Disambiguating the role of contact in the areal distribution of glottalized consonants

Shelece Easterday
Department of Linguistics
University of Hawai‘i at Mānoa

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Glottalized consonants

pʰ	p	tʰ	t			kʰ	k g	kʷʰ	kʷ gʷ	ʔ
			t’					k’	kʷ’	
	ɓ		ɗ							
		t͡sʰ	t͡s	t͡ʃʰ	t͡ʃ					
			t͡s’		t͡ʃ’					
sʰ	s	z ʃ				ʃ ʒ	ɣ			h
s’										
	m̥ m		n̥ n		ɲ ɲ̥					
	m̰		n̰		ɲ̰					
			l							
			ɾ							
					j̥ j				w̥ w	
					j̰				w̰	

ejectives

implosives

glottalized resonants

Consonant inventory of
Central Mazahua (Knapp 2008)

Glottalized consonants

pʰ	p	tʰ	t			kʰ	k g	kʷʰ	kʷ gʷ	ʔ
			tʼ					**kʼ**	**kʷʼ**	
	ɓ		ɗ							
		t͡sʰ	t͡s	t͡ʃʰ	t͡ʃ					
			t͡sʼ		**t͡ʃʼ**					
sʰ	s	z ʃ				ʃ ʒ	ɣ			h
sʼ										
	m̥ m		n̥ n		ɲ ɲ̥					
	m̰		n̰		ɲ̰					
			l							
			ɾ							
					j̥ j				w̥ w	
					j̰				w̰	

ejectives

implosives

glottalized resonants

Consonant inventory of
Central Mazahua (Knapp 2008)

Glottalized consonants

p^h	p	t^h	t			k^h	k g	k^{wh}	k^w g^w	ʔ
			tʼ					kʼ	k^wʼ	
	ɓ		ɗ							
		$\widehat{ts}^h$	$\widehat{ts}$	$\widehat{tʃ}^h$	$\widehat{tʃ}$					
			$\widehat{ts}$ʼ		$\widehat{tʃ}$ʼ					
s^h	s	z ʃ				ʃ ʒ	ɣ			h
sʼ										
	m̥ m		n̥ n		ɲ ɲ̥					
	m̃		ñ		ɲ̃					
			l							
			ɾ							
					j̥ j				w̥ w	
					j̃				w̃	

ejectives

implosives

glottalized resonants

Consonant inventory of
Central Mazahua (Knapp 2008)

Glottalized consonants

p^h	p	t^h	t			k^h	k g	k^{wh}	k^w g^w	ʔ
			t’					k’	k^w’	
	ɓ		ɗ							
		$\widehat{ts}^h$	$\widehat{ts}$	$\widehat{tʃ}^h$	$\widehat{tʃ}$					
			$\widehat{ts}$’		$\widehat{tʃ}$’					
s^h	s	z ʃ				ʃ ʒ	ɣ			h
s’										
	m̥ m		n̥ n		ɲ ɲ̥					
	m̰		n̰		ɲ̰					
			l							
			ɾ							
					j̥ j				w̥ w	
					j̰				w̰	

ejectives

implosives

glottalized resonants

Consonant inventory of
Central Mazahua (Knapp 2008)

Glottalized consonants: highly diffusible?

*“The geographical distribution of **glottalized consonants** is strongly regional.”* (Maddieson 2013)

*“**Implosives** […] display a primarily areal rather than genealogical pattern of distribution.”* (Maddieson 2013)

*“**[E]jectives** have been shown to figure prominently as the targets of replication in contact situations” in Indo-European, Quechuan* (Urban & Moran 2021)

Glottalized consonants: old and stable?

*Consonant system features in the **Caucasus** region, including **ejectives**, "are generally inherited, and they reconstruct independently for the three proto-languages; their origins are curious, but there is no evidence that their cross-family distribution is due to contact."* (Nichols 2003: 306)

*The wide distribution of **implosives** "does not suggest a pattern of diffusion from a single source." This is an old inherited feature in some families of **Africa**, and frequently innovated in others within the region.* (Clements and Rialland 2007)

*"**Ejectives** in [**Surmic**] are archaic and old in the system, and are not the result of contact or borrowing from the neighboring languages." This is supported with comparative evidence from Koman, Gumuz, and Ta-Ne-Omotic.* (Yigezu 2001: 217)

Glottalized consonants: other confounds

*"The areal restriction [of glottalized resonants] suggests that the association between **glottalized resonants** and **ejectives** might best be viewed as a result of overlapping patterns of spread, and **not as the consequence of any particular linguistic dependence** between the occurrence of these two classes of consonants."* (Maddieson 2013)

The **same phonological process** — fusion — creates both **ejectives** and **glottalized resonants** out of **C**ʔ sequences in many unrelated languages of North America, including Nuu-chah-nulth, Nuxalk, and Towa.
(Fallon 2002, Yumitani 1998)

How do we get to the bottom of this?

Nichols (2003): Understanding the stability of a linguistic pattern requires a disambiguation of its propensity to be **inherited** from its propensity to be **innovated** or **acquired through contact**.

Weighing the effect of contact against other factors in the distribution of glottalized consonants would require the same disambiguation.

Table 5.2 Sample scenarios and hypothetical outcomes

Scenario	Inherit	Borrow	Select
(a)	High	Low	Low
(b)	High	High	Low
(c)	Low	High	*
(d)	High	Low	*
(e)	Low	Low	Low
(f)	Low	Low	High
(g)	Low	Low	Low

Notes:
* = unknown or not considered

(a) The item is inherited in most of the daughter languages.
(b) The element is borrowed in several of the daughter languages.
(c) The element is borrowed in many of the daughter languages. If it is borrowed from the same source, the daughter languages will exhibit an acquired resemblance.
(d) The element is inherited in most of the daughter languages, but replaced in several that have prominent substratal effects.
(e) The element is unstable in the daughter languages, often replaced though not by borrowing, often retained from a substratum where there was one. If several daughter languages share the same substratum, it will look as though a rare and unstable feature has been independently innovated several times.
(f) Non-inherited or non-cognate forms in the daughter languages converge (multiple parallel innovation, or similar outputs from different processes or sources).
(g) Structural change occurs independently in several or many daughter languages: the element is lost and not replaced.

adapted from Nichols 2003: 288

Research questions

- ➡ How likely are present-day glottalized consonants to be inherited from the earliest reconstructible stage of a family?

- ➡ How likely are glottalized consonants to be innovated?
- ➡ What are the properties of these processes?

- ➡ How likely are glottalized consonants to be introduced into a language through contact?
- ➡ What other effects does contact have on glottalized consonant distribution?

I address these questions with three large-scale (diachronic) typological studies.

How likely are present-day glottalized consonants to be inherited from the earliest reconstructible stage of a family?

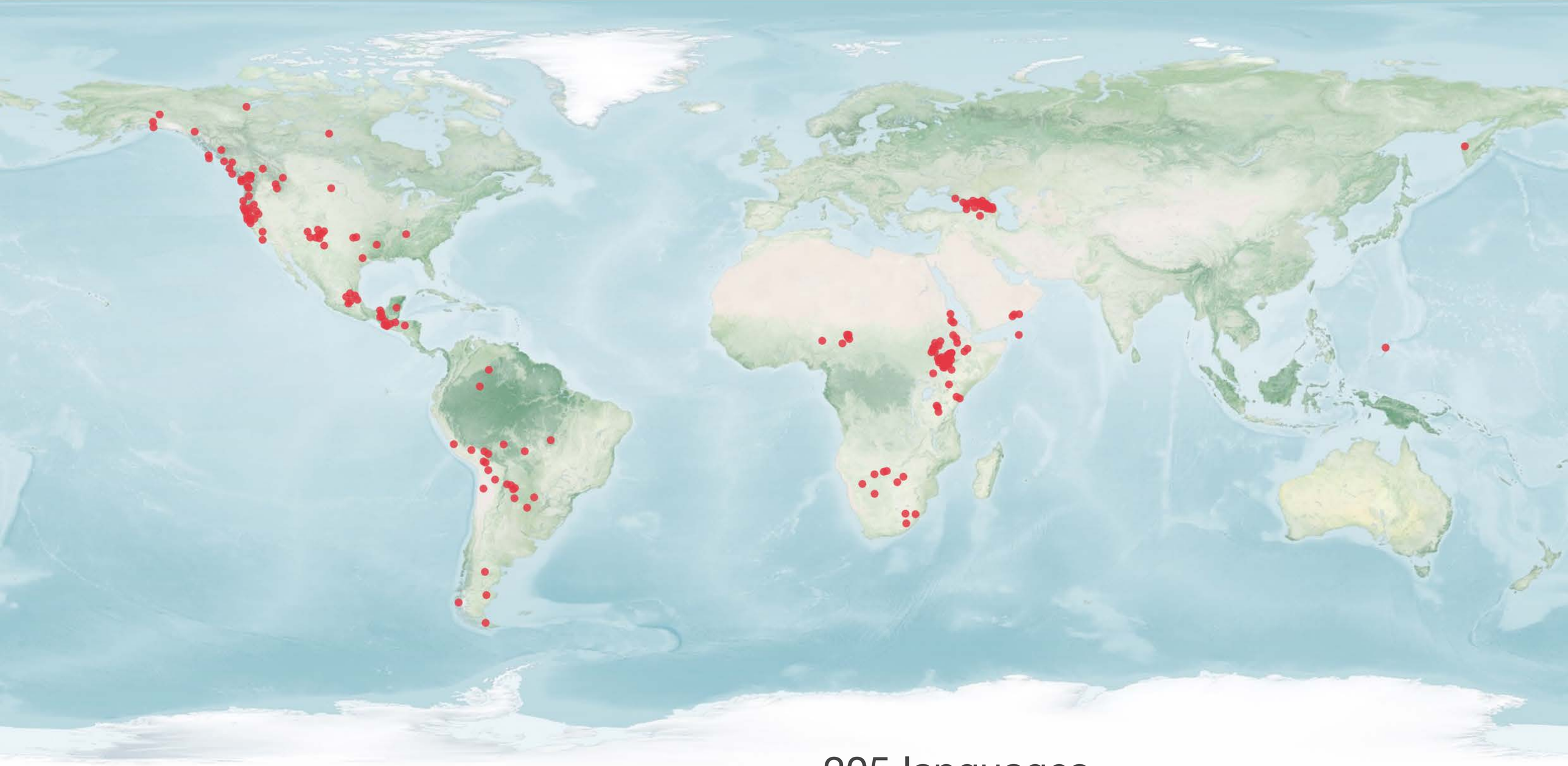
Study 1: Inheritance and glottalized consonants

Starting point: All languages reported to have ejectives, implosives, and/or glottalized resonants in any of three databases:

- *World Atlas of Language Structures ch. 7*
  (WALS, Maddieson 2013)
- *Lyon-Albuquerque Phonological Systems Database*
  (LAPSyD; Maddieson et al. 2014-2016)
- *PHOIBLE*
  (Moran & McCloy 2019)

Examined primary sources and excluded a handful of languages for which I disagreed with the database coding.

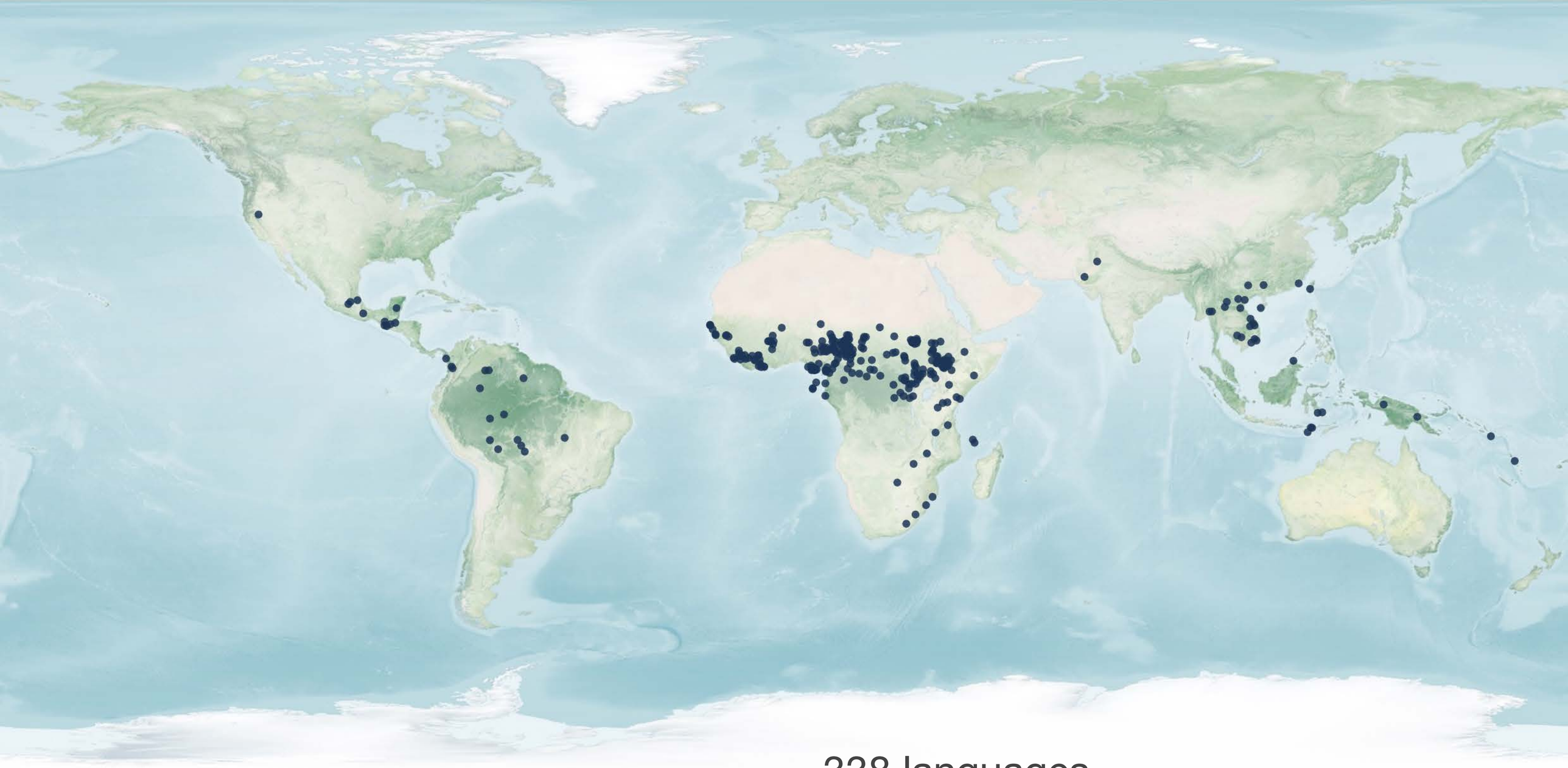
Assigned all languages to top-level families according to classifications in Glottolog 5 (Hammarström et al. 2024)



Ejectives

205 languages

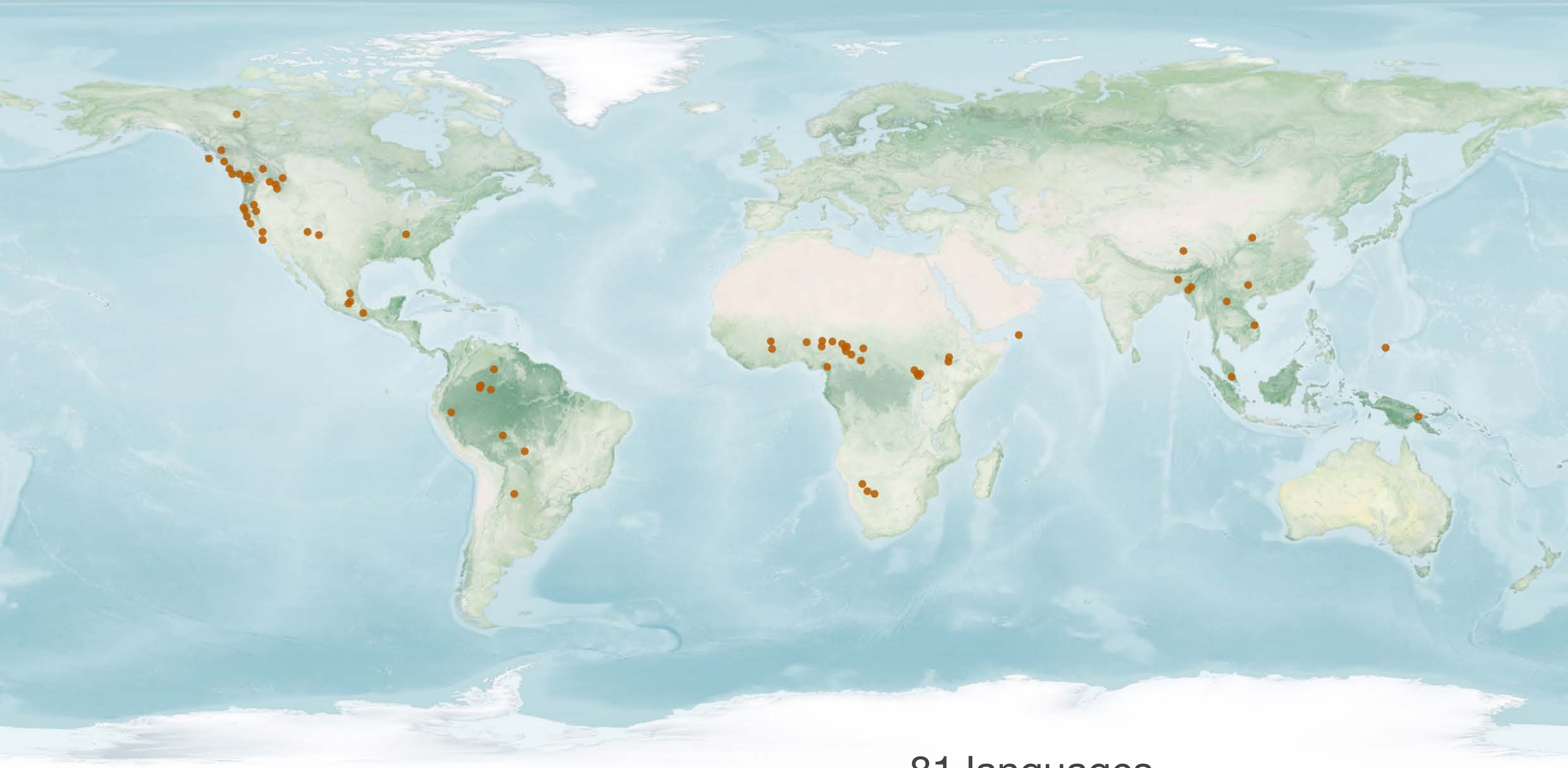
73 families



Implosives

338 languages

43 families

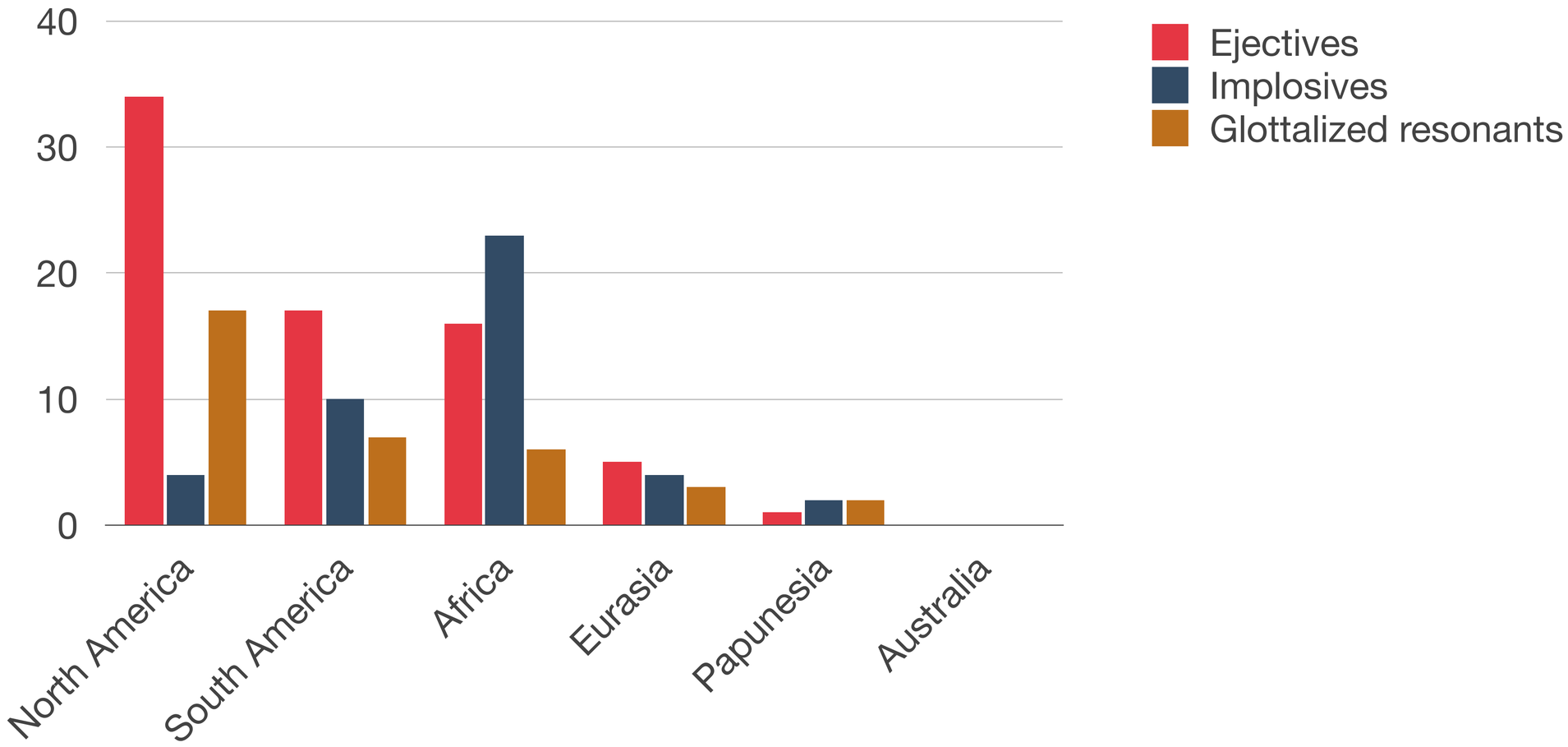


Glottalized resonants

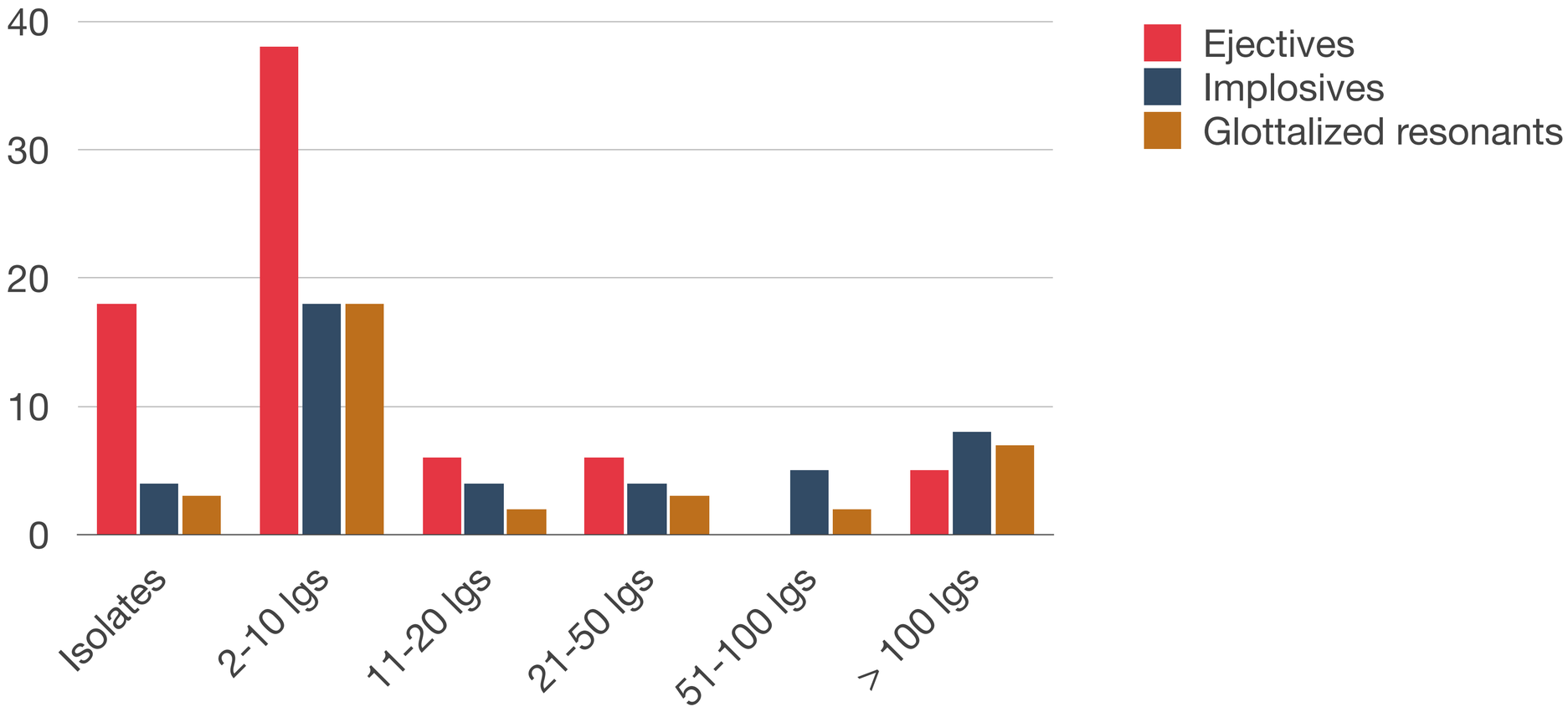
81 languages

35 families

Distribution of families by macro-area (Hammarström et al 2024)



Distribution of families by size in number of languages



Study 1: Inheritance and glottalized consonants

Next, I located phonological reconstructions for top-level families.

- In some cases a reconstruction could not be found (e.g, *Saliban*)
- In other cases, the reconstruction of a next-level family had to be used instead (e.g, *Southeast Surmic* and *Southwest Surmic* instead of *Surmic*).

I coded for the ***presence/absence of ejectives, implosives,*** *and* ***glottalized sonorants*** in the reconstruction.

I noted when reconstructed segments/ series were tentative.

When multiple reconstructions were available, I typically coded the most recent one, but noted disagreements where the relevant consonants were concerned.

Language (sub-)families with ejectives (75)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: Volta-Congo
Berta
Blue Nile Mao
Dizoid
Gumuz
Hadza
Khoe-Kwadi
Koman
Kuliak
Kxa
Sandawe
South Omotic
Surmic: Southeast Surmic
Ta-Ne-Omotic
Tuu

N. AMERICA

Algic
Athabaskan-Eyak-Tlingit
Caddoan
Chimakuan
Chimariko
Chumashan
Coosan
Haida
Jicaquean
Keresan
Klamath-Modoc
Kutenai
Maiduan
Mayan
Miwok-Costanoan
Molale
Otomanguean
Palaihnihan
Pomoan
Sahaptian

N. AMERICA, CONT'D

Salishan
Shastan
Siouan
Tonkawa
Totonacan
Tsimshian
Wakashan
Wintuan
Yana
Yokutsan
Yuchi
Yuki-Wappo
Zuni

EURASIA

Abkhaz-Adyge
Chukotko-Kamchatkan
Indo-European
Kartvelian
Nakh-Daghestanian

S. AMERICA

Aymaran
Chonan
Itonama
Kakua-Nukak
Kawesqar
Kunza
Leco
Lule
Matacoan
Naduhup
Nambiquaran
Puelche
Quechuan
Saliban
Trumai
Uru-Chipaya
Vilela

PAPUNESIA

Austronesian

Language (sub-)families with ejectives, isolates removed (57)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: Volta-Congo

Blue Nile Mao
Dizoid
Gumuz

Khoe-Kwadi
Koman
Kuliak
Kxa

South Omotic
Surmic: Southeast Surmic
Ta-Ne-Omotic
Tuu

N. AMERICA

Algic
Athabaskan-Eyak-Tlingit
Caddoan
Chimakuan

Chumashan
Coosan
Haida
Jicaquean
Keresan

Maiduan
Mayan
Miwok-Costanoan

Otomanguean
Palaihnihan
Pomoan
Sahaptian

N. AMERICA, CONT'D

Salishan
Shastan
Siouan

Totonacan
Tsimshian
Wakashan
Wintuan

Yokutsan

Yuki-Wappo

EURASIA

Abkhaz-Adyge
Chukotko-Kamchatkan
Indo-European
Kartvelian
Nakh-Daghestanian

S. AMERICA

Aymaran
Chonan

Kakua-Nukak
Kawesqar

Matacoan
Naduhup
Nambiquaran

Quechuan
Saliban

Uru-Chipaya

PAPUNESIA

Austronesian

(Sub-)families with ejectives which have reconstructions (55)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: Volta-Congo

Blue Nile Mao
Dizoid
Gumuz

Khoe-Kwadi
Koman
Kuliak
Kxa

South Omotic
Surmic: Southeast Surmic
Ta-Ne-Omotic
Tuu

N. AMERICA

Algic
Athabaskan-Eyak-Tlingit
Caddoan
Chimakuan

Chumashan
Coosan
Haida
Jicaquean
Keresan

Maiduan
Mayan
Miwok-Costanoan

Otomanguean
Palaihnihan
Pomoan
Sahaptian

N. AMERICA, CONT'D

Salishan

Siouan

Totonacan
Tsimshian
Wakashan
Wintuan

Yokutsan

Yuki-Wappo

EURASIA

Abkhaz-Adyge
Chukotko-Kamchatkan
Indo-European
Kartvelian
Nakh-Daghestanian

S. AMERICA

Aymaran
Chonan

Kakua-Nukak
Kawesqar

Matacoan
Naduhup
Nambiquaran

Quechuan

Uru-Chipaya

PAPUNESIA

Austronesian

Ejectives confidently reconstructed for 43/55 (sub-)families *(78%)*

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: Volta-Congo

Blue Nile Mao
Dizoid
Gumuz

Khoe-Kwadi
Koman
Kuliak
Kxa

South Omotic
Surmic: Southeast Surmic
Ta-Ne-Omotic
Tuu

N. AMERICA

Algic?
Athabaskan-Eyak-Tlingit
Caddoan
Chimakuan

Chumashan
Coosan
Haida
Jicaquean
Keresan

Maiduan
Mayan
Miwok-Costanoan

Otomanguean
Palaihnihan
Pomoan
Sahaptian

N. AMERICA, CONT'D

Salishan

Siouan

Totonacan?
Tsimshian
Wakashan
Wintuan

Yokutsan

Yuki-Wappo

EURASIA

Abkhaz-Adyge
Chukotko-Kamchatkan
Indo-European?
Kartvelian
Nakh-Daghestanian

S. AMERICA

Aymaran
Chonan

Kakua-Nukak
Kawesqar

Matacoan
Naduhup
Nambiquaran

Quechuan

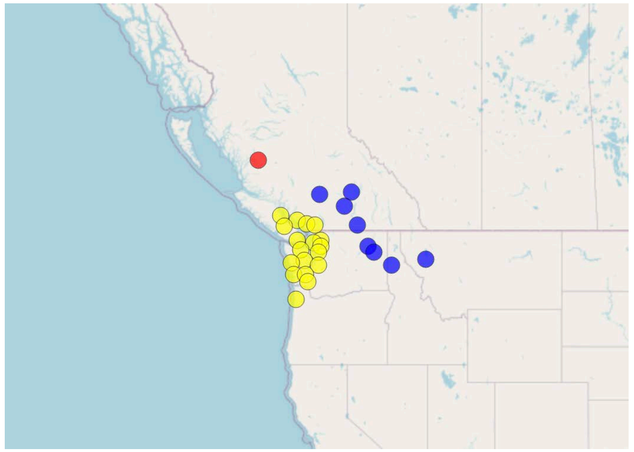
Uru-Chipaya

PAPUNESIA

Austronesian

Age and persistence of ejectives

In **37/43 families** *(87%)* for which ejectives are reconstructed to the proto-language, all present-day languages retain them.



The time depth of **Salishan** is likely 3000-3800 years (Kroeber 1999, Holman et al. 2011). Ejectives in the family have remained remarkably stable during that time:

Bella Coola	Squamish	Coeur d'Alene	Proto-Salish	PS gloss
t͡sʼɬ	t͡sʼajʔ	t͡sʼilʼ	*t͡sʼi/al	shade, shadow, shelter
skʼʷult	kʼʷlawʔ	skʼʷkʼʷelʼ	*kʼʷəl	skin, feather, quill
	pʼlat͡ʃʼm	pʼet͡ʃʼ	*pʼəkʼm	bobcat
qʼalm	qʼlqʼan	sqʼelʼéps	*qʼəl	to spin, curl, wind around

(Kuipers 2002: 29, 48, 79, 86)

Language (sub-)families with implosives (48)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Atlantic-Congo: Mel
Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo
Berta
Blue Nile Mao
Central Sudanic
Dajuic
Gumuz
Heibanic
Ijoid

AFRICA, CONT'D

Kadugli-Krongo
Khoe-Kwadi
Koman
Kresh-Aja
Kru
Kuliak
Mande
Nilotic
Shabo
South Omotic
Surmic: Southeast Surmic
Surmic: Southwest Surmic
Ta-Ne-Omotic
Tamaic
Temeinic

N. AMERICA

Maiduan
Mayan
Otomanguean
Totonacan

EURASIA

Austroasiatic
Indo-European
Sino-Tibetan
Tai-Kadai: Hlaic
Tai-Kadai: Kam-Tai

PAPUNESIA

Austronesian
Nuclear Trans New Guinea

S. AMERICA

Arawakan
Arawan
Chocoan
Kwaza
Movima
Naduhup
Nambiquaran
Nuclear Macro-Je
Pano-Tacanan: Tacanan
Saliban

Language (sub-)families with implosives, isolates removed (44)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Atlantic-Congo: Mel
Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo

Blue Nile Mao
Central Sudanic
Dajuic
Gumuz
Heibanic
Ijoid

AFRICA, CONT'D

Kadugli-Krongo
Khoe-Kwadi
Koman
Kresh-Aja
Kru
Kuliak
Mande
Nilotic

South Omotic
Surmic: Southeast Surmic
Surmic: Southwest Surmic
Ta-Ne-Omotic
Tamaic
Temeinic

N. AMERICA

Maiduan
Mayan
Otomanguean
Totonacan

EURASIA

Austroasiatic
Indo-European
Sino-Tibetan
Tai-Kadai: Hlaic
Tai-Kadai: Kam-Tai

PAPUNESIA

Austronesian
Nuclear Trans New Guinea

S. AMERICA

Arawakan
Arawan
Chocoan

Naduhup
Nambiquaran
Nuclear Macro-Je
Pano-Tacanan: Tacanan
Saliban

(Sub-)families with implosives which have reconstructions (39)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic

Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo

Blue Nile Mao
Central Sudanic
Dajuic
Gumuz
Heibanic
Ijoid

AFRICA, CONT'D

Kadugli-Krongo
Khoe-Kwadi
Koman

Kru
Kuliak
Mande
Nilotic

South Omotic
Surmic: Southeast Surmic
Surmic: Southwest Surmic
Ta-Ne-Omotic
Tamaic

N. AMERICA

Maiduan
Mayan
Otomanguean
Totonacan

EURASIA

Austroasiatic
Indo-European
Sino-Tibetan
Tai-Kadai: Hlaic

PAPUNESIA

Austronesian
Nuclear Trans New Guinea

S. AMERICA

Arawakan
Arawan
Chocoan

Naduhup
Nambiquaran
Nuclear Macro-Je
Pano-Tacanan: Tacanan

Implosives confidently reconstructed for 22/39 (sub-)families *(56%)*

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic

Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo

Blue Nile Mao
Central Sudanic
Dajuic
Gumuz
Heibanic
Ijoid

AFRICA, CONT'D

Kadugli-Krongo
Khoe-Kwadi
Koman

Kru
Kuliak
Mande
Nilotic

South Omotic
Surmic: Southeast Surmic
Surmic: Southwest Surmic
Ta-Ne-Omotic?
Tamaic

N. AMERICA

Maiduan
Mayan
Otomanguean
Totonacan

EURASIA

Austroasiatic
Indo-European
Sino-Tibetan
Tai-Kadai: Hlaic

PAPUNESIA

Austronesian
Nuclear Trans New Guinea

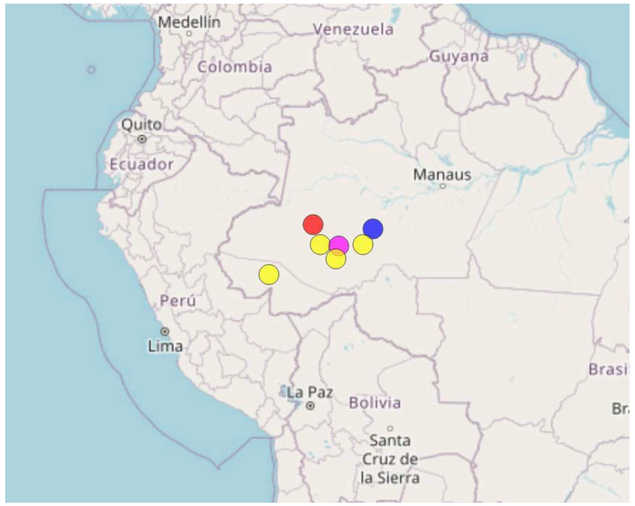
S. AMERICA

Arawakan
Arawan
Chocoan

Naduhup
Nambiquaran
Nuclear Macro-Je
Pano-Tacanan: Tacanan

Age and persistence of implosives

In **11/22 families** *(50%)* for which implosives are reconstructed to the proto-language, all present-day languages retain them.



Arawan

Paumarí: /ɓ ɗ/ contrast with /b d/

Deni: /ɓ ɗ/, no plain voiced stops

Other languages: plain voiced stops

Language (sub-)families with glottalized resonants (38)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo
Central Sudanic
Kxa
Ta-Ne-Omotic
Tuu

N. AMERICA

Algic
Athabaskan-Eyak-Tlingit

Chumashan
Haida
Keresan
Kiowa-Tanoan
Klamath-Modoc
Kutenai
Otomanguean
Palaihnihan
Sahaptian
Salishan
Tsimshian
Wakashan
Yokutsan
Yuchi
Yuki-Wappo

EURASIA

Austroasiatic
Sino-Tibetan
Tai-Kadai: Kam-Tai

PAPUNESIA

Austronesian
Nuclear Trans New Guinea

S. AMERICA

Cahuapanan
Chapacuran
Kakua-Nukak
Matacoan
Naduhup
Nambiquaran
Saliban

Language (sub-)families with glottalized resonants, isolates removed (35)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo
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N. AMERICA

Algic
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Chumashan
Haida
Keresan
Kiowa-Tanoan

Otomanguean
Palaihnihan
Sahaptian
Salishan
Tsimshian
Wakashan
Yokutsan

Yuki-Wappo

EURASIA

Austroasiatic
Sino-Tibetan
Tai-Kadai: Kam-Tai

PAPUNESIA

Austronesian
Nuclear Trans New Guinea

S. AMERICA

Cahuapanan
Chapacuran
Kakua-Nukak
Matacoan
Naduhup
Nambiquaran
Saliban

(Sub-)families with glottalized resonants which have reconstructions (33)

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo
Central Sudanic
Kxa
Ta-Ne-Omotic
Tuu

N. AMERICA

Algic
Athabaskan-Eyak-Tlingit

Chumashan
Haida
Keresan
Kiowa-Tanoan

Otomanguean
Palaihnihan
Sahaptian
Salishan
Tsimshian
Wakashan
Yokutsan

Yuki-Wappo

EURASIA

Austroasiatic
Sino-Tibetan

PAPUNESIA

Austronesian
Nuclear Trans New Guinea

S. AMERICA

Cahuapanan
Chapacuran
Kakua-Nukak
Matacoan
Naduhup
Nambiquaran

Glottalized resonants confidently reconstructed for 13/33 (sub-)families *(39%)*

AFRICA

Afro-Asiatic: Central Chadic
Afro-Asiatic: Cushitic
Afro-Asiatic: Semitic
Atlantic-Congo: North Central Atlantic
Atlantic-Congo: Volta-Congo
Central Sudanic
Kxa
Ta-Ne-Omotic
Tuu

N. AMERICA

Algic?
Athabaskan-Eyak-Tlingit

Chumashan
Haida
Keresan
Kiowa-Tanoan

Otomanguean
Palaihnihan
Sahaptian
Salishan
Tsimshian
Wakashan
Yokutsan

Yuki-Wappo

EURASIA

Austroasiatic
Sino-Tibetan

PAPUNESIA

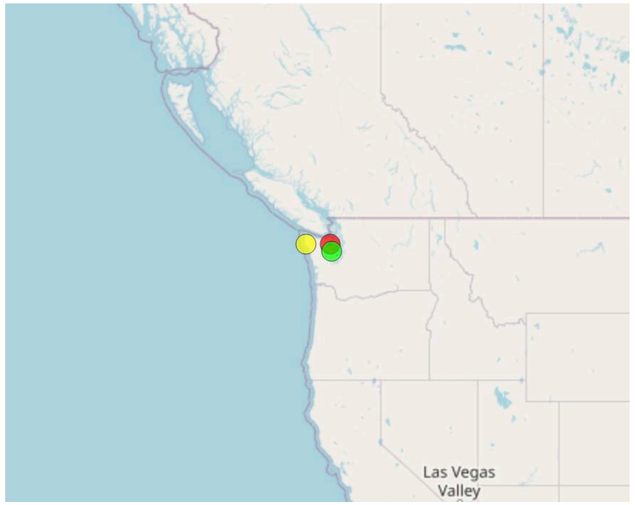
Austronesian
Nuclear Trans New Guinea

S. AMERICA

Cahuapanan
Chapacuran
Kakua-Nukak
Matacoan
Naduhup
Nambiquaran

Age and persistence of glottalized resonants

In **9/14 families** *(64%)* for which glottalized resonants are reconstructed to the proto-language, all present-day languages retain them.



Chimakuan:
Proto-language reconstructed to have glottalized resonants, but daughter languages don’t have them.
(Powell 1974: 38)

Noted for **Eyak-Athabaskan-Tlingit**, **Salishan**, **Yurok**, **Wolaytta**:

Glottalized resonants are unstable and subject to cycles of fission (**R’ > R?**) and fusion (**R? > R’**).

Inheritance and glottalized consonants: takeaways

Ejectives	**Implosives**	**Glottalized resonants**
Relatively higher propensity to be inherited *(78% of families)*	Moderate propensity to be inherited *(56% of families)*	Relatively lower propensity to be inherited *(39% of families)*
Old feature in all regions that have it in more than one family	Old feature in Africa	Old feature in North America, and to a lesser extent South America
Strongly persistent	Moderately persistent	More persistent than not

How likely are glottalized consonants to be innovated?

What are the properties of these processes?

Study 2: Innovation and glottalized consonants

To get an idea of the relative frequencies of innovation, I consulted the following surveys of phonological processes:

- *P-Base:* **629 lgs**, allophonic and morphophonological processes (Mielke 2008)
- *AlloPhon*: **81 lgs**, allophonic processes (Bybee and Easterday 2022)

➡ Altogether, there are ***97 families*** represented in these surveys

I searched these databases for processes yielding glottalized consonants.

The interest is in process types that could ***introduce*** glottalized consonants into a system. Thus, assimilation processes were excluded:

Boraana Oromo *(Afro-Asiatic)*

/sup'-**t**i/

[sup'**t'**i]

mould.pot-3F

'she moulds a pot'

(Stroomer 1987: 39)

Frequencies of phonological processes yielding glottalized Cs, P-Base and AlloPhon

Processes producing:	**Families with process type**	
Ejectives	**2/97**	*Atlantic-Congo* *Zuni*
Implosives	**5/97**	*Austroasiatic* *Austronesian* *Mayan* *Nilotic* *Trumai*
Glottalized resonants	**5/97**	*Algic* *Atlantic-Congo* *Dravidian* *Eyak-Athabaskan-Tlingit* *Wakashan*

*Is this suggestive of **low rates of innovation** of glottalized consonants?*

If so, it might be supportive of a contact account, especially for ejectives.

Study 2: Innovation and glottalized consonants

To determine the properties of processes, I broaden the study to include other sources on synchronic and diachronic processes leading to glottalized consonants:

- Sample for Study 3 (Di Garbo and Napoleão de Souza 2023)
- Typological study of ejective consonants (Fallon 2002)
- Typological studies of implosive consonants (Greenberg 1970, Blust 1980)
- Other reference grammars and historical-comparative works where I've noted such processes reported

This method has (thus far) yielded **73** processes producing ejectives, **43** producing implosives, and **21** producing glottalized resonants.

Processes yielding ejectives

Process type	**Families** (synchronic)	**Families** (diachronic)

Processes yielding ejectives

Process type	Families (synchronic)	Families (diachronic)
Fusion **Cʔ, ʔC > C’**	*Algic* *Athabaskan-Eyak-Tlingit* *Austronesian* *Caddoan* *Chumashan* *Iroquoian* *Kartvelian* *Keresan* *Klamath-Modoc* *Kutenai* *Mataguayan* *Mayan* *Molale* *Nakh-Daghestanian* *Otomanguean* *Pomoan* *Sahaptian* *Salishan* *South Omotic* *Takelma* *Tequistlatecan* *Wakashan* *Zuni*	*Abkhaz-Adyge* *Afro-Asiatic* *Algic* *Athabaskan-Eyak-Tlingit* *Austronesian* *Caddoan* *Haida* *Klamath-Modoc* *Naduhup* *Pomoan* *Sahaptian* *Siouan* *Totonacan* *Wakashan* *Washo*

32/38 languages *(84%)* with synchronic fusion processes already have contrastive ejectives!

Zuni *(isolate)*

A sequence of a stop and glottal stop across a word boundary may be realized as an ejective.

/ʔimat ʔan tenaka/

[ʔimat’antenaka]

it-seems for-him he-sang

‘it seems he sang for him’

(Newman 1965: 13)

ko:wi ‘few’
k’ola ‘chile’

p	t		k	k^w	ʔ
			k’	k^w’	
	t͡s	t͡ʃ			
	t͡s’	t͡ʃ’			
	s	ʃ			h
	ɬ				
m	n				
w	l	j			

Processes yielding ejectives

Process type	Families (synchronic)	Families (diachronic)
Fusion Cʔ, ʔC > C’	*Algic* *Athabaskan-Eyak-Tlingit* *Austronesian* *Caddoan* *Chumashan* *Iroquoian* *Kartvelian* *Keresan* *Klamath-Modoc* *Kutenai* *Mataguayan* *Mayan* *Molale* *Nakh-Daghestanian* *Otomanguean* *Pomoan* *Sahaptian* *Salishan* *South Omotic* *Takelma* *Tequistlatecan* *Wakashan* *Zuni*	*Abkhaz-Adyge* *Afro-Asiatic* *Algic* *Athabaskan-Eyak-Tlingit* *Austronesian* *Caddoan* *Haida* *Klamath-Modoc* *Naduhup* *Pomoan* *Sahaptian* *Siouan* *Totonacan* *Wakashan* *Washo*

Fusion can happen iteratively in a family.

In **Sahaptian**, there are variable *phonetic*, *morphophonological*, and *reconstructed* fusion processes leading to ejectives (Rude 2012).

Processes yielding ejectives

Process type	Families (synchronic)	Families (diachronic)
Fusion C**ʔ**, **ʔ**C > C’	23	15
Glottal transfer **CG, GC > C’**	*Chimakuan* *Mayan* *Pomoan* *Totonacan*	*Totonacan*

Kashaya *(Pomoan)*

An obstruent is ejectivized preceding a glottalized resonant.

/s’uwa**t͡ʃ**-m’a/

[s’uwa**t͡ʃ’**ba]

dry-SEQ.ADV

‘after drying’

(Buckley 1992: 83)

Processes yielding ejectives

Process type	Families (synchronic)	Families (diachronic)
Fusion CʔC, ʔCC > C’	23	15
Glottal transfer CG, GC > C’	4	1
Implosive > C’	*Berta* *Mayan*	*Afro-Asiatic* *Koman* *South Omotic* *Surmic* *Ta-Ne-Omotic*

Me’en dialects *(Surmic)*

Implosives are shifting to ejectives in some dialects.

Bodi	Goda Gushi	
ɓūʃi	**p’**uʃi	‘good’
ɓétʃ	**p’**ɛɛtʃ	‘axe’
ɗoj-	**t’**oj-	‘follow’

(Yigezu 2001-2002: 221)

Processes yielding ejectives

Process type	**Families** (synchronic)	**Families** (diachronic)
Fusion C?, ?C > C’	23	15
Glottal transfer CG, GC > C’	4	1
Implosive > C’	2	5
Other	*Atlantic-Congo* *Cahuapanan* *Guaicuruan* *Indo-European*	*Atlantic-Congo* *Chukotko-Kamchatkan*

including:

Domain-conditioned **C’**

Post-nasal **C’**

Processes yielding ejectives

Process type	**Families** (synchronic)	**Families** (diachronic)
Fusion Cʔ, ʔC > C’	23	15
Glottal transfer CG, GC > C’	4	1
Implosive > C’	2	5
Other	4	2

Processes yielding implosives

Process type	Families (synchronic)	Families (diachronic)

Processes yielding implosives

Process type	Families (synchronic)	Families (diachronic)
Voiced stops > implosives	*Atlantic-Congo* *Austroasiatic* *Austronesian* *Kuliak* *Mande* *Nilotic* *Surmic*	*Afro-Asiatic* *Atlantic-Congo* *Austroasiatic* *Austronesian* *Indo-European*

Nyang'i *(Kuliak)*

*Voiced stops /**b d ɟ g**/ are often produced as implosives [**ɓ ɗ ʄ ɠ**].*

(Beer 2007: 21)

Processes yielding implosives

Process type	Families (synchronic)	Families (diachronic)
Voiced stops > implosives	*Atlantic-Congo* *Austroasiatic* *Austronesian* *Kuliak* *Mande* *Nilotic* *Surmic*	*Afro-Asiatic* *Atlantic-Congo* *Austroasiatic* *Austronesian* *Indo-European*

Only **6/28** languages *(21%)* with synchronic processes of this type already have contrastive implosives.

Many of these processes are reported as *optional*.

Many are restricted to just /**ɓ**/ or /**ɓ ɗ**/.

Processes yielding implosives

Process type	Families (synchronic)	Families (diachronic)
Voiced stops > implosives	7	5
Voiceless stop > implosive	*Austroasiatic* *Japonic* *Nambiquaran* *Salishan* *Trumai* *Uto-Aztecan*	

Trumai *(isolate)*

*Voiceless stops /**p k**/ have implosive allophones when word-final in monosyllabic words.*

/pu**k**/

[pu**ɠ**]

‘bird sp.’

(Guirardello 1999: 2)

Processes yielding implosives

Process type	Families (synchronic)	Families (diachronic)
Voiced stops > implosives	7	5
Voiceless stop > implosive	6	-
Ejective > implosive	*Abkhaz-Adyge* *Blue Nile Mao* *Mayan*	*Afro-Asiatic* *Kuliak* *Mataguayan* *Naduhup* *Ta-Ne-Omotic*

Wichí dialects *(Mataguayan)*

Ejective consonants are becoming implosives in these dialects.

*mópʼi Proto-Wichí

[muɓi] El Sauzalito Wichí

‘white heron’

(Nikulin and Carol 2024: 433-435)

Processes yielding implosives

Process type	Families (synchronic)	Families (diachronic)
Voiced stops > implosives	7	5
Voiceless stop > implosive	6	-
Ejective > implosive	3	5
Other		*Austronesian* *Indo-European* *Mande* *Surmic*

including:

Geminate > **Implosive**
Labialvelar > **Implosive**
Voiced C + ? > **Implosive**

Processes yielding implosives

Process type	**Families** (synchronic)	**Families** (diachronic)
Voiced stops > implosives	7	5
Voiceless stop > implosive	6	-
Ejective > implosive	3	5
Other	-	4

Processes yielding glottalized resonants

Process type	**Families** (synchronic)	**Families** (diachronic)

Processes yielding glottalized resonants

Process type	Families (synchronic)	Families (diachronic)
Fusion **Rʔ, ʔR > R’**	*Afro-Asiatic* *Chukotko-Kamchatkan* *Kiowa-Tanoan* *Sahaptian* *Salishan* *Sino-Tibetan* *Wakashan*	*Athabaskan-Eyak-Tlingit* *Ta-Ne-Omotic*

Nuu-chah-nulth *(Wakashan)*

A resonant fuses with a glottal stop across a morpheme boundary.

/t͡ɬ’i:xʷi**n-ʔ**ap/

[t͡ɬ’i:w’i**n’**ap]

laugh-sound.of-CAUS

‘she laughed’

(Stonham 1999: 32)

Processes yielding glottalized resonants

Process type	**Families** (synchronic)	**Families** (diachronic)
Fusion RʔR, ʔRR > R’	7	2
Glottal transfer **RGR, GRR > R’**	*Dravidian* *Tupian*	*Ta-Ne-Omotic*

Koya Gondi *(Dravidian)*

*Glides /**w j**/ are glottalized preceding preglottalized stops.*

(Subrahmanyam 1968)

Processes yielding glottalized resonants

Process type	Families (synchronic)	Families (diachronic)
Fusion R?, ?R > R’	7	2
Glottal transfer RG, GR > R’	2	1
Implosive > R’	*Atlantic-Congo*	*Mayan*
Ejective > R’	*Athabaskan-Eyak-Tlingit*	

Noon *(Atlantic-Congo)*

In coda position, implosives /ɓ ƒ/ are realized as glottalized approximants.

/líiɓ/

[li:**w’**]

‘be dirty’

(Soukka 2000: 38)

Bearlake Slave *(Athabaskan)*

*/**kʷ’**/ is sometimes realized as [**w’**], especially among Hare-origin Bearlake speakers.*

(Rice 1989: 33)

Processes yielding glottalized resonants

Process type	**Families** (synchronic)	**Families** (diachronic)
Fusion R?, ?R > R’	7	2
Glottal transfer RG, GR > R’	2	1
Implosive > R’	1	1
Ejective > R’	1	-
Other	*Algic* *Salishan* *Totonacan*	

including:

Domain-conditioned **R’**

Processes yielding glottalized resonants

Process type	**Families** (synchronic)	**Families** (diachronic)
Fusion Rʔ, ʔR > R’	7	2
Glottal transfer RG, GR > R’	2	1
Implosive > R’	1	1
Ejective > R’	1	-
Other	3	-

Innovation and glottalized consonants: takeaways

Ejectives	Implosives	Glottalized resonants
Most common source: fusion of C and ʔ	Most common source: voiced stops	Most common source: fusion of R and ʔ
Most common process tends to create extended inventories	Most common process tends to affect just /ɓ/ or /ɓ ɗ/	Most common process tends to create extended inventories
Fusion tends to occur in systems which already have contrastive ejectives *(85% of synchronic processes)*	This process does not tend to occur in languages with contrastive implosives *(21% of synchronic processes)*	
Fusion may recur in a family's history.		Fusion tends to alternate with fission in a family's history.

How likely are glottalized consonants to be introduced into a language through contact?

What other effects does contact have on glottalized consonant distribution?

Study 3: Contact and glottalized consonants

Di Garbo and Napoleão de Souza (2023) propose a method for disentangling contact/areal effects from genealogical effects. They develop a sample using sets of 3 languages determined as follows:

Focus: language examined for contact effects

Neighbor: genealogically unrelated, potential source of contact influence on Focus

Benchmark: close relative of Focus not in contact with either

There are **49 sets** in their 147-lg sample (~2 per Autotyp area)

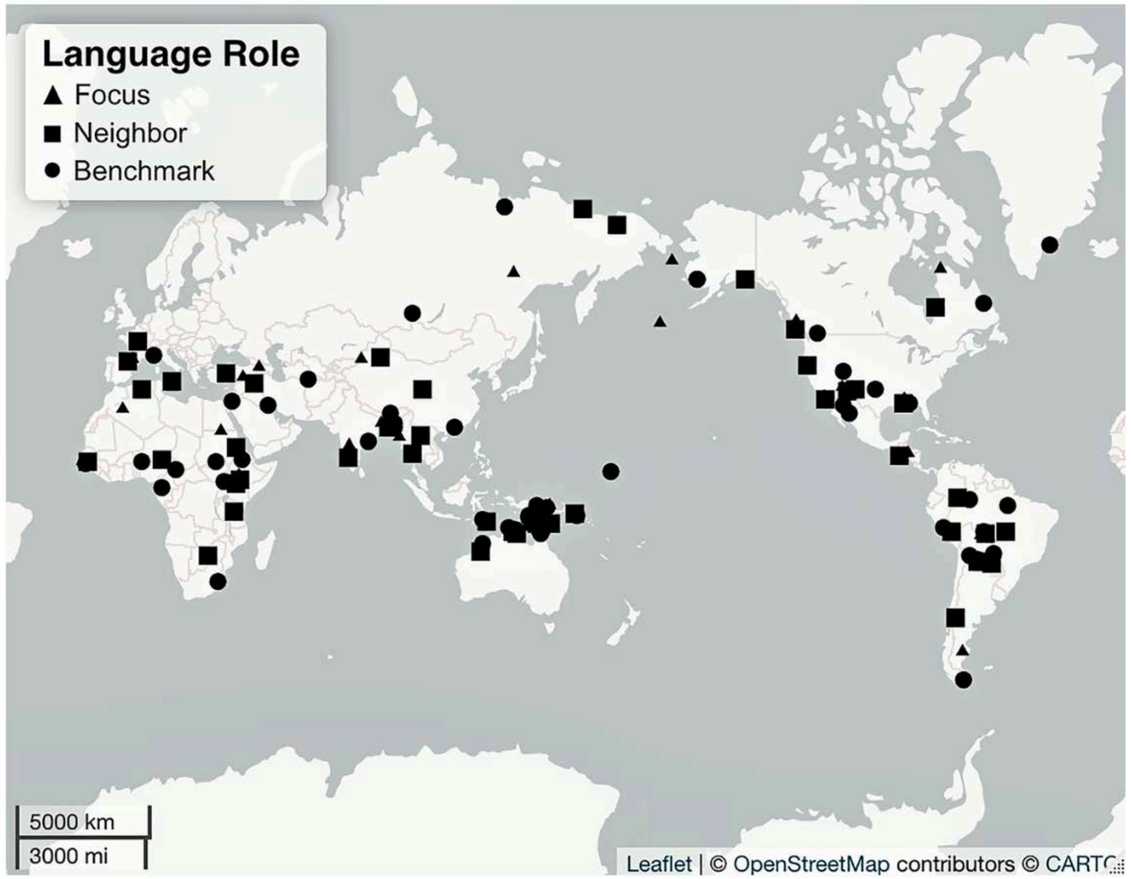


Figure 4: The language sample (for illustrative purposes).

Di Garbo & Napoleão de Souza (2023: 569)

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>
> **Neighbor:** genealogically unrelated, potential source of contact influence on Focus
>
> **Benchmark:** close relative of Focus not in contact with either

There are **49 sets** in their 147-lg sample (~2 per Autotyp area)

I coded all 147 languages for the presence/absence of ***ejectives***, ***implosives***, and ***glottalized resonants***, making note of:

- Inventory structure of glottalized Cs
- Phonotactic distribution
- Reports of inheritance, innovation, and contact as sources for these

Di Garbo and Napoleão de Souza (2023) sample: ejectives

Neighbor language has ejectives in **10 sets**

Set	Language name	Family	Ejective inventory	*C’	
03 Focus	Mursi	Surmic (Southeast)	-	t’ k’ t͡ʃ’	(Yigezu 2001-2002)
03 Neighbor	Hamer-Banna	South Omotic	t’ t͡ʃ’	q’ t͡ʃ’ s’	(Yigezu 2015)
03 Benchmark	Tennet	Surmic (Southwest)	-	-	(Yigezu 2001-2002)
38 Focus	Hopi	Uto-Aztecan	-	-	(Stubbs 2011)
38 Neighbor	Zuni	Zuni	k’ kʷ’ t͡s’ t͡ʃ’	*(NA)*	
38 Benchmark	Ute	Uto-Aztecan	-	-	(Stubbs 2011)
46 Focus	Kuikuro-Kalapalo	Cariban	-	-	(Gildea 2012)
46 Neighbor	Trumai	Trumai	t̪’ t’ k’ t͡s’	*(NA)*	
46 Benchmark	Pará Arára	Cariban	-	-	(Gildea 2012)

Di Garbo and Napoleão de Souza (2023) sample: ejectives

Neighbor language has ejectives in **10 sets**

Set	Language name	Family	Ejective inventory	*C’	
08 Focus	Langi	Atlantic-Congo (V-C)	-	-	(Stewart 1983)
08 Neighbor	Alagwa	Afro-Asiatic (Cushitic)	t͡s’ t͡ɬ’	p’ t’ k’ kʷ’ t͡s’ t͡ʃ’	(Ehret 1987)
08 Benchmark	Zulu	Atlantic-Congo (V-C)	p’ t’ k’ pf’ t͡s’ t͡ɬ’ t͡ʃ’ k͡ɬ’	-	(Stewart 1983)
20 Focus	Pipil	Uto-Aztecan	-	-	(Stubbs 2011)
20 Neighbor	Kaqchikel	Mayan	t’ k’ q’ t͡s’ t͡ʃ’	t’ t̪’ k’ q’ t͡s’ t͡ʃ’	(Campbell 1985)
20 Benchmark	Yaqui	Uto-Aztecan	-	-	(Stubbs 2011)
35 Focus	Aleut	Eskimo-Aleut	-	-	(Fortescue 1998)
35 Neighbor	Eyak	Athabaskan-Eyak-Tlingit	tˈ k’ q’ t͡s’ t͡ɬ’ t͡ʃ’	t’ kʲ’ k’ kʷ’ q’ qʷ’ t͡s’ t͡ɬ’ t͡ʃ’	(Leer 2008)
35 Benchmark	Central Alaskan Yupik	Eskimo-Aleut	-	-	(Fortescue 1998)

Di Garbo and Napoleão de Souza (2023) sample: ejectives

Neighbor language has ejectives in **10 sets**

Set	Language name	Family	Ejective inventory	*C’	
36 Focus	Nuxalk	Salishan	pʼ tʼ kʼ kʷʼ qʼ qʷʼ t͡sʼ t͡ɬʼ	pʼ tʼ kʼ kʷʼ qʼ qʷʼ t͡sʼ t͡ɬʼ	(Kuipers 2002)
36 Neighbor	Kwak’wala	Wakashan	pʼ tʼ kʲʼ kʷʼ qʼ qʷʼ t͡sʼ t͡ɬʼ	pʼ tʼ kʼ kʷʼ qʼ qʷʼ t͡sʼ t͡ɬʼ	(Sapir & Swadesh 1952)
36 Benchmark	Okanagan	Salishan	pʼ tʼ kʼ kʷʼ qʼ qʷʼ t͡sʼ t͡ɬʼ	pʼ tʼ kʼ kʷʼ qʼ qʷʼ t͡sʼ t͡ɬʼ	(Kuipers 2002)
37 Focus	Towa	Kiowa-Tanoan	pʼ tʼ kʲʼ kʼ	pʼ tʼ t͡sʼ kʼ kʲʼ kʷʼ	(Hale 1967)
37 Neighbor	Eastern Keres	Keresan	pʼ tʼ kʼ t͡sʼ t͡ʃʼ t͡ʂʼ sʼ ʃʼ ʂʼ	pʼ tʼ kʼ t͡sʼ (t͡ʂʼ) t͡ʃʼ	(Miller & Davis 1963)
37 Benchmark	Kiowa	Kiowa-Tanoan	pʼ tʼ kʼ t͡sʼ	pʼ tʼ t͡sʼ kʼ kʲʼ kʷʼ	(Hale 1967)
04 Focus	Kambaata	Afro-Asiatic (Cushitic)	pʼ tʼ kʼ t͡ʃʼ	pʼ tʼ kʼ kʷʼ t͡sʼ t͡ʃʼ	(Ehret 1987)
04 Neighbor	Wolaytta	Ta-Ne-Omotic	pʼ tʼ kʼ t͡ʃʼ	(pʼ tʼ) kʼ (t͡sʼ t͡ʃʼ)	(Bender 1987)
04 Benchmark	Xamtanga	Afro-Asiatic (Cushitic)	tʼ kʼ kʷʼ t͡ʃʼ sʼ	pʼ tʼ kʼ kʷʼ t͡sʼ t͡ʃʼ	(Ehret 1987)

Di Garbo and Napoleão de Souza (2023) sample: ejectives

Neighbor language has ejectives in **10 sets: 1** of these shows the expected pattern

Set	Language name	Family	Ejective inventory	*C’	
07 Focus	Ndebele	Atlantic-Congo (V-C)	p’ t’ k’ t͡ʃ’	-	(Stewart 1983)
07 Neighbor	Tjwao	Khoe-Kwadi	t’ t͡s’ t͡ʃ’ k͡x’	t’ k’ K’ TS’	(Fehn & Rocha 2024)
07 Benchmark	Gyele	Atlantic-Congo (V-C)	-	-	(Stewart 1983)

Di Garbo and Napoleão de Souza (2023) sample: ejectives

Neighbor language has ejectives in **10 sets: 1** of these shows the expected pattern

Set	Language name	Family	Ejective inventory	*C’	
07 Focus	Ndebele	Atlantic-Congo (V-C)	p’ t’ k’ t͡ʃ’	-	(Stewart 1983)
07 Neighbor	Tjwao	Khoe-Kwadi	t’ t͡s’ t͡ʃ’ k͡x’	t’ k’ K’ TS’	(Fehn & Rocha 2024)
07 Benchmark	Gyele	Atlantic-Congo (V-C)	-	-	(Stewart 1983)

“Perhaps a recent sound change resulted in the loss of the plain voiceless consonants” producing a system contrasting voiceless aspirated stops with voiced stops and **ejectives**.
(Bowern & Lotridge 2002: 5)

Herbert (1987: 406) discusses the contact situation: *“It is well established that clicks entered the Bantu languages through contact with Khoisan languages […] Clicks occur mainly in borrowed words, whereas [ejectives] are regular developments from Proto-Bantu consonants.”* He proposes a contact-induced development of a **Southern Bantu ‘articulatory mode’** in which variable degrees of ejection are characteristic of the plain voiceless obstruent series.

Di Garbo and Napoleão de Souza (2023) sample: implosives

Neighbor language has implosives in **5 sets**

Set	Language name	Family	Implosive inventory	*Implosive	
03 Focus	Mursi	Surmic (Southeast)	ɓ ɗ	ɓ ɗ ɠ	(Yigezu 2001-2002)
03 Neighbor	Hamer-Banna	South Omotic	ɓ ɗ (ɠ)	ɓ ɗ	(Yigezu 2015)
03 Benchmark	Tennet	Surmic (Southwest)	ɓ ɗ ɠ	ɓ ɗ ɠ	(Yigezu 2001-2002)
04 Focus	Kambaata	Afro-Asiatic (Cushitic)	-	-	(Ehret 1987)
04 Neighbor	Wolaytta	Ta-Ne-Omotic	ɗ	(ɓ ɗ)	(Bender 1987)
04 Benchmark	Xamtanga	Afro-Asiatic (Cushitic)	-	-	(Ehret 1987)
20 Focus	Pipil	Uto-Aztecan	-	-	(Stubbs 2011)
20 Neighbor	Kaqchikel	Mayan	ɓ	ɓ	(Campbell 1985)
20 Benchmark	Yaqui	Uto-Aztecan	-	-	(Stubbs 2011)

Di Garbo and Napoleão de Souza (2023) sample: implosives

Neighbor language has implosives in **5 sets: none** show the expected pattern

Set	Language name	Family	Implosive inventory	*Implosive
34 Focus	Burmese	Sino-Tibetan	-	- (Hill 2019)
34 Neighbor	Mon	Austroasiatic	ɓ ɗ	ɓ ɗ (ʄ) (Sidwell & Rau 2014)
34 Benchmark	Kurtöp	Sino-Tibetan	-	- (Hill 2019)
49 Focus	Western Toba	Guaicuruan	-	?
49 Neighbor	Wichí Noctén	Mataguayan	ɓ ɗ	- (Nikulin & Carol 2024)
49 Benchmark	Kadiweu	Guaicuruan	-	?

Di Garbo and Napoleão de Souza (2023) sample: glottalized resonants

Neighbor language has glottalized resonanats in **2 sets: both** show the expected pattern

Set	Language name	Family	Glottalized resonant inventory	*R’	
04 Focus	Kambaata	Afro-Asiatic (Cushitic)	r’ l’	-	(Ehret 1987)
04 Neighbor	Wolaytta	Ta-Ne-Omotic	m’ n’ l’	-	(Bender 1987)
04 Benchmark	Xamtanga	Afro-Asiatic (Cushitic)	-	-	(Ehret 1987)
37 Focus	Towa	Kiowa-Tanoan	‘m ‘n ‘l ‘j ‘w	-	(Hale 1967)
37 Neighbor	Eastern Keres	Keresan	m’ n’ r’ j’ w’	m’ n’ r’ j’ w’	(Miller & Davis 1963)
37 Benchmark	Kiowa	Kiowa-Tanoan	-	-	(Hale 1967)

Di Garbo and Napoleão de Souza (2023) sample: glottalized resonants

Neighbor language has glottalized resonants in **2 sets: both** show the expected pattern

Set	Language name	Family	Glottalized resonant inventory	*R’	
04 Focus	Kambaata	Afro-Asiatic (Cushitic)	r’ l’	-	(Ehret 1987)
04 Neighbor	Wolaytta	Ta-Ne-Omotic	m’ n’ l’	-	(Bender 1987)
04 Benchmark	Xamtanga	Afro-Asiatic (Cushitic)	-	-	(Ehret 1987)
37 Focus	Towa	Kiowa-Tanoan	‘m ‘n ‘l ‘j ‘w	-	(Hale 1967)
37 Neighbor	Eastern Keres	Keresan	m’ n’ r’ j’ w’	m’ n’ r’ j’ w’	(Miller & Davis 1963)
37 Benchmark	Kiowa	Kiowa-Tanoan	-	-	(Hale 1967)

"*The historical origin of the **glottalized liquids** remains obscure and requires further investigation. To the best of my knowledge, these sounds have not been found in languages related to Kambaata. [A] comparison of Kambaata words containing glottalized liquids with cognates in [Highland East Cushitic] languages is so far impossible, because such uncommon lexemes are not found in publications on HEC.*" (Treis 2008: 37)

Di Garbo and Napoleão de Souza (2023) sample: glottalized resonants

Neighbor language has glottalized resonants in **2 sets: both** show the expected pattern

Set	Language name	Family	Glottalized resonant inventory	*R’	
04 Focus	Kambaata	Afro-Asiatic (Cushitic)	r’ l’	-	(Ehret 1987)
04 Neighbor	Wolaytta	Ta-Ne-Omotic	m’ n’ l’	-	(Bender 1987)
04 Benchmark	Xamtanga	Afro-Asiatic (Cushitic)	-	-	(Ehret 1987)
37 Focus	Towa	Kiowa-Tanoan	‘m ‘n ‘l ‘j ‘w	-	(Hale 1967)
37 Neighbor	Eastern Keres	Keresan	m’ n’ r’ j’ w’	m’ n’ r’ j’ w’	(Miller & Davis 1963)
37 Benchmark	Kiowa	Kiowa-Tanoan	-	-	(Hale 1967)

While /‘l/ can occur within stems, the rest of the **glottalized resonants** in Towa come about through a heavily morphologized fusion process in verbal inflection, which also produces ejectives:

Impf. ɦáːwásɑ Perf. ɦáˋːʼwè ‘take, carry’

Impf. kʷíbɑsɑ Perf. kʷipʼæ ‘stand up’ (Yumitani 1998: 54)

Study 3: Contact and glottalized consonants

3 of the 17 potential cases in the Di Garbo & Napoleão de Souza (2023) sample showed the expected contact pattern for glottalized consonants.

➡ Is this a **low/medium/high** number? Hard to know without reference points!

Broadening the survey:

- I noted any other reports of contact effects on glottalized consonant presence within the references in the Di Garbo & Napoleão de Souza (2023) sample.
- I also compiled examples I've noted in reference grammars, historical-comparative studies, etc.
- I classified these reported contact effects as: ***"general" effects***, ***loanwords***, ***loanword adaptation***, and ***sound change precipitated by contact***.

“General” effects

“*[V]oiced stops are often realized as implosive in […]* ***Karimojong****. The distribution of voiced and* ***implosive stops*** *in* ***Nyang'i****, then, results in increased similarity between Nyang'i's consonantal system and Karimojong's consonantal system.”* (Beer 2017: 51)

(On **Ossetic**) *“It seems e.g., tempting to ascribe the adoption of the* ***glottalic stops*** *to* ***Kabardian*** *influence at a time when it was fashionable to imitate the speech of the Kabardian feudal lords.*" (Thordarson 2009: 190)

“Some group II languages, including ***Cusco Quechua****, have voiceless aspirated stops and* ***ejectives*** *[…] It is believed that this feature is an effect of the linguistic contact with* ***Aymara****.”* (Ebina 2011: 2)

“The existence of this alveodental ***implosive consonant*** */ɗ/ in* ***Diddessa Mao*** *may be due to the influence of* ***Afan Oromo****, the socially dominant language in the area.”* (Dumessa 2007: 5)

“*Phonological features* [of **Chimariko**]*, such as large consonant inventories with three series of stops, plain, aspirated, and* ***glottalized****, show strong areal distributions as a result of language contact.*" (Jany 2009: 207)

Loanwords

Gbari *(Atlantic-Congo)*

/kʼəɾí/ ‘fishing net’ (Hausa loan)

Native ejective inventory: -

(Rosendall 1998: 18)

Kwegu *(Surmic)*

/tʼukura/ ‘rubbish heap’ (Kara loan)

Native ejective inventory: kʼ t͡ʃʼ

(Yigezu 2001-2002: 114-116)

Also:

Amharic → **Kambaata**

Aymaran → **Chipayan**

Chechen, Georgian → **Ossetic**

Chimariko, Eastern Pomo, Klamath, Patwin, Wintu, Shasta →**Yurok**

Hausa → **Gbari**

Hausa → **Goemai**

Kara → **Kwegu**

Klamath → **Molale**

Oram → **Ilwana**

Quechuan → **Andean Spanish**

Quechuan → **Anserma**

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Quechuan → **Andean Spanish**

Quechuan → **Anserma**

*These lgs already have ejectives (**6/11** cases)*

Loanword adaptation

Mursi *(Surmic)*

In Amharic loans, /**pʼ**/ is adapted as /**ɓ**/:

Amharic *tʼära**pʼpʼ**eza*
→ Mursi [tara**ɓ**eza] ‘table’

(Firew 2020: 58)

Pokot *(Nilotic)*

In Turkana loans, /**d**/ is adapted as /**ɗ**/.

(Dimmendaal 1988: 19)

Wolaytta *(Ta-Ne-Omotic)*

In loans, /**n**/ is sometimes adapted as /**nʼ**/:

Amharic *kʼu**nn**a*
→ Wolaytta [kʼú**nʼnʼ**aa] ‘grain measure’

(Wakasa 2008: 52)

Loanword adaptation

Hinuq *(Nakh-Daghestanian)*

In Russian loans, /k/ is adapted as /k’/:

Russ. *mar**k**a* → Hin. *mar**k’**a* ‘stamp’

Russ. *čajni**k*** → Hin. *čayni**k’*** ‘teapot’

This may be due to Georgian being the intermediate language.

(Forker 2013: 46)

Also:

Amharic /**pʼ kʷʼ sʼ**/ → **Kambaata /kʼ kʼ tʼ/**

Tlingit /**sʼ ɬʼ xʷʼ**/ → **Eyak /t͡sʼ t͡ɬʼ kʼ/**

Arabic /**tˤ q**/ → **Avar /tʼ qʼ/**

Arabic /**tˤ**/ → **Amharic /tʼ/**

Avar /**t**/ → **Khwarshi /tʼ/**

Chechen /**k**/→ **Khwarshi /kʼ/**

Russian /**k**/ → **Hinuq /kʼ/**

English /**g**/ → **Setswana /kʼ/**

Arabic /**q**/ → **Hausa /kʼ/**

Russian voiceless stops and affricates
→ ejectives in **Archi, Ossetic**

English, Afrikaans voiceless stops
→ **Ndebele** ejectives / *s* __

Sound change precipitated by contact

Hamer-Banna *(South Omotic)*

/q/ → [q’] / #__a among speakers exposed to Amharic (which doesn’t have uvulars)

Native ejective inventory: t’ t͡ʃ’

(Petrollino 2016: 14)

Lake Miwok *(Miwok-Costanoan)*

*p > p’~p / #ˈ_ /o u/ C

This may be a sound change by analogy, perhaps precipitated by Southeastern Pomo loan stem p’ut- ‘to kiss’.

Native ejective inventory: -

(Callaghan 2014: 93)

Yurok *(Algic)*

*Ct > *Cʔ > C’

This change is proposed to have introduced native ejectives into Yurok as the result of a ‘perceptual magnet effect’ owing to the sound systems of surrounding languages.

Native ejective inventory: -

(Blevins 2002, 2017)

Sound symbolism has been proposed as a source of some ejectives in **Cusco Quechua** (Mannheim and Newfield 1982) and **Kwegu** (Yigezu 2001: 115)**.**

Contact and glottalized consonants: takeaways

Ejectives	**Implosives**	**Glottalized resonants**
Show contact effects in **1/10** potential cases in Di Garbo & Napoleão de Souza sample	Show contact effects in **0/5** potential cases in Di Garbo & Napoleão de Souza sample	Show contact effects in **2/2** potential cases in Di Garbo & Napoleão de Souza sample
Loanwords with ejectives are often borrowed into languages that already have ejectives.		
Frequently, other patterns in loans are adapted as ejectives.	Infrequently, other patterns in loans are adapted as implosives.	Infrequently, other patterns in loans are adapted as glottalized resonants.

Wrapping up: profiles of glottalized consonants

	Ejectives	Implosives	Glottalized resonants
Propensity to be inherited	**Strongest** (78% of families)	**Medium** (56% of families)	**Weakest** (39% of families)
Propensity to be innovated	**Strongest** through fusion	**Medium** through voiced stops	**Weakest** through fusion
Propensity to spread through contact	**Weak** (1/10 cases)	**Weak** (0/5 cases)	**Strongest** (2/2 cases)
	Strong proliferation through loanword adaptation and sound change in languages that already have them	**Weaker** proliferation through loanword adaptation	**Weaker** proliferation through loanword adaptation and sound change

Conclusions

A complication in making conclusions here is that there aren't widely established values corresponding to absolute "strong" and "weak" patterns in inheritance, innovation, and spread through contact.

However, the studies here have established ***relative*** patterns for the three glottalized consonant types examined.

- The evidence for **ejective** and **implosive** consonants being inherited or innovated seems much more robust than the evidence for them being spread through contact.
- **Glottalized resonants**, on the other hand, show less of a propensity for inheritance and innovation, and stronger evidence of being spread through contact.

A final question

“Of course, the fact that so many proto-units have implosives raises the question of whether diffusion might have been at work ***in the distant past.****”*
(Clements & Rialland 2007: 60)

In pursuing this line of argumentation, should we assume that propensities for inheritance, innovation, and spread through contact are inherent and unchanging?

If not, then how can we approach the factor of the distant (i.e. unrecoverable) past in a principled and systematic way?


Mahalo nui
Thank you