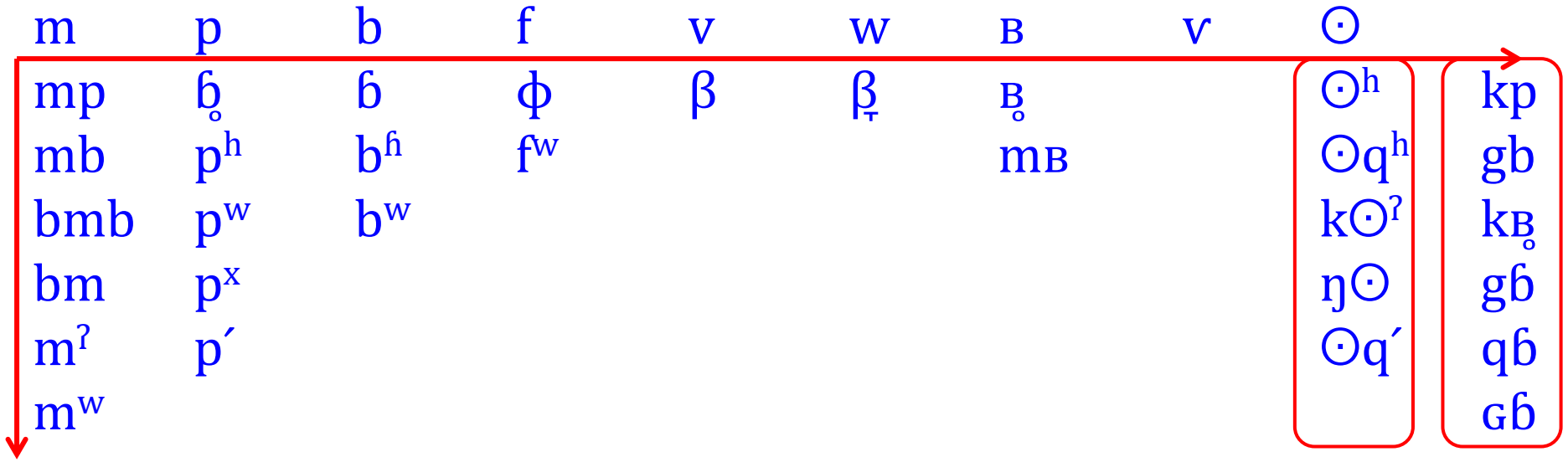
The complexification of labial consonants follows a pattern similar to the acquisition of speech in children → m, p, b, w > m, p, b, f, v, w….

This follows the development of motor skills. The jaw and lips form a simple control unit in the early stages of babbling.

The mandible and lower lip are highly correlated.

Then there is a differentiation between the lower and upper lips towards actions, but independent in relation to lip gestures.

Differentiation > Integration > Expansion (Refinement)
Characteristics of Open Systems



What is a relevant speech sound in language?

(90% of the world's languages are unwritten)

Conative animal interjections in *Maasai*

ɣɣ	sound produced to incite bull to fight' (not an IPA symbol)		
mḿ	bad smell	↓m̀m̀	good smell
↓p	calling come	↓s	go

Ideophones and sound symbolism in *Maasai*

píal	brightly - of white	kúlukúlu	sound of pouring
píd	quickly - of jumping	kúm	hard bang sound
pío	depiction of bad smell	kúmúkúm	sound of walking
tír:ya	quietly	kúr:kúr:	sound of thunder
tíak	sound of dropping something	ŋóɓ	sound of gulping

⇒ more than the usual set of phonemes used to symbolize the sounds that are eventually present in an orthographic system.

Conative animal interjections: ɣɣ

‘sound produced to incite bull to fight’ (no IPA symbol)

Interjections: ḿḿ ‘bad smell’; ᶥm̀m̀ ‘good smell’.

Karani, Ghio & Demolin (2022)

Interjections

ǁ ~ ǂ 
ǀ

Conative animal calls

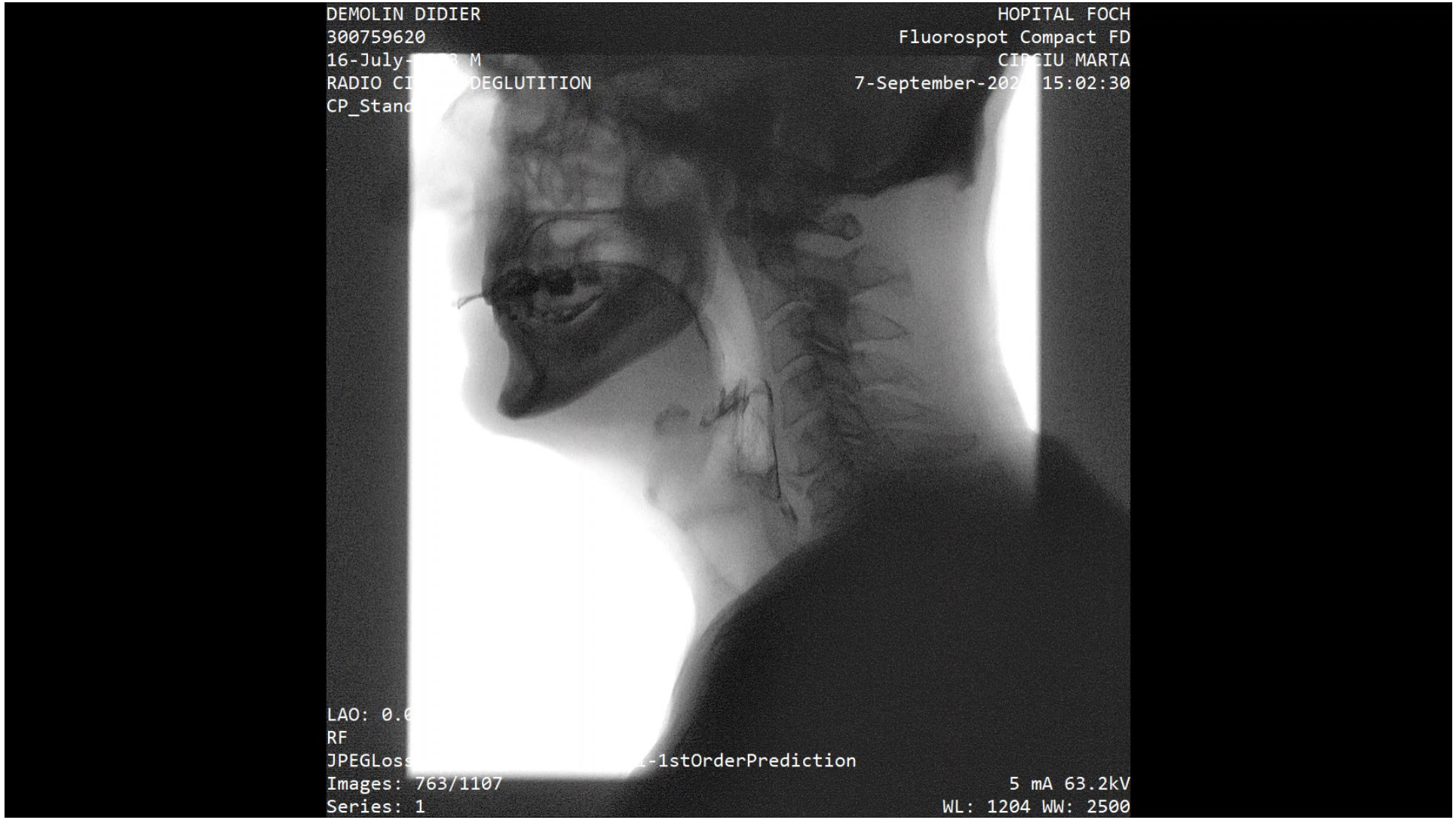
↓p 
ɣɣ
⊙

Non-pulmonic consonants in the Rift valley languages.

It is possible to make the hypothesis that the sound systems encountered in the two branches of the Rift presenting non-pulmonic and labio-dorsal consonants result from similar biomechanical mechanisms.

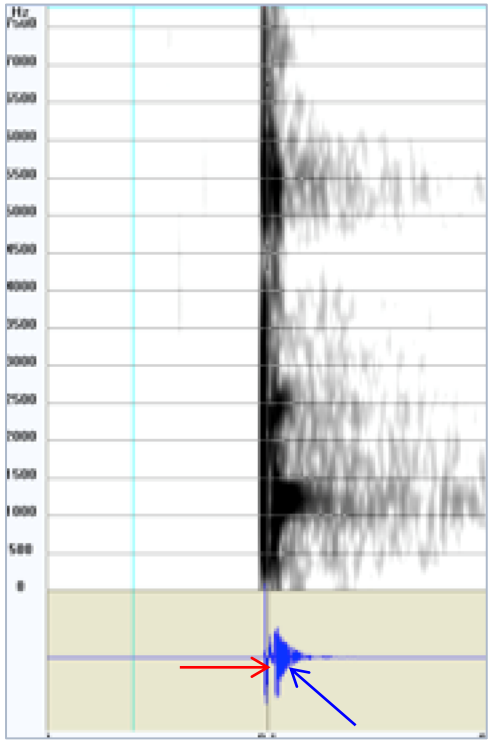
The production of clicks, [!, !ʔ, !h, ŋ!], ejectives [cʎ̝̊ˊ, kʟˊ, tʎˊ] implosives [ɓ, ɗ, ɠ] and labio-dorsal consonants [kp, gb, qɓ] is likely based on the reuse and the specialization of movements produced in swallowing mechanisms for the purposes of communication.

This phenomenon is part of the complexification process of sound systems.

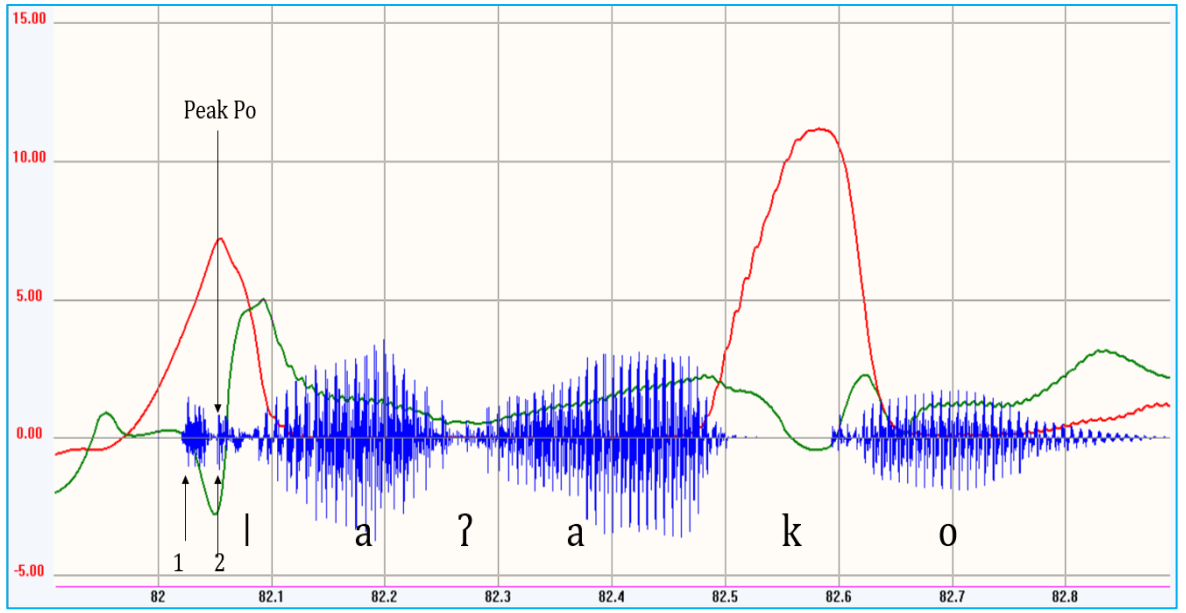


1 Swallow + alveolar click ! 2 Swallow + palatal click ǂ

Demolin
Kingston
& Circiu
2023



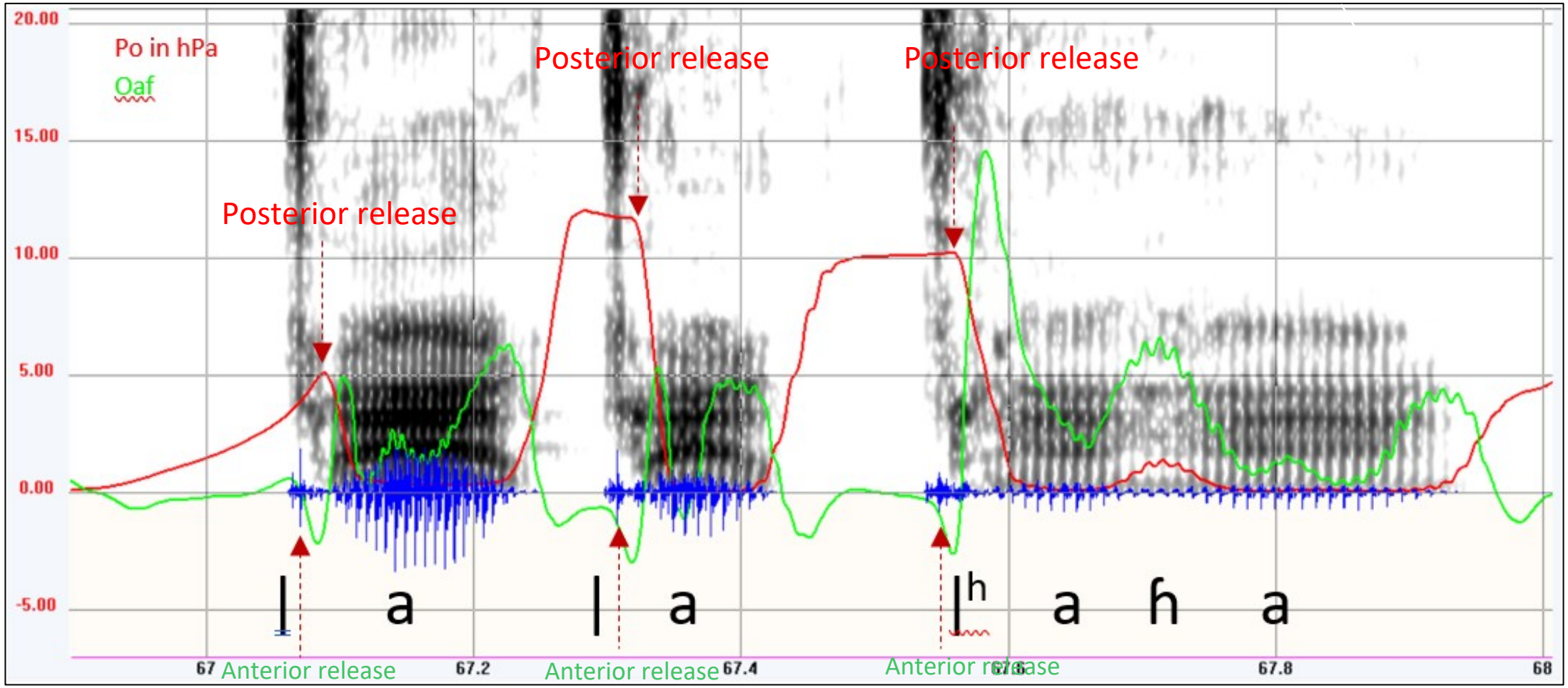
Clicks have acoustically two components an attack transient and a extinction transient



Double attack transient for the dental click [ǀ]

Clicks are very brief acoutic events.

Aerodynamic evidence for the synchronization of the anterior and posterior releases in the production of dental clicks [|] in *Hadza*



How it is this controlled?

Are clicks relics of early sounds produced by humans?

They occur in languages spoken by people whose common genetic ancestor lived more than 35,000 years ago, perhaps as long as 55,000 years ago (Knight et al., 2003; Tishkoff et al., 2007).

Clicks are no more likely to be retained than other speech sounds (Sands & Güldemann (2009), Traill (1986), Traill & Vossen (1997)

They might have been innovated independently in the languages where they now belong to their consonant inventories.

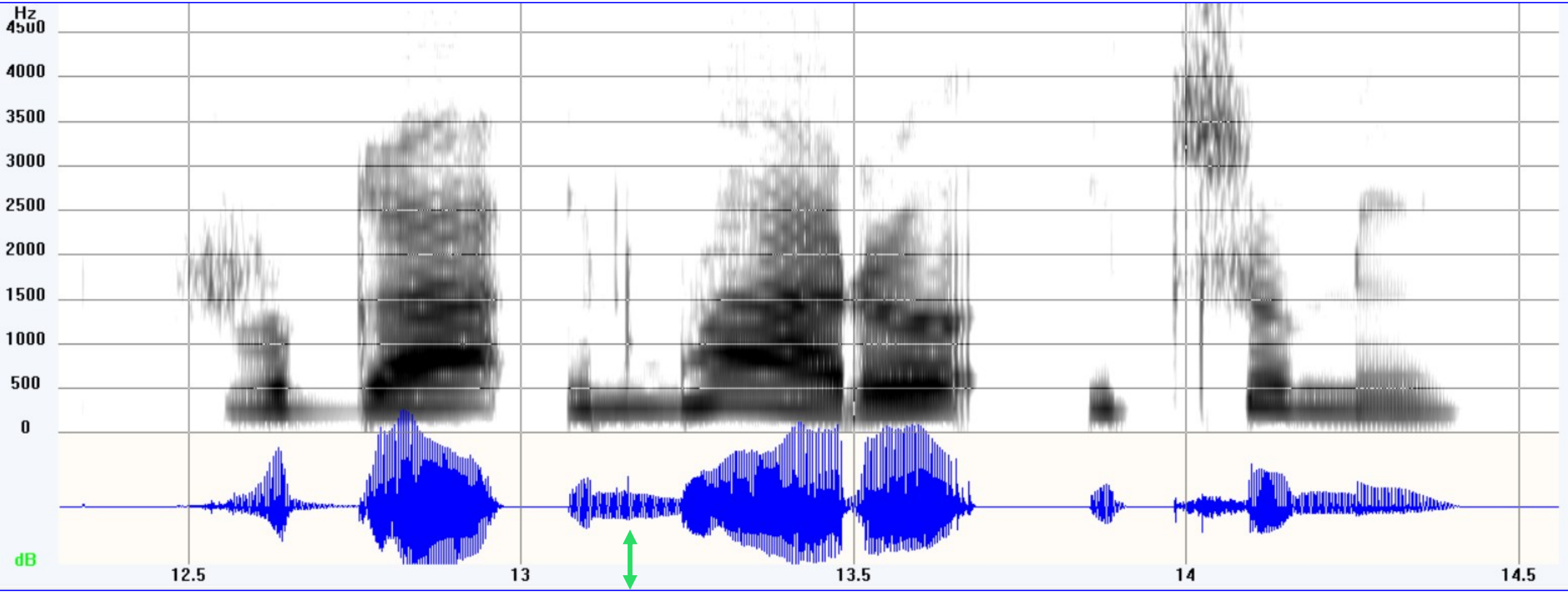
Clicks emerged in Khoesan languages within a linguistic area where there is already a great diversity of sounds and sound systems, an environment that would dynamically encourage further increases in complexity.

An examination of the mechanisms of clicks and ejectives of production *Hadza* and *Iraqw* suggests links in the production and perception of these sounds.

This shows sound production mechanisms probably resulting from a process of complexification and adaptation to new biomechanical and environmental constraints (in the social sense).

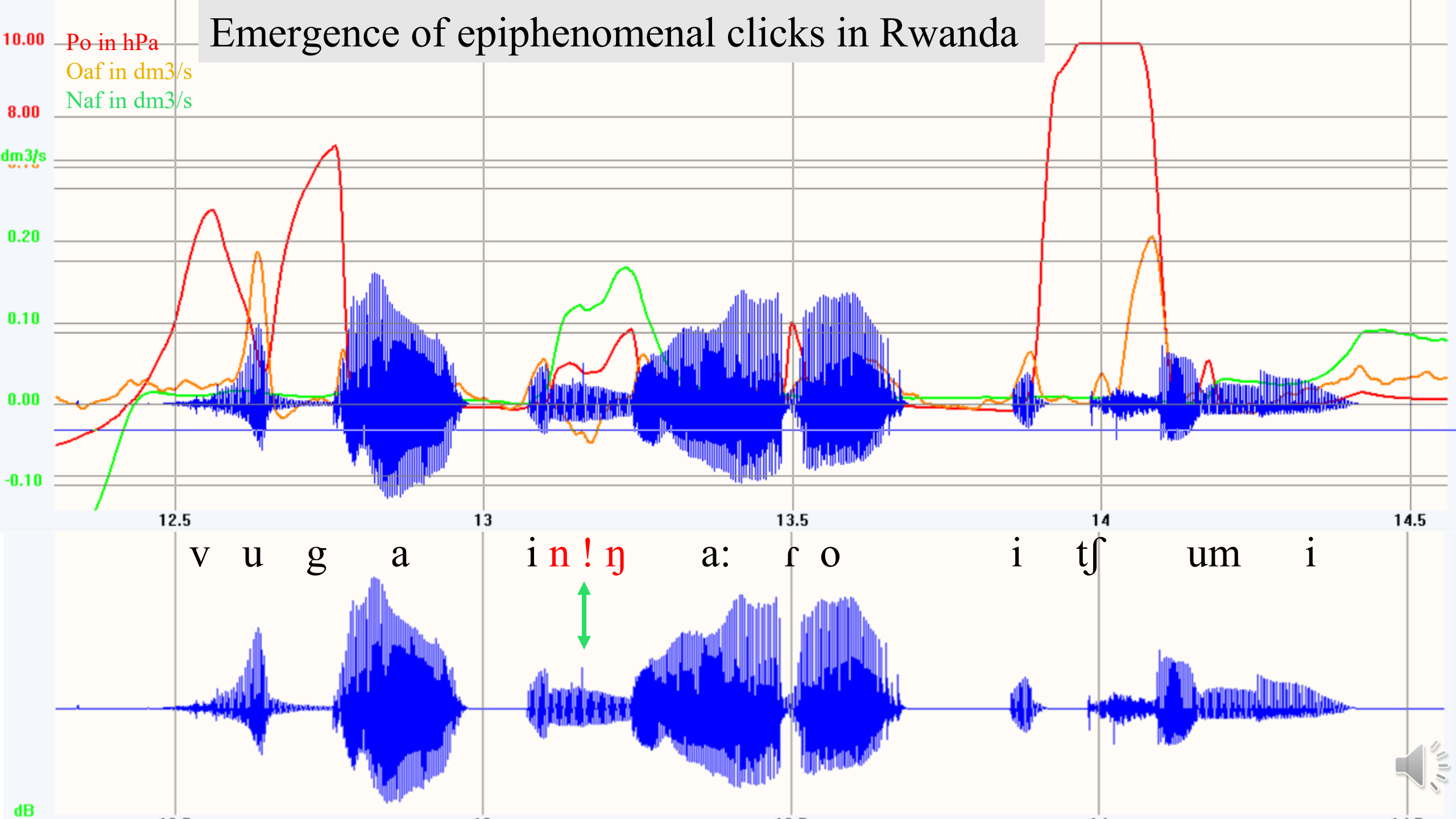
Based on these observations, it is possible to propose hypotheses on the role of non-pulmonic consonants as markers in the history of the languages of this region of Africa.

Emergence of epiphenomenal clicks in Rwanda



v u g a i n ! ŋ a: ɾ o i tʃ um i

Emergence of epiphenomenal clicks in Rwanda



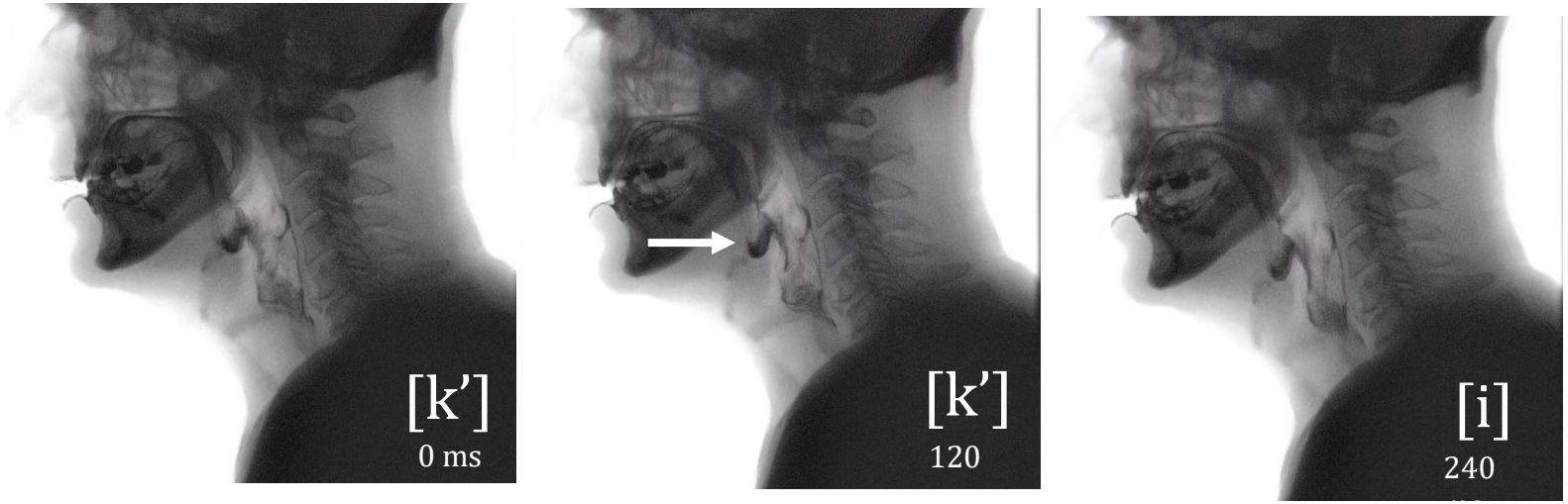
Links between clicks and ejectives

ǁ has a similar articulation to that of the palatal lateral ejective cʎ̝̊ʼ in Hadza

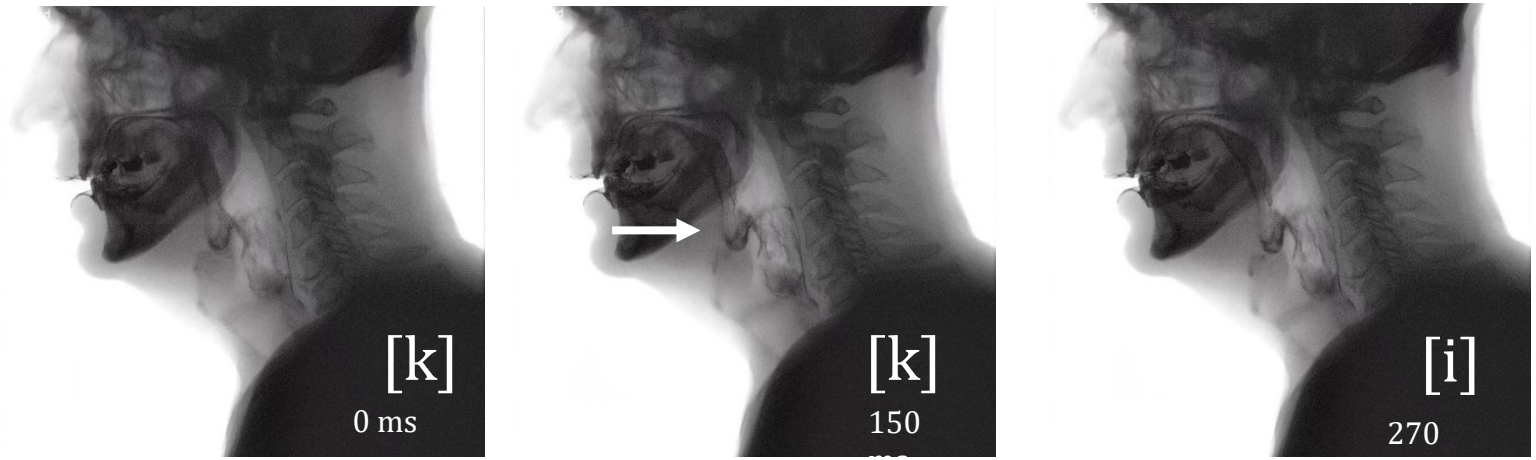
cʎ̝̊ʼ is the Hadza variant of tɬʼ in Iraqw

ǀˀ > tsʼ the click has a lingual initiation (swallowing type movement) and the ejective (return movement) is produced with glottalic initiation.

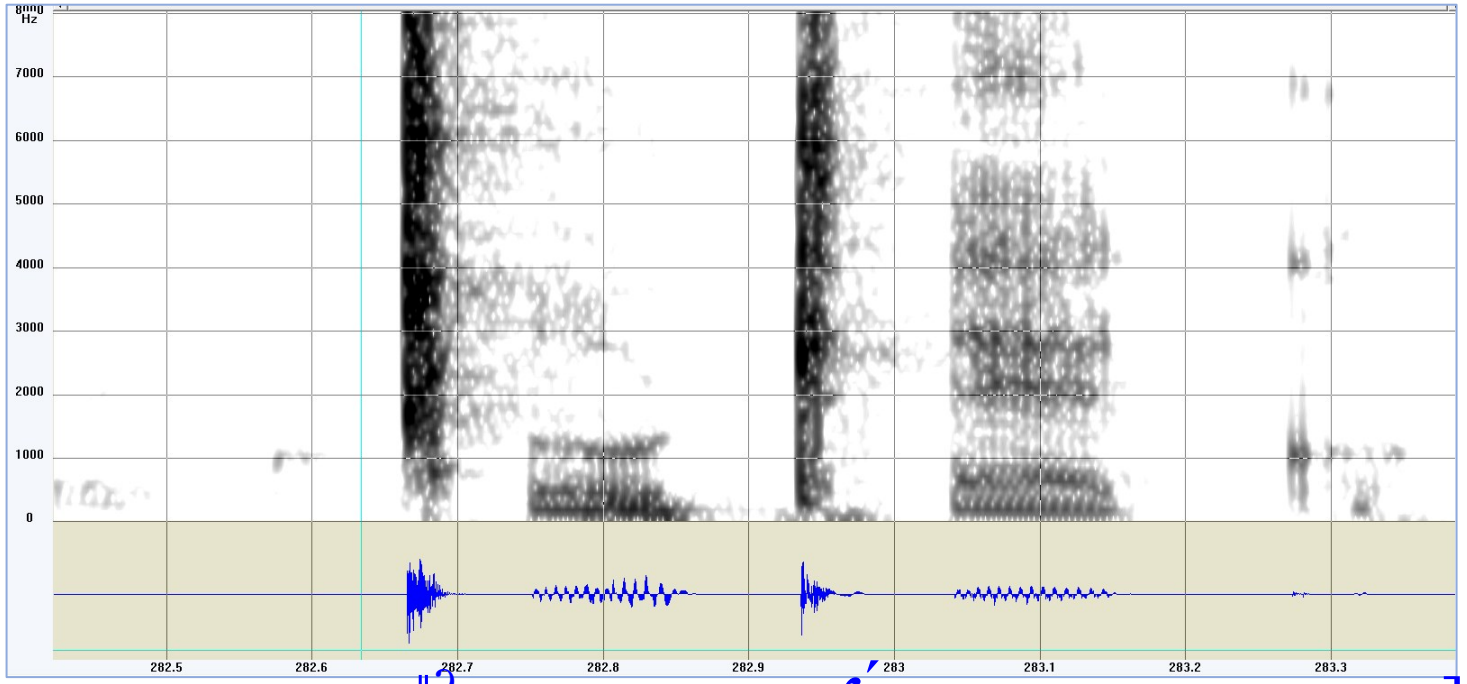
Ejective [k’ in k’i]



Pulmonic [k in ki]




k’


8000
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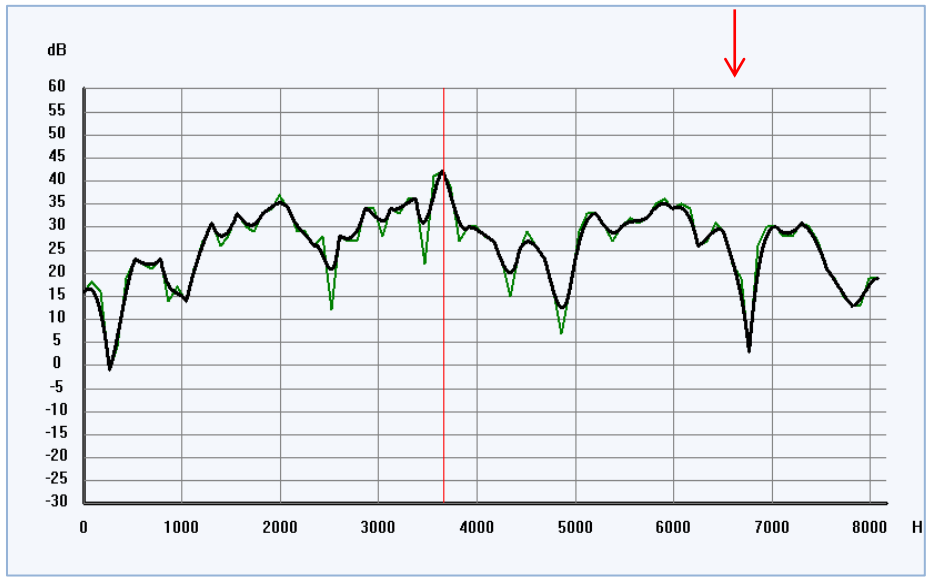
283.1
283.2
283.3

[ŋ̃ʔ o cʏ̯˳ o]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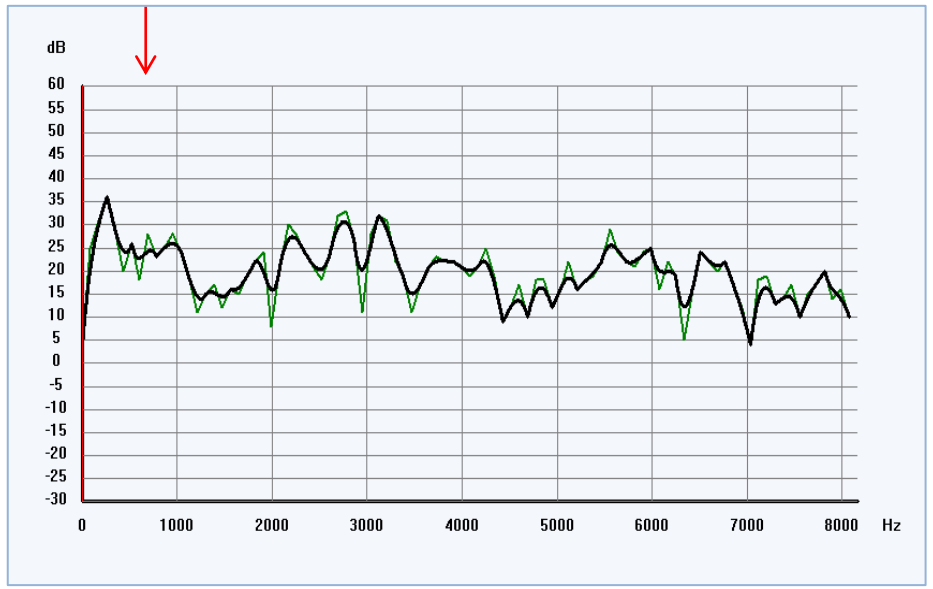
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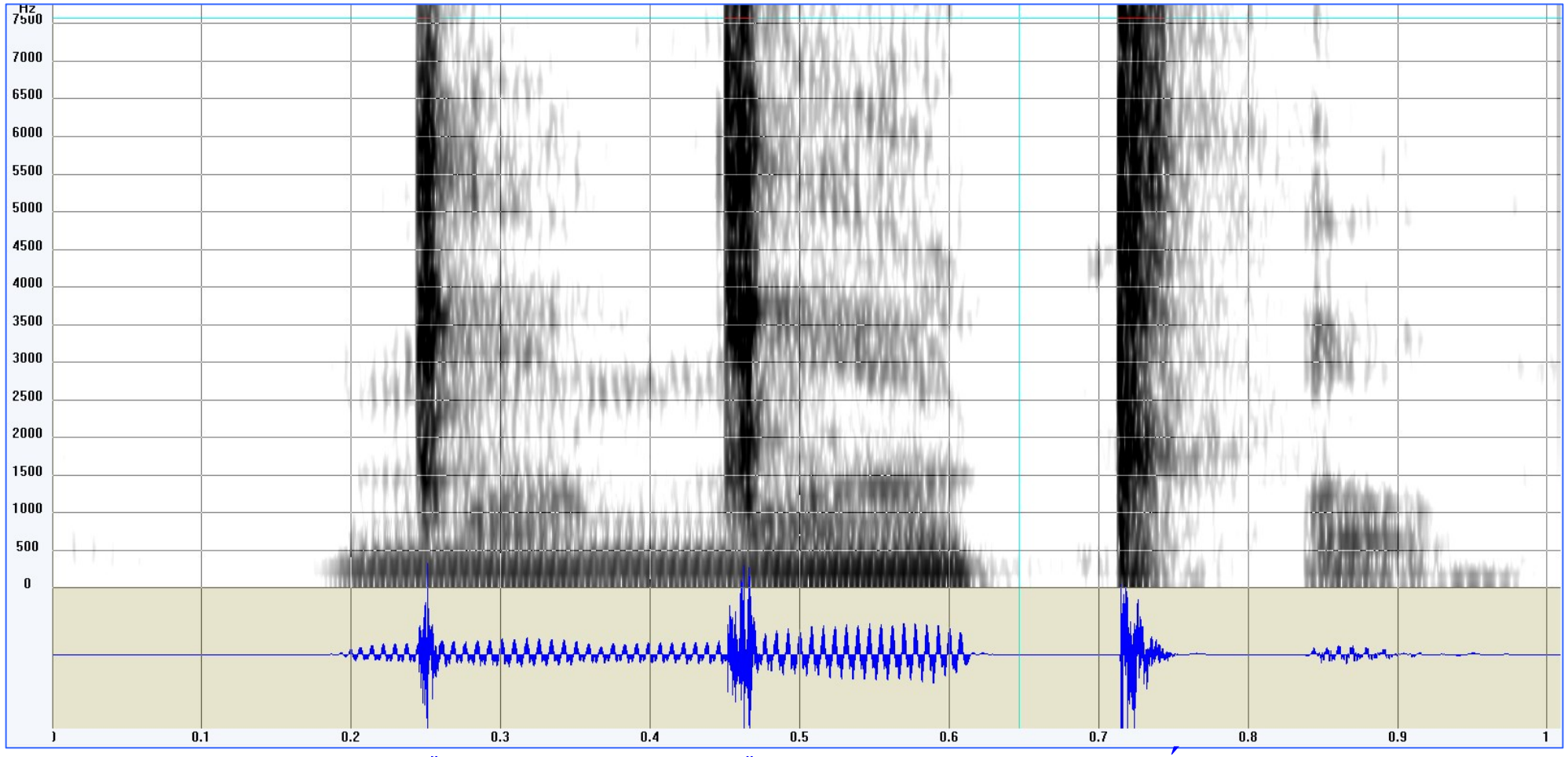
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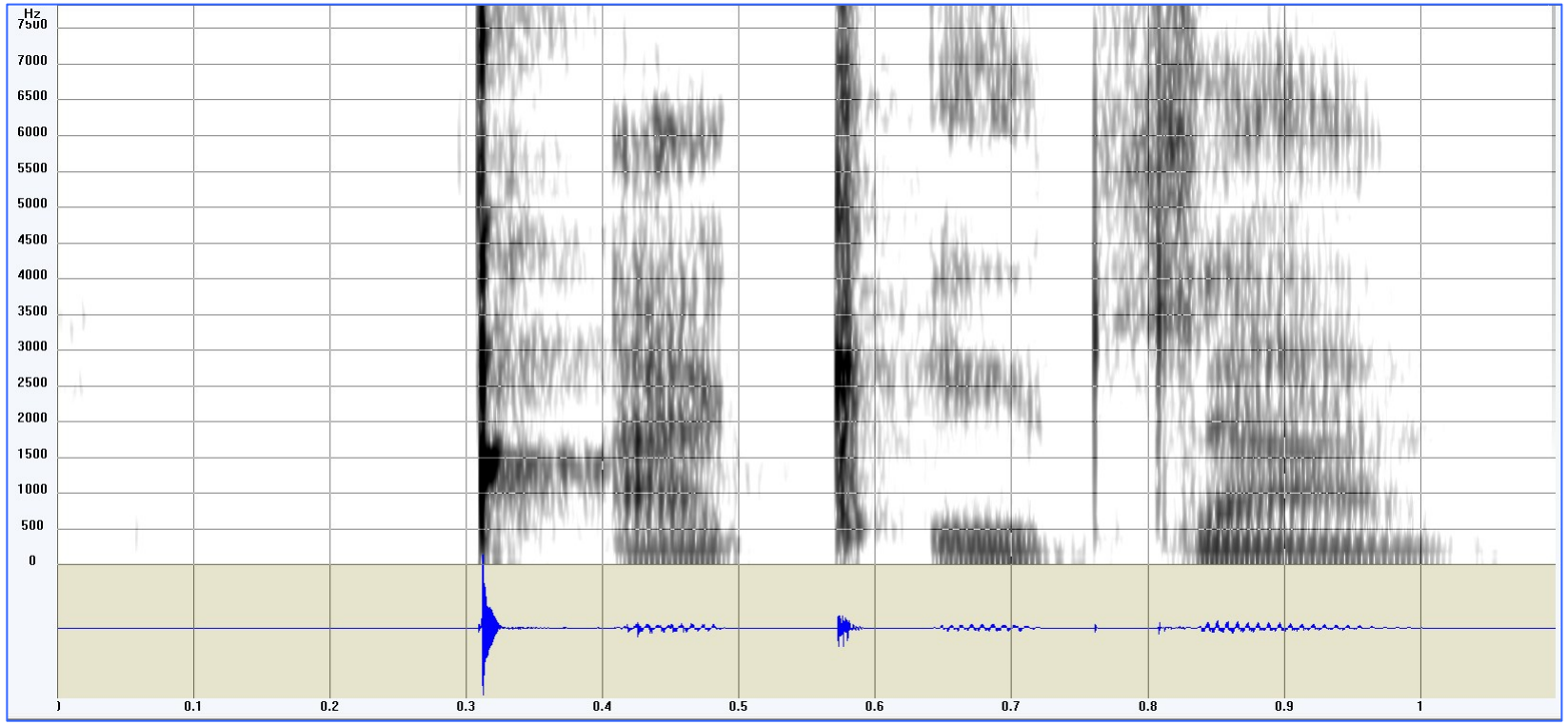
1

[ŋl̴ o ŋl̴ o cʏ́ o]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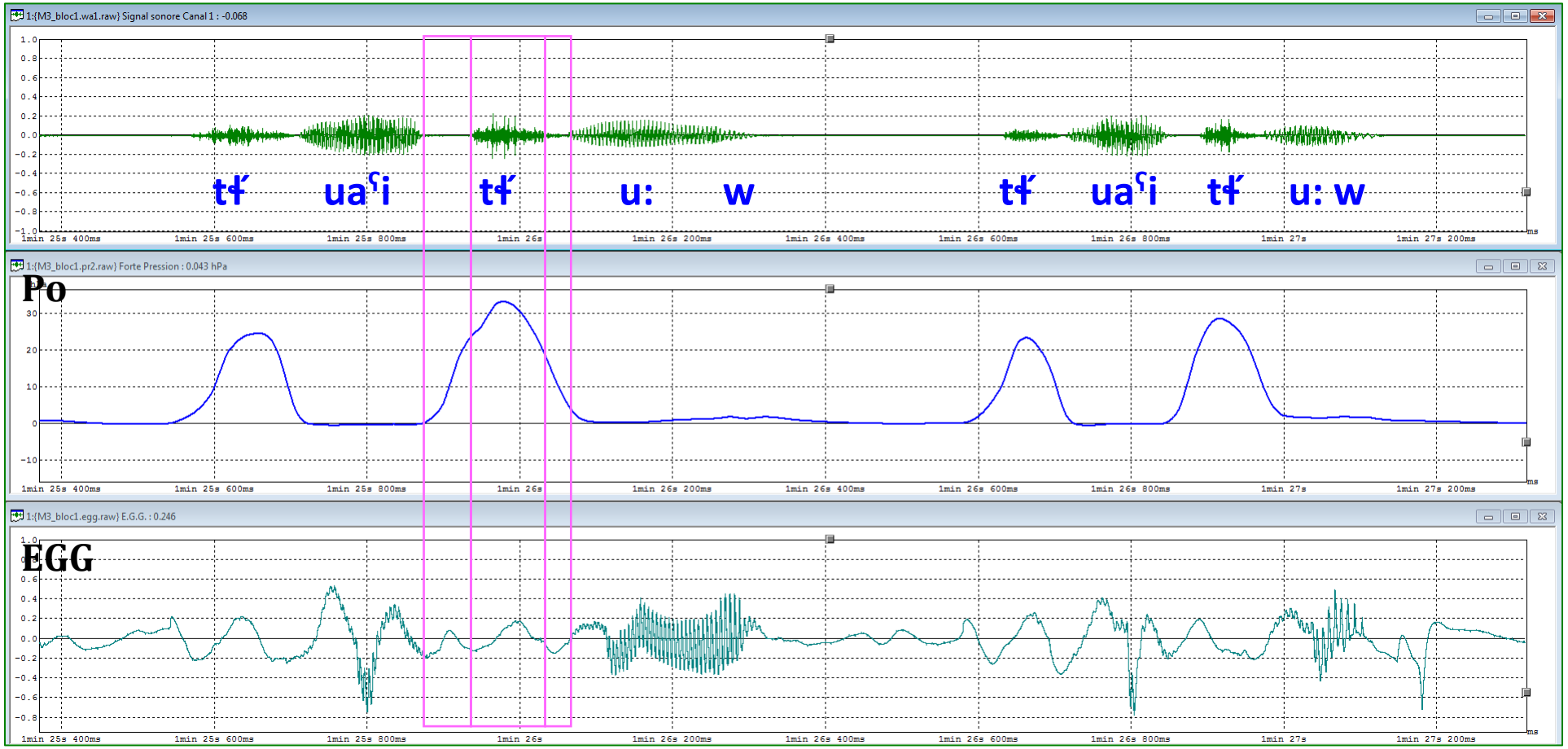
1

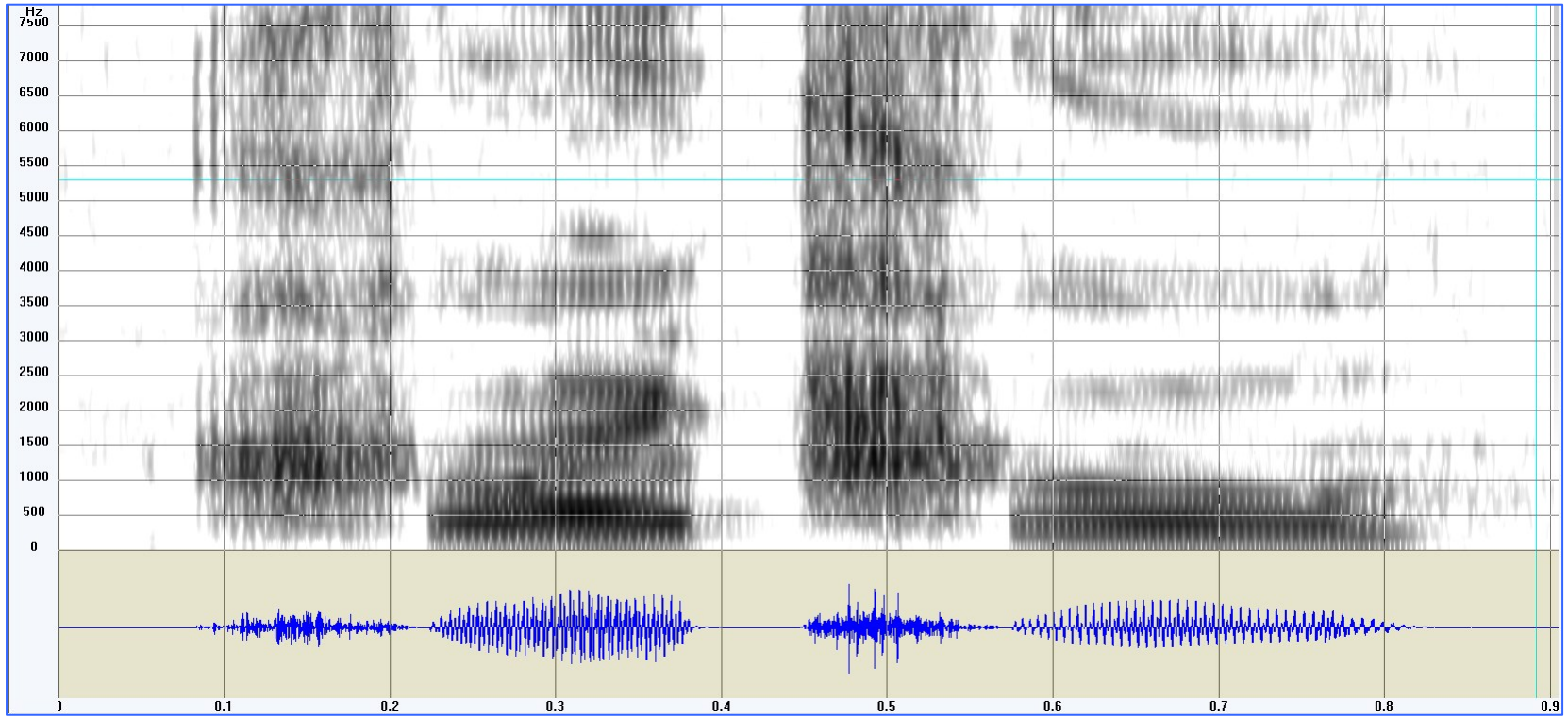
[!ʔ a kx’ i tɬ’ a]

tɬˀ voiceless ejective palatal affricate with lateral release

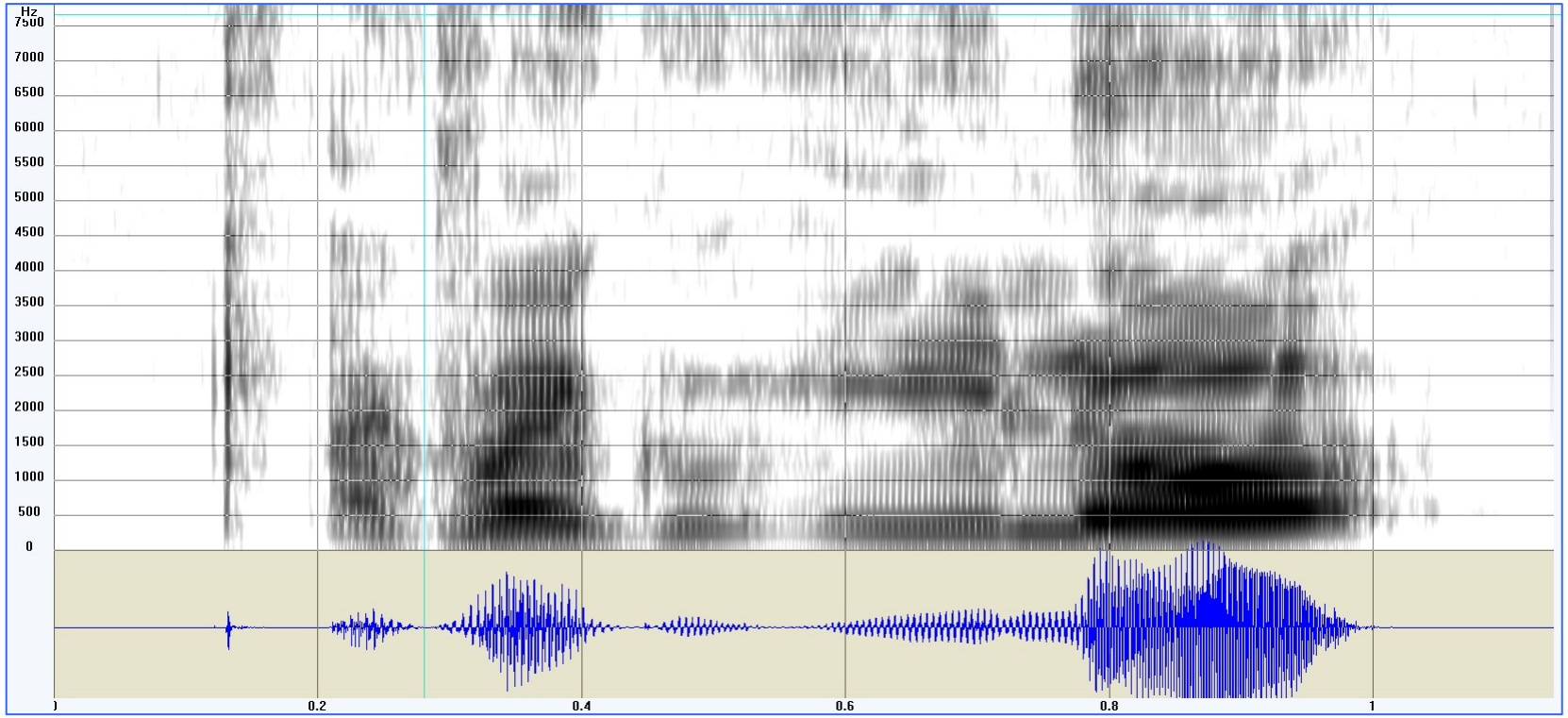


tɬˀuwaitɬˀuw *‘rain’*

tɬʼ voiceless ejective palatal affricate with lateral release



[tɬʼ u aˤ i tɬʼ u w]



[tɬʼ a kʷ a j k u ʔ i l o:]

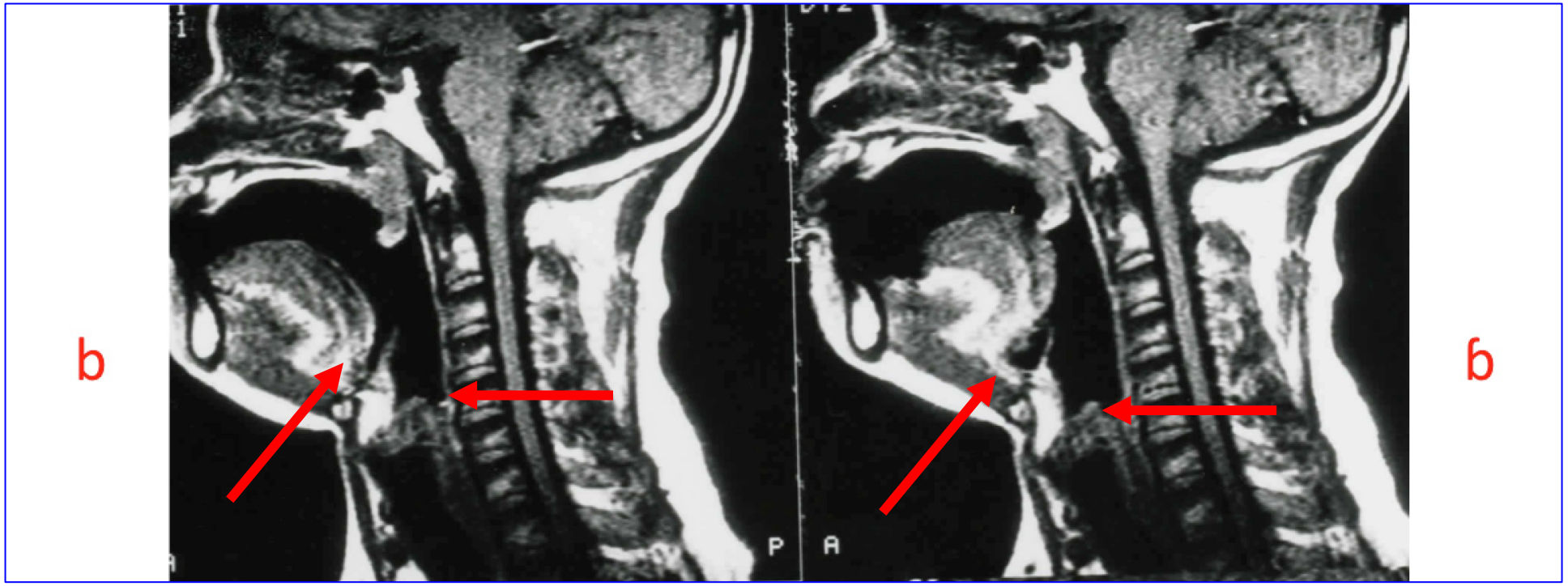
Implosives

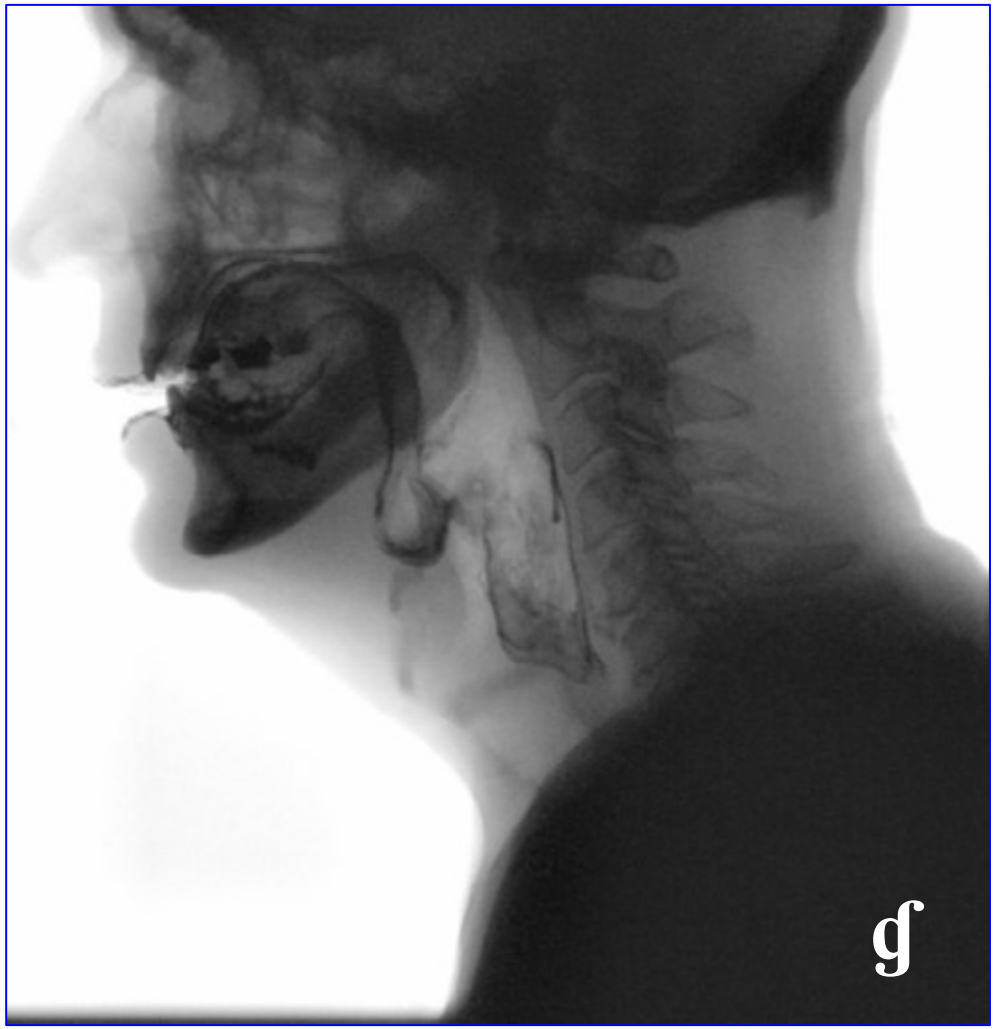
Where do they come from?

Variation with pulmonic stops

Voiced bilabial pulmonic stop

Voiced bilabial implosive





South West Surmic correspondances between voiced geminated stops and implosives

(108)	Narim	Tennet	Didinga	Murle	Baale	Proto-SWS
fish	kuluggo-tʃ	ulugʃ-ít	úlúggo-tʃ	kúlúgʃ-it	ʊluggɛ́	-*gg-
thief	ʌ-gʃorjjʌj-it	ʌ-ggorjʌ́j-it	i-gʃoriʌɣ-it	á-gʃúrjáɪ	ú-ggúɲáa-ɣí	-*gg-
tooth	ŋigʃittʌ-t	ŋiggittʌ-t	ŋɪgʃɪtta-t	ɲigʃitáa-t	ɲíɣíðáá-ní	-*gg-
good	ʌ-ɓunnʌ	ʌ-ɓunnʌ	ʌ-ɓunnʌ	a-bbón	(a-tʃtʃallɛ́)	-*bb-
hot (as fire)	ʌ-bburrí	ʌ-ɓure	ʌ-ɓuri	a-ɓúr	a-bbúre	-*bb-
dust	tudduwʌ-tʃ	túɗúwʌ-tʃ	túɗúɣʌ́-tʃ	túɗúwa-tʃ	(ɓílíɲá)	-*dd-

In Baale, the addition of a discontinuous morpheme triggers the gemination of the initial consonant. Fast speech often turns the geminated voiced stops into implosives.

Imperative singular	Imperative plural	Gloss
ɗúɣ- ó	u-dduɣ- é / u- ɗuɣ- é	'plant'
gʃinn- ó	i- gginn- é / i-gʃinn- é	'ask'
ɓáɣ- ó	a- bbaɣ- í / a- ɓaɣ- í	'split'

Yigezu 2001

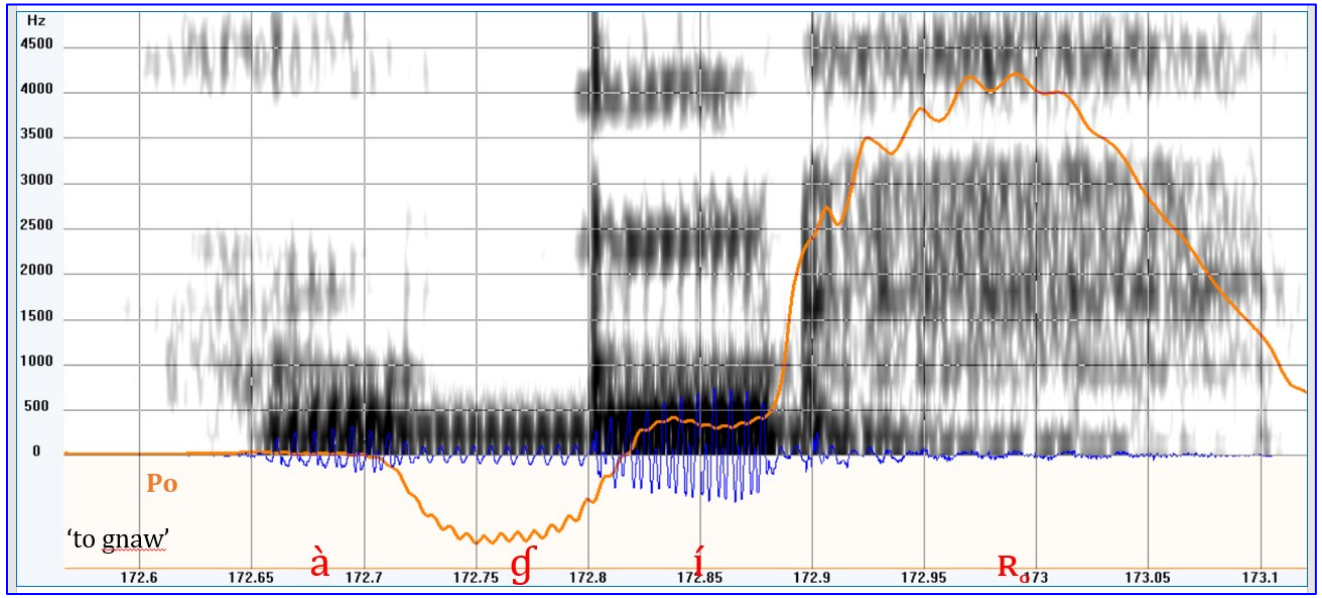
Maasai implosives

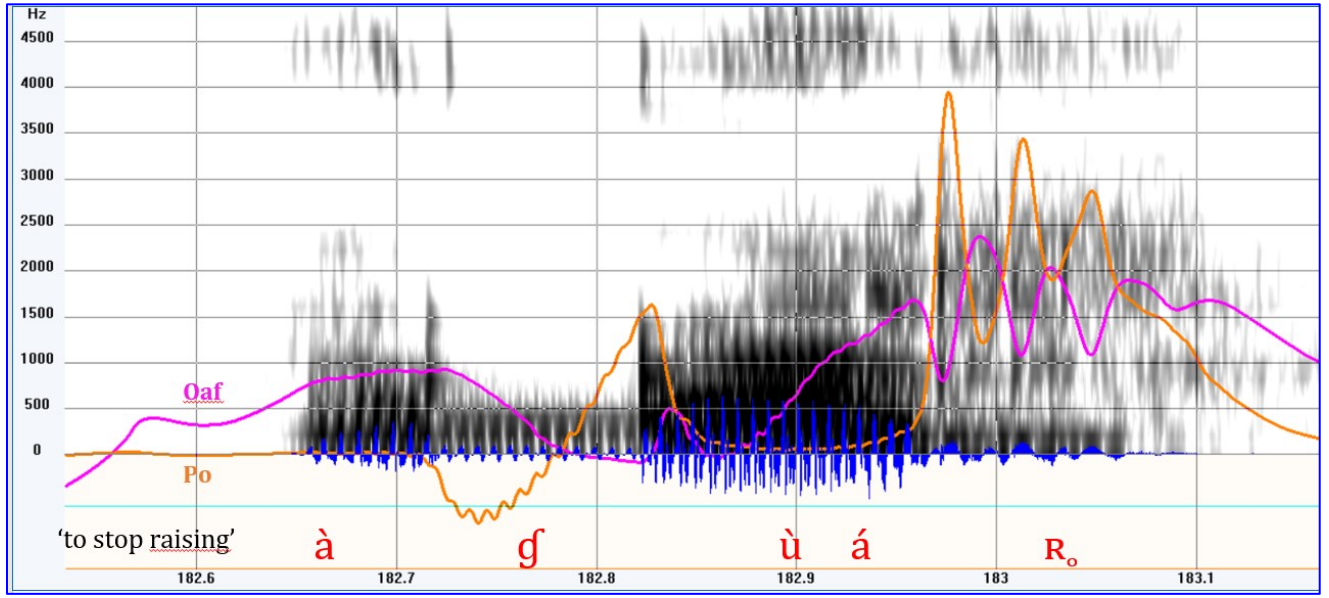
Whey do they come from? Contact? Innovation?

≠ origin from Surmic

Intraspeaker variability

Likely ⇒ of the aerodynamic constraint for the voicing of stops.





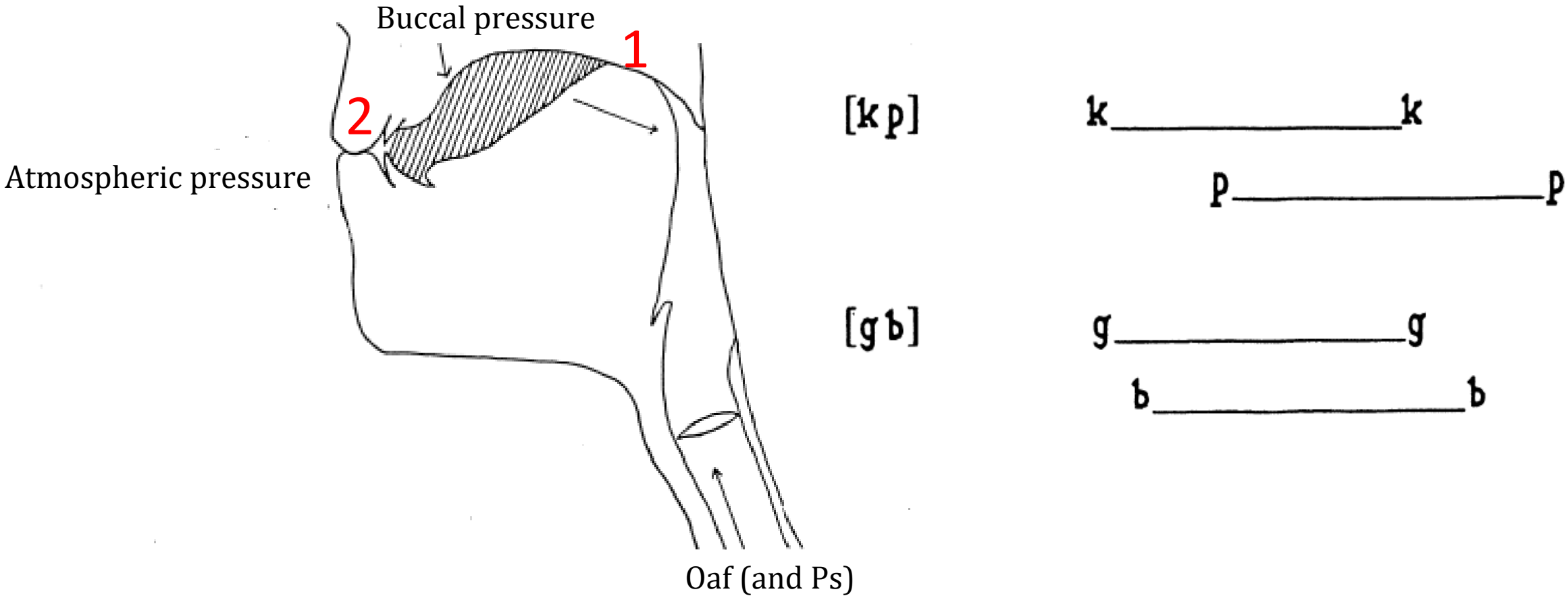
Labio-dorsal consonants > Pulmonic airstream

kp, kʁ̥

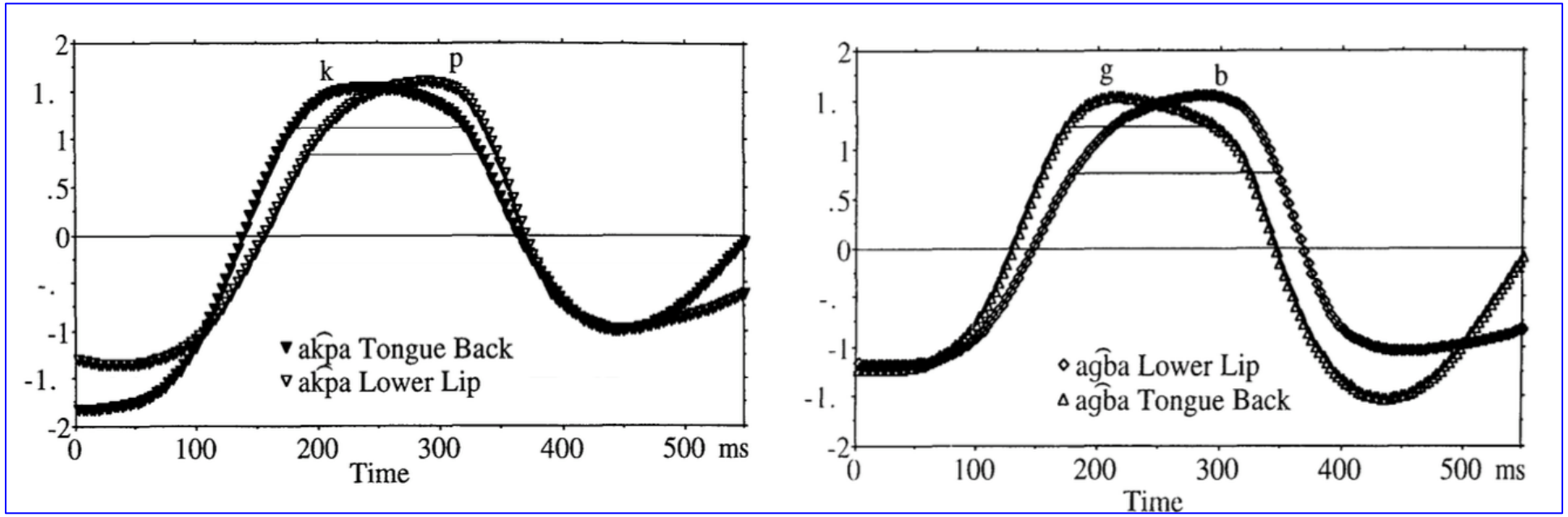
ɢb, gɓ

qp, ɢɓ, qɓ

Present in the Central Sudanic languages of the W. Rift (Ituri in the RDC). Their distribution extend to the West.
They are not reconstructable in proto Niger-Congo and in the languages families linked to Nilo-Saharan (Idiatov 2022).
⇒ they result from the emergence of an innovation (complexification process).



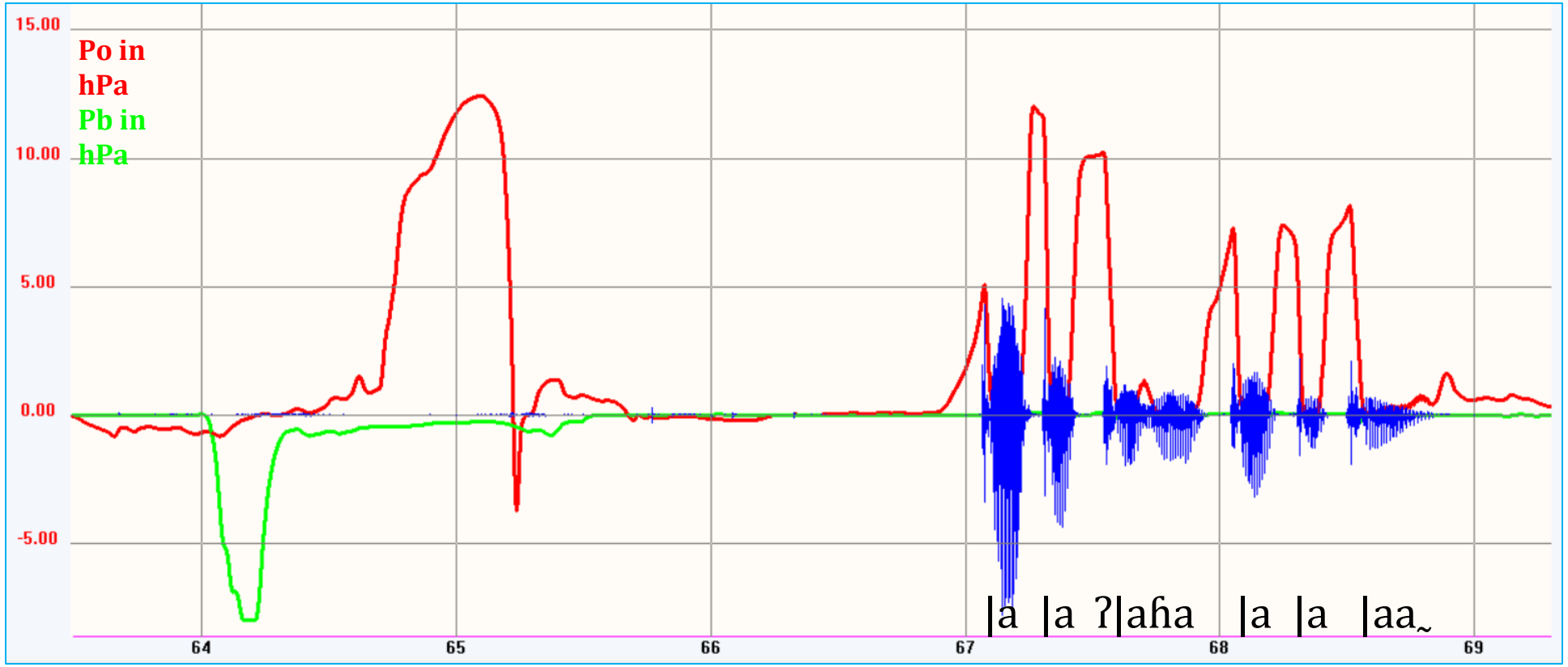
Similar to clicks but not lingual ⇒ of a ≠ sequence of closure releases.
In clicks 2 → 1 (lingual) for labio-dorsals 1 → 2 (pulmonic).



Maddieson (1993)

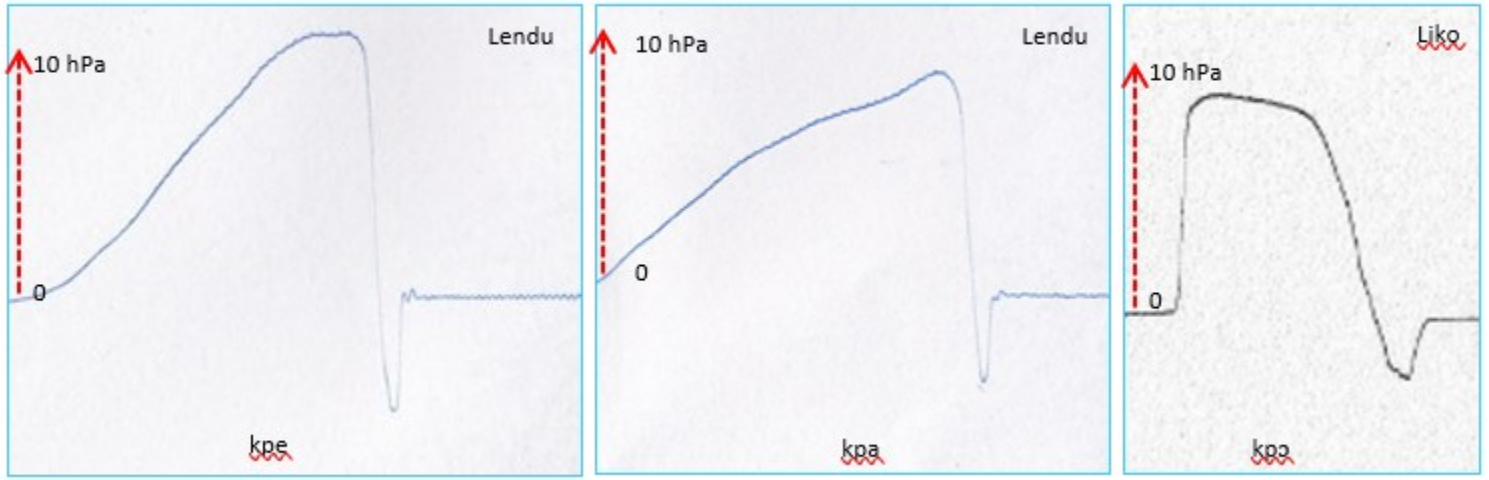
Aerodynamics in swallowing

Hadza

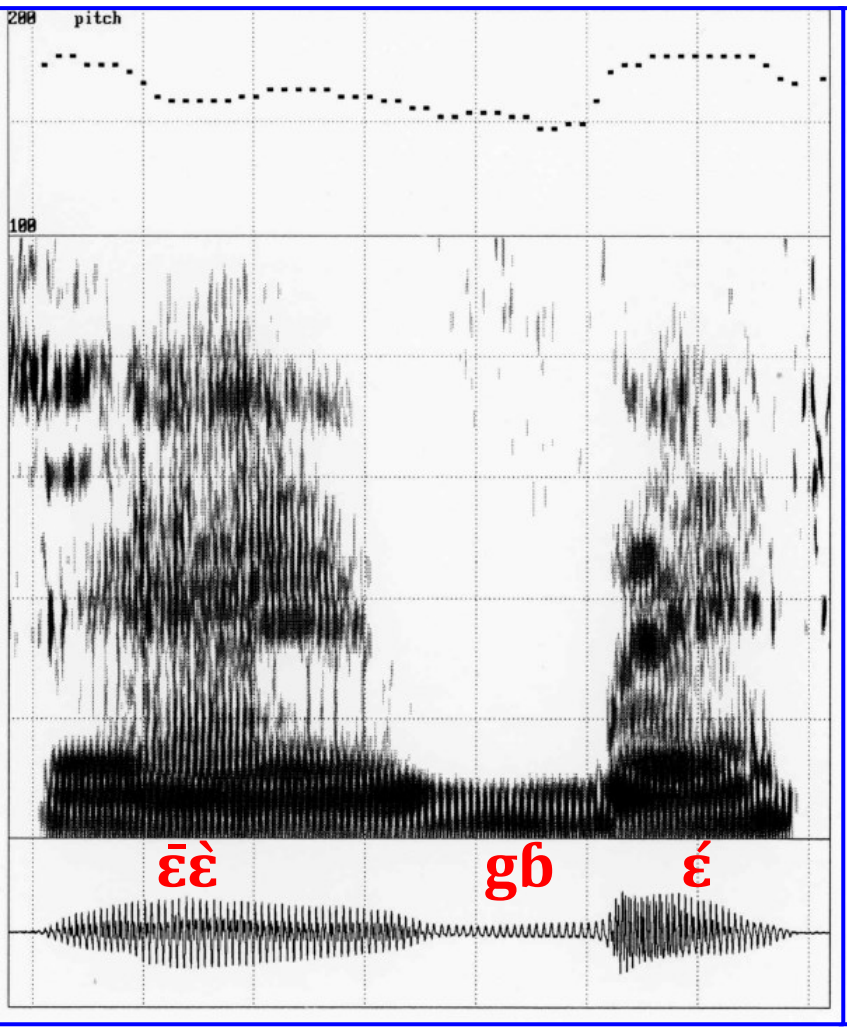


Aerodynamics in swallowing

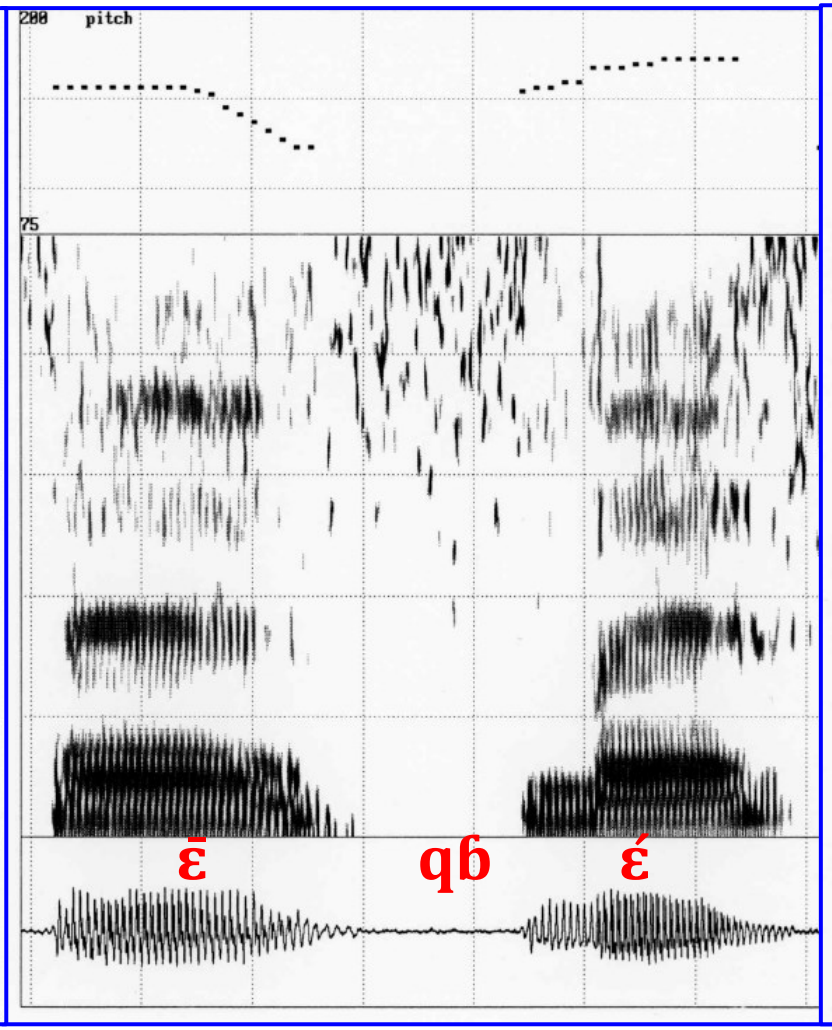
Swallowing saliva before speaking
(note the small burst -audible)



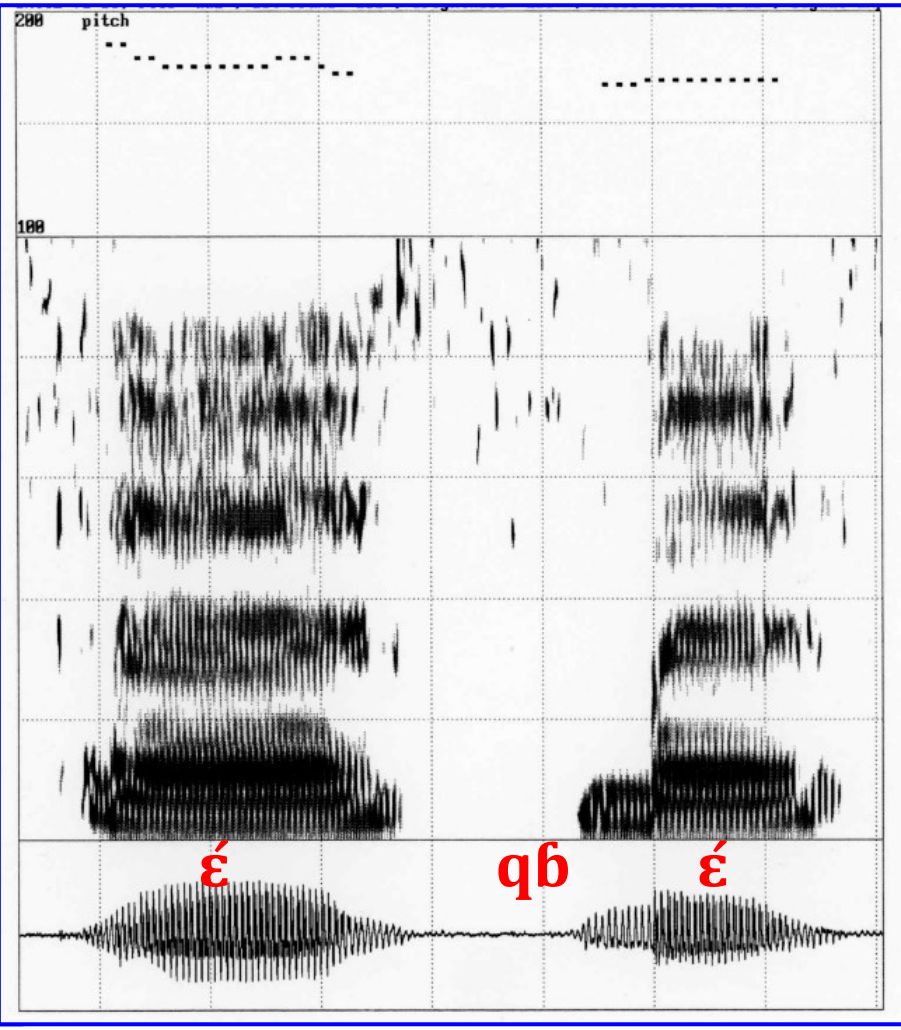
Po of [kp] in 3 Lendu and Liko words



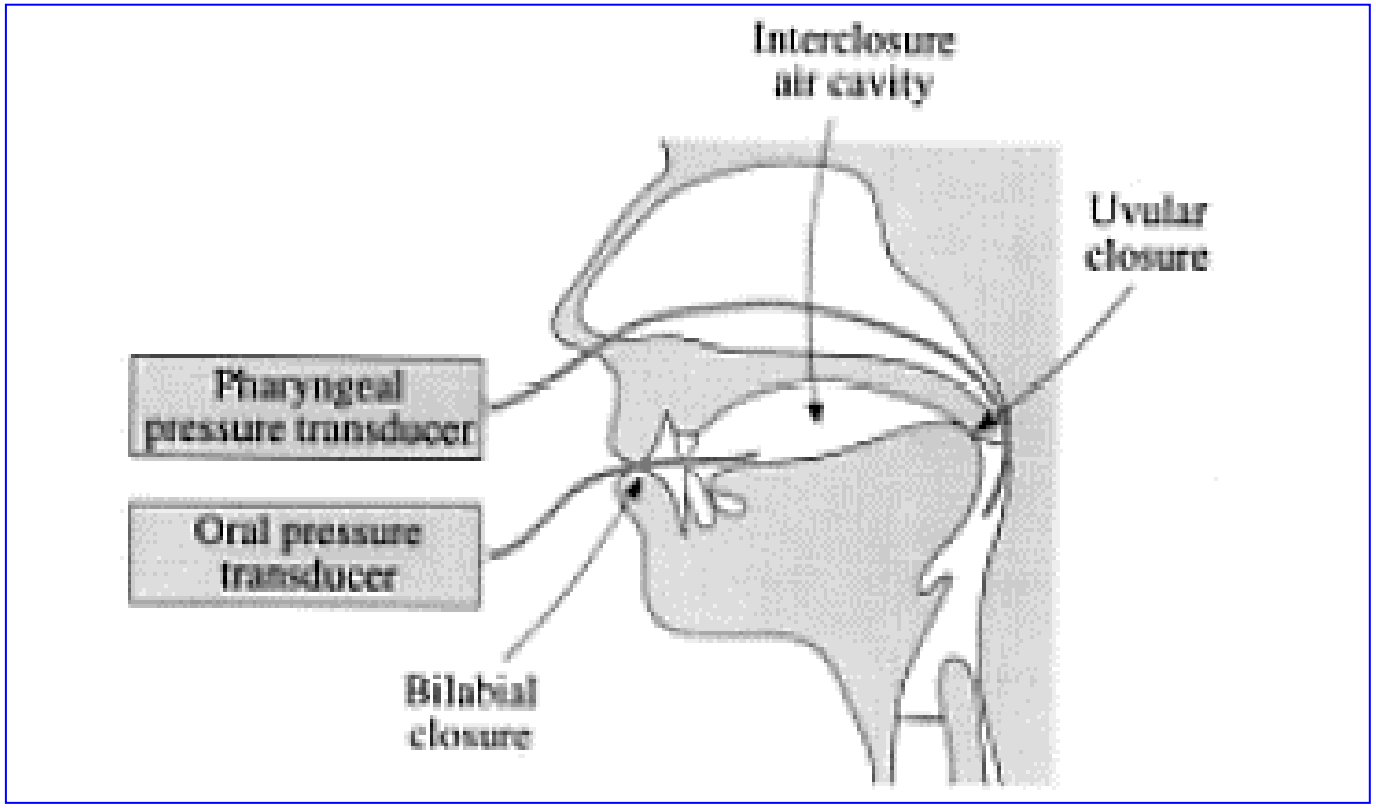
‘to do’

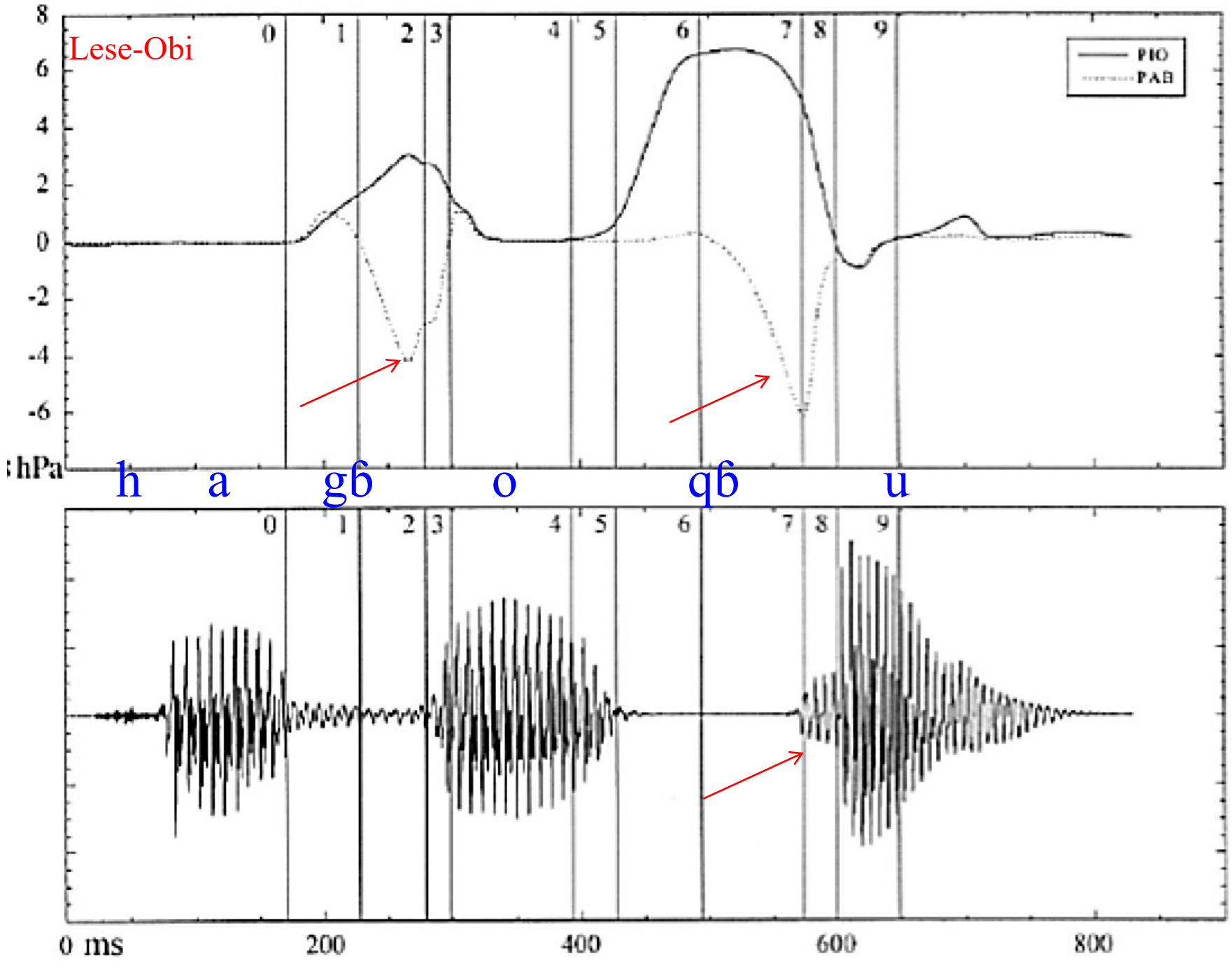


‘two’



‘belly’


Interclosure
air cavity
Uvular
closure
Pharyngeal
pressure transducer
Oral pressure
transducer
Bilabial
closure


Lese-Obi
PIO
PAB
hPa
h a gɓ o qɓ u
0 ms
200
400
600
800

Conclusion

A good understanding of the biomechanics of speech process and its relation to variation and sound change and other speech phenomena in languages can contribute to a better understanding of the emergence of diachronic phenomena and of some new patterns in the Rift languages' sound systems.