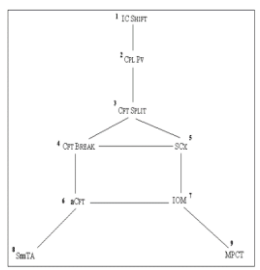
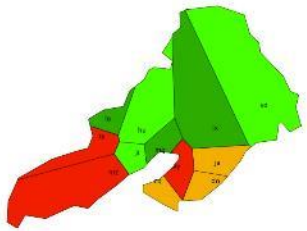
A sketch of processes involved in Mazatec Inflectional Class shifts

	Pattern sampling	Example	Diasystem
1. IC Shift	(SL) IA ⇔ (Hu) IC1	Ntr.3sg ***b'éya*** ⇔ ***biyaa***	*ubiquitous*
2. Cpl Pv	Cpl *y'é-*	Ntr.3sg ***b'éxá*** / Cpl.3sg ***y'éxá-***	Ja, Ix (*y'é-* > *i-*)
3. Cft Split	IA complexified	***b'éxá*** ⇔ ***b'éxá*** / ***bixá-***	Northwestern Highlands
4. Cft Break	+3 vs. 1sg vs. 2sg	Mz (So) 3sg ***b'éñama*** / 1sg ***batexñama*** / 1pl.ex ***bixñamajin***	Mz & *endemic*
5. SCx	TAMV prefixal strings complexified	Ay 3Cpl ***tsek'***=*etañón* > ***ní***=***tsík'***=*etanión*	Ay & *endemic*
6. aCft	Neutralization of conflative patterns	Hu Ntr 3sg ***síxá*** vs. 2sg ***nìxái***, but Incpl 3sg ***si̱ìxá*** vs. Incpl 2sg ***si̱xái***	Hu & *endemic*
7. IOM	Complexification of Incpl pref. contrasts	Ji Incpl 3 ***kuak'***=*èntjé* vs. 1sg ***kuík'***=*èntjé* vs. 1plIncl ***kuák'***=*èntjé*	Ji & *endemic*
8. SmTA	Stem allomorphy, stem suff. derivation	Mz (So) Ntr 3sg *kisí*=*ská* vs. 1sg *kìsì*=*skáàsiàn*	Mz & *endemic*
9. MPCT	Conflative pattern applies to an onset	Ntr 3sg ***b'èxoa̱n*** vs. 1sg ***b'exò*** vs. 1plIncl ***'ex'oji̱n***	SJ Ind



A sample of IC shifts and correlated processes



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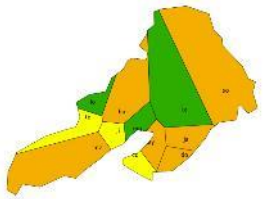
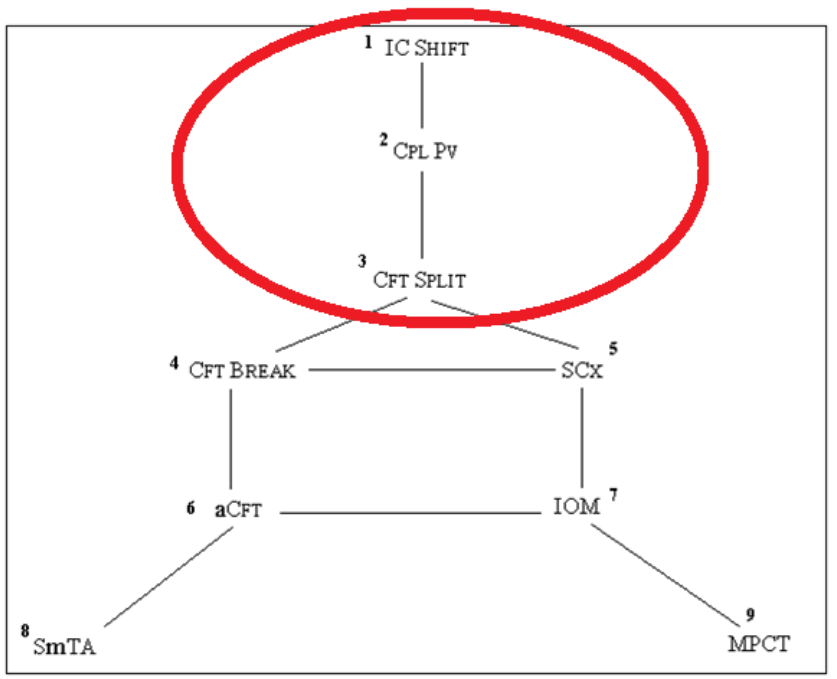
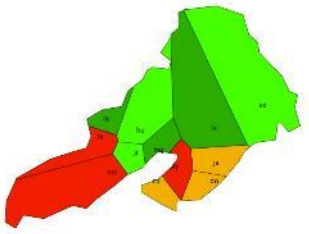
Implicational graph: **parameters 1-3** (IC shift, CPL PV, CFL Split) are more widespread and predictable in the diasystem than e.g. parameters 8 & 9







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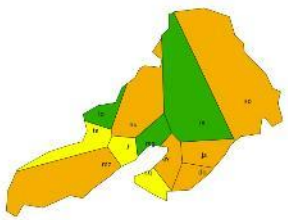

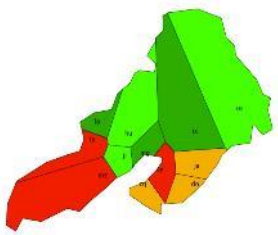

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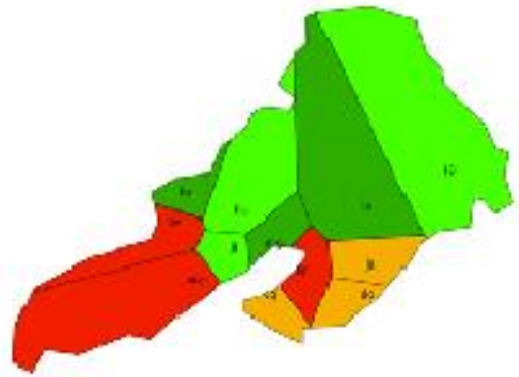
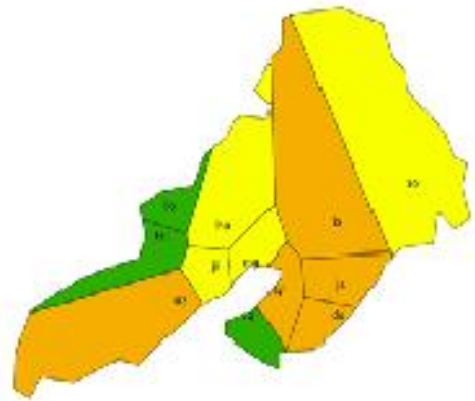
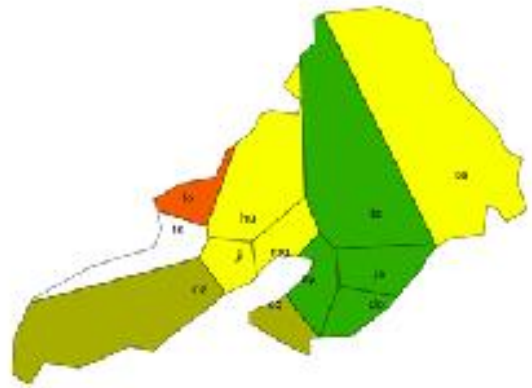
Fragmentary data on morphology in Kirk 1966, yet…

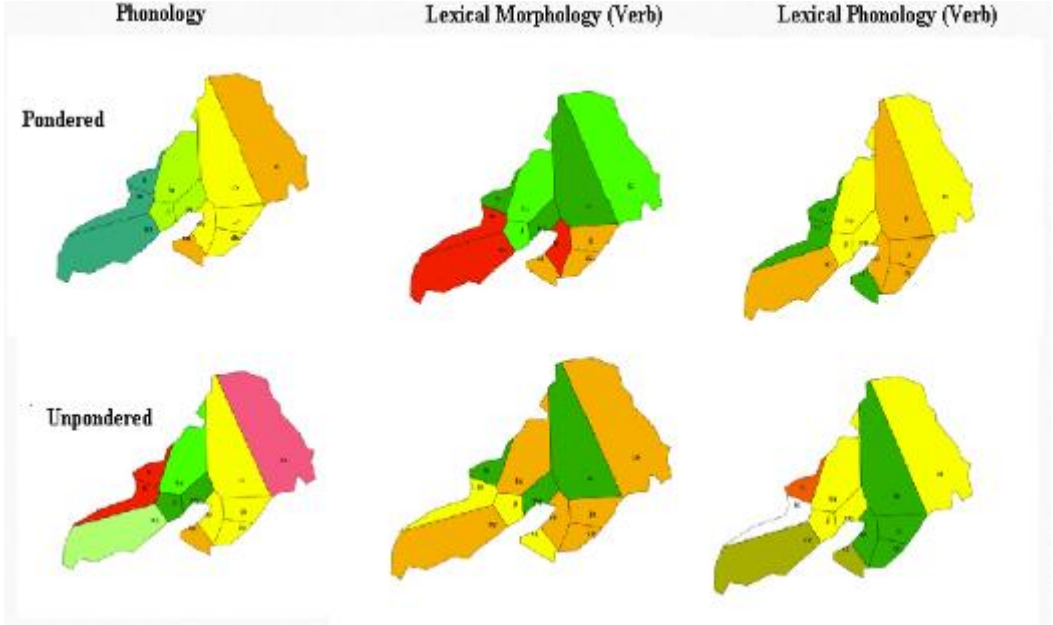
- The structural complexity described above inverb inflectional classes has been documented trhough fieldwork (2011-15).
- Results obtained from the ALMaz/Kirk database are much poorer indeed (e.g. only 3rd person, neutre aspect, and some 1Sg forms are taken into account in Kirk's PhD dissertation, as morphology was not his main concern.
- Yet, those fragmentary items still are worthy as clues. Better results should araise from further research.
- The above data, with impicational graph, hint at the richness of empirical data, and enhance the importance of preverbation as a strategic clue for Mazatec geolinguistics.

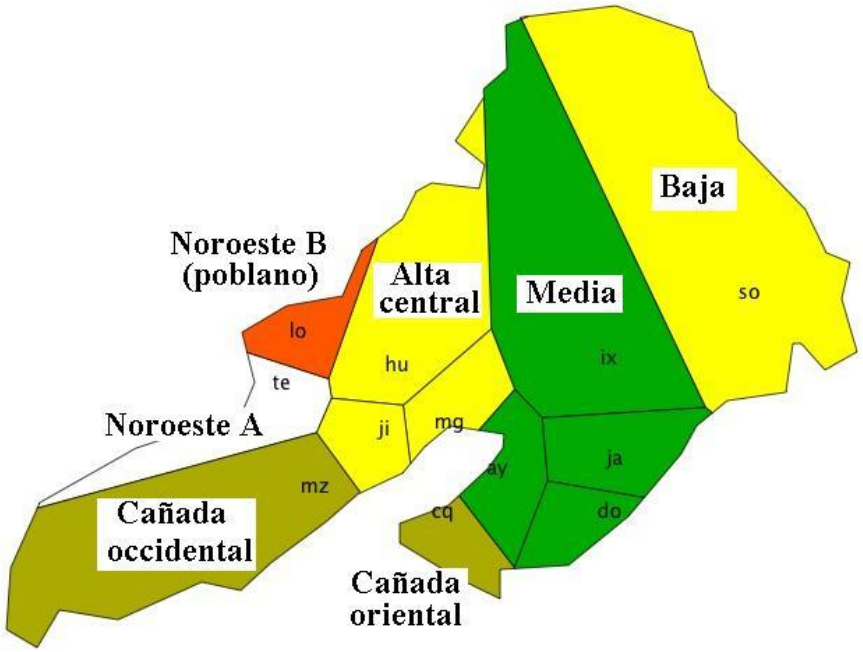
From many views and variegated componential results to a synthesis

- Indeed, Kirk's 1966 data amounts to:
- **Phonological change** (diachrony: cognate sets)
- **Lexical morphology** (preverbation)
- **Lexical phonology** (morphophonological processes at the preverb/root juncture).
- The next slide gives the whole panorama of results for this first cladistic glance at Mazatec dialect network diversification.

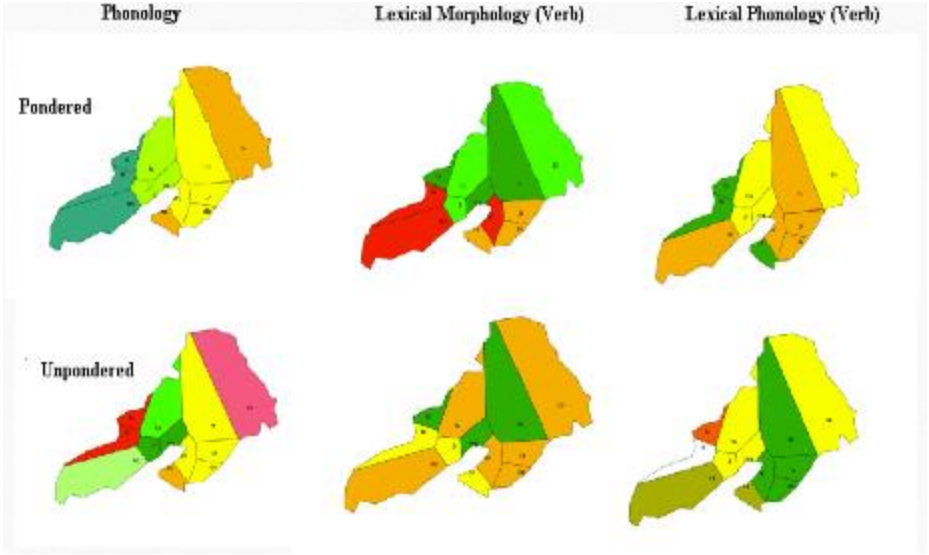
	Phonology	Lexical Morphology (Verb)	Lexical Phonology (Verb)
Pondered			
Unpondered			

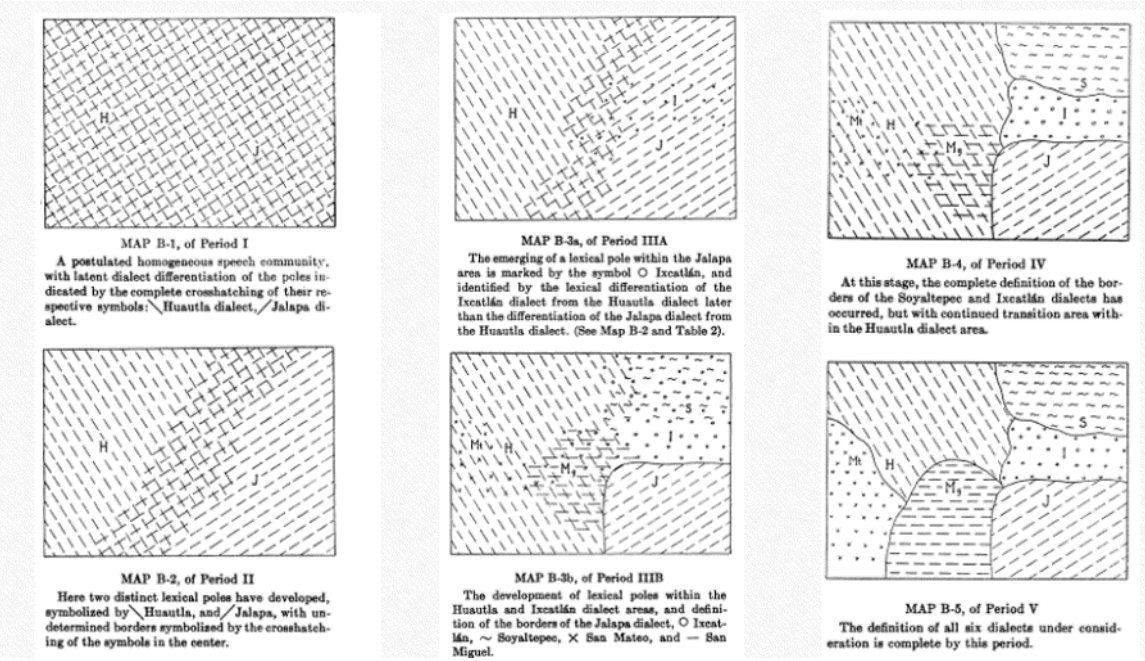
Main map (to the right): a ***synthesis*** of three sets of cladograms (to the left)



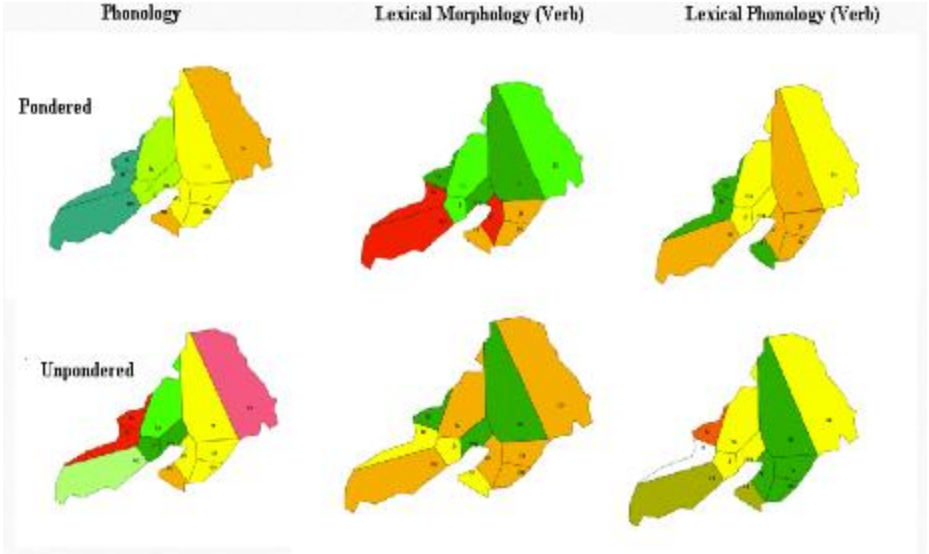


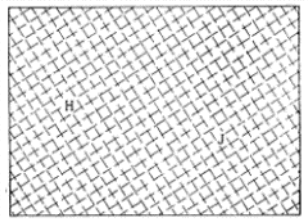
Comparing cladistic sampling with Gudschinsky's areas (1955)





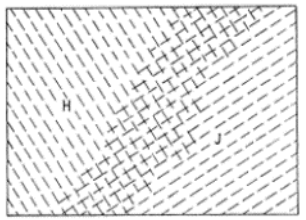
Cladistic results provide congruent areas with Gudschinsky's model. Phases IV & V appear in the phonological set, whereas morphological areas cling more to Phases II & III – especially verbal lexical morphology.





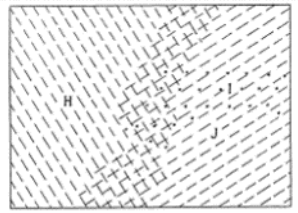
MAP B-1, of Period I

A postulated homogeneous speech community, with latent dialect differentiation of the poles indicated by the complete crosshatching of their respective symbols: \ Huautla dialect, / Jalapa dialect.



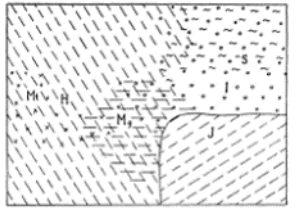
MAP B-2, of Period II

Here two distinct lexical poles have developed, symbolized by \ Huautla, and / Jalapa, with undetermined borders symbolized by the crosshatching of the symbols in the center.



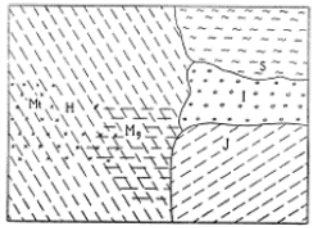
MAP B-3a, of Period IIIA

The emerging of a lexical pole within the Jalapa area is marked by the symbol ○ Ixcatlán, and identified by the lexical differentiation of the Ixcatlán dialect from the Huautla dialect later than the differentiation of the Jalapa dialect from the Huautla dialect. (See Map B-2 and Table 2).



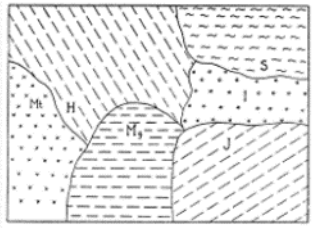
MAP B-3b, of Period IIIB

The development of lexical poles within the Huautla and Ixcatlán dialect areas, and definition of the borders of the Jalapa dialect, ○ Ixcatlán, ~ Soyaltepec, × San Mateo, and — San Miguel.



MAP B-4, of Period IV

At this stage, the complete definition of the borders of the Soyaltepec and Ixcatlán dialects has occurred, but with continued transition area within the Huautla dialect area.

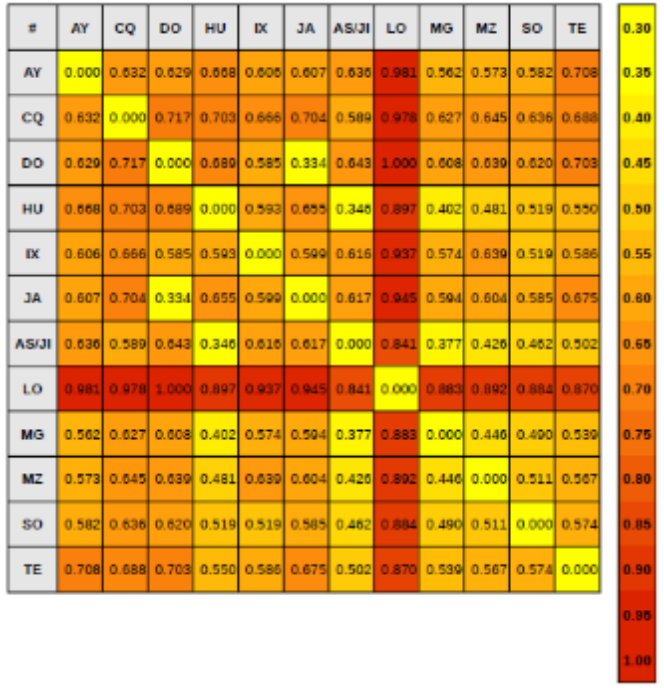


MAP B-5, of Period V

The definition of all six dialects under consideration is complete by this period.

2.2. Levenshtein distance (LD)

	AY	CQ	DO	HU	IX	JA	JI	LO	MG	MZ	SO	TE
AY		0.28	0.20	0.32	0.21	0.24	0.30	0.52	0.29	0.27	*0.24*	*0.29*
CQ	*0.28*		*0.30*	*0.38*	*0.30*	*0.33*	*0.37*	*0.54*	*0.34*	*0.35*	*0.30*	*0.34*
DO	*0.20*	*0.30*		0.33	*0.19*	*0.11*	*0.33*	*0.54*	*0.27*	*0.26*	*0.24*	*0.28*
HU	*0.32*	*0.38*	*0.33*		0.32	0.30	0.21	0.53	0.25	0.30	0.24	*0.33*
IX	*0.21*	*0.30*	*0.19*	*0.32*		*0.22*	*0.31*	*0.53*	*0.29*	*0.27*	*0.24*	*0.25*
JA	*0.24*	*0.33*	*0.11*	*0.30*	*0.22*		*0.32*	*0.55*	*0.28*	*0.28*	*0.25*	*0.28*
JI	*0.30*	*0.37*	*0.33*	*0.21*	*0.31*	*0.32*		0.55	0.33	0.28	0.24	0.28
LO	*0.52*	*0.54*	*0.54*	*0.53*	*0.53*	*0.55*	*0.55*		*0.55*	*0.33*	*0.50*	*0.50*
MG	*0.29*	*0.34*	*0.27*	*0.25*	*0.29*	*0.28*	0.33	0.55		*0.25*	*0.24*	*0.31*
MZ	*0.27*	*0.35*	*0.26*	*0.30*	*0.27*	*0.28*	*0.28*	*0.33*	*0.25*		*0.22*	*0.29*
SO	0.24	0.30	0.24	0.24	0.24	0.25	0.24	0.50	0.24	0.22		*0.26*
TE	*0.29*	*0.34*	*0.28*	*0.33*	*0.25*	*0.28*	*0.28*	0.50	0.31	0.29	0.26	



2.2.1. LD sampling (111 cognates, all lexical categories)

Overall LD measures (by Vittorio dell'Aquila & Léonard, 2014)

A sample of the word list (from Kirk 1966)

id	Proto-maz	anglais	espagnol
4	*can³khũ¹*	fears	tiene miedo
14	*-ce⁴*	new	nuevo
26	*-ci¹ʾi¹-*	does	hace
39	*ci⁴*	yours (sg.)	tu (sg.)
45	*cu¹ʾu¹*	blouse	blusa, huipil
46	*cu¹ʾwa³*	walks	está caminando
62	*ča³kũ³*	holy	sagrado
64	*ča³yaa³*	forgets	olvida
68	*čakĩ*	firewood	lumbre
75	*čhau*	egg	huevo, blanquillo
77	*čhi*	pays	paga
96	*čucĩ*	glass	vidrio
101	*či'i*	drunk, intoxicated	borracho
107	*ču*	animal	animal
112	*čuntu*	worm	gusano
126	*haskã*	afterwards	después
128	*hau*	two	dos
153	*hnũ¹*	owl	buho
154	*hnũ⁴*	cornfield	milpa
155	*-hña¹*	woods, wild place	bosque
157	*hña⁴*	chile pepper	chile
166	*hwe²*	sleeps	duerme
168	*-hwi²*	slowly	despacio
298	*nča³hu³*	dust	polvo
299	*nča³hũ²*	tomorrow	mañana
303	*ncha⁴*	talks	habla
315	*nĩ³hñã³*	mat	petate
321	*nĩ³ntu³¹*	needle, spine	aguja
322	*nĩ³ñũ³*	star	estrella
327	*nĩ³ʾnte³*	land	tierra
329	*nĩ⁴hĩ⁴*	corn	maíz
333	*nĩ⁴se³*	bird	pájaro
337	*ni⁴štʰĩ³*	day	día
338	*nĩ⁴ ʾnti⁴*	smoke	humo
340	*nka³-*	that	que
349	*nki'wa*	chin, jaw	mentón, quijada
353	*ntanãtya*	saliva	saliva
361	*nta'ya*	thorn	espina
374	*nteci'ĩ*	tail	cola
376	*ntecĩ*	market	mercado
385	*nthe*	seed	semilla
389	*nti'ya*	house	casa
390	*nti'yamãsẽ*	town hall	ayuntamiento, palacio municipal
394	*nti'yu*	ant	hormiga
400	*ntuhu*	soap	jabón
401	*ntuwaya*	jail	cárcel
405	*ntyaha*	horn	horno

	AY	CQ	DO	HU	IX	JA	JI	LO	MG	MZ	SO	TE
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DO	*0.20*	*0.30*		0.33	*0.19*	*0.11*	*0.33*	*0.54*	*0.27*	*0.26*	*0.24*	*0.28*
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JA	*0.24*	*0.33*	*0.11*	*0.30*	*0.22*		*0.32*	*0.55*	*0.28*	*0.28*	*0.25*	*0.28*
JI	*0.30*	*0.37*	*0.33*	*0.21*	*0.31*	*0.32*		0.55	0.33	0.28	0.24	0.28
LO	*0.52*	*0.54*	*0.54*	*0.53*	*0.53*	*0.55*	*0.55*		*0.55*	*0.33*	*0.50*	*0.50*
MG	*0.29*	*0.34*	*0.27*	*0.25*	*0.29*	*0.28*	0.33	0.55		*0.25*	*0.24*	*0.31*
MZ	*0.27*	*0.35*	*0.26*	*0.30*	*0.27*	*0.28*	*0.28*	*0.33*	*0.25*		*0.22*	*0.29*
SO	0.24	0.30	0.24	0.24	0.24	0.25	0.24	0.50	0.24	0.22		*0.26*
TE	*0.29*	*0.34*	*0.28*	*0.33*	*0.25*	*0.28*	*0.28*	0.50	0.31	0.29	0.26	

How the LD matrix confirms or invalidates Gudschinsky's model(s) of dialect diversification in Mazatec?

	AY	CQ	DO	HU	IX	JA	JI	LO	MG	MZ	SO	TE
AY		0.28	0.20	0.32	0.21	0.24	0.30	0.52	0.29	0.27	*0.24*	*0.29*
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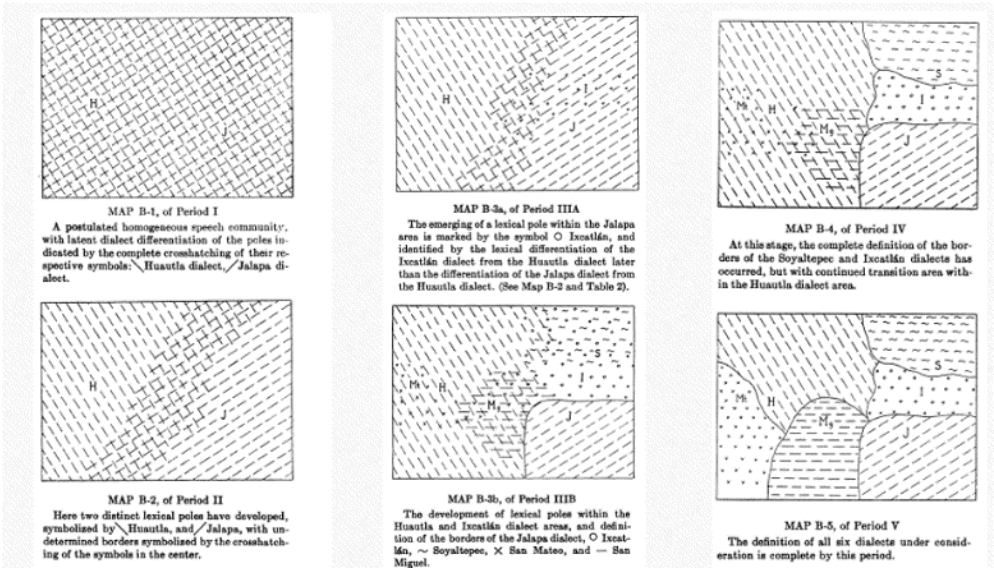
DO	*0.20*	*0.30*		0.33	*0.19*	*0.11*	*0.33*	*0.54*	*0.27*	*0.26*	*0.24*	*0.28*
HU	*0.32*	*0.38*	*0.33*		0.32	0.30	0.21	0.53	0.25	0.30	0.24	*0.33*
IX	*0.21*	*0.30*	*0.19*	*0.32*		*0.22*	*0.31*	*0.53*	*0.29*	*0.27*	*0.24*	*0.25*
JA	*0.24*	*0.33*	*0.11*	*0.30*	*0.22*		*0.32*	*0.55*	*0.28*	*0.28*	*0.25*	*0.28*
JI	*0.30*	*0.37*	*0.33*	*0.21*	*0.31*	*0.32*		0.55	0.33	0.28	0.24	0.28
LO	*0.52*	*0.54*	*0.54*	*0.53*	*0.53*	*0.55*	*0.55*		*0.55*	*0.33*	*0.50*	*0.50*
MG	*0.29*	*0.34*	*0.27*	*0.25*	*0.29*	*0.28*	0.33	0.55		*0.25*	*0.24*	*0.31*
MZ	*0.27*	*0.35*	*0.26*	*0.30*	*0.27*	*0.28*	*0.28*	*0.33*	*0.25*		*0.22*	*0.29*
SO	0.24	0.30	0.24	0.24	0.24	0.25	0.24	0.50	0.24	0.22		*0.26*
TE	*0.29*	*0.34*	*0.28*	*0.33*	*0.25*	*0.28*	*0.28*	0.50	0.31	0.29	0.26	



MAP B-1, of Period I

A postulated homogeneous speech community, with latent dialect differentiation of the poles indicated by the complete crosshatching of their respective symbols: \ Huautla dialect, / Jalapa dialect.

MAP B-2, of Period II

Here two distinct lexical poles have developed, symbolized by \ Huautla, and / Jalapa, with undetermined borders symbolized by the crosshatching of the symbols in the center.

MAP B-3a, of Period IIIA

The emerging of a lexical pole within the Jalapa area is marked by the symbol ○ Ixcatlán, and identified by the lexical differentiation of the Ixcatlán dialect from the Huautla dialect later than the differentiation of the Jalapa dialect from the Huautla dialect. (See Map B-2 and Table 2).

MAP B-3b, of Period IIIB

The development of lexical poles within the Huautla and Ixcatlán dialect areas, and definition of the borders of the Jalapa dialect, ○ Ixcatlán, ~ Soyaltepec, × San Mateo, and — San Miguel.

MAP B-4, of Period IV

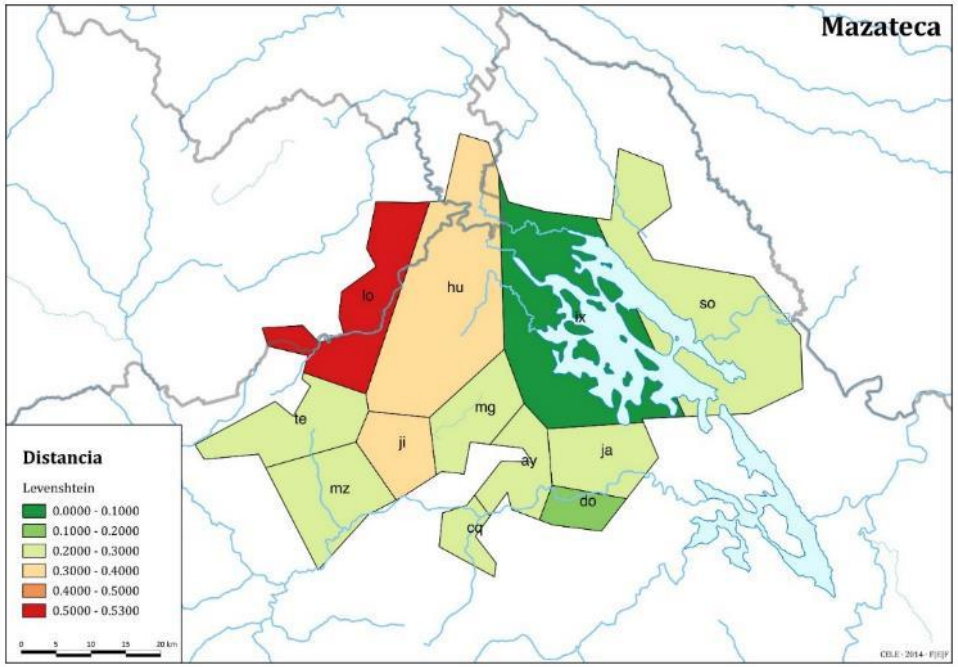
At this stage, the complete definition of the borders of the Soyaltepec and Ixcatlán dialects has occurred, but with continued transition area within the Huautla dialect area.

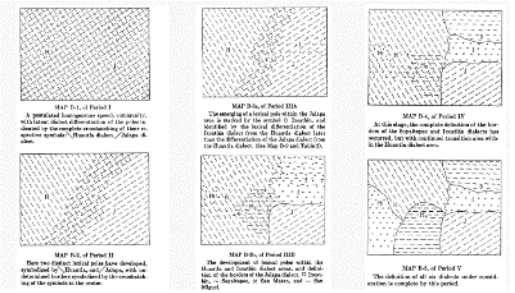
MAP B-5, of Period V

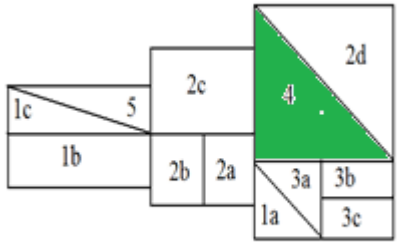
The definition of all six dialects under consideration is complete by this period.

San Pedro Ixcatlán : the western lowland center,
on the shore of the Miguel Alemán dam. *Levenshtein algorithm*

=> Ix indeed still converges with all the diasystem, except with Hu and its satellite Ji. Lo is a fairly recent overdifferentiated subvariety of Te. The Ja-Ix cluster resilience is hinted at by the structural affinity of Do, in the south.

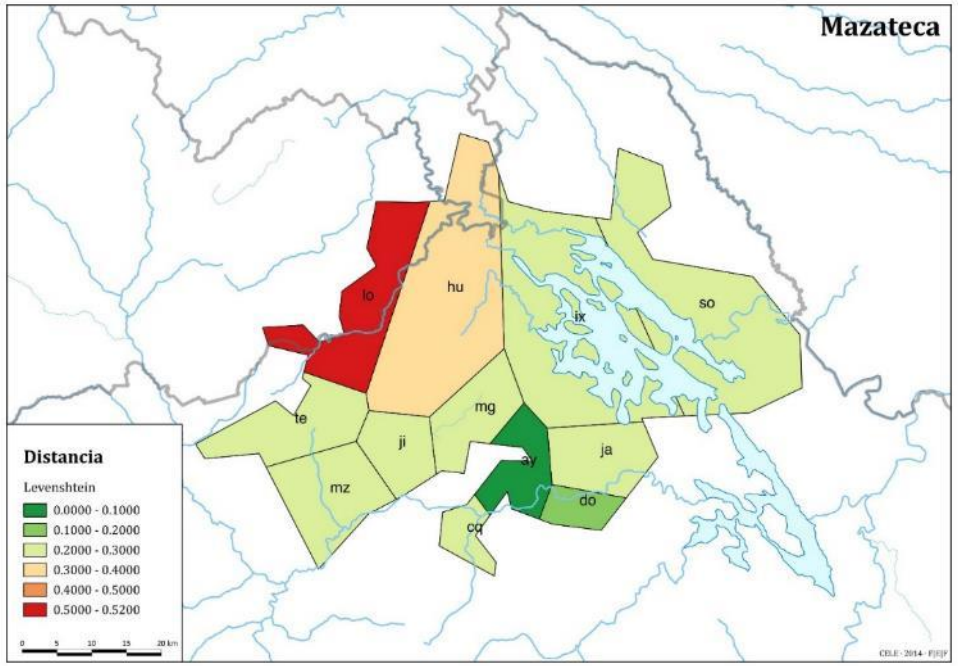


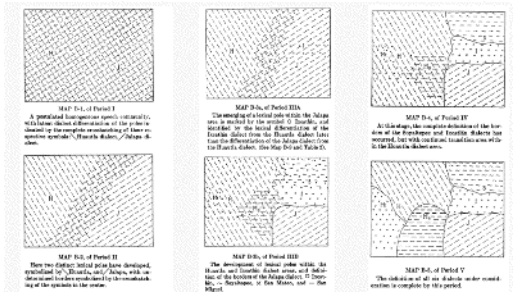




Ayautla : the Piedmont – Levenshtein algorithm (340 > items, Kirk 1966)

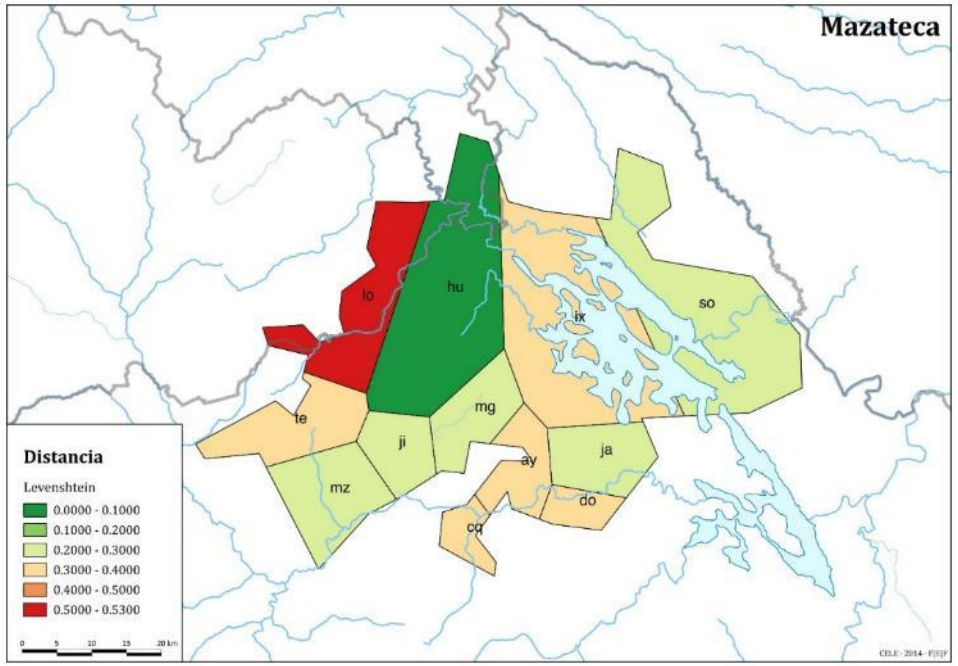
=> As a remnant of the phase II buffer zone, Ay agrees with all its neighbours, especially with Do, and even with Huautla's satellites (Ji & Mg). The basic (and old) polarity between the Lowlands and Hu clearly appears. Lo as franctically innovative as ever, as a « young » subvariety of Te…

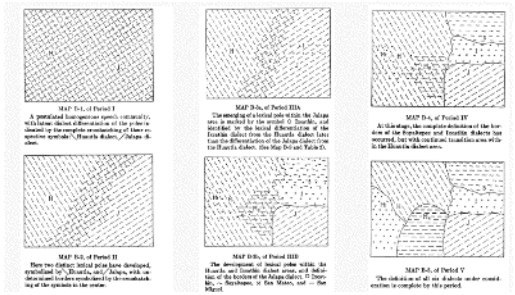




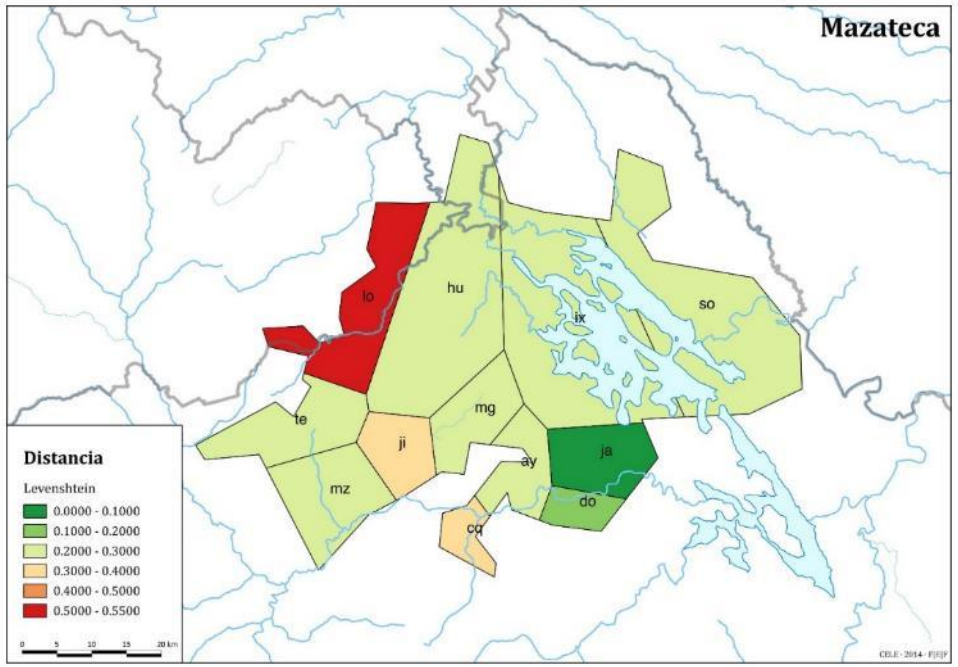
Huautla: the core of the zona cafetalera – the *head* of the coffee agrarian system. Levenshtein algorithm.

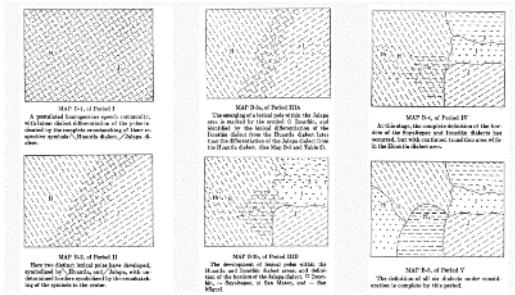
=> As a Phase II « old » dialect, Hu shows both a continuity with the oldest Lowland dialect (Ja) and a Phase IIIb/IV dialect (So). It has also condensated under its umbrella most central and south-western dialects (Ji, Mg & Mz). Instead, as a Phase IIIa dialect, Ix and its buffer zone in the south resists Huautla's hegemony. So does the Northwestern variety of Te.



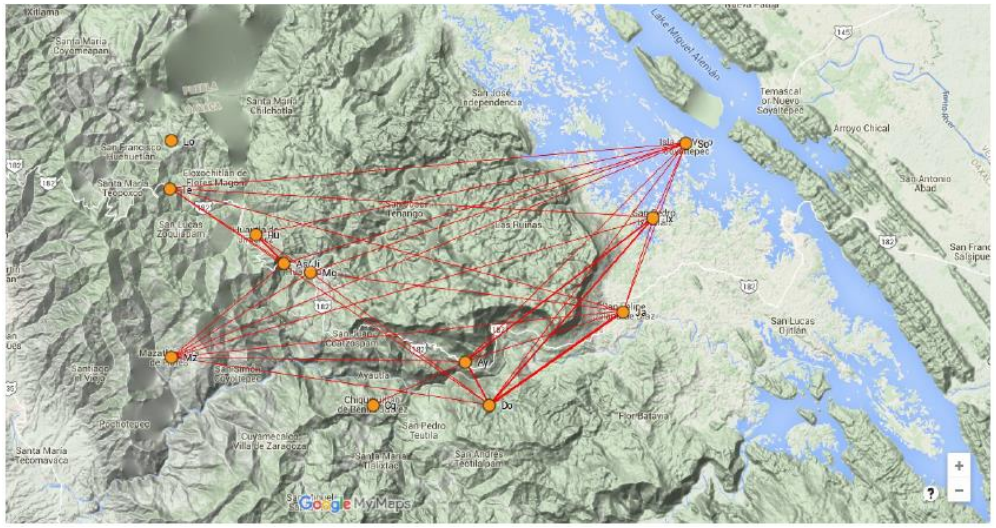


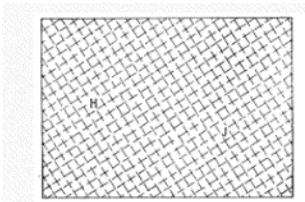
Jalapa: the core of the Piedmond or « Valley » region, according to Gudschinsky.
=> **as a Phase II dialect, Ja strongly converges with all other dialects, including Hu. A « buffer zone variety » resists more (Ji), and a peripheral variety, out of its reach, also resists, in the Southern Canyon (Cq).**





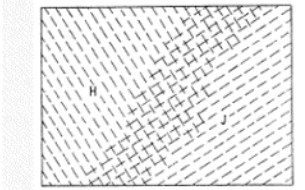
A Threshold representation of the 111 items, processed with LD





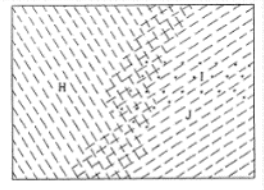
MAP B-1, of Period I

A postulated homogeneous speech community, with latent dialect differentiation of the poles indicated by the complete crosshatching of their respective symbols: \ Huautla dialect, / Jalapa dialect.



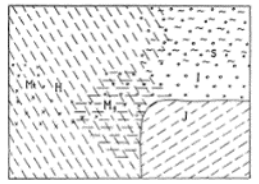
MAP B-2, of Period II

Here two distinct lexical poles have developed, symbolized by \ Huautla, and / Jalapa, with undetermined borders symbolized by the crosshatching of the symbols in the center.



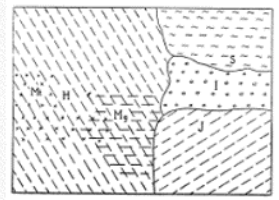
MAP B-3a, of Period IIIA

The emerging of a lexical pole within the Jalapa area is marked by the symbol ○ Ixcatlán, and identified by the lexical differentiation of the Ixcatlán dialect from the Huautla dialect later than the differentiation of the Jalapa dialect from the Huautla dialect. (See Map B-2 and Table 2).



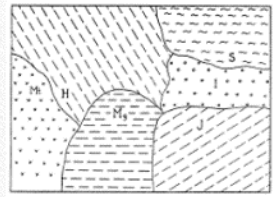
MAP B-3b, of Period IIIB

The development of lexical poles within the Huautla and Ixcatlán dialect areas, and definition of the borders of the Jalapa dialect, ○ Ixcatlán, ~ Soyaltepec, × San Mateo, and — San Miguel.



MAP B-4, of Period IV

At this stage, the complete definition of the borders of the Soyaltepec and Ixcatlán dialects has occurred, but with continued transition area within the Huautla dialect area.



MAP B-5, of Period V

The definition of all six dialects under consideration is complete by this period.

Processing of the dell'Aquila & Léonard's results,
Threshold of differenciation:
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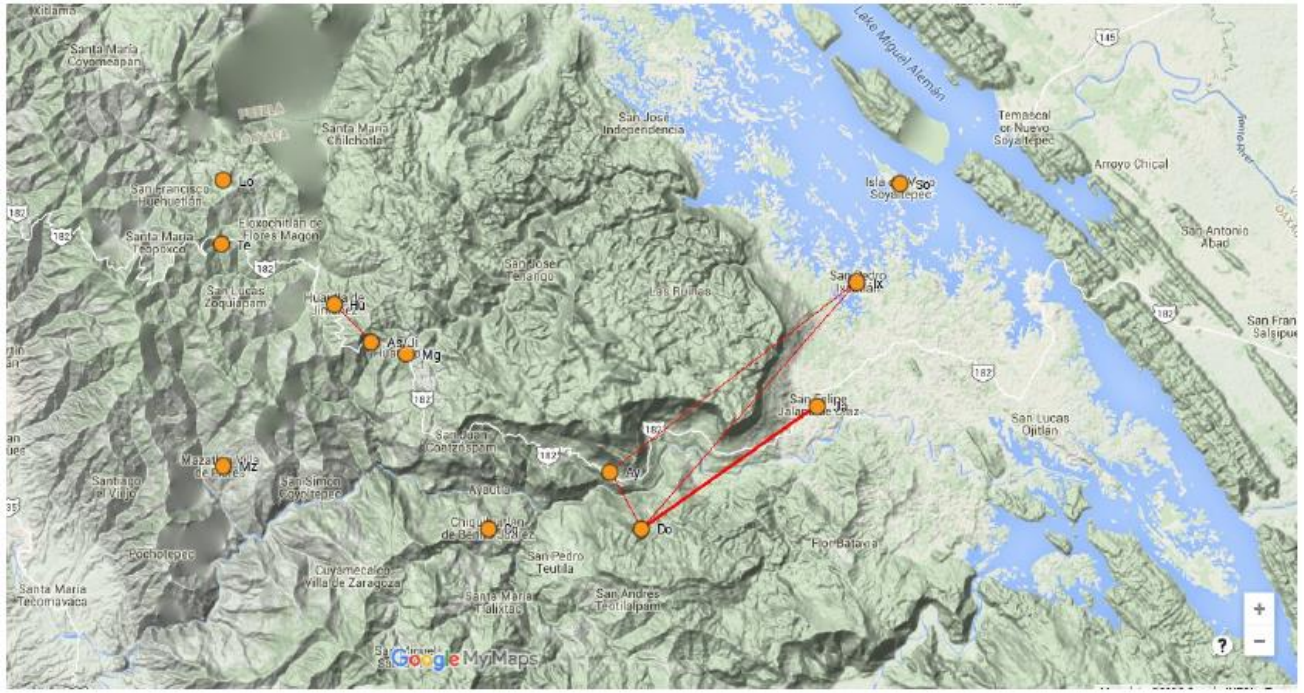

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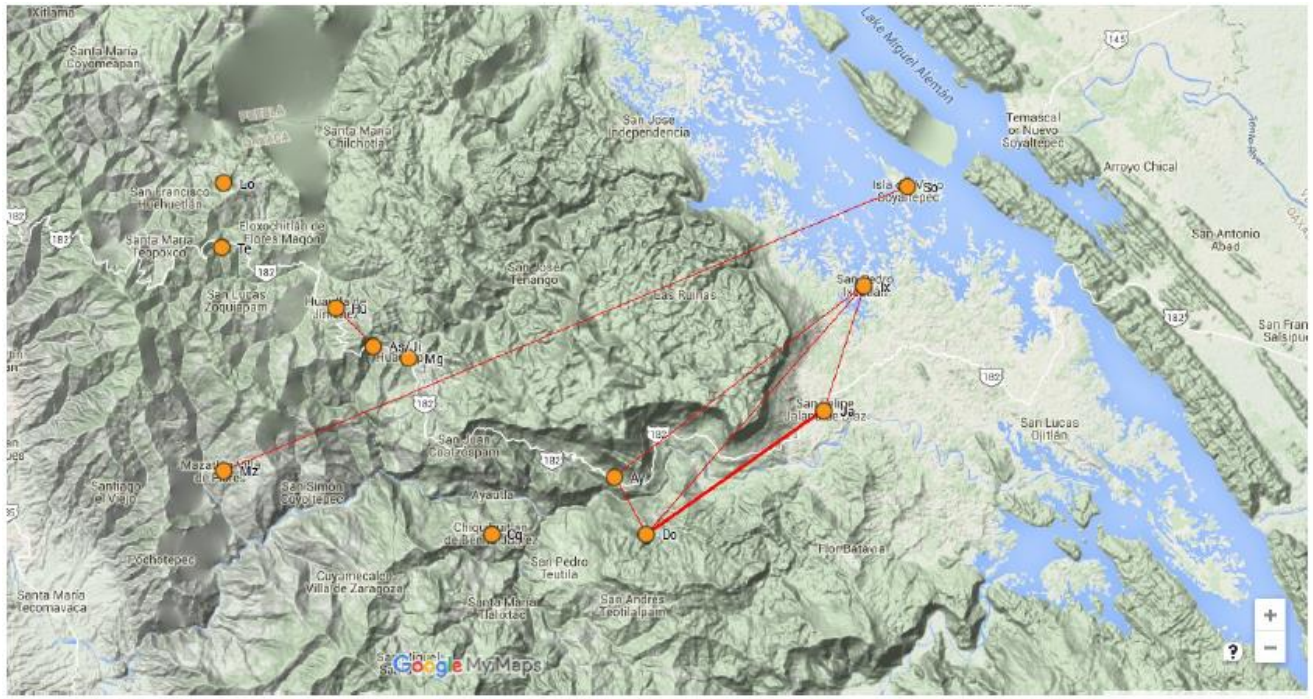
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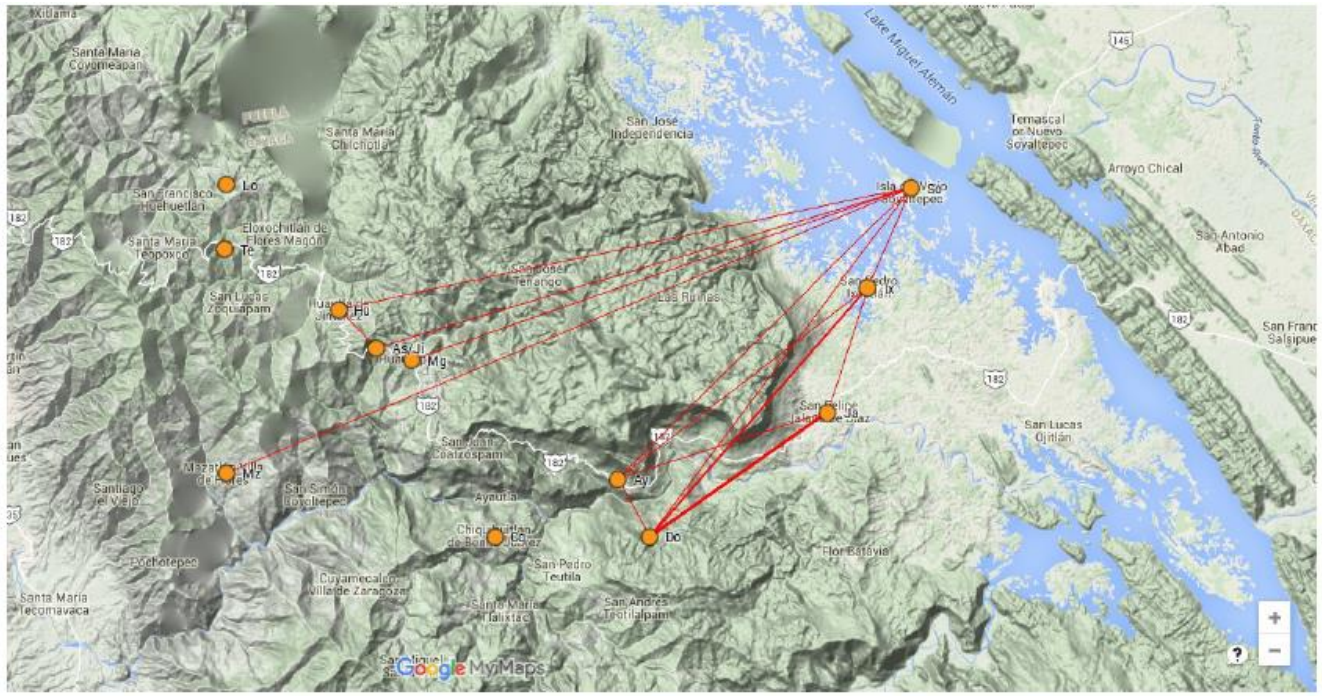
Santa María Coyomeapan
Santa María Chilchotla
San José Independencia
Temascal or Nuevo Soyaltepec
Arroyo Chical
San Antonio Abad
San Francisco Huehuetlán
Santa María Teopoxco
Eloxochitlán de Flores Magón
San Lucas Zoquiapam
San José Tenango
Las Ruinas
San Lucas Ojitlán
San Juan Coatzospam
Ayautla
Santiago del Valle
San Simón Soyaltepec
Chiquihuitlán de Benito Juárez
San Pedro Teutila
Cuyamecalco Villa de Zaragoza
Santa María Tecomavaca
Santa María Tlalixtac
San Andrés Teotilalpam
Flor Batavia
Google MyMaps

T = 0,25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Santa María Chichotla
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Temascal de Nuevo Soyaltepec
Arroyo Chical
San Francisco Huehuetlán
Eloxochitlán de Flores Magón
Santa María Teopoxco
San Lucas Zoquiapam
Los Ruines
San Antonio Abad
San Lucas Ojitlán
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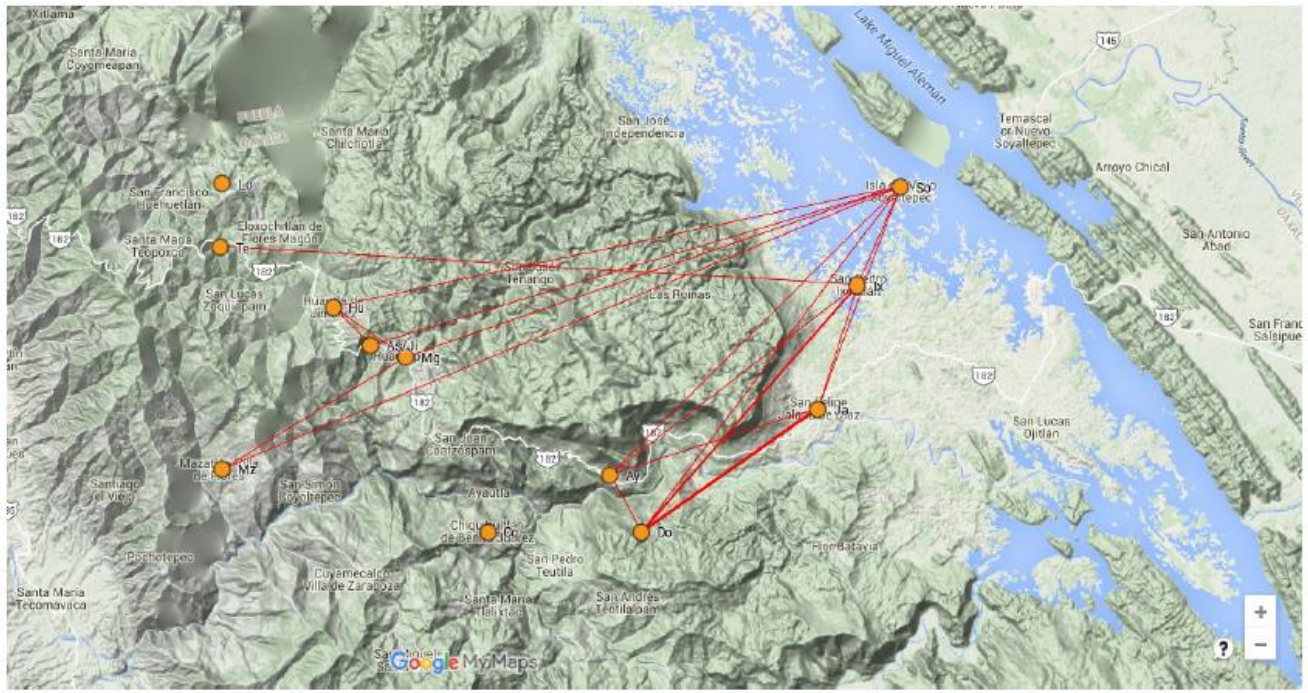
San Andrés Teotilalpam
Google MyMaps

T = 0,26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Santa María Coyomeapam
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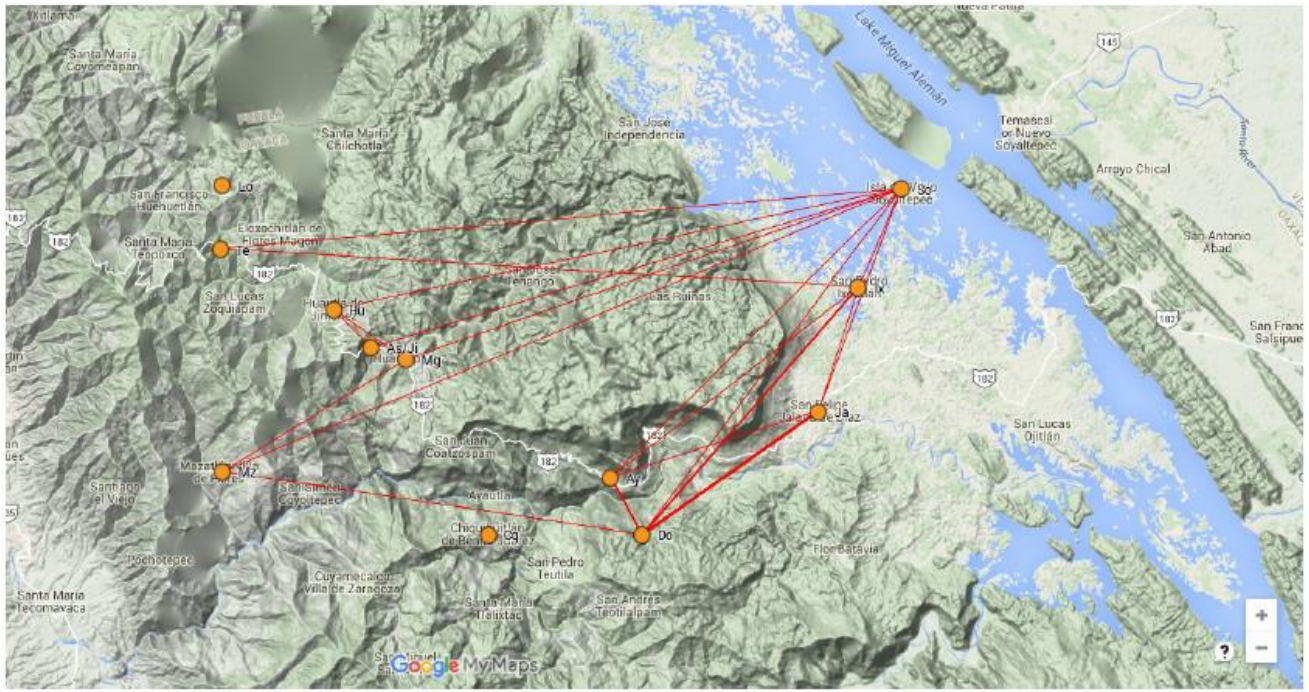
San José Independencia
Temascal or Nuevo Soyaltepec
Arroyo Chical
San Francisco Huehuetlán
Santa María Teopoxco
Eloxochitlán de Flores Magón
San Antonio Abad
San Lucas Zoquiapam
Las Ruinas
San Lucas Ojitlán
Mazatlán de Flores
Santiago el Viejo
San Simón Pochtepec
Ayautla
Pochotepec
San Pedro Teutila
Cuyamecalco Villa de Zaragoza
Santa María Tecomavaca
Flor Batavia
145
182
187
Google MyMaps

T = 0,27


Lake Miguel Alemán
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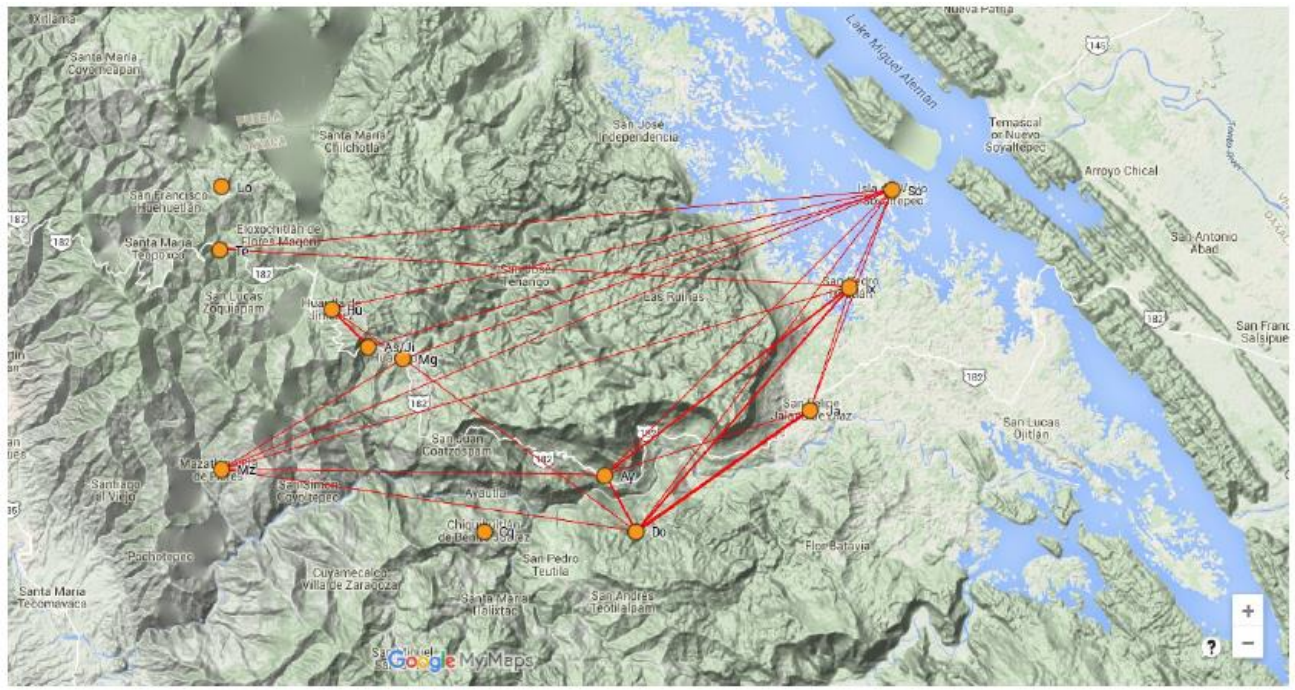
Santa María Chilchotla
San José Independencia
Temascal or Nuevo Soyaltepec
Arroyo Chical
San Antonio Abad
Santa María Tecomavaca
San Pedro Teutila
San Lucas Ojitlán
Flor Batavia
Google MyMaps

T = 0,28


Lake Miguel Aleman
Temascal or Nuevo Soyaltepec
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San José Independencia
Santa María Coyaltepan
San Francisco Huehuetlán
Santa María Tepopotla
San Lucas Zoquiapam
Santa María Tecomavaca
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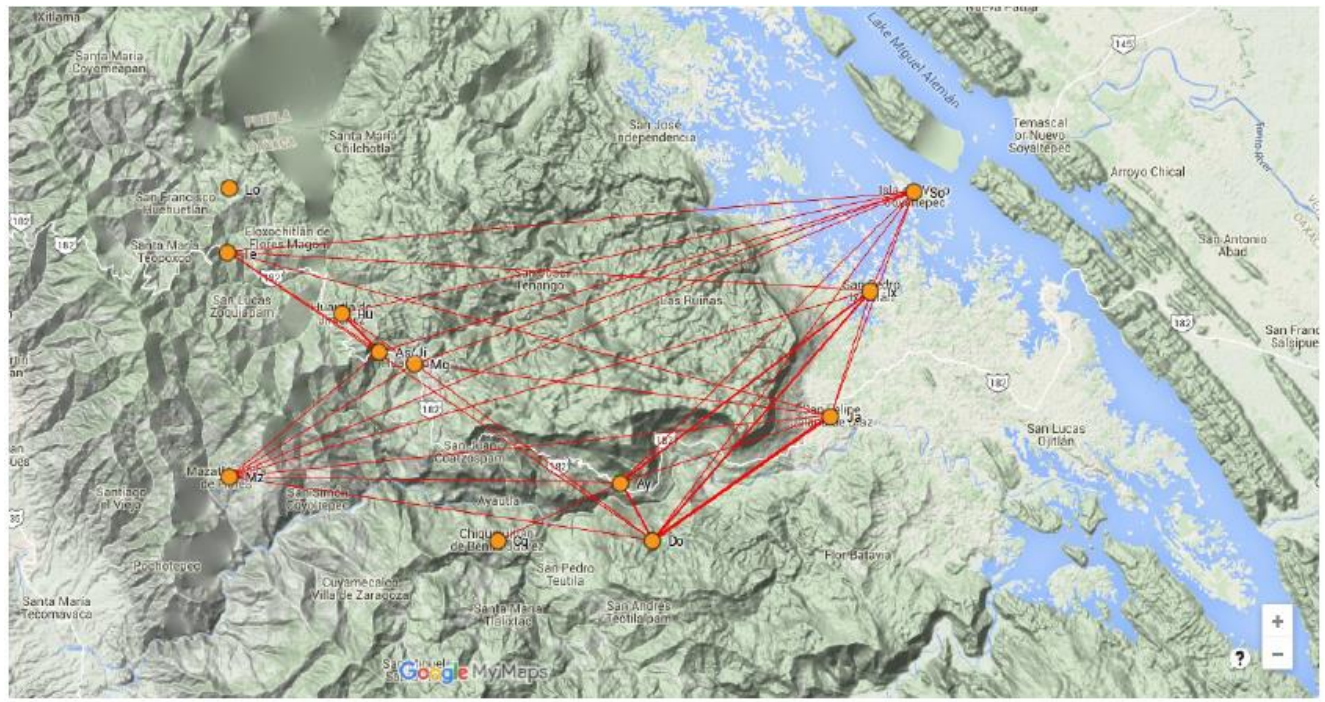
San Andrés Teotilalpam
Flor de Batavia
Google MyMaps

T = 0,29


Lake Miguel Alemán
Santa María Coyomeapan
Santa María Chilchotla
San José Independencia
Temascal or Nuevo Soyaltepec
Arroyo Chical
San Francisco Huehuetlán
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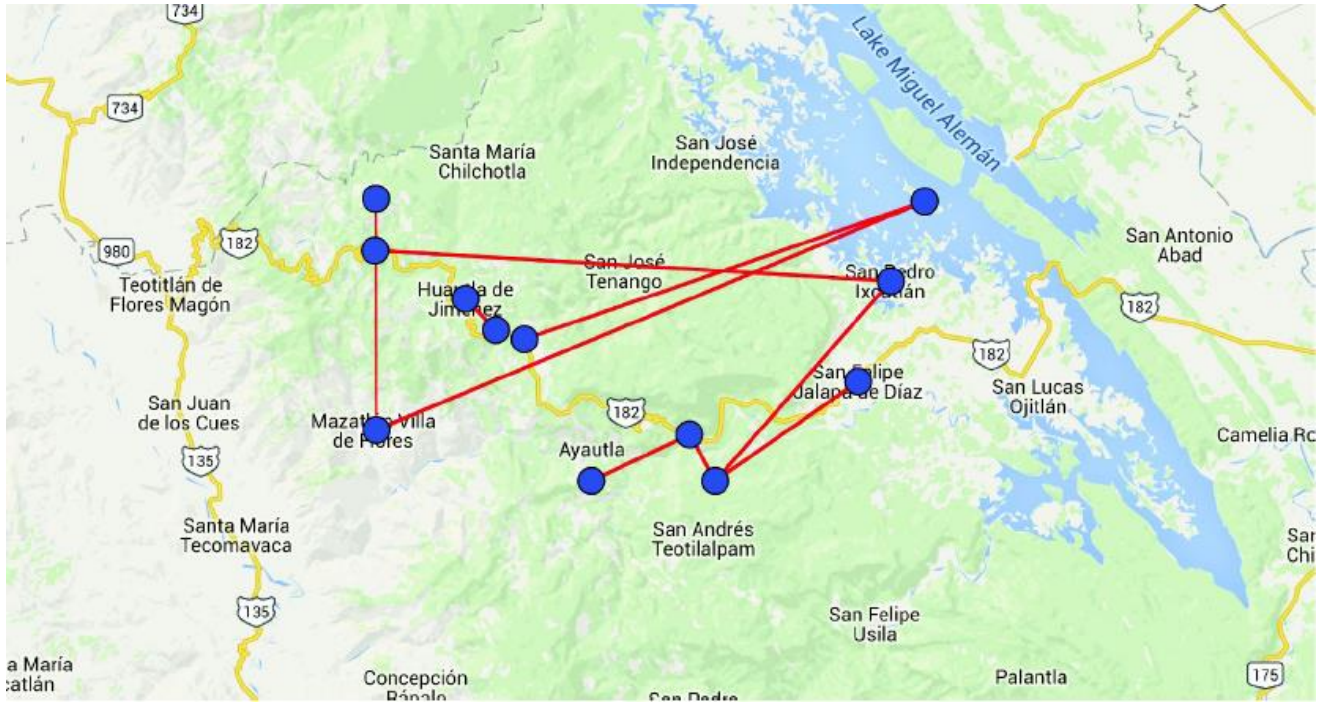
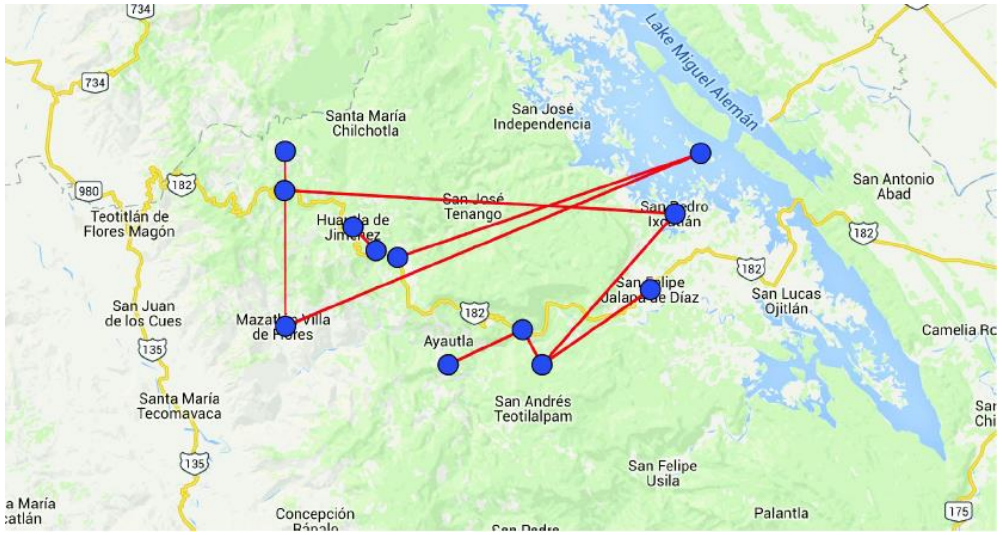
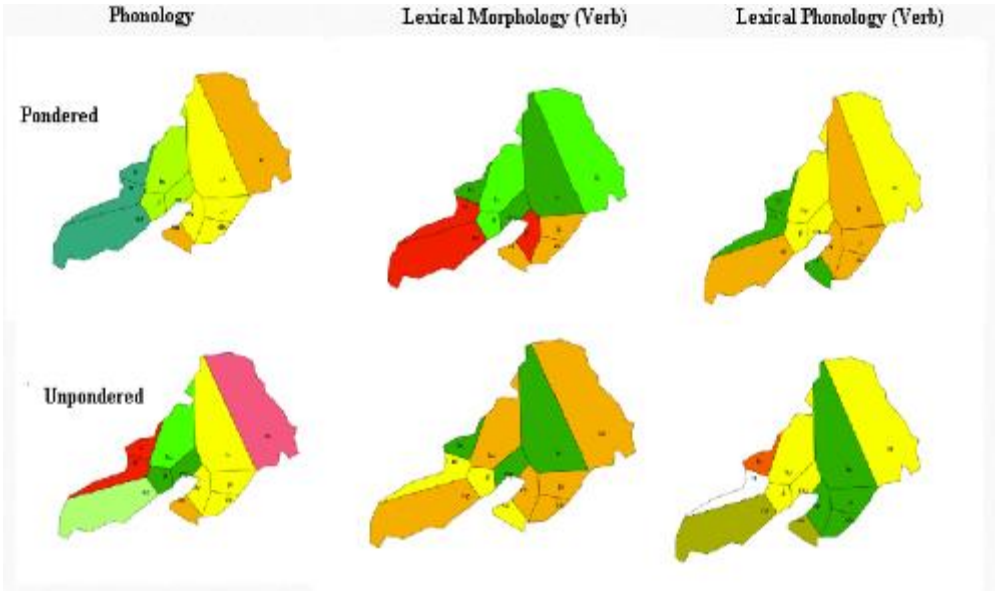
Santiago Yaveo
Chiquihuitlán de Benito Juárez
Flor Batavia
Pochotepec
Cuyamecalco Villa de Zaragoza
San Pedro Teutila
Santa María Tecomavaca
San Andrés Teotilalpam
Google MyMaps

Only shortest distance for each node

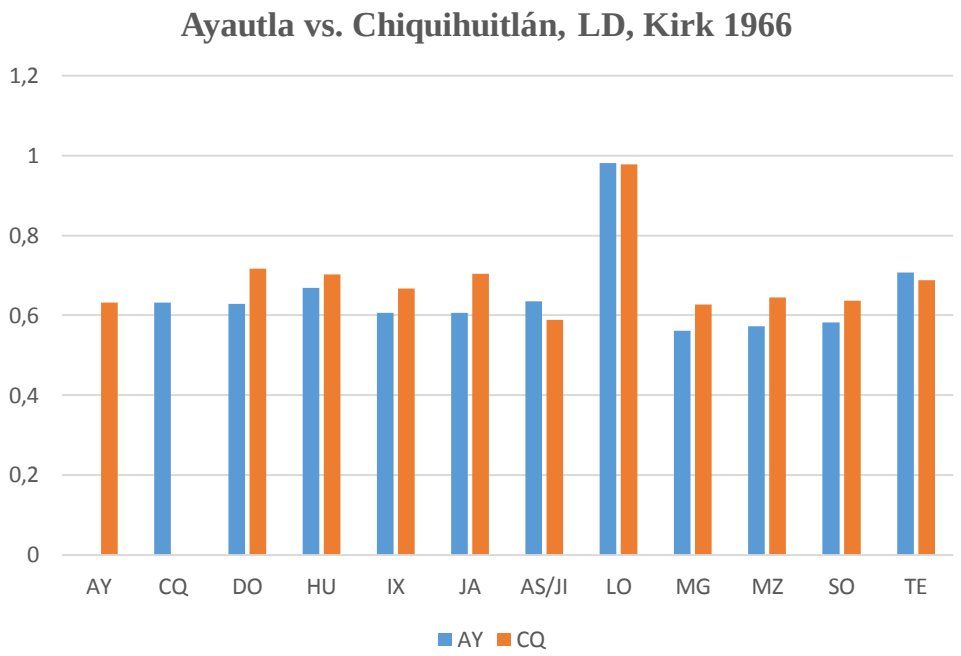


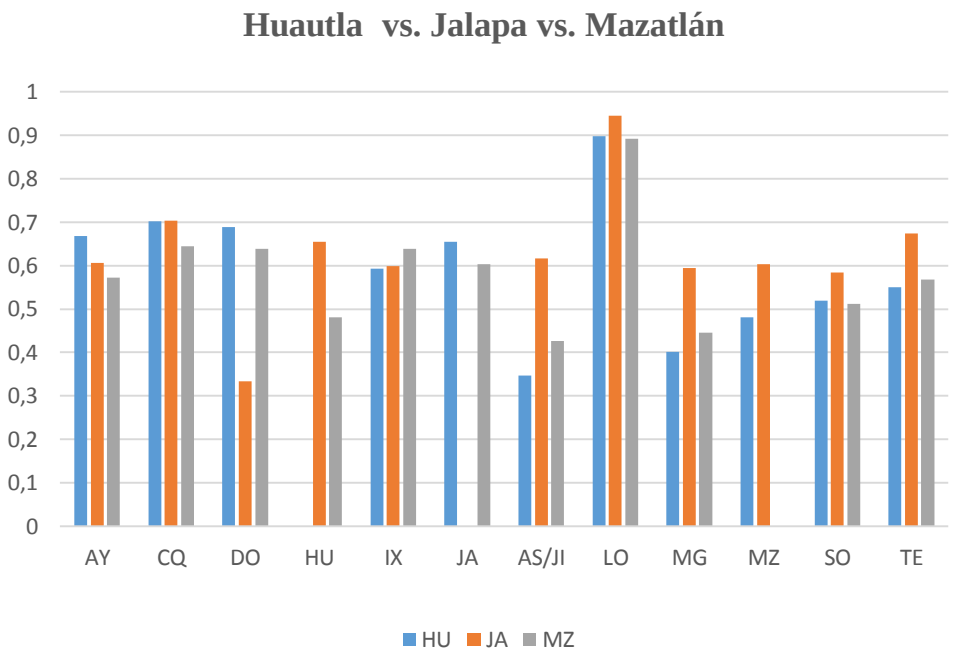
Comparison of the cladistic test and the LD test: long range effects of the structural continuum (So & the Hu cluster, So & Mz, Ix & the Ay cluster) are confirmed.
An intriguing Mz & Te + Lo appears in the Western Highlands, partly confirmed by diachronic phonology, when pondered.





2.2.2. LD sampling (300> cognates, only nouns)





Working on ***nouns*** in the ALMaz/Kirk database

- Why more LD results now, and how different are they? Aren't those presented before enough?
- Nominal lexical morphology is much more simple in Mazatec than verb morphology.
- Conditions for trivial computation of differences between varieties are therefore better.
- For further research, ponderation and structural weight assignement will be more easily handled than for verbs.
- To focus on a more homogeneous and simplex sector of the database may provide clear-cut results.

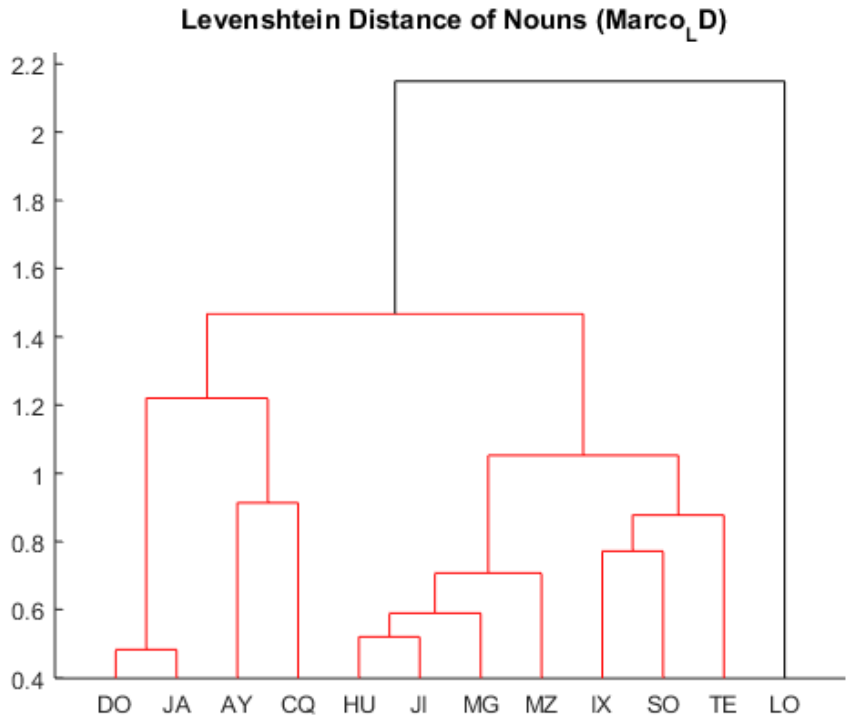
Some tokens from the db

Ex.	CG-3	CG-3	CG-4
	‘squirrel’	‘maïze cob’	‘pot’
MZ	*ʧahmũ*	*nãhɲã*	*tihi*
AY	*ʧaʃɲũ*	*nãhɲã*	*tihi*
CQ	*ʃɲũ*	*nãhɲã*	*tihi*
JA	*ʧatuʔia*	*nãhɲã*	*ndhi*
DO	*ʧatuʔia*	*nãhɲã*	*tihi*
HU	*ʧahmũ*	*nãhnã*	*ti*
JI	*ʧahmũ*	*nãhnã*	*ti*
IX	*ʧihmũ*	*nãhɲã*	*tihi*
MG	*ʧihmũ*	*mĩhɲã*	*tihi*
LO	*ʧɨjohmɨ̃*	*nõhnõ*	*tehe*
TE	*ʧihmũ*	*nãhnã*	*tihi*

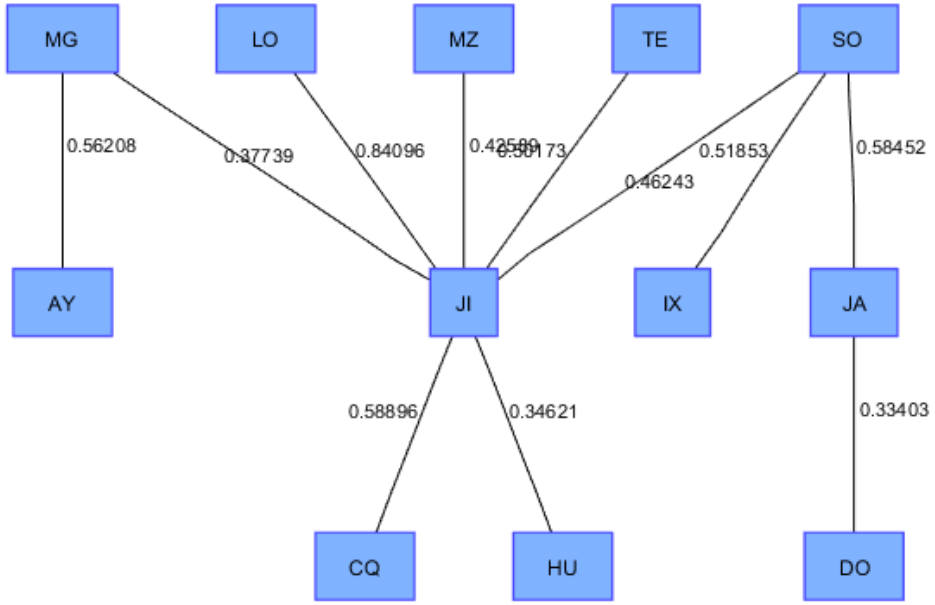
Some tokens from the db

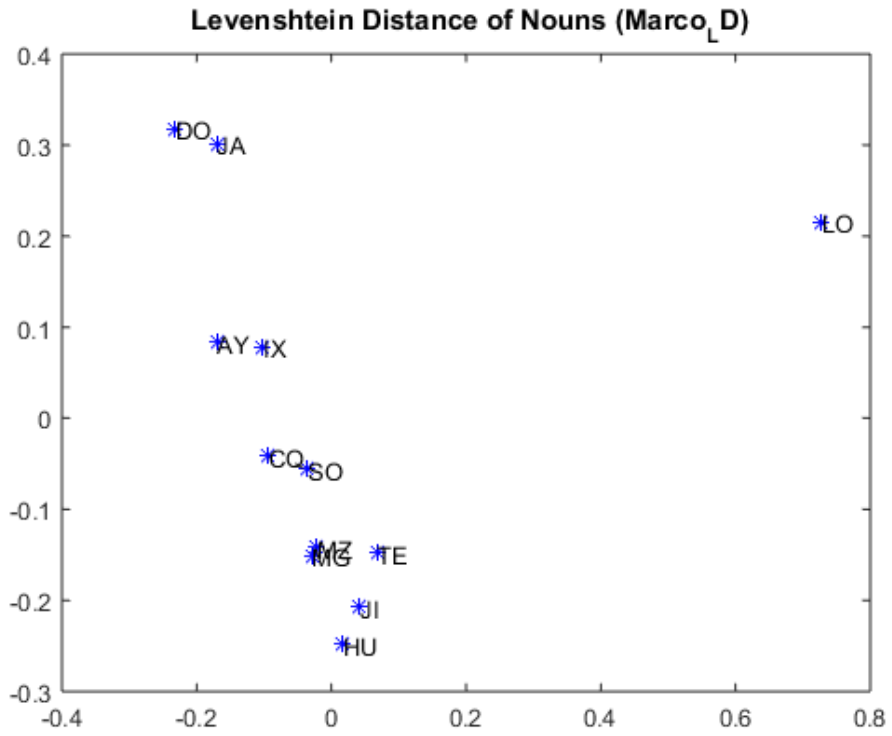
Ex.	CG-3	CG-3	CG-4
	‘squirrel’	‘maïze cob’	‘pot’
MZ	*ʧa=hnũ*	*nã=ɦɲã*	*tihi*
AY	*ʧa=ʃnũ*	*nã=ɦɲã*	*tihi*
CQ	*ʃnũ*	*nã=ɦɲã*	*tihi*
JA	*ʧa=tuʔia*	*nã=ɦɲã*	*n.dhi*
HU	*ʧa=hnũ*	*nã=hnã*	*ti*
JI	*ʧa=hnũ*	*nã=hnã*	*ti*
IX	*ʧi=hnũ*	*nã=ɦɲã*	*tihi*
MG	*ʧi=hnũ*	*ɲĩ=ɦɲã*	*tihi*
LO	*ʧiʲjo=hɲ̃ɾ*	*nõ=hnõ*	*tehe*
TE	*ʧi=hnũ*	*nã=hnã*	*tihi*

LD (Levenshtein Distance),
only nouns (data: Kirk 1966)
Dendogram
Data processing by Marco Patriarca & Anirban Chakraborti



LD, nouns (data: Kirk 1966)
Lefthand: Minimum Spanning Tree (MST);
Righthand: Multidimensional scaling (MDS) for nouns, in Kirk 1966
Data processing by Marco Patriarca & Anirban Chakraborti





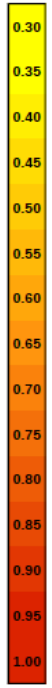
Sur 315 cognats, uniquement substantivaux, sur lesquels nous appliquons la distance de Levenshtein, les résultats sont les suivants :

#	AY	CQ	DO	HU	IX	JA	AS/JI	LO	MG	MZ	SO	TE
AY	0,000	0,632	0,629	0,668	0,606	0,607	0,636	0,981	0,562	0,573	0,582	0,708
CQ	0,632	0,000	0,717	0,703	0,666	0,704	0,589	0,978	0,627	0,645	0,636	0,688
DO	0,629	0,717	0,000	0,689	0,585	0,334	0,643	1,000	0,608	0,639	0,620	0,703
HU	0,668	0,703	0,689	0,000	0,593	0,655	0,346	0,897	0,402	0,481	0,519	0,550
IX	0,606	0,666	0,585	0,593	0,000	0,599	0,616	0,937	0,574	0,639	0,519	0,586
JA	0,607	0,704	0,334	0,655	0,599	0,000	0,617	0,945	0,594	0,604	0,585	0,675
AS/JI	0,636	0,589	0,643	0,346	0,616	0,617	0,000	0,841	0,377	0,426	0,462	0,502
LO	0,981	0,978	1,000	0,897	0,937	0,945	0,841	0,000	0,883	0,892	0,884	0,870
MG	0,562	0,627	0,608	0,402	0,574	0,594	0,377	0,883	0,000	0,446	0,490	0,539
MZ	0,573	0,645	0,639	0,481	0,639	0,604	0,426	0,892	0,446	0,000	0,511	0,567
SO	0,582	0,636	0,620	0,519	0,519	0,585	0,462	0,884	0,490	0,511	0,000	0,574
TE	0,708	0,688	0,703	0,550	0,586	0,675	0,502	0,870	0,539	0,567	0,574	0,000

Tableau 5.1. Matrice de distances de Levenshtein (LD), données Kirk 1966 : substantifs.
Traitement algorithmique : Kiran Sharma, Anirban Chakraborti, Marco Patriarca, Els Heinsalu & Jean Léo Léonard, juin 2016.

The *noun* matrix for LD computing in the ALMaz/Kirk 1966 database

#	AY	CQ	DO	HU	IX	JA	AS/JI	LO	MG	MZ	SO	TE
AY	0.000	0.632	0.629	0.668	0.606	0.607	0.636	0.981	0.562	0.573	0.582	0.708
CQ	0.632	0.000	0.717	0.703	0.666	0.704	0.589	0.978	0.627	0.645	0.636	0.688
DO	0.629	0.717	0.000	0.689	0.585	0.334	0.643	1.000	0.608	0.639	0.620	0.703
HU	0.668	0.703	0.689	0.000	0.593	0.655	0.346	0.897	0.402	0.481	0.519	0.550
IX	0.606	0.666	0.585	0.593	0.000	0.599	0.616	0.937	0.574	0.639	0.519	0.586
JA	0.607	0.704	0.334	0.655	0.599	0.000	0.617	0.945	0.594	0.604	0.585	0.675
AS/JI	0.636	0.589	0.643	0.346	0.616	0.617	0.000	0.841	0.377	0.426	0.462	0.502
LO	0.981	0.978	1.000	0.897	0.937	0.945	0.841	0.000	0.883	0.892	0.884	0.870
MG	0.562	0.627	0.608	0.402	0.574	0.594	0.377	0.883	0.000	0.446	0.490	0.539
MZ	0.573	0.645	0.639	0.481	0.639	0.604	0.426	0.892	0.446	0.000	0.511	0.567
SO	0.582	0.636	0.620	0.519	0.519	0.585	0.462	0.884	0.490	0.511	0.000	0.574
TE	0.708	0.688	0.703	0.550	0.586	0.675	0.502	0.870	0.539	0.567	0.574	0.000

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Ayautla
San Simón Coyoltepec
Cuyamecalco Villa de Zaragoza
San Pedro Teutila
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San Andrés Teotilalpam
Flor Batavia
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Google My Maps


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Francisco
Eloxochitlán de Flores Magón
San Lucas Zoquiapam
San José Tenango
Las Ruinas
Isla del Viejo Soyaltepec
San Pedro Ixcatlán
182
San Juan Coatzóspam
San Simón Coyoltepec
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Google My Maps


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San Simón Coyoltepec
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Cuyamecalco Villa de Zaragoza
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San Andrés Teotilalpam
Flor Batavia
182
Google My Maps


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OAXACA
Santa María Chilchotla
San José Independencia
Lo
Eloxochitlán de Flores Magón
Te
182
San Lucas Zoquiapam
San José Tenango
Las Ruinas
Hu
As/Ji
So
Ix
Ja
Mz
Ay
Do
Cq
San Simón Coyoltepec
Ayautla
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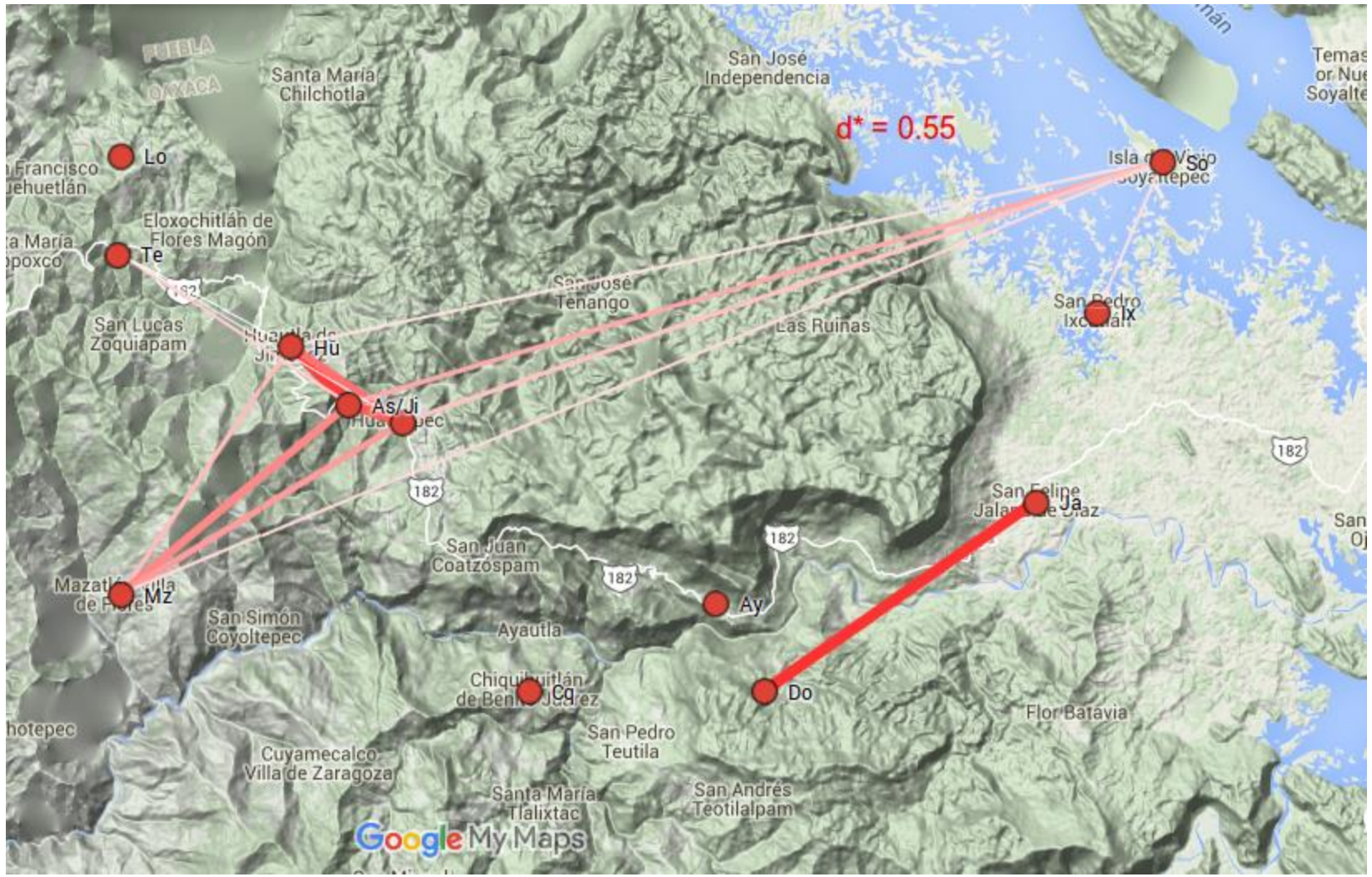
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Ay
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San Lucas Zoquiápam
San José Tenango
Las Ruinas
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Ayautla
San Simón Coyoltepec
Chiquihuitlán de Benito Juárez
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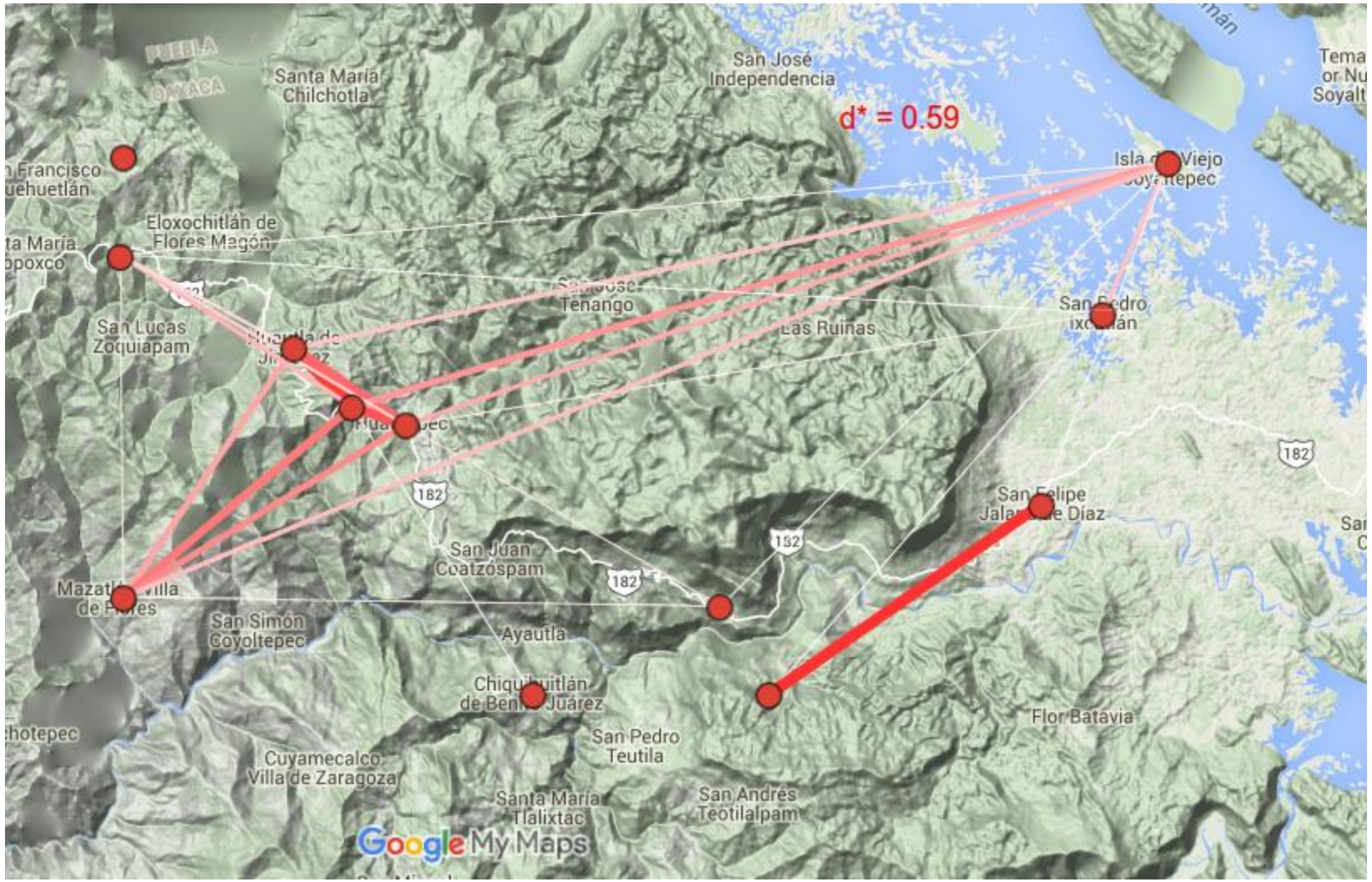
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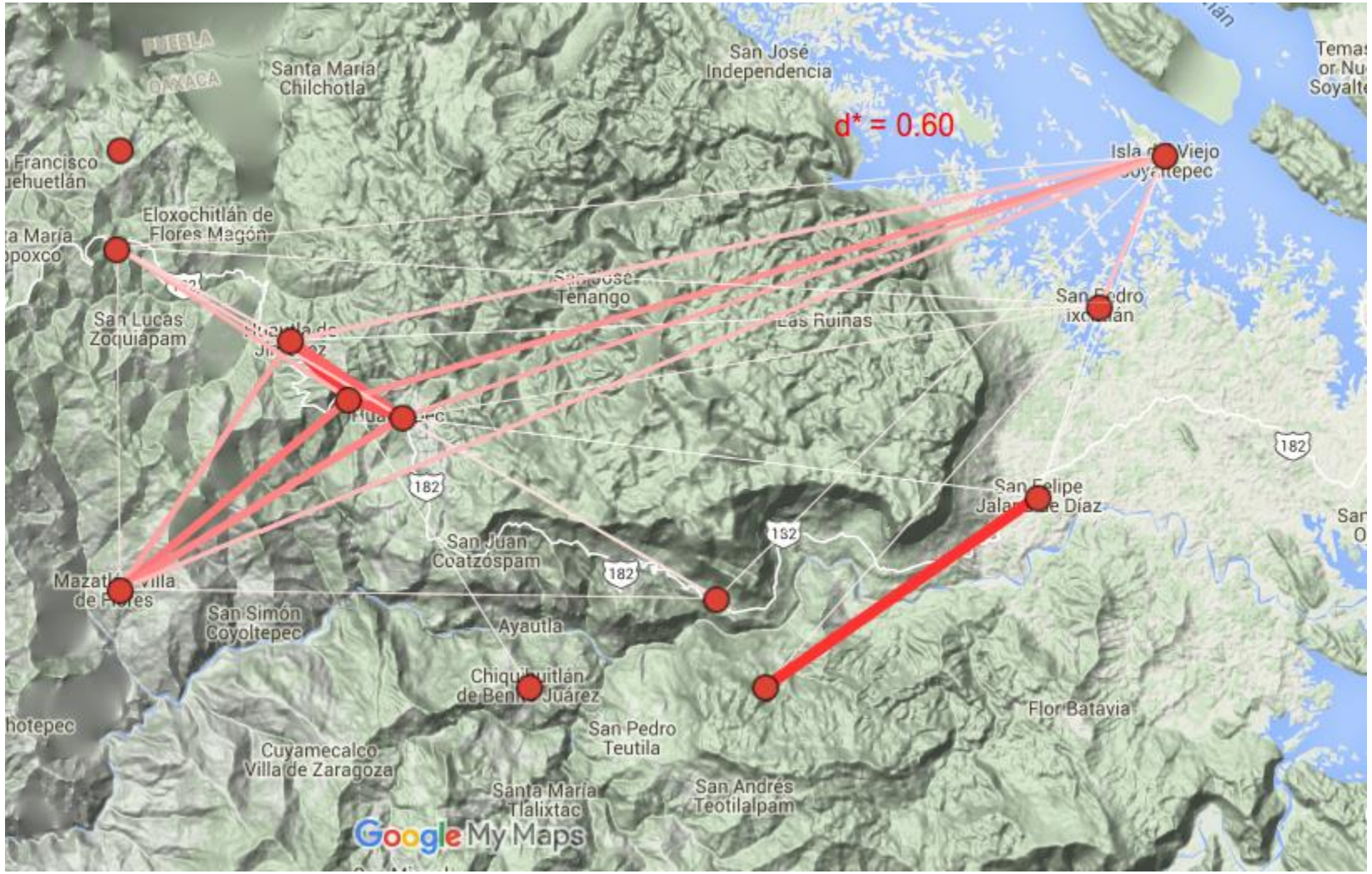
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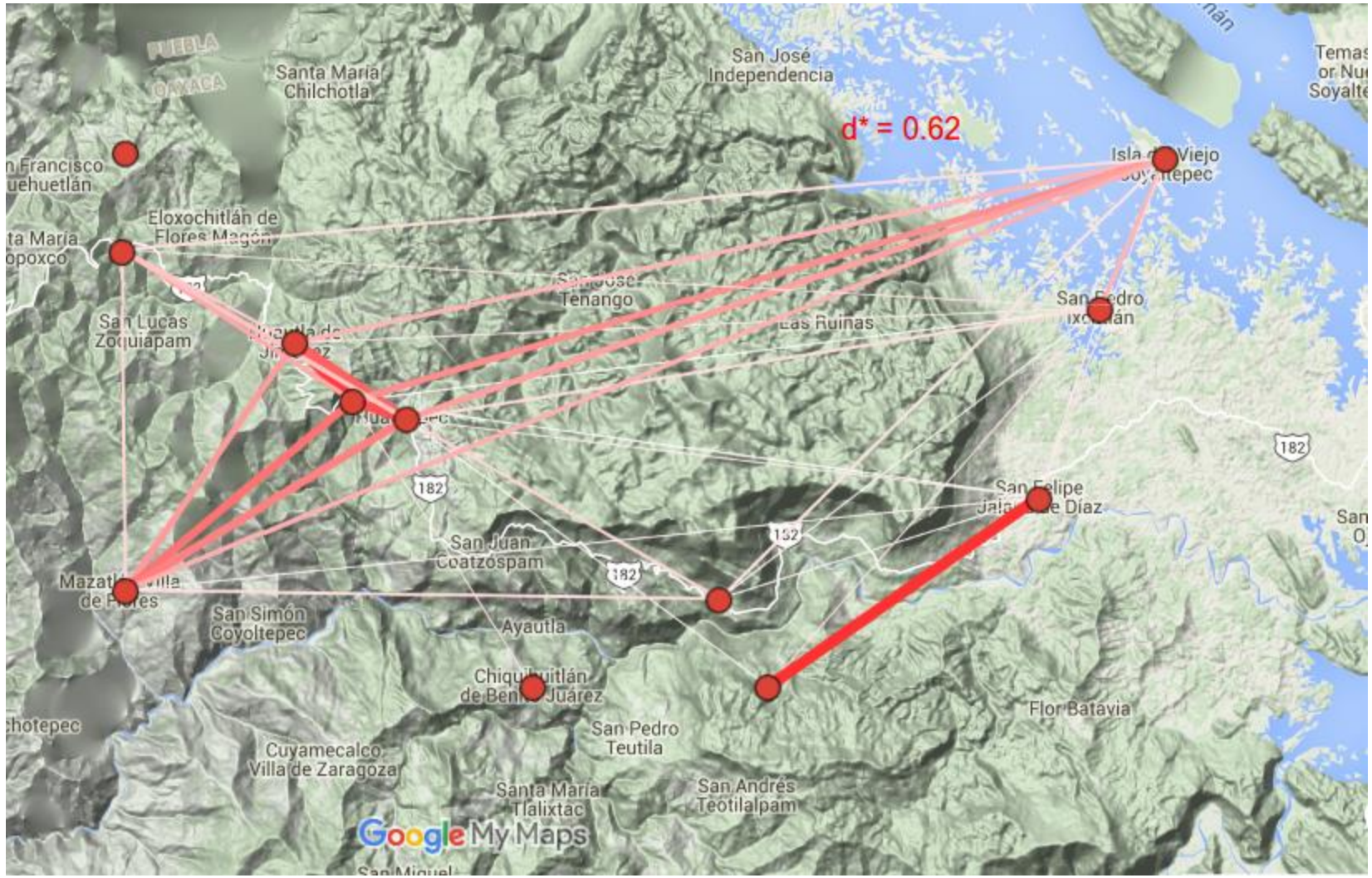
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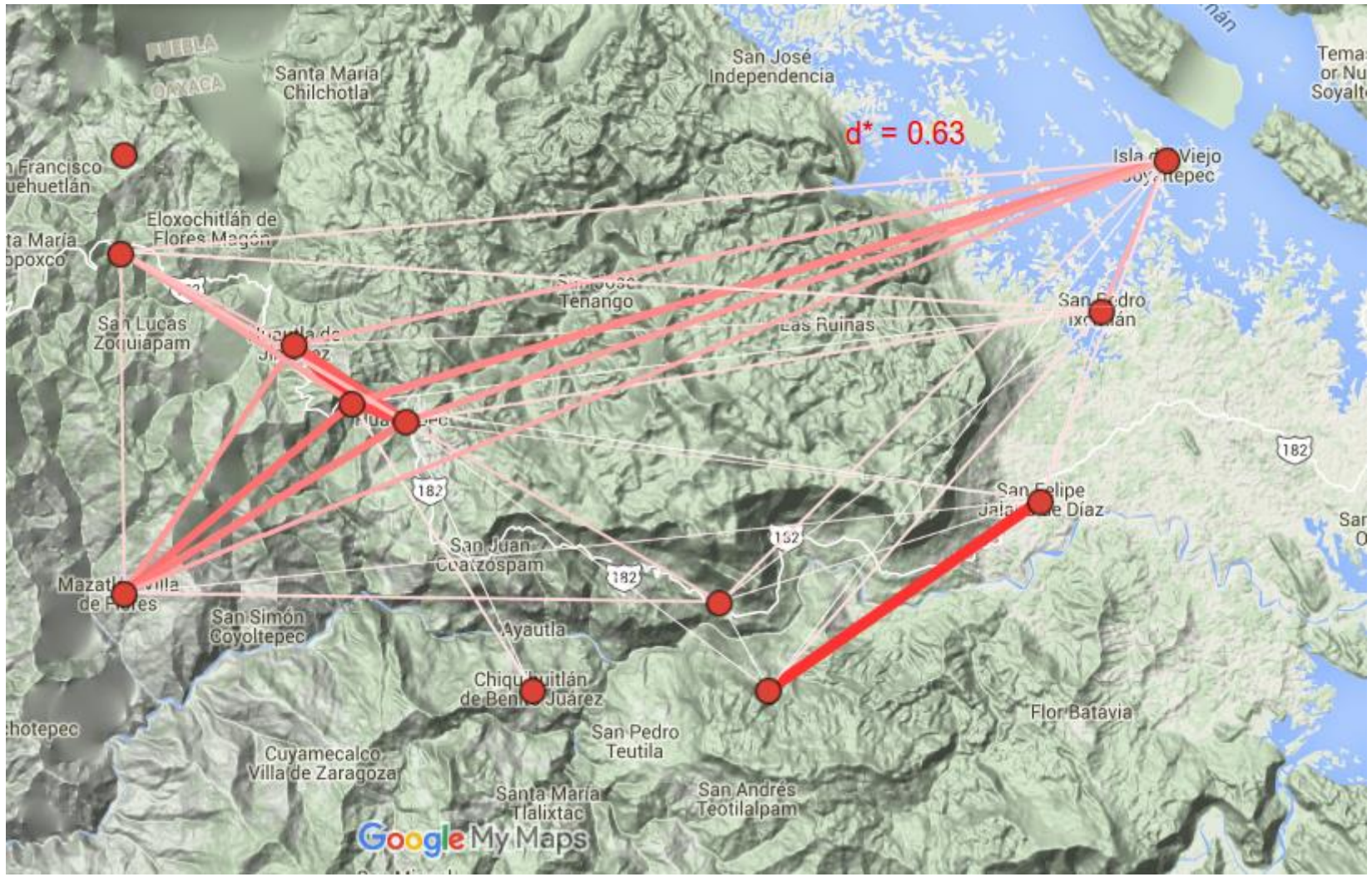
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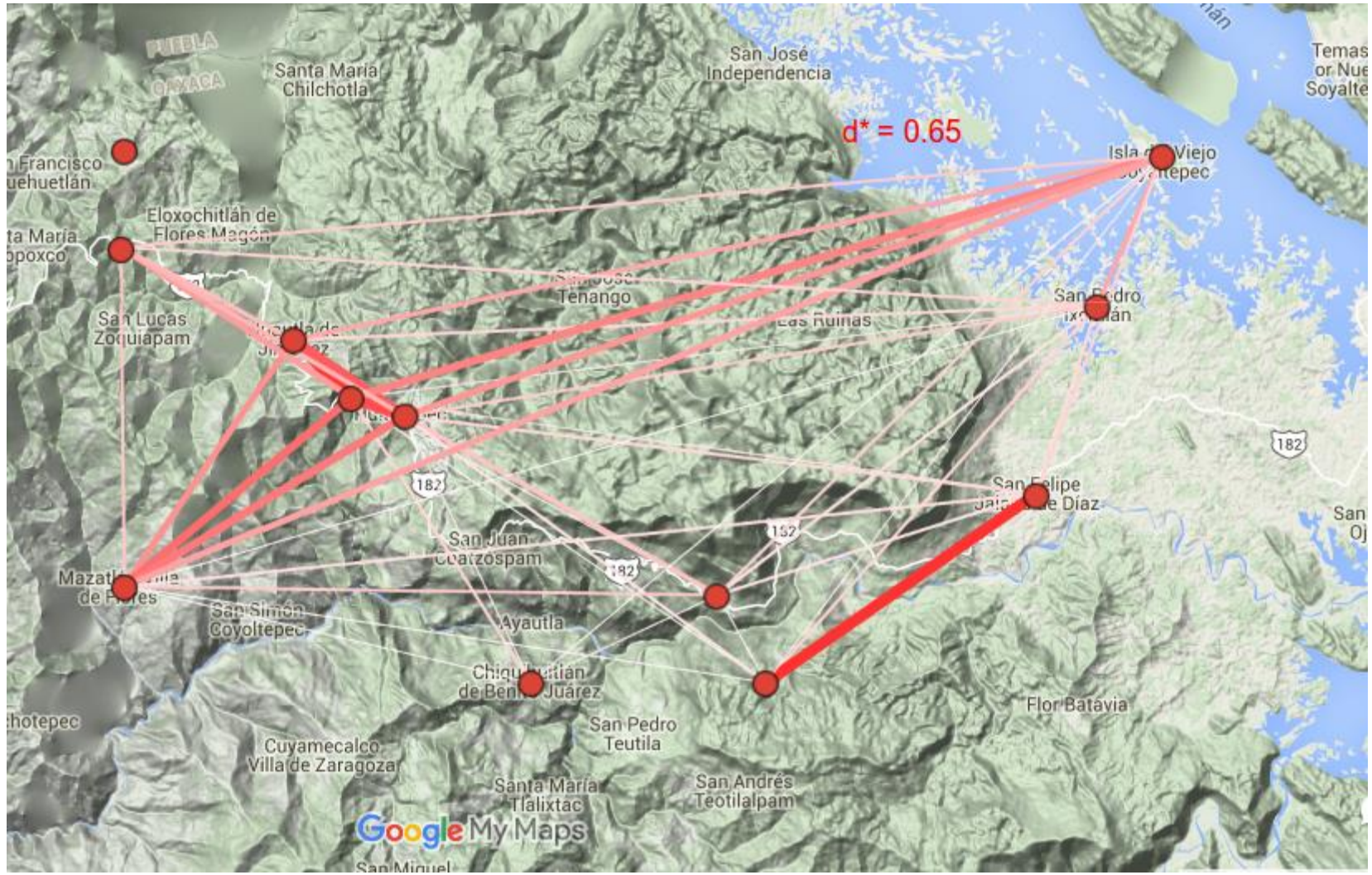
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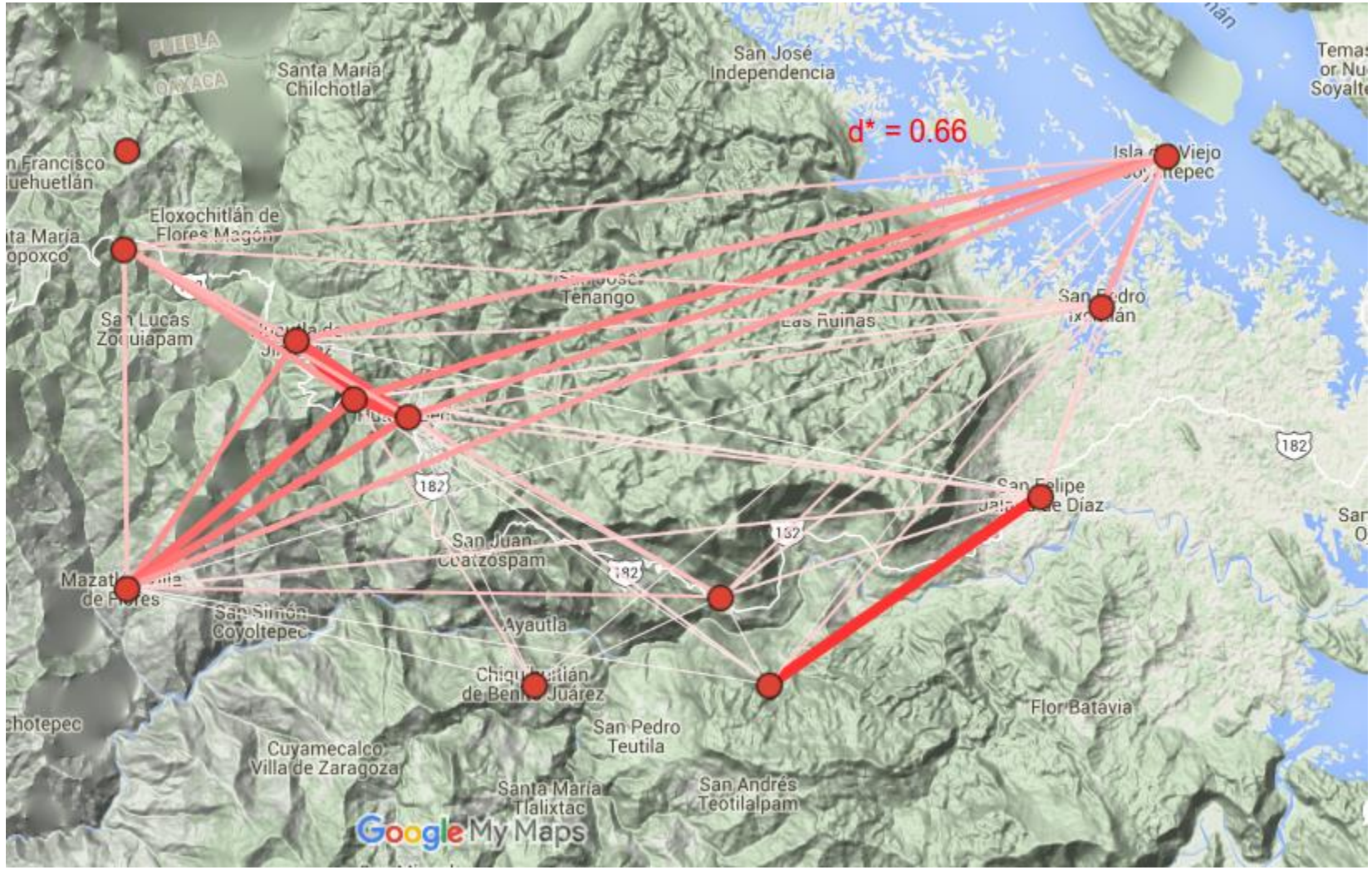
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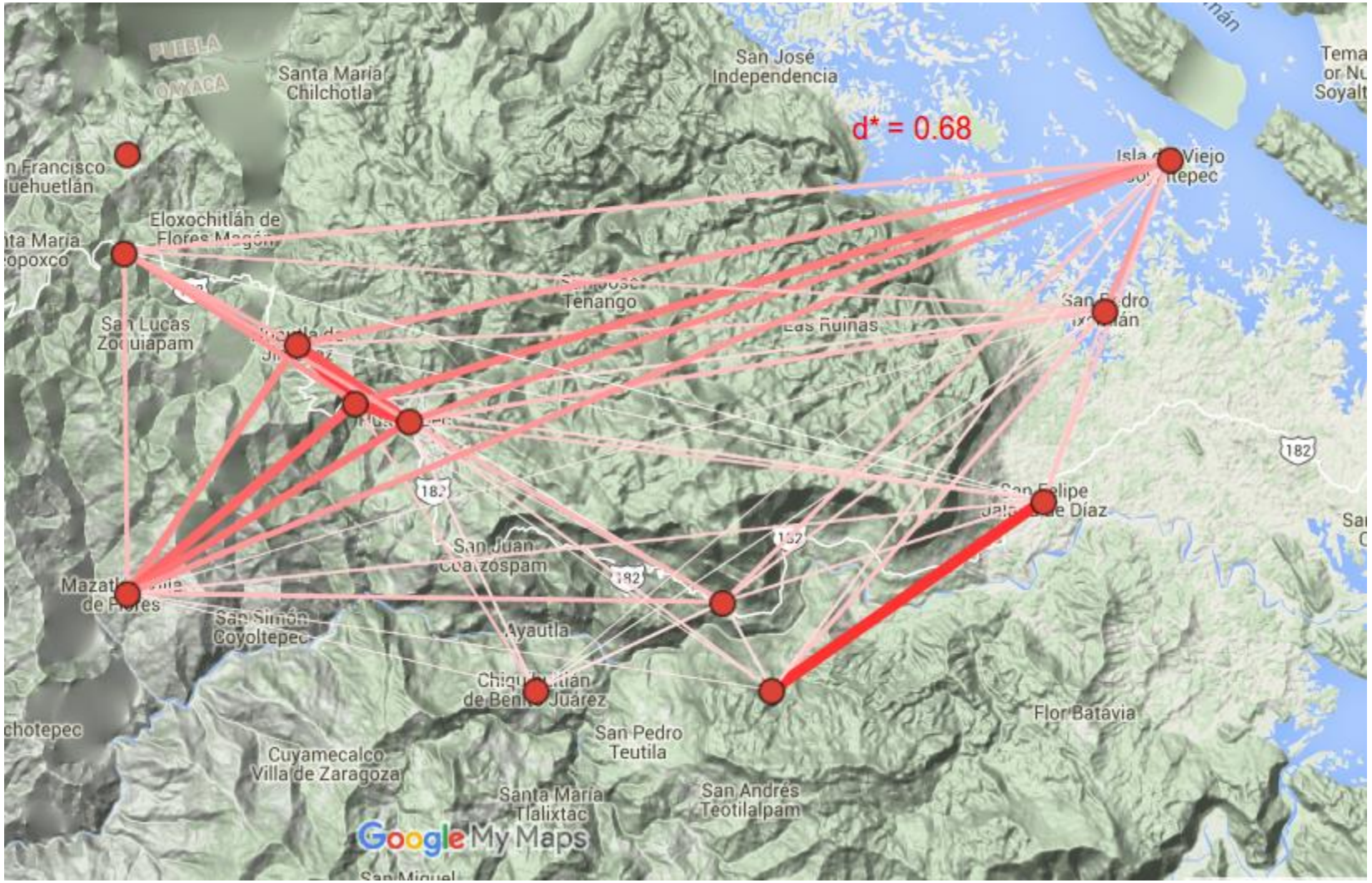
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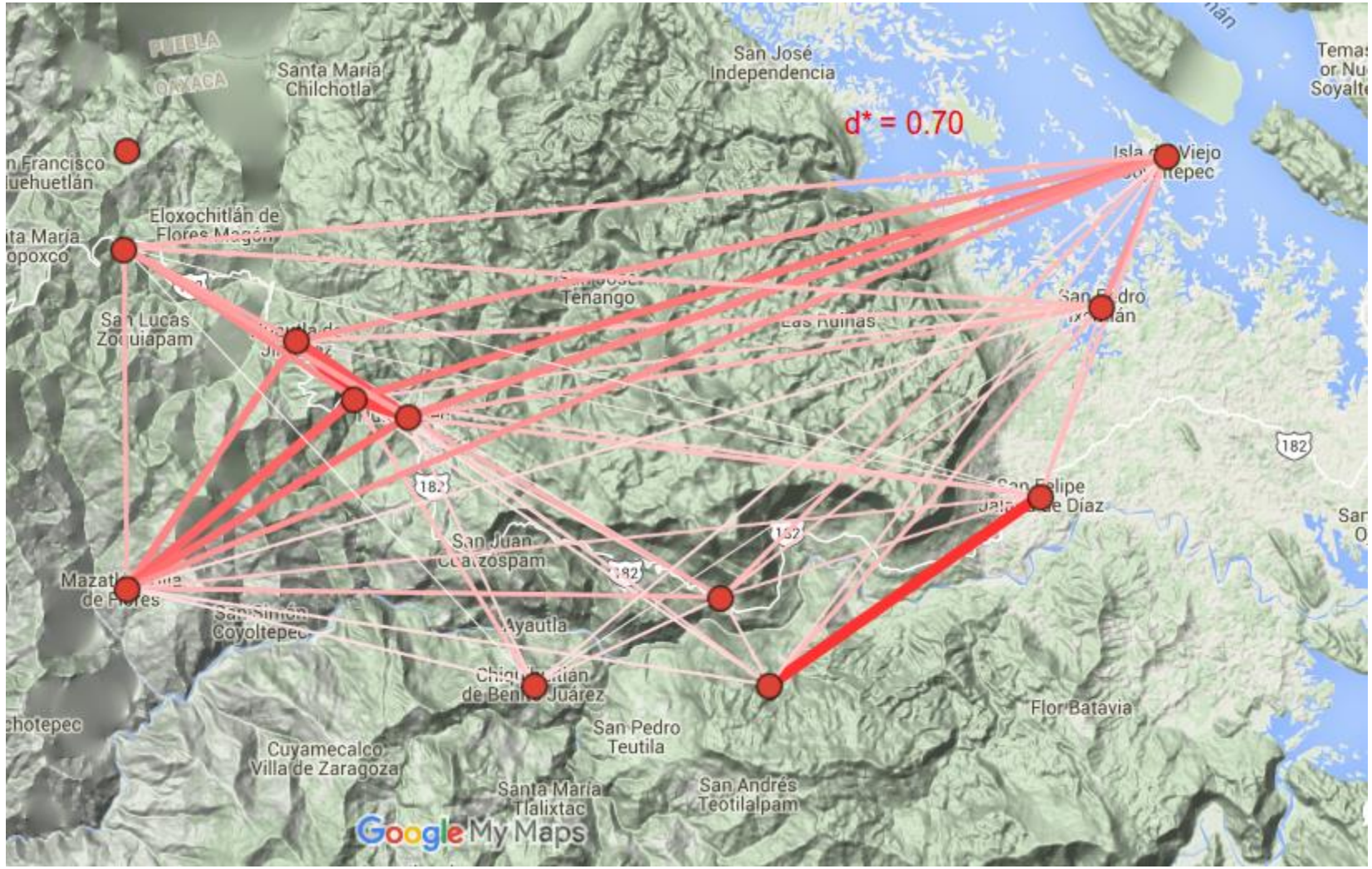
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San Lucas
Zoquiapam
182
San Juan
Coatzospam
Ayautla
Coyoltepec
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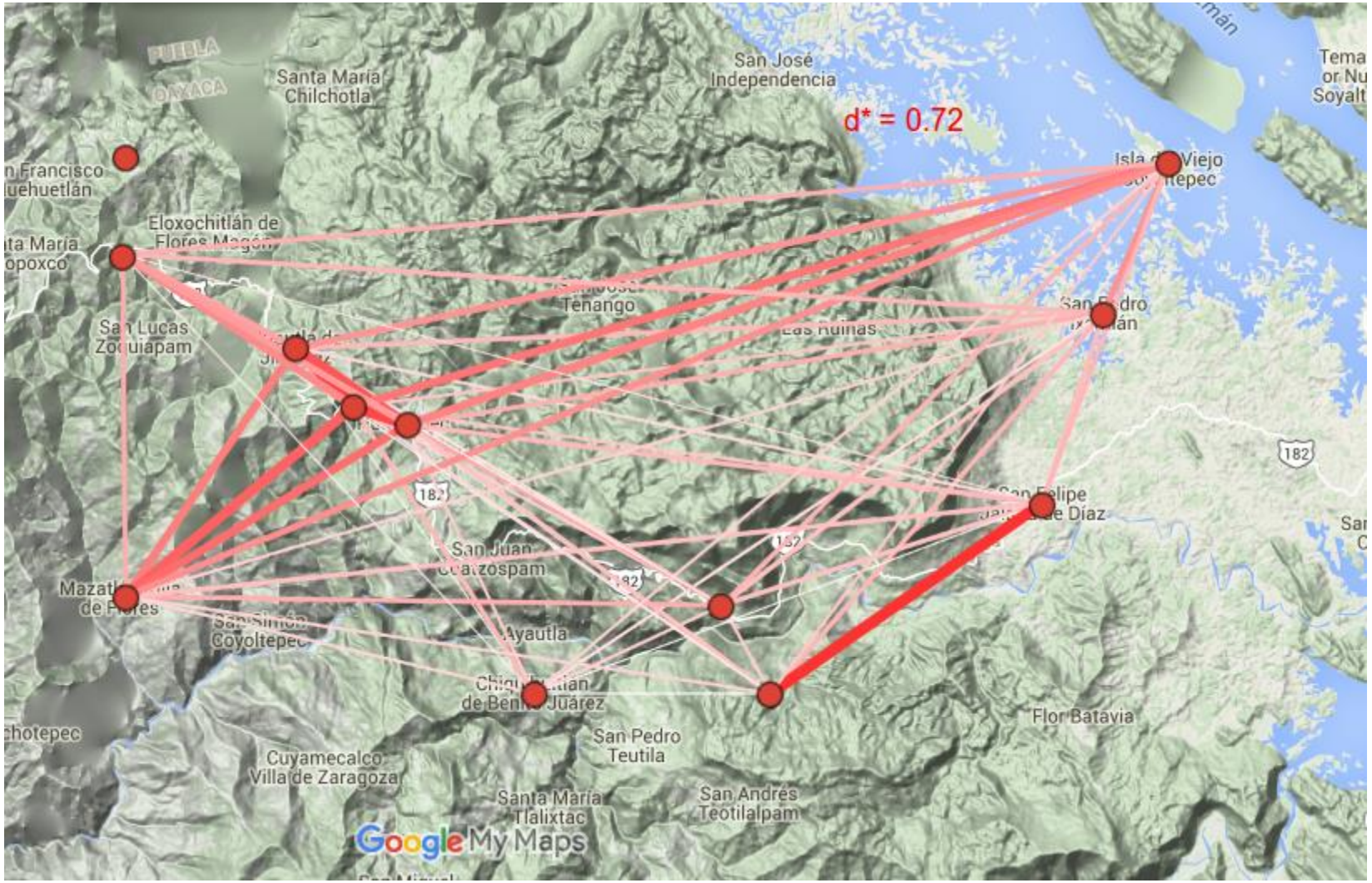
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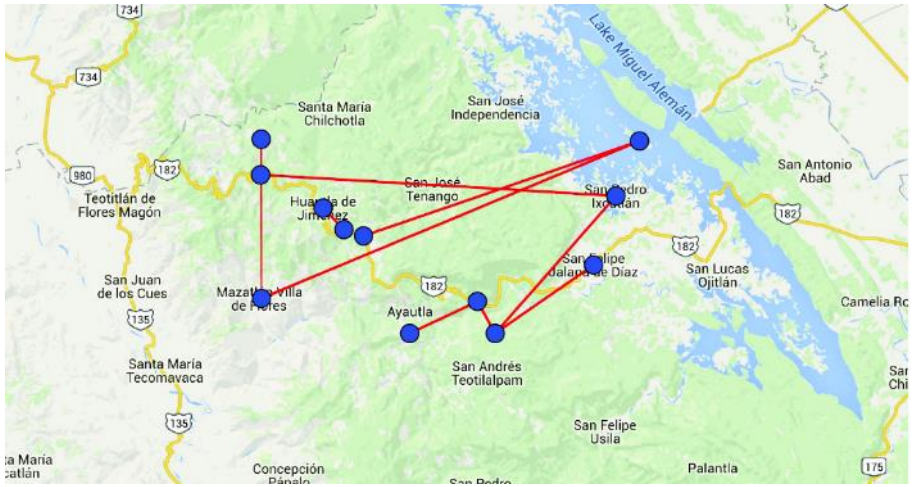
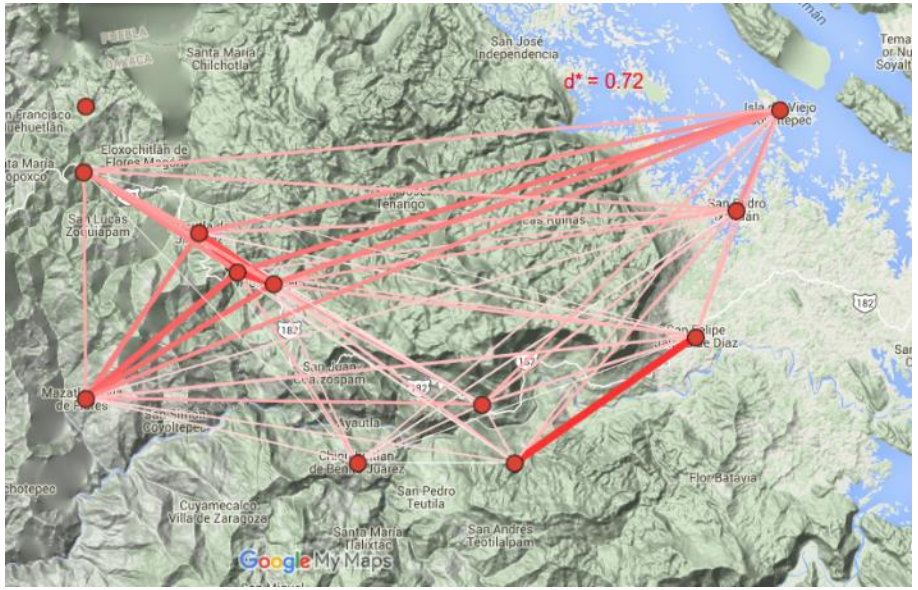
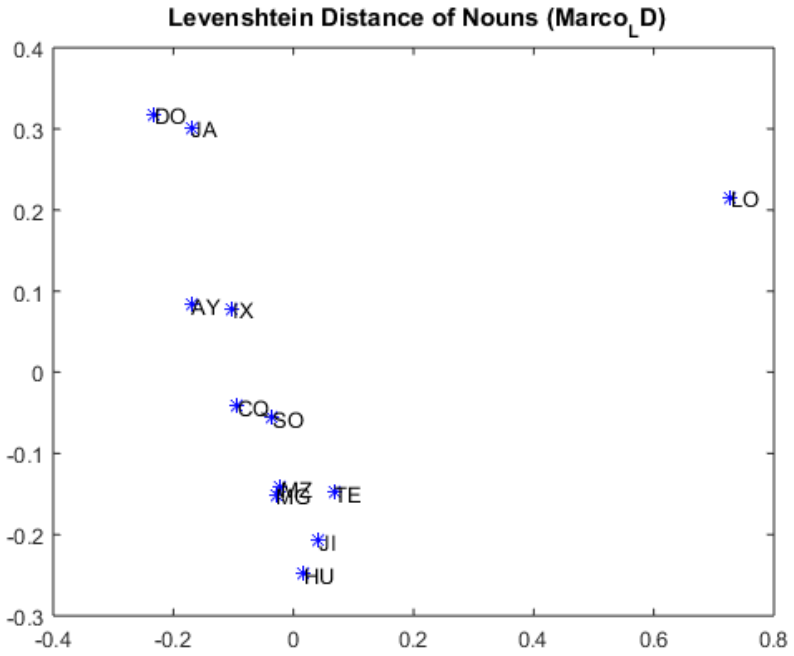
Chiquihuitlán de Benito Juárez
San Pedro Teutila
Cuyamecalco Villa de Zaragoza
Santa María Tlalixtac
San Andrés Teotilalpam
Flor Batavia
San Felipe de Díaz
182
152
Google My Maps

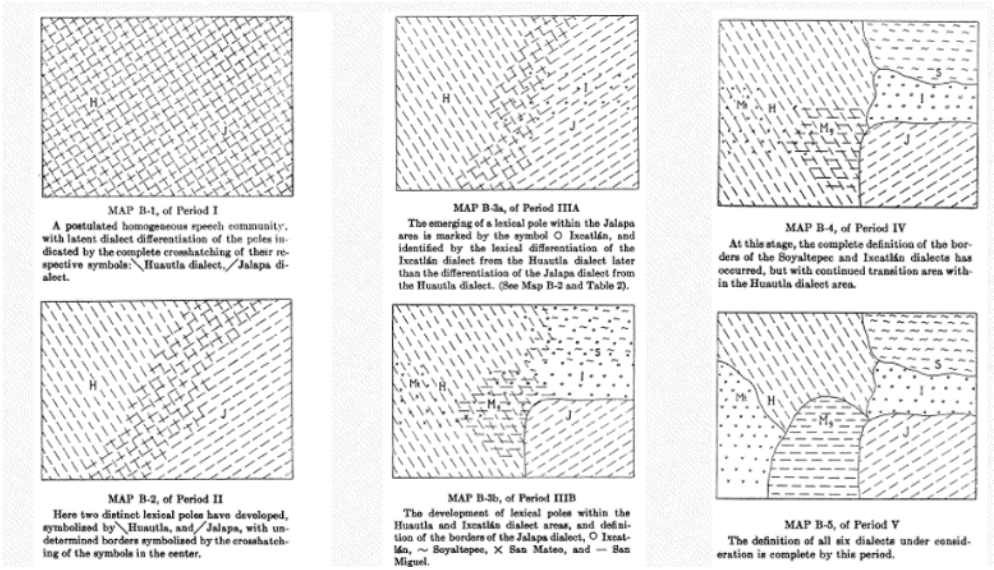
Deux « tests » par DL (Distance de Levenshtein) sur deux échantillons de données : à gauche, multivariables (toutes parties du discours), à droite, test sur liste de substantifs comme *supra*.





3. Conclusion & prospects





MAP B-1, of Period I

A postulated homogeneous speech community, with latent dialect differentiation of the poles indicated by the complete crosshatching of their respective symbols: \ Huautla dialect, / Jalapa dialect.

MAP B-2, of Period II

Here two distinct lexical poles have developed, symbolized by \ Huautla, and / Jalapa, with undetermined borders symbolized by the crosshatching of the symbols in the center.

MAP B-3a, of Period IIIA

The emerging of a lexical pole within the Jalapa area is marked by the symbol ○ Ixcatlán, and identified by the lexical differentiation of the Ixcatlán dialect from the Huautla dialect later than the differentiation of the Jalapa dialect from the Huautla dialect. (See Map B-2 and Table 2).

MAP B-3b, of Period IIIB

The development of lexical poles within the Huautla and Ixcatlán dialect areas, and definition of the borders of the Jalapa dialect, ○ Ixcatlán, ~ Soyaltepec, × San Mateo, and — San Miguel.

MAP B-4, of Period IV

At this stage, the complete definition of the borders of the Soyaltepec and Ixcatlán dialects has occurred, but with continued transition area within the Huautla dialect area.

MAP B-5, of Period V

The definition of all six dialects under consideration is complete by this period.

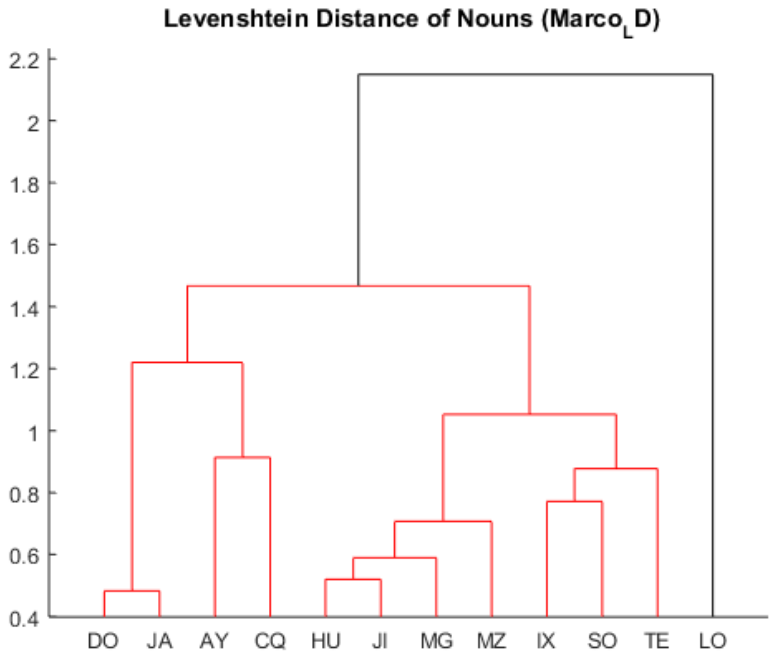
What did we get from all these results?

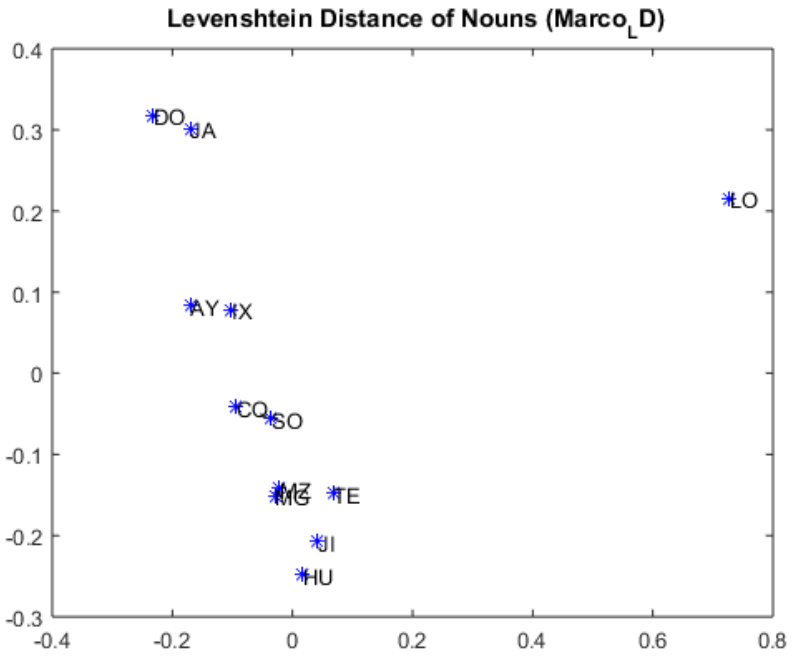
- 1) Not only our results confirm broadly Gudschinsky's hypothesis on the scenarios for dialect diversification in Mazatec (1955, 1958), but they also enabled us to enter deep inside the fine-grain of this evolution, which has taken place within a span of a millenium, or slightly over.
- 2) Main fine-grain results read as follows:
- Subdialects of the former « buffer zone » between Ja and Hu, such as Ji and Mg, turn out to be crossroad spots which link Huautla, the central Highland dialect, to Mazatlan, but also to more distant lowlands dialects, such as So and Ix.
- The link between another bufferzone dialect, Ayautla (Ay), with a far distant peripheral dialect, in the Southern Canyon, such as Chiquihuitlan (Cq) is very good news: it allows to understand far better ancient patterns of settlement, and it also corroborates fieldwork observations, especially in linguistic anthropology, as far as Ayautla is concerned.

Other interesting results:

- As to methods, cladistic sampling and LD results give broadly congruent, though strongly contrastive results.
- Indeed, cladistic results tend to be more categorial and clear-cut, especially when pondered, whereas (yet unpondered) LD results provide smoother geolinguistic landscapes, especially when one compares each dialect to the rest of the dialect network.
- Instead, threshold levels of normalized differentiation show strong and robust clusters, such as the Do-Ja vs. the Hu-Ji-Mg sets, and far-reaching affinities, such as the So-Hu relationship.

Two exemplary results (from LD processing of nouns): a dendogram (lefthand) and Multidimensional scaling (righthand)





The Beaver’s lesson

- Was Sarah Gudschinsky right, since the beginning?
- Probably yes: her subdivision between Hu and Ja (Phase II) initially is strongly confirmed, and so is confirmed her « buffer zone » but…
- … The scenarios of diversification are far more complex than what she initially assumed.
- The thread of diversification and interaction between the town dialects (Hu, Ja, Ix, So & Mz) and the satellite dialects (Te, Do) or the buffer zone dialects (Ji, Mg, Ay) and the peripheral dialects (Lo, Cq), are far more intricated and subtle than what she initially suggested. Nevertheless, her model still holds as a framework for more complex (and *complexity*) analyzis and testing of hypothesis.

Algorithms of this kind require the patience of a beaver…
Moreover, processing data from cognate lists, as from Kirk 1966, with the tools of Complexity Theory, opens widely the trail towards… Ecogeolinguistics – a sub paradigm of *ecolinguistics* or *linguistic ecology*.
(source: http://ressources-et-environnement.com/2012/03/le-castor-fervent-defenseur-de-lenvironnement/)

The Hunting of the Snark
Lewis Carroll
Fit the Fifth - The Beaver's Lesson
Source: http://literature.org/authors/carroll-lewis/the-hunting-of-the-snark/chapter-05.html

- (...) "'Tis the note of the Jubjub! Keep count, I entreat;
  You will find I have told it you twice.
  'Tis the song of the Jubjub! The proof is complete,
  If only I've stated it thrice."
- The Beaver had counted with scrupulous care,
  Attending to every word:
  But it fairly lost heart, and outgrabe in despair,
  When the third repetition occurred.
- It felt that, in spite of all possible pains,
  It had somehow contrived to lose count,
  And the only thing now was to rack its poor brains
  By reckoning up the amount.
- "Two added to one--if that could but be done,"
  It said, "with one's fingers and thumbs!"
  Recollecting with tears how, in earlier years,
  It had taken no pains with its sums. (...)

References

[LD] Levenshtein distance ; [ALMaz] : articles liés à la base de données ALMaz ; [Cx] : théorie de la complexité ; [DesMaz] : descriptions du mazatec ; [MD] Modélisation.

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