Rhythm in four Colombian Languages

Kamsá, Kogi, Embera-Chamí and Wuayuú

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Outline:

- **1. Introduction**
  1.1 Rhythm
  1.2 Colombian languages

- **2. Methodology**
  Data from each language
  Measurements and Analyses

- **3. Results**
  Deltas and PVI of sampled languages
 Comparisons with world languages

- **4. Discussion**
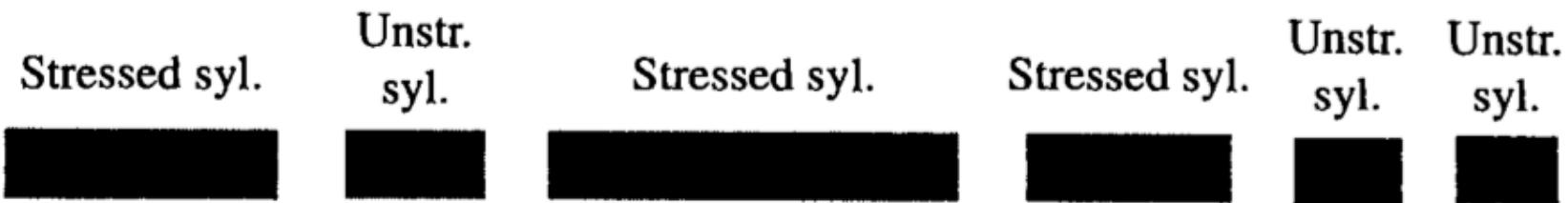
Rhythm

1.1. Rhythm
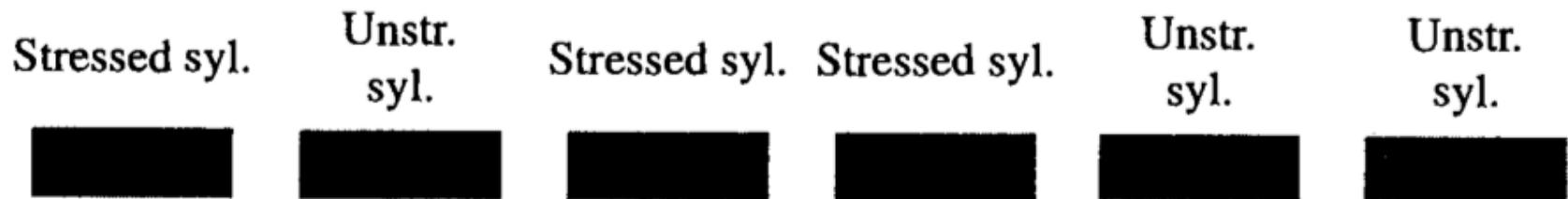
- Pike (1946) and Abercrombie (1965, 1967): described classes of rhythm:

  - **Stressed-timed:** The stressed syllables are longer that unstressed ones, for instance, English.

  - **Syllable-timed:** All syllables are *isochronic,* commonly illustrated by Spanish.

1.1. Rhythm

Idealized stress timing

Stressed syl.	Unstr. syl.	Stressed syl.	Stressed syl.	Unstr. syl.	Unstr. syl.

Idealized syllable timing

| Stressed syl.	Unstr. syl.	Stressed syl.	Stressed syl.	Unstr. syl.	Unstr. syl.
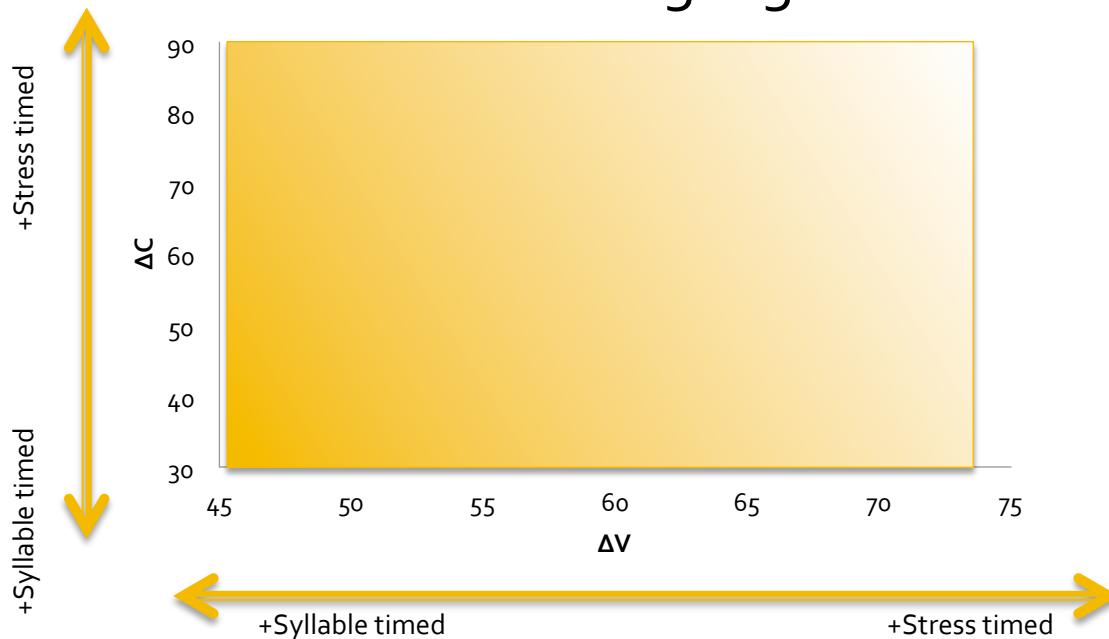
1.1. Rhythm

- These categories are problematic:
  - perceptually salient, but challenging to establish acoustic correlates.

- Grabe & Low (2002): described different methods to account for rhythm.

- Different results have been obtained.

1.1. Rhythm

- Ramus et al (1999) have shown a continuous distribution of rhythmic patterns, using:
  - *ΔC:* standard deviation of duration of Consonantal intervals.
  - *ΔV:* standard deviation of duration of Vowel intervals.
  - %V: proportion of vocalic intervals.
- Syllable-timed: *+V%, -ΔC, -ΔV*
- Stressed-timed: *-V%, +ΔC, +ΔV*

1.1. Rhythm
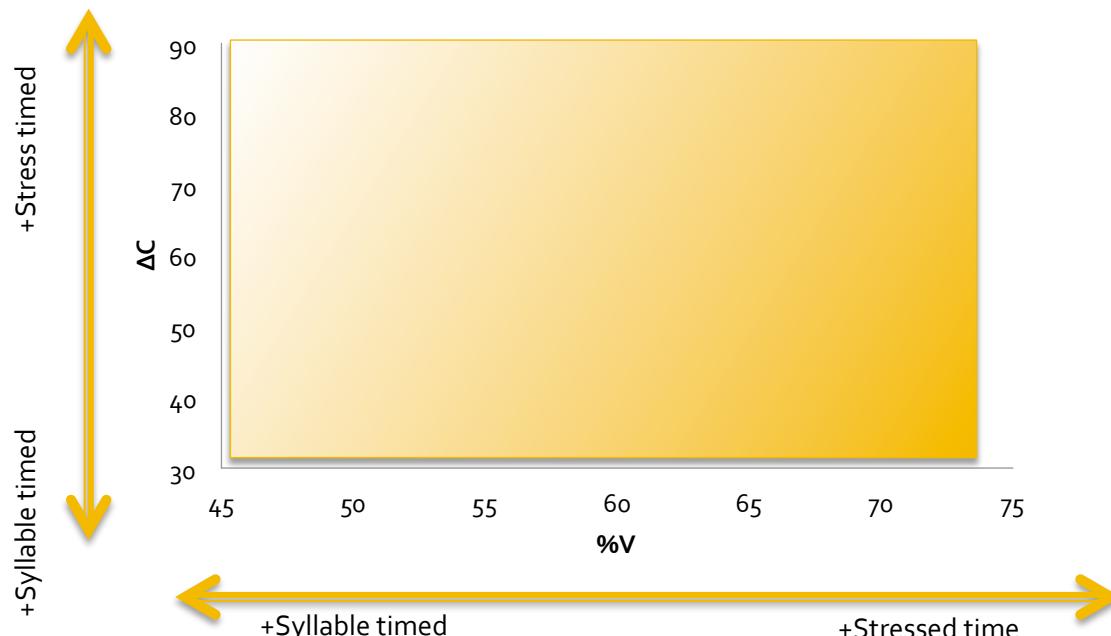
- Relation *ΔV and ΔC*

  - Syllable-timed languages would present lower values of ΔV and ΔC than stress-timed languages

1.1. Rhythm

- Relation *%V and ΔC*
 - higher values of %V indicate that the language is more Syllable-timed.
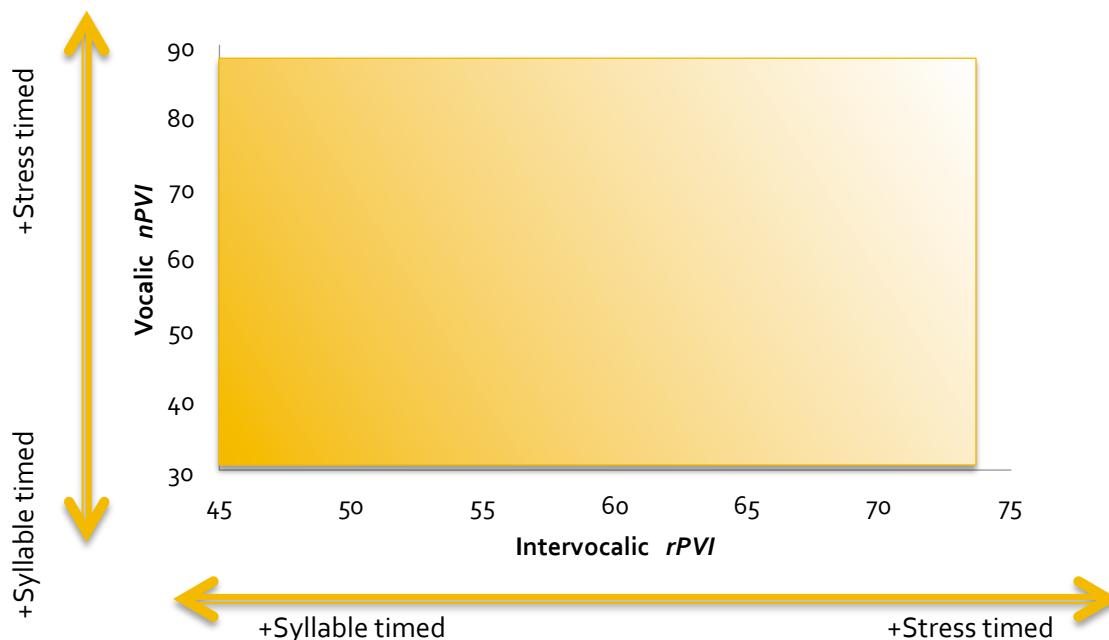
1.1. Rhythm

- Grabe & Low (2002) proposed measuring Pairwise Variability Indexes (PVI), which allow to account for variation in speech rate.

- *PVI* Calculates duration of a syllable relative to another
  - Raw PVI = rPVI: Consonants
  - Normalized PVI = nPVI: vowels
  - Syllable-timed: *-nPVI -rPVI*
  - Stressed-timed: *+nPVI +rPVI*

1.1. Rhythm

- ## PVI
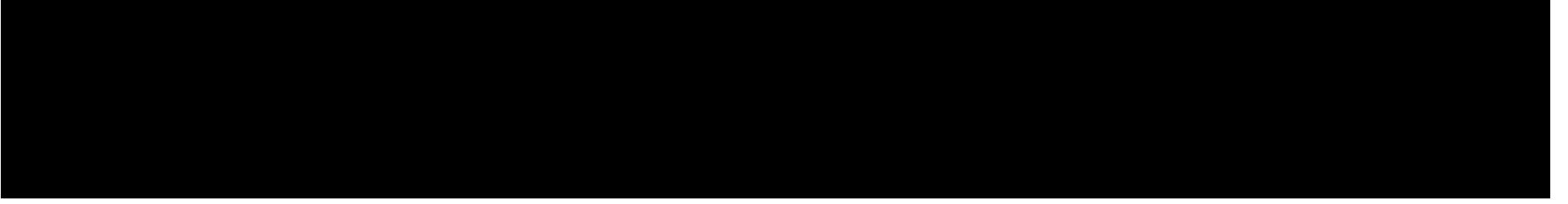
  - Syllable-timed languages would present lower values of nPVI and rPVI than stress-timed languages

1.1. Rhythm

Additionally...
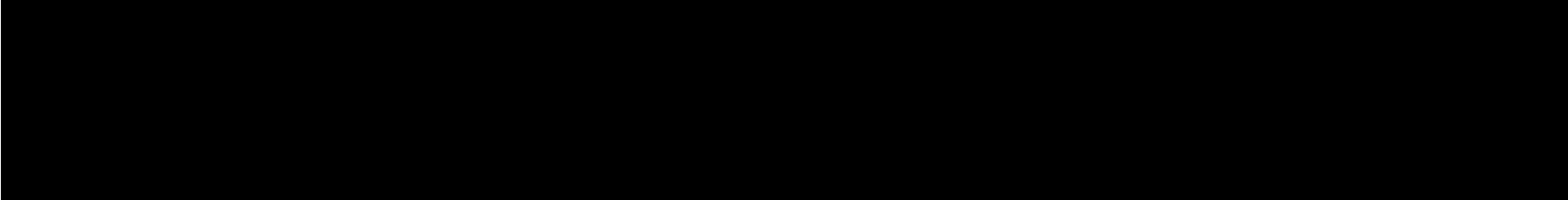
- It has been suggested that syllable complexity and vowel length are also related with rhythmic patterns:
  - Easterday et al (2011) found that there IS a relation ΔC / syllable complexity.

Colombian Languages

1.2. Colombian Languages

- ~64 languages in Colombia
- Limited research:
  - Grammars & Dictionaries
  - Phonological descriptions
    (mostly segmental; prosodic information limited or absent)
  - Phonetic detail scarce
  - Rhythm
    very few characterizations, mostly qualitative with no phonetic measurements (Keels 1985 fro Guayaber, and Gralow 1985 for Coreguaje)

METHODOLOGY

2. Methodology: Data

- 4 Colombian languages (geographically and genetically diverse):
  - Kamsá, Kogi, Embera-Chamí and Wuayuú

- Data Sources:
  - **Global Recordings**: Kogi, Embera-Chamí and Wayuú
  - **Archive of the Indigenous Languages of Latin America (AILLA)**: Kamsá

- Type of data:
  - Narratives

2. Methodology: Data

- LAPSyD/WALS criteria:
  - Syllcat:
    - Complexity of the syllable: Simple, Moderate, Complex
  - Syllabic Index:
    - Maximal degree of elaboration in Onset, Nucleus and Coda (e.g., 3,1,2)
 - Canonical Form
    - E.g., (C) V (C)
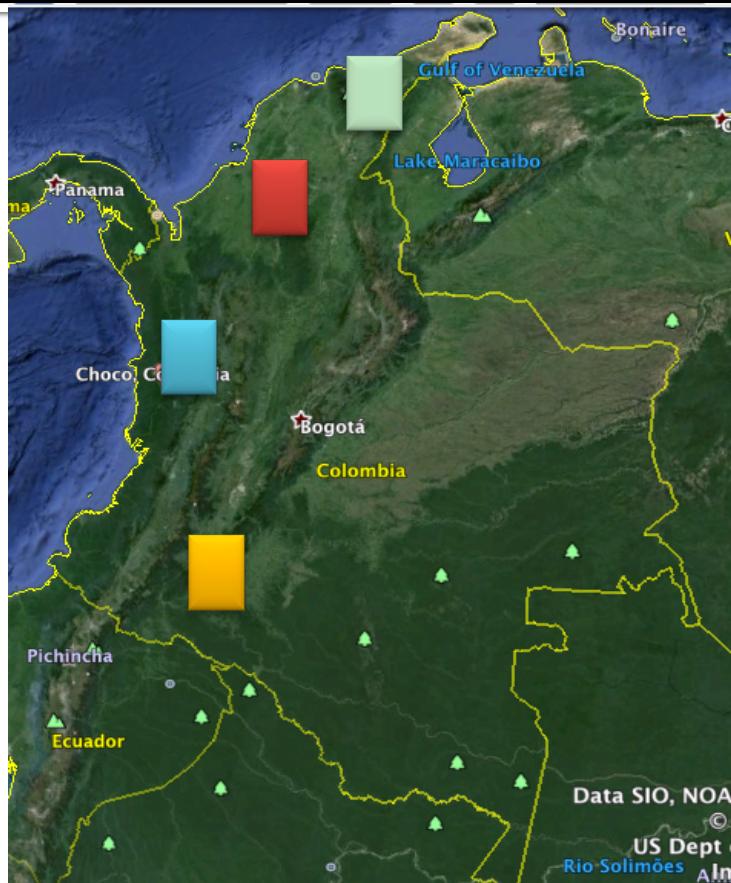
2. Methodology: Data

WAYUÚ

KOGI

EMBERA-CHAMÍ

KAMSA

2. Methodology: Data

WAYUÚ

- Classification : Arawakan, Maipuran, Northern
- Location: La Guajira peninsula on Venezuela/Colombia border

- Syllcat: Moderate

- Syllabic index : 2   ONC : 011

- Canonical Form :   (C)V(C)

Source: LAPSyD

WAYUÚ

15 Consonants
6 Vowels

Source: LAPSyD

Vowels	front unrounded	central unrounded	back rounded
high	i	ɨ	u
lower mid	ɛ		ɔ
low		a	

Consonants					bilabial	dental	alv	pal–alv	palatal	velar	glottal
Airstreams	Manners	ERA features	Secondary source	Voicing properties	velar						
pulm	stop			–vless	p	t̪				k	ʔ
	aff		sib	–vless				tʃ			
	fric			–vless							h
			sib	–vless			s	ʃ			
	nasal			–ved	m	n̪			ɲ		
	trill			–ved			r				
	tap/flap	lat					l				
	appr			–ved	w				j		

2. Methodology: Data

KOGI

- Classification: Chibchan

- Location: Sierra Nevada de Santa Marta, Colombia

- Syllcat: Moderate

- Syllabic index : 2   ONC : 011

- Canonical Form :   (C)V(V)(C)

        Source: LAPSyD

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2. Methodology: Data

15 Consonants
7 Vowels

Source: LAPSyD

Vowels	front unrounded	central unrounded	back rounded
high	i	ɨ	u
higher mid	e		o
raised low		ɐ	
low		a	

Consonants					bilabial	alv	pal–alv	palatal	velar	glottal
Airstreams	Manners	ERA features	Secondary source	Voicing properties	velar					
pulm	stop			–vless	p	t			k	ʔ
				–ved	b	d			g	
	fric		sib	–vless					x	h
				–vless		s	ʃ			
				–ved		z	ʒ			
	nasal			–ved	m	n			ŋ	
	appr			–ved			w	j		
		lat		–ved		l				

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2. Methodology: Data

EMBERA-CHAMÍ

- Classification : Chocó

- Location : Departments of Risaralda, Caldas, Antioquia, Valle, Colombia

- Syllcat: Moderate

- Syllabic index : 3   ONC : 111

- Canonical Form   C(C)V(C)

    Source: LAPSyD

EMBERA-CHAMÍ

18 Consonants
12 Vowels

Source: LAPSyD

Vowels		front		central		back
		unrounded	rounded	unrounded	rounded	rounded
high		i			ʉ	u
	nasalized	ĩ			ʉ̃	ũ
higher mid		e	ø			
	nasalized	ẽ	ø̃			
low				a		
	nasalized			ã		

Consonants				bilabial	lab-den	alv	pal-alv	palatal	velar	glottal
Airstreams	Manners	Secondary source	Voicing properties	velar						
pulm	stop		–vless	p		t			k	ʔ
			–ved	b		d				
	aff	sib	–vless				t͡ʃ			
	fric		–vless							h
		sib	–vless			s				
	nasal		–ved	m		n				
	trill		–ved			r				
	tap/flap		–ved			ɾ				
	appr		–ved		w	ʋ		j		
impl	stop		–ved	ɓ		ɗ				

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2. Methodology: Data

KAMSA

- Classification :   Isolate

- Location :   Western Colombia, Sibundoy Valley

- Syllcat: Complex

- Syllabic index : 6*   ONC :231

- Canonical Form :   C(C)(C)V(V)(V)(C)

Source: LIC/ WALS26

22 Consonants
6 Vowels

Source: Lenguas de Colombia.gov

Vocales

	ANTERIORES	CENTRALES	POSTERIORES
ALTAS	i	i̵	u
BAJAS	e	a	o
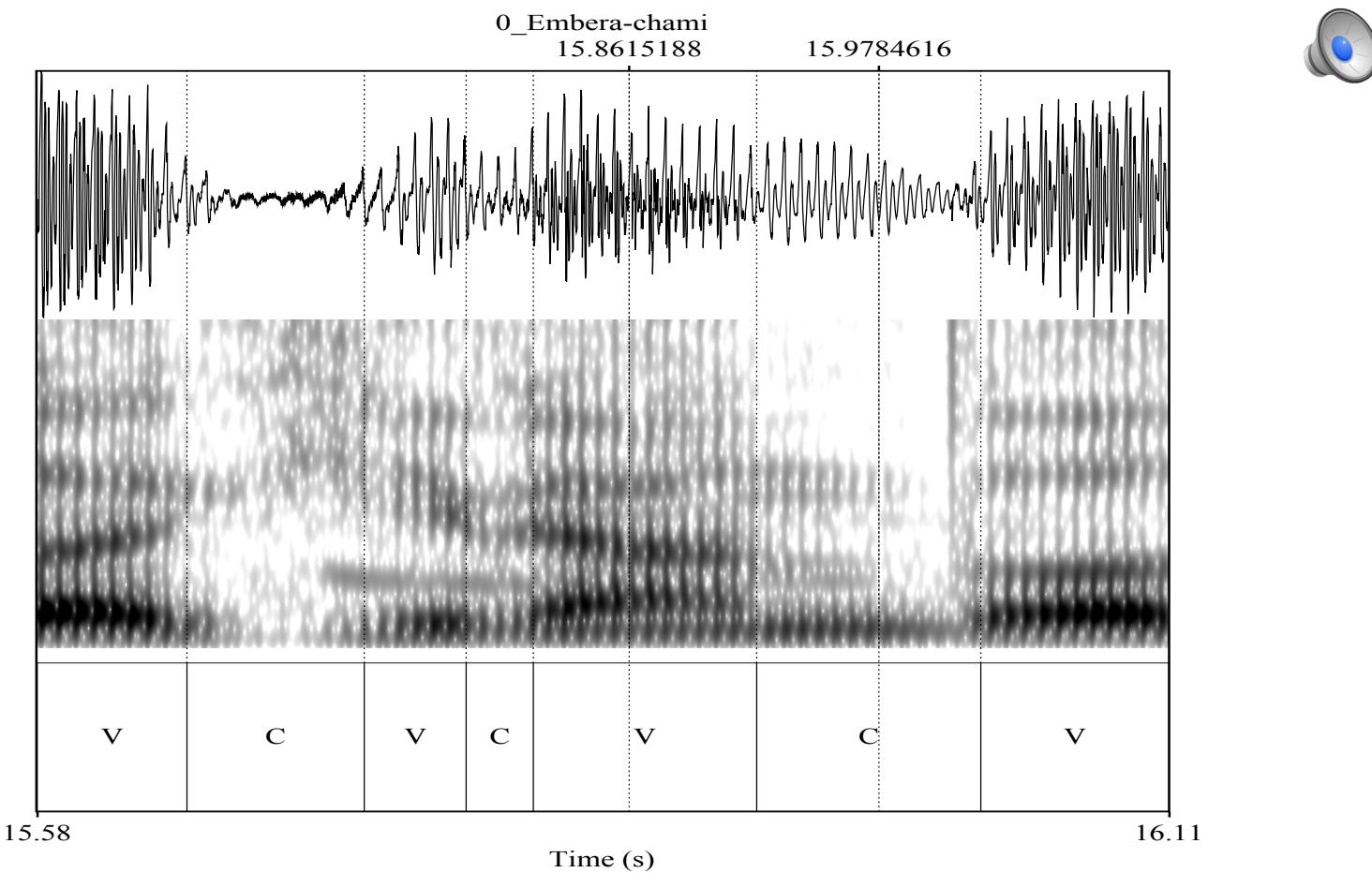
Consonantes
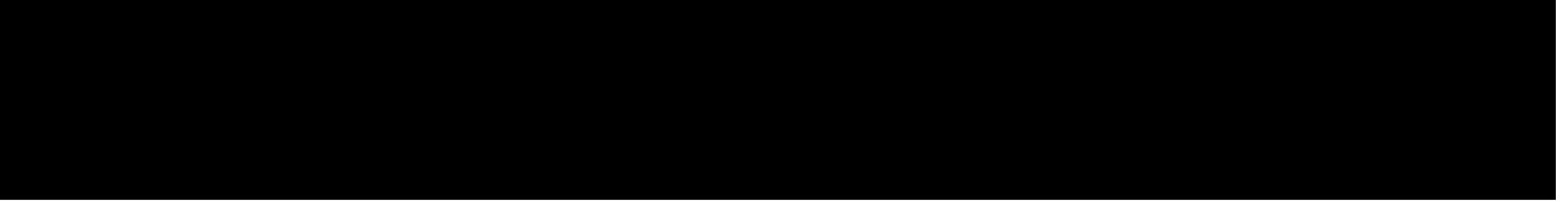
		LABIALES	ALVEOLARES	RETROFLEJAS	PALATALES	VELARES
OCLUSIVAS	sd.	p	t			k
	sn.	b	d			g
AFRICADAS	sd.		ts	tṣ	tš	
FRICATIVAS	sd.	ꝑ	s	ṣ	š	x
NASALES	sn.	m	n		ñ	
LATERALES	sn.		l		lʸ	
VIBRANTES	sn.		ř			
SEMIVOCALES	sn.	w			y	

2. Methodology: Measurements

- 2 minutes of speech
- Vocalic and consonantal intervals in continuous speech

  - a sequence of segments (V or C) is an interval regardless of word limits: [VV#V] ~ [C.CC]

- Duration of the interval in Praat
- Initial and Final segments in **IU** were ignored

2. Methodology: Measurements
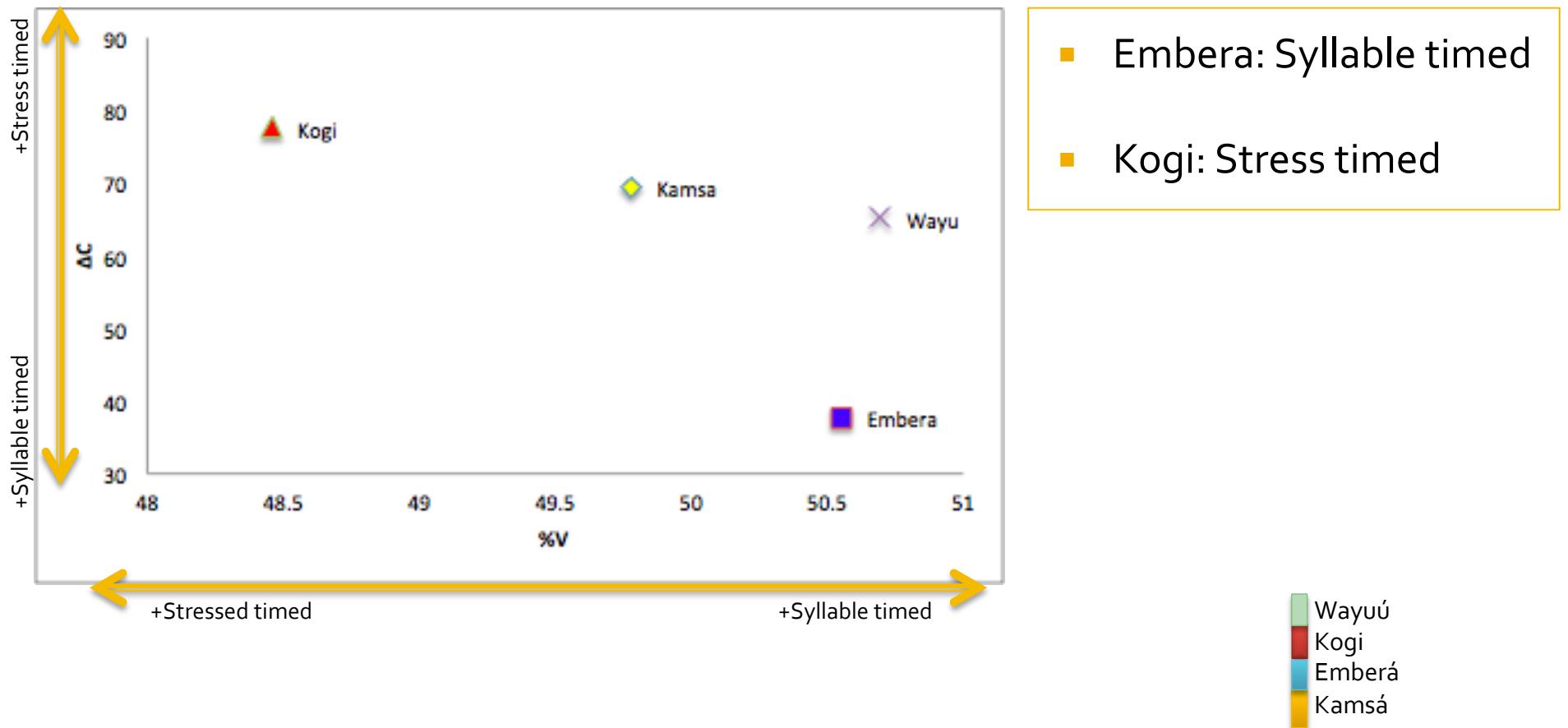
RESULTS
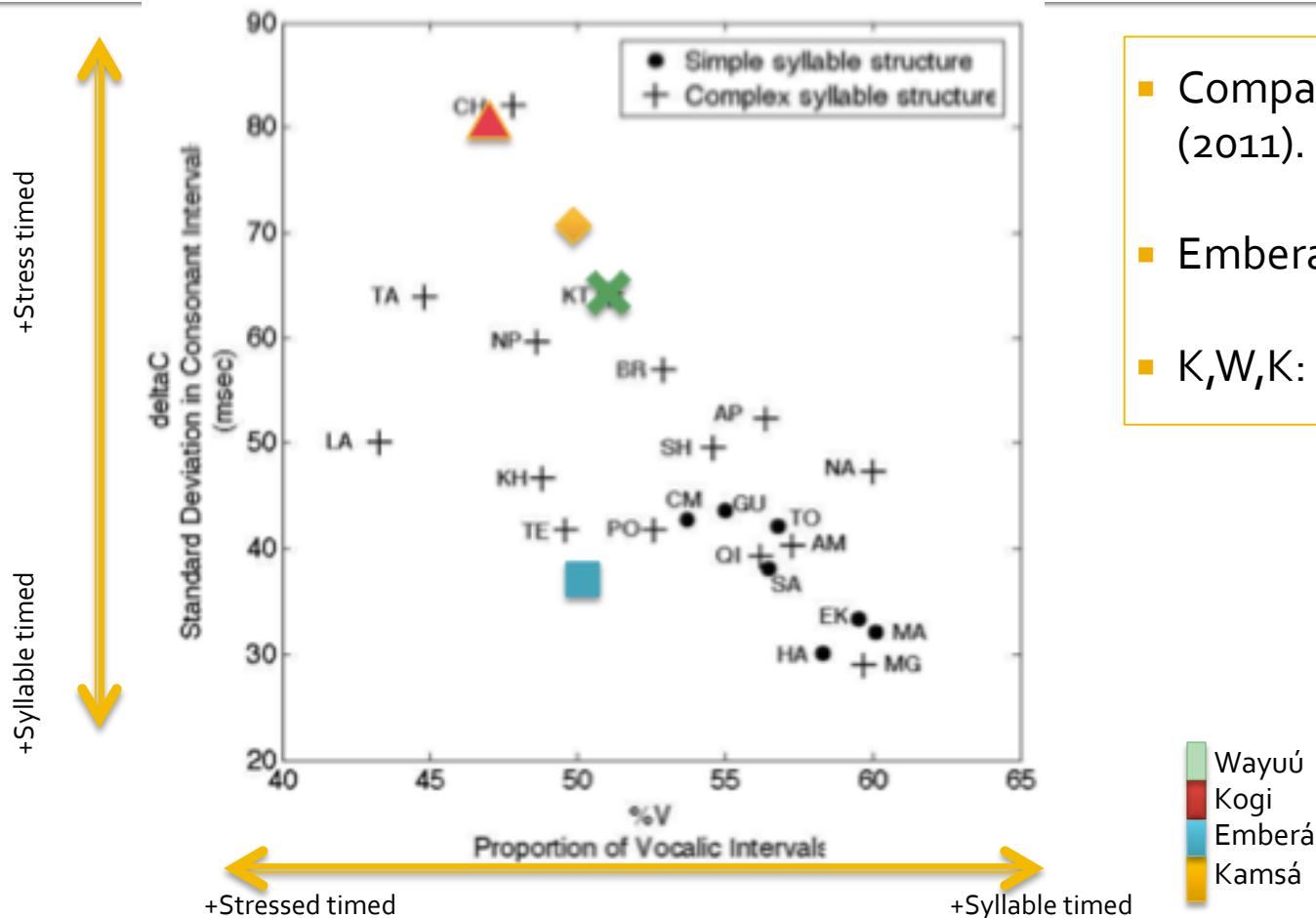
3. Results

|		STRUCTURE	rPVI	nPVI	% V	ΔV	ΔC
Wayuú		CVC = 2	65.2	55.1	50.6	69.9	65.1
Kogi		CVVC = 3	65	52.2	48.4	68.3	77.6
Embera-chamí		CCVC = 3	39.7	46.6	50.5	52.3	37.6
Kamsá		CCCVVVC =6	73.7	47.1	49.7	57.3	69.3

3. Results: ΔC, %V


- Embera: Syllable timed

- Kogi: Stress timed
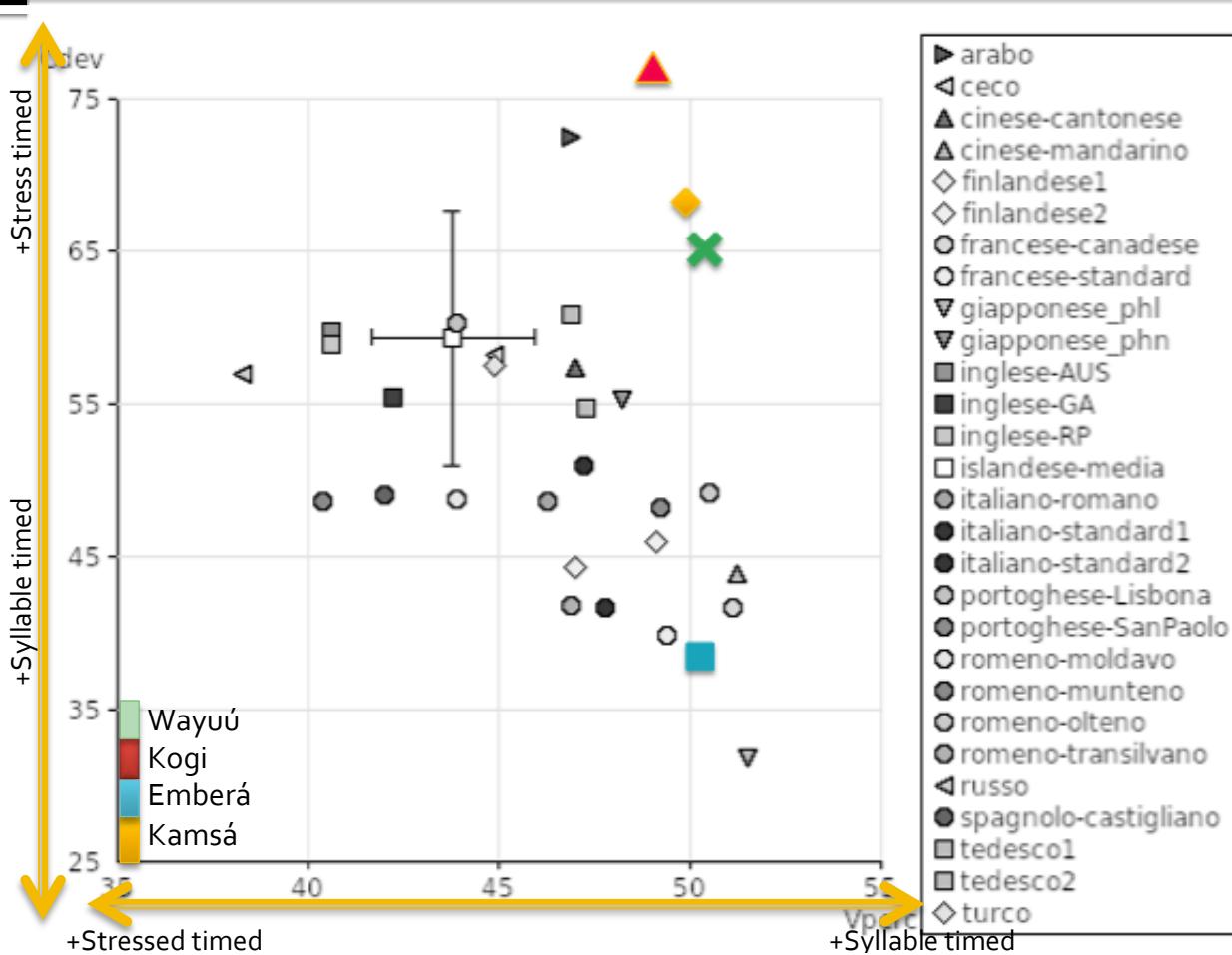
Results: ΔC, %V

- Compared to Easterday et al (2011).

- Embera: Syllable timed

- K,W,K: closer to each other
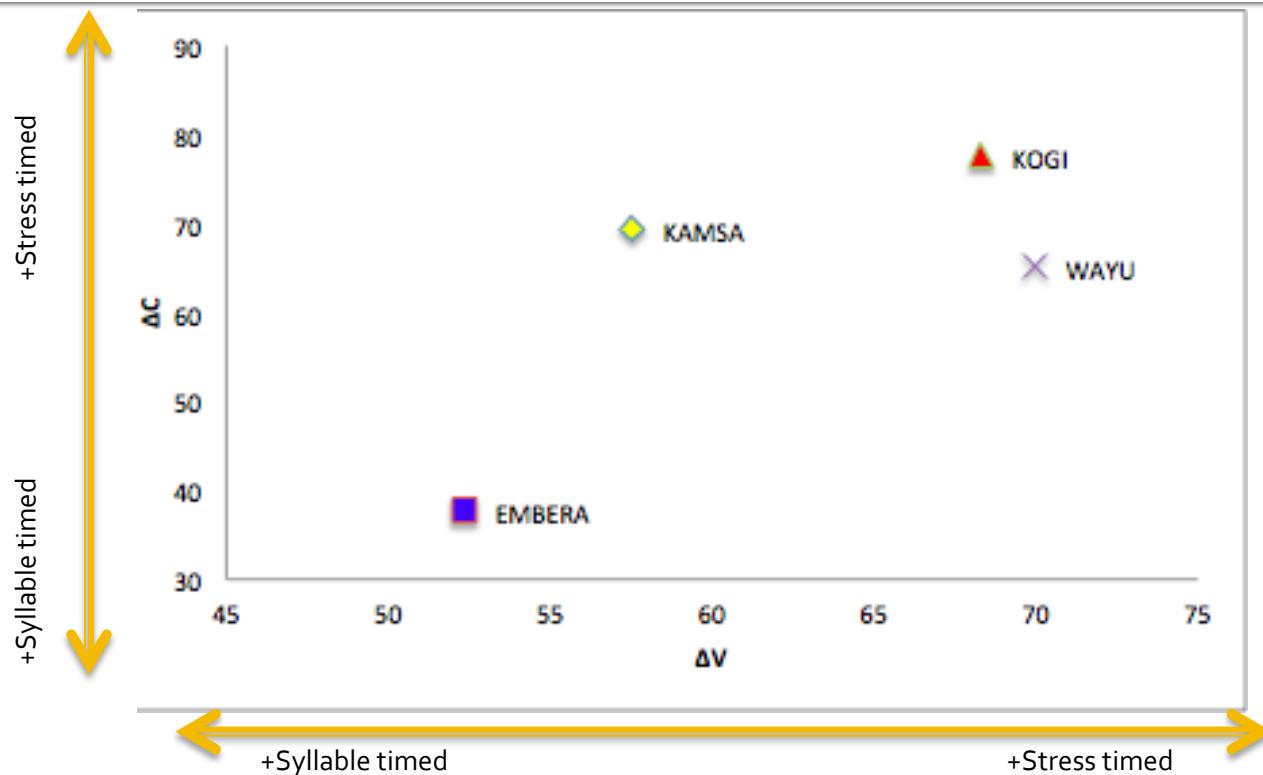
Results: ΔC, % V

- Compared to Romano & Mairano (2010).

- K, W, K: closer to Arabic and Tedesco, but rather separated from English, a typically known stress-timed language.

- Embera: very far from Spanish; highly syllable timed
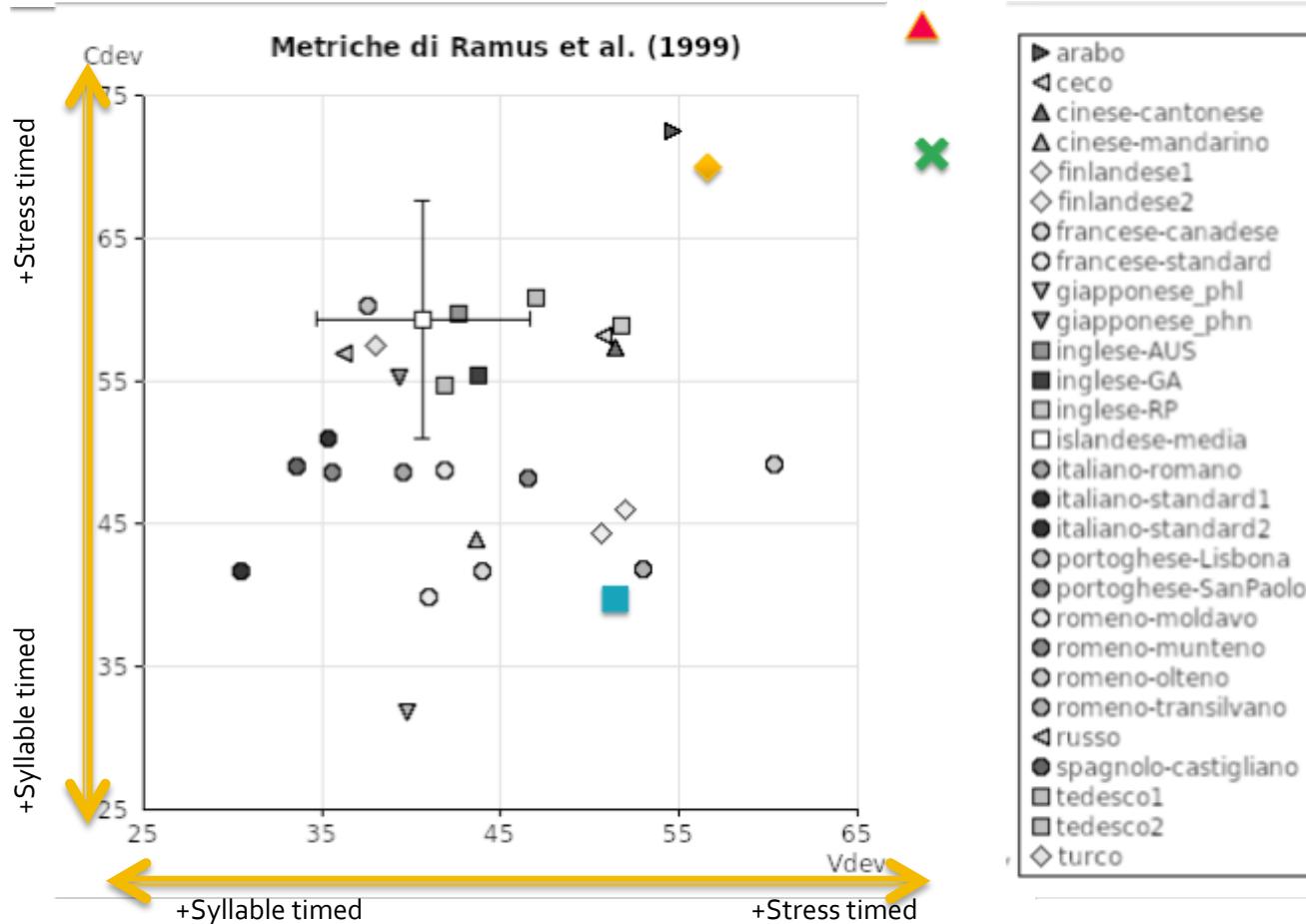
3. Results: ΔC, ΔV

- Embera: Highly Stress timed

- Kogi and Wayuú, Highly Syllable timed

- Kamsá: in the middle

3. Results: ΔC, ΔV

Metriche di Ramus et al. (1999)
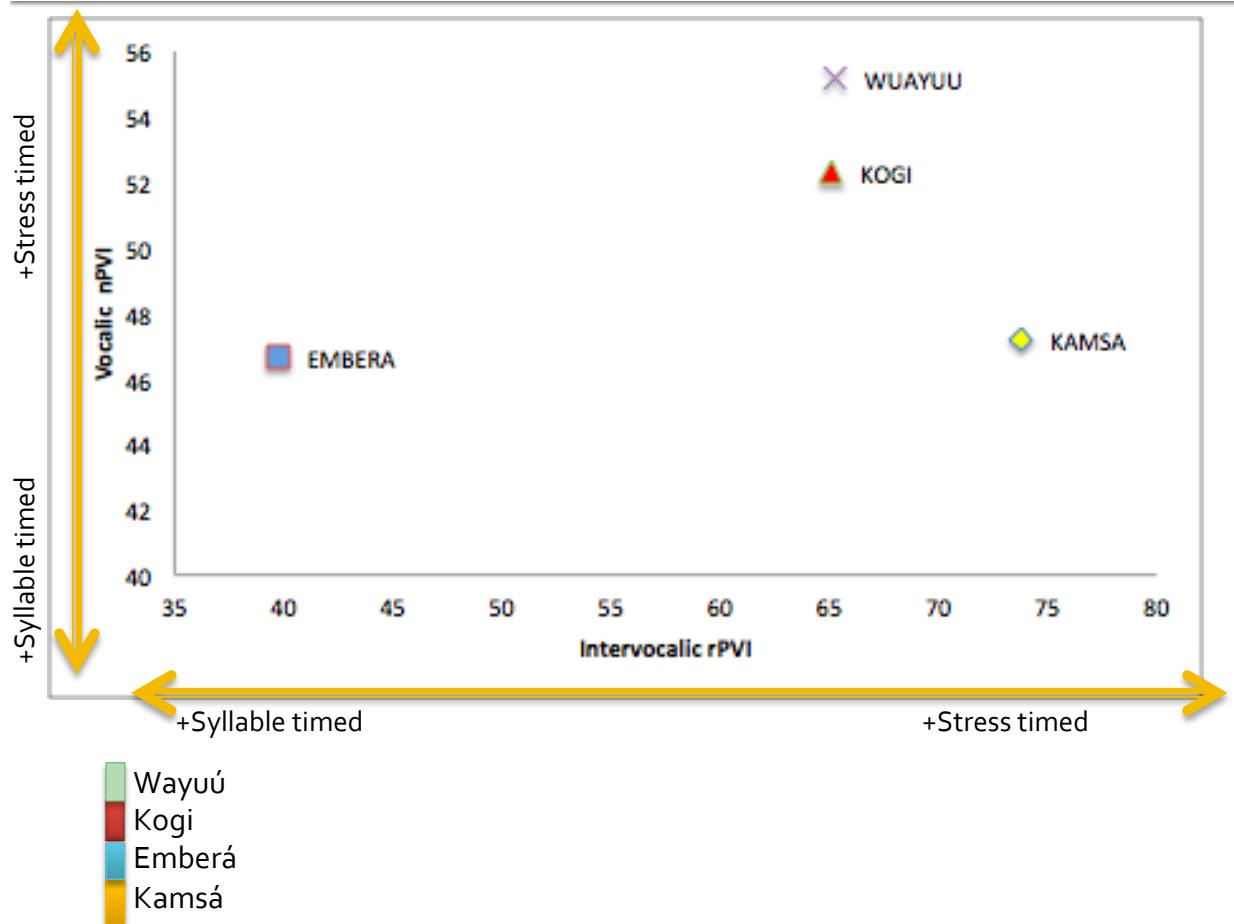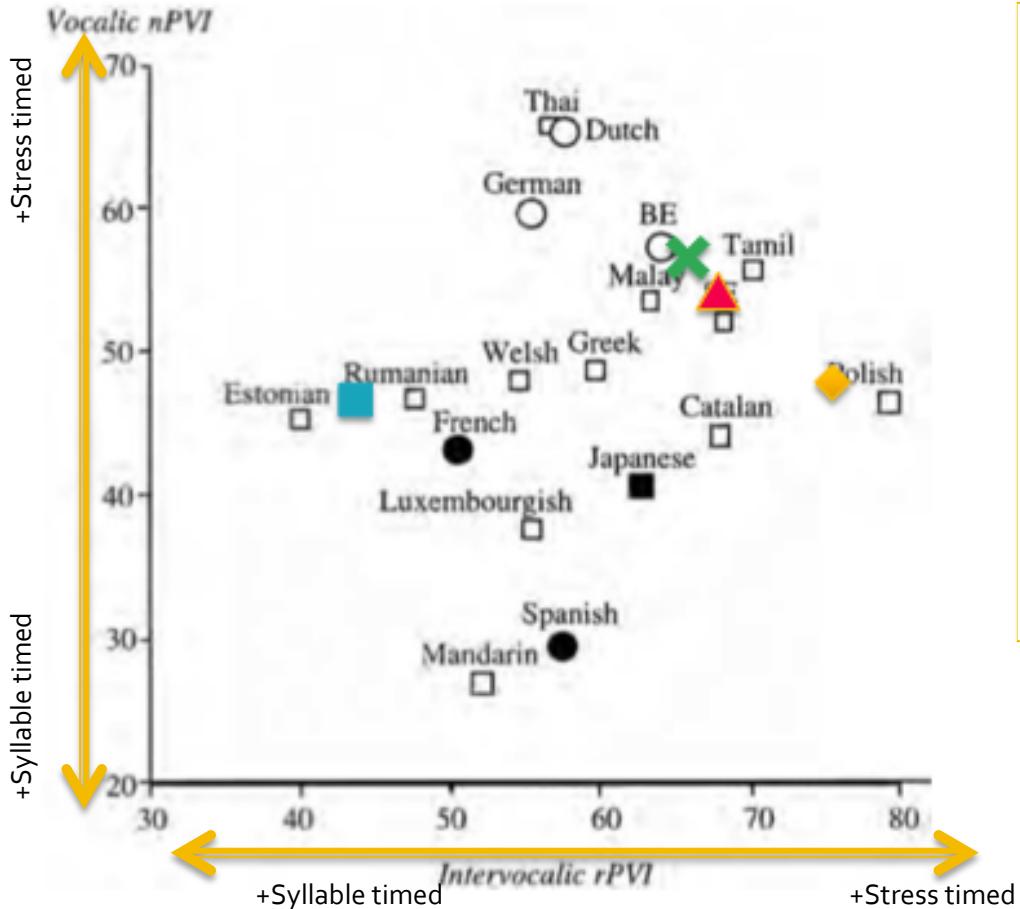
- Compared to Romano & Mairano (2010)

- K,W,K: Extremely distant

- Embera: Closer, but still far form Spanish.

3. Results: PVI
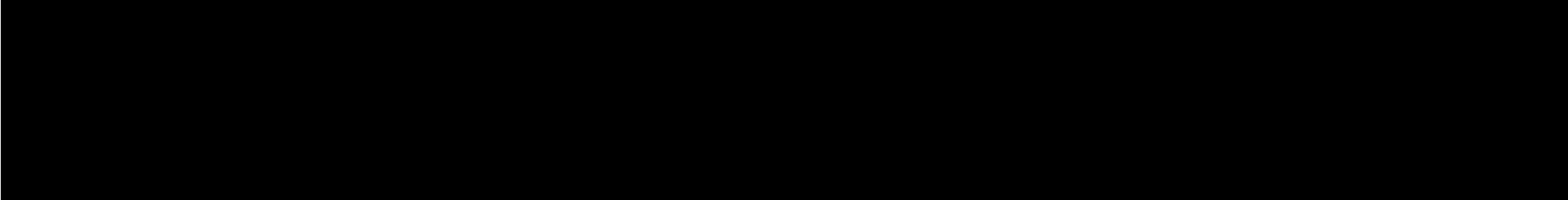
- Embera: Highly Syllable timed

- Kogi and Wayuú: Stressed timed

- Kamsá:
  - lower values of rPVI = more stressed timed
  - Higher values of nPVI = more syllable timed

3. Results: PVI

- Compared to Grabe & Low (2002)

- Embera: close to Syllable timed languages.

- Kogi and Wayuú, close to Stress timed languages

- Kamsá: close to Polish (A mixed language!)

Legend:
- Wayuú
- Kogi
- Emberá
- Kamsá

DISCUSSION

4. Discussion

- The analyses of Deltas and PVI values revealed a pattern according to which:
  - Embera: syllable-timed
  - Kogi and Wayuú: stress-timed
  - Kamsá: mixed language (apparently)

- Kamsá reportedly with the most complex patterns of in syllabic structure.

- Possibly a reason for Kamsá's distinct behavior.

4. Discussion

- All four Colombian languages are distributed farther in the continuum of ΔC and %V from the more widely known languages (Romano & Mairano 2010). In that sense, theses languages can serve as points of reference on the continuum.

- Nevertheless, comparison with less known languages as those reported by Easterday et al (2011), and the more common ones, reported by Grabe & Low (2002), the Colombian languages are in the middle of the continuum.

4. Discussion: Future research

- Correlation between syllable complexity, vowel length, vowel reduction and rhythm.

- There is a possibility that this correlation is central in the consideration of Kamsá as a mixed language.

4. Discussion: Future research

- It is important to run perceptual studies that corroborate that our results correspond to actual perceptual experience.

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Gracias

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