Tone in Mainland Southeast Asia: Convergence, inheritance (*and intensity of contact*)

Marc Brunelle
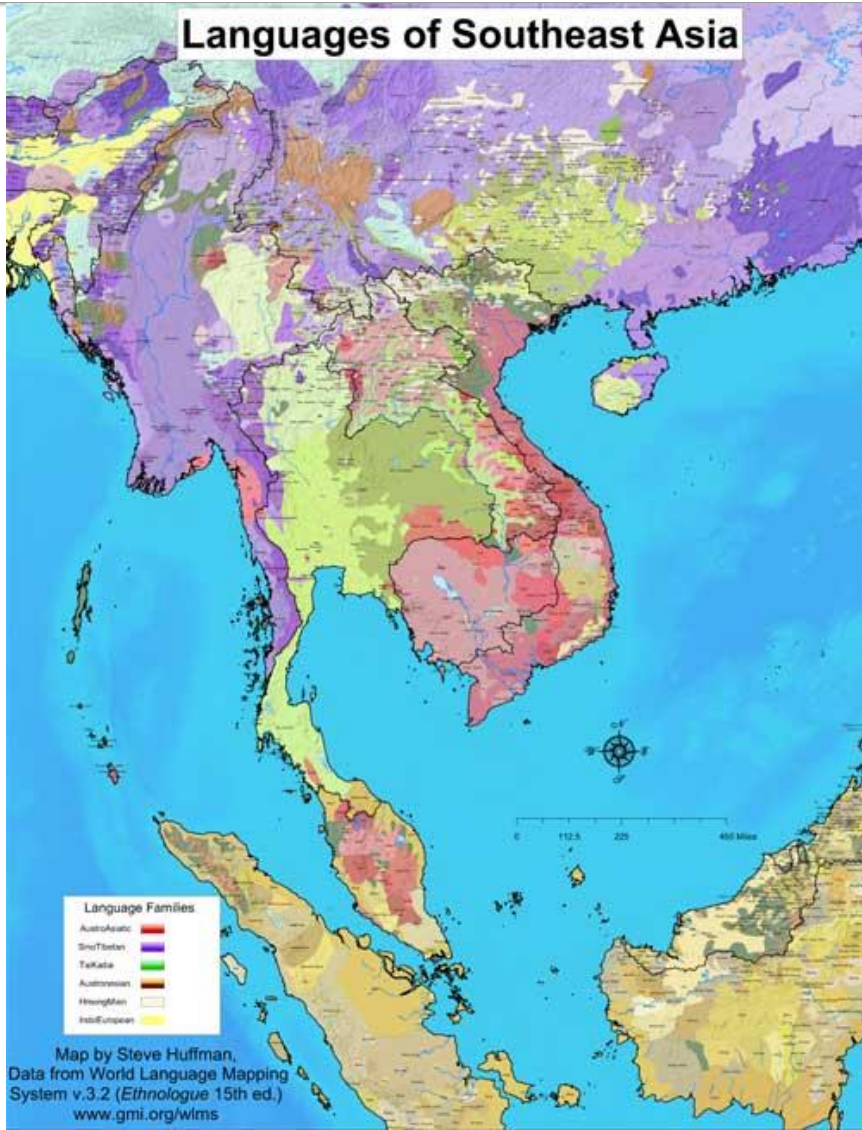*University of Ottawa*
*(an earlier version of this project was published with **James Kirby** in 2013)*

Mainland Southeast Asian Language History

Languages of Southeast Asia

Map by Steve Huffman,
Data from World Language Mapping
System v.3.2 (*Ethnologue* 15th ed.)
www.gmi.org/wlms

- **Austroasiatic** (either atonal or registral) was the original family in MSEA

- **Austronesian** (atonal) migration from Borneo around 1000 BC

- **Sino-Tibetan** in various waves
  - Ancient Chinese (moderately tonal) in Red river Delta in 100 BC
  - Tibeto-Burman (tonal) in Western MSEA in the 8th century
  - Modern Chinese (tonal) migrations from 17th century

- **Tai-Kadai** (tonal) from 1000 AD

- **Hmong-Mien** (tonal) in the 19th century

Acoustics of Northern Vietnamese tones
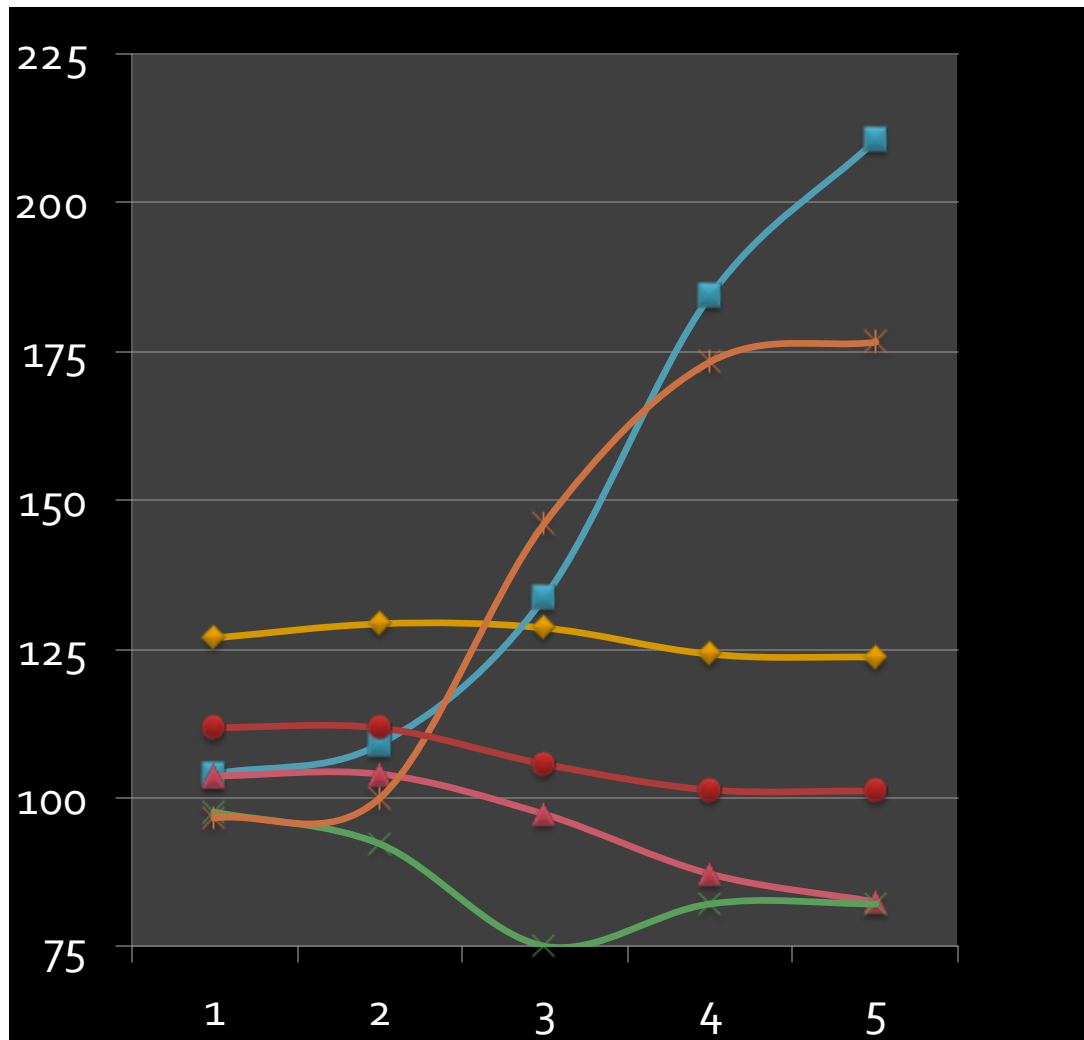
🔊 High-rising

🔊 Rising glottalized

🔊 Mid modal

🔊 Lowish glottalized

🔊 Low breathy

🔊 Falling creaky

Southern Vietnamese
1) merged the rising glottalized and falling creaky tones
2) lost voice qualities

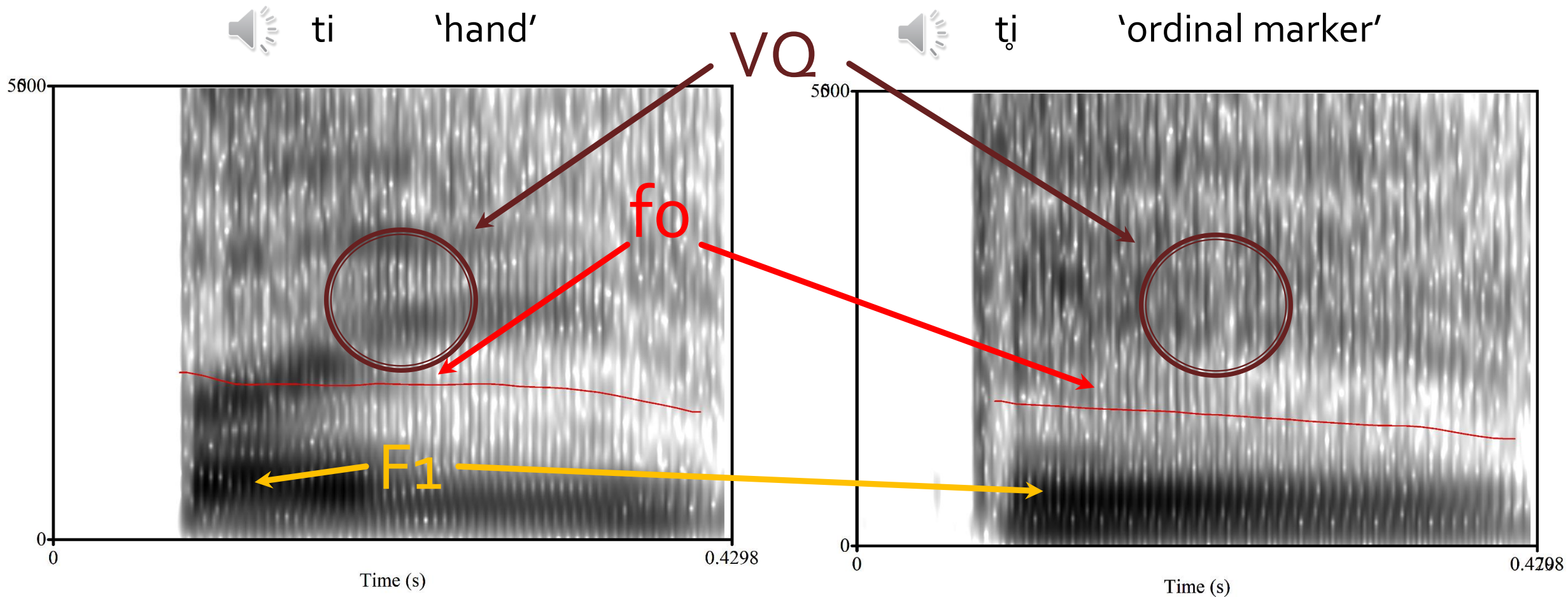# The register contrast in Chrau
(Tạ, Brunelle, Nguyễn 2022)

ti 'hand'   tị 'ordinal marker'

VQ   f0   F1

Phonetic underpinnings of tonogenesis

- Standard tonogenetic scenario: Haudricourt (1954) on Vietnamese

1st century AD	6th century	12th century
pa	pa	pa
ba	ba	pà
pah	pà	på
bah	bà	pã
pa?	pá	pá
ba?	bá	pạ

- Tone seems to have developed in similar ways in Chinese and Hmong-Mien

- Tai-Kadai at least underwent the two–way split

- Other languages typically undergo tonogenesis along similar lines
  - Kammu (AA): Svantesson 1983
  - Tsat (AN): Maddieson and Pang 1993
  - Vietic languages of Laos (AA): Ferlus 1998

Factors favoring tonogenesis

- Monosyllabization
  - Number of tones increases when a language becomes monosyllabic (Matisoff 1973)

- Contact
  - « How such a trend [i.e. tonogenesis] can spread across linguistic boundaries is an intriguing puzzle, on which I shall not venture to make any guesses. » (Pulleyblank, 1986: 78)

Contact and tonogenesis

- Diffusion of tone from Chinese to Mainland SEA phyla

 - «It seems likely that the development of true tones in Vietnamese was precipitated not only by influence from Chinese, but also from Siamese as well. This indicates that Tai (and Miao-Yao) acquired their tone systems from Chinese before Vietnamese did… (Matisoff 1973: 88).

  - « Subtlety, and even mystery, do enter the picture, however, when we consider another common feature shared by Vietnamese, Dong-Tai and Miao-Yao, namely the identity between their tonal systems and that of Middle Chinese. This is no doubt one of the most striking cases of areal diffusion between languages of different genetic origin that one can find anywhere in the world. » (Pulleyblank, 1986: 88).
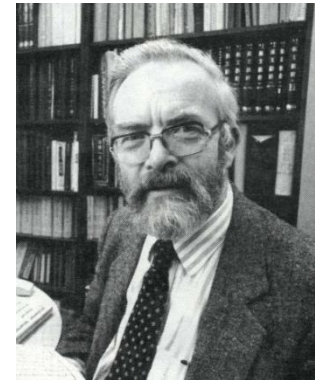
Contact and tonogenesis

- Within Mainland Southeast Asia

  - "There have not only been enormous cultural changes but the languages have been slowly restructured in the direction of Vietnamese, as exemplified by the dramatic evolution of tones in Phan Rang Cham." (Thurgood 1999: 27)

  - "Suai and Pattani Malay, are pursuing different paths leading […] to a kind of prosodic salience. This could be a matter of a replacement by phonemic stress or accent, yet, given the close contact with Thai, a tone language, and the widespread bilingualism of the speakers of the two minority languages, we may have here a way station on the road to tonogenesis." (Abramson 2004: 4)
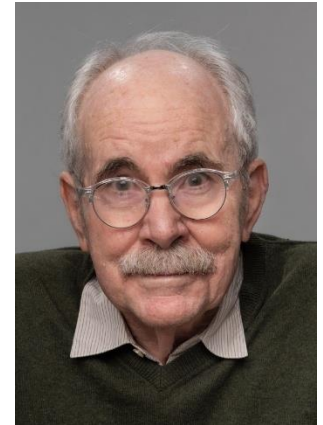
The research questions

- Q1: Is tone that prevalent in MSEA?

- Q2: How much of it is attributable to inheritance and structural factors?

- Q3: Is there any evidence that contact makes languages tonally alike?
  - Geography as a proxy for contact

Database
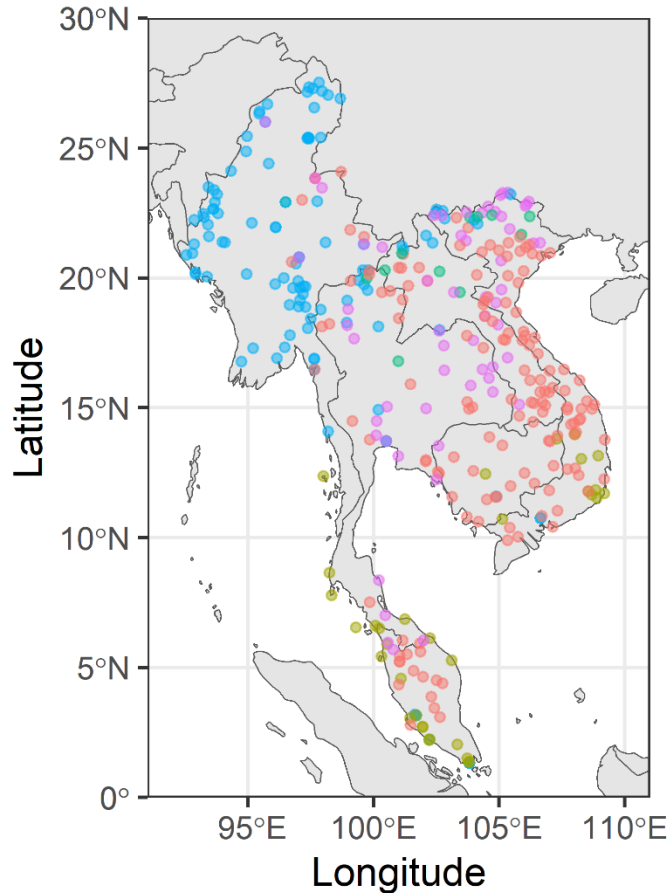
- **362 varieties**
  - Austroasiatic: 148
  - Tai-Kadai: 59
  - Sino-Tibetan: 110
  - Austronesian: 33
  - Hmong-Mien: 12

- **Inclusion criteria**
  - Spoken in a Mainland ASEAN country
  - Availability of reliable description of tones
  - Several dialects are represented if...
    - the tone systems differ
    - varieties are spoken in different countries
    - the language is spoken over an extensive area

- **Info**
  - Family (and branch)
  - Geographic coordinates
  - # of contrastive tones (pitch and/or VQ)
    - *# of pitch units*
    - *# of voice qualities*
  - Word type
    - Monosyllabic
    - **Sesquisyllabic**
    - Polysyllabic
 - And more...

Number of tones
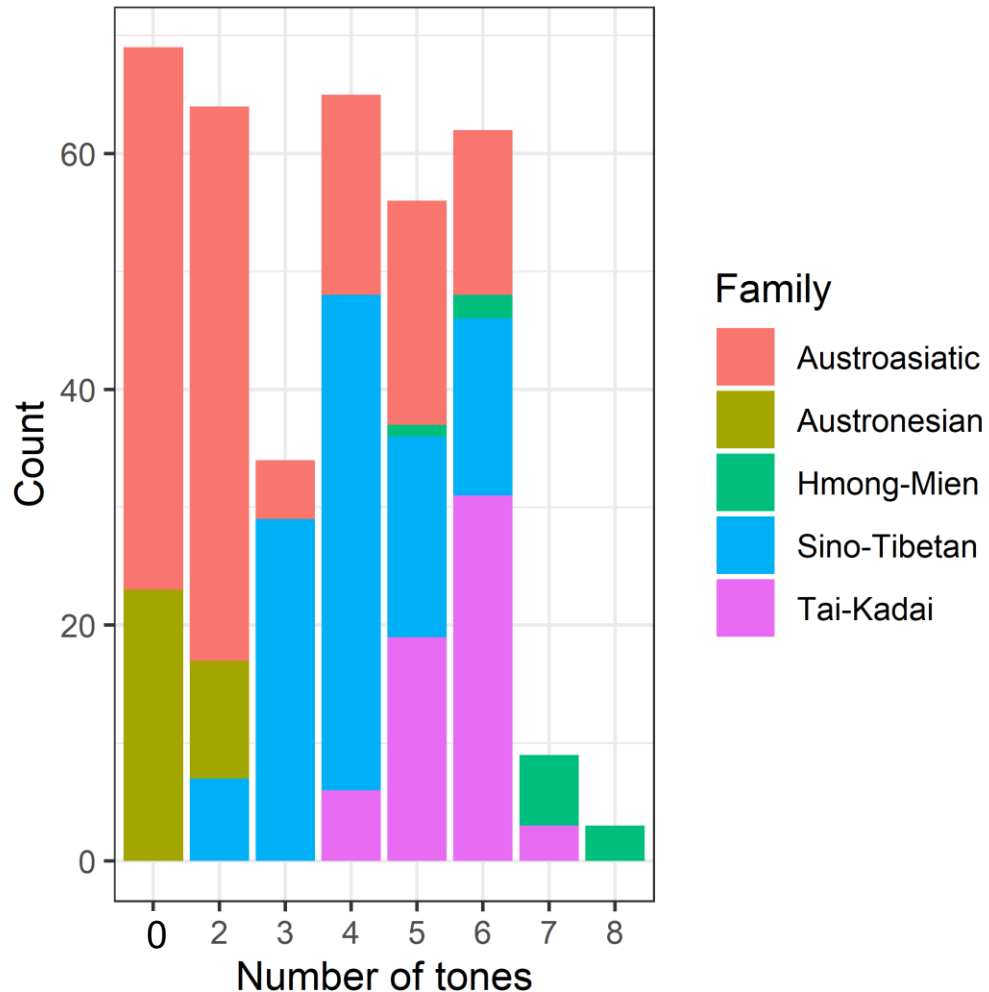
- **Austronesian**: atonal or 2 registers

- **Austroasiatic**: mostly atonal or few tones, but some very tonal languages

- **Sino-Tibetan** : tonal but with variable inventories (2 to 6 tones)

- **Tai-Kadai**: tonal, with sizeable inventories (4 to 7 tones)

- **Hmong-Mien**: very tonal (5 to 8 tones)

Families and tone types
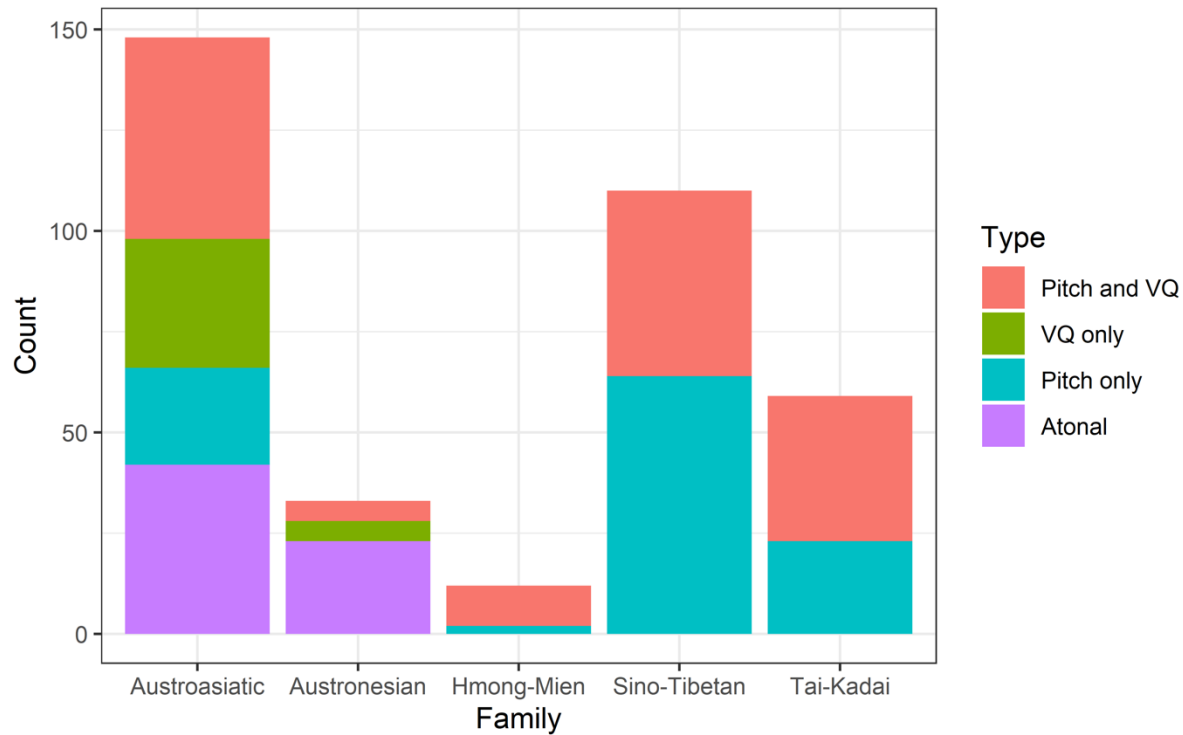
- Austroasiatic is diverse

- « VQ only » in AA and AN: register languages w. vowel and voice quality contrasts, but no clear pitch contrast

- In Hmong-Mien, Sino-Tibetan and Tai-Kadai, voice quality is a part of the tonal system more than half of the time

Word types and tone types
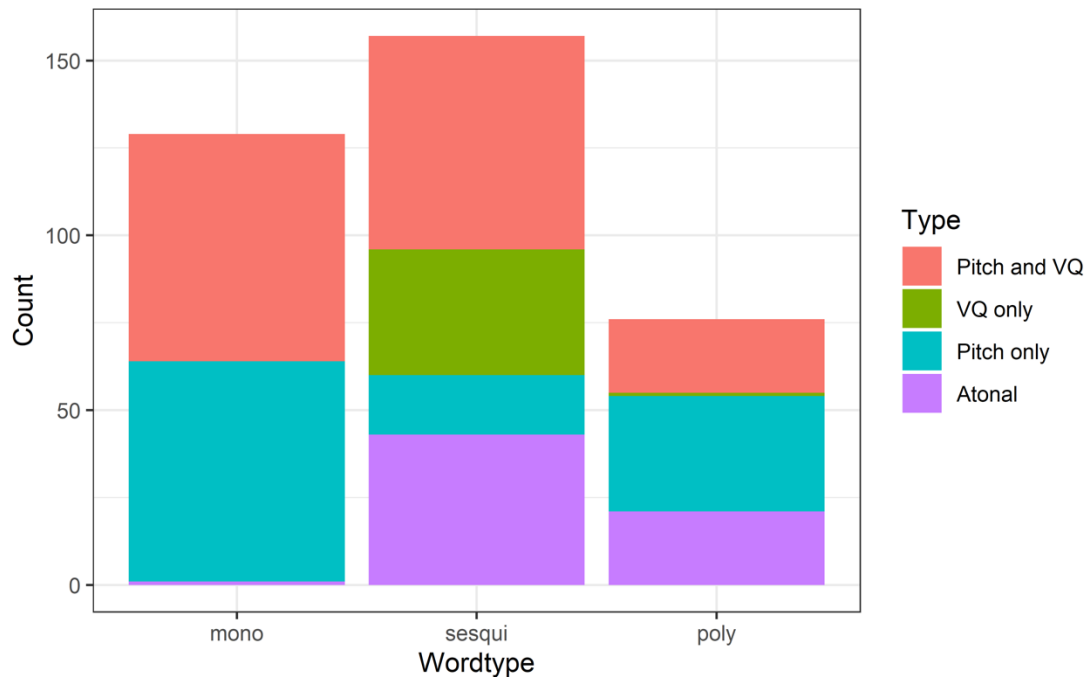
- Monosyllabic languages are almost always tonal

- Sesquisyllabic languages have some form of tone half of the time, but sometimes only voice quality based

- Polysyllabic languages
    - Either Austronesian languages without tone...
    - or tonal Sino-Tibetan languages in which monosyllables are merging into longer non-decomposable words

Q1: Is tone that prevalent in MSEA?

- Quite prevalent: some form of tone in 82% of languages

- However, tone is quite diverse in the area
  - 18.0% of languages are atonal
  - 10.2% have tone systems based on voice quality only
  - 31.2% have tone systems based on pitch only
  - 40.6% have tone systems based on both pitch and voice quality

- Monosyllabic languages are almost always tonal

Geographical distribution of tone contrasts
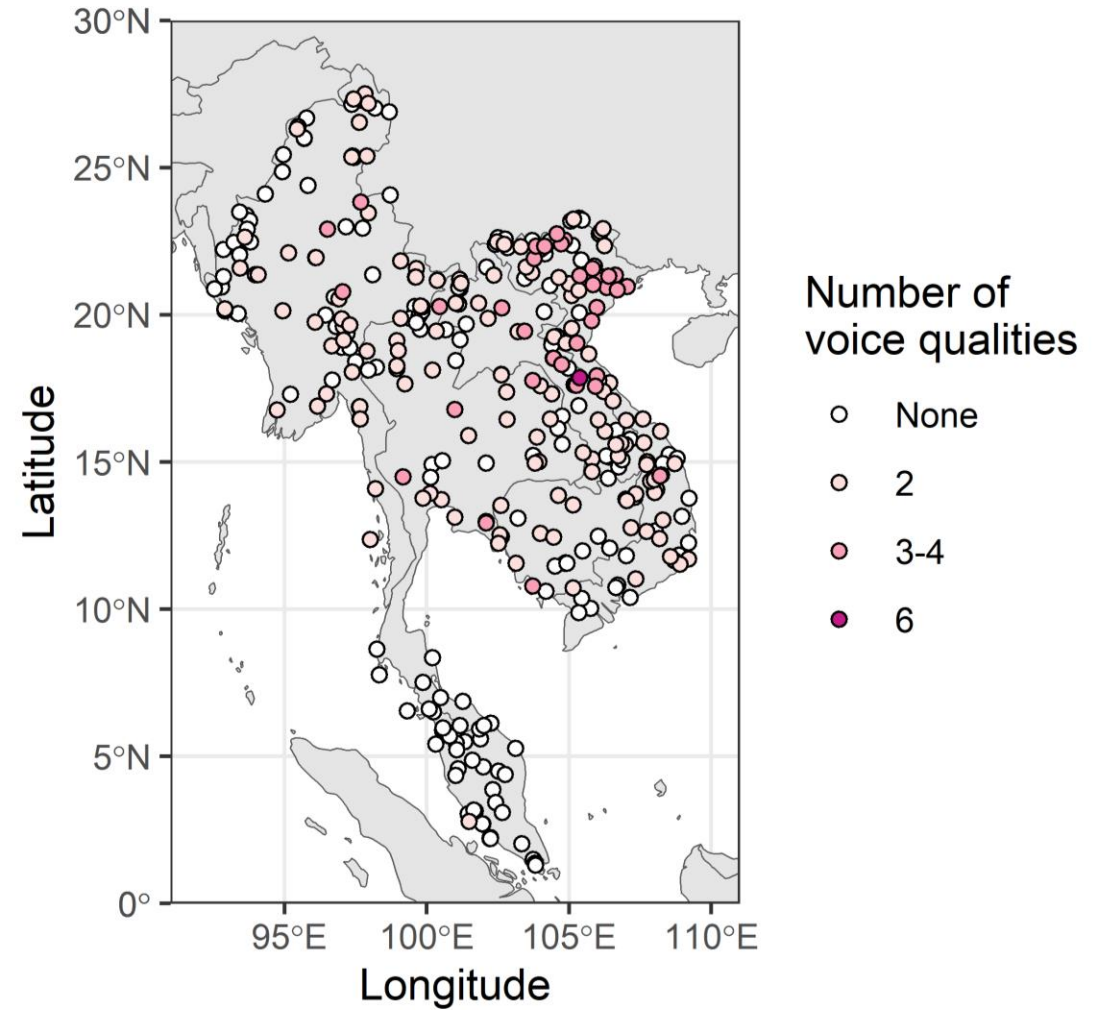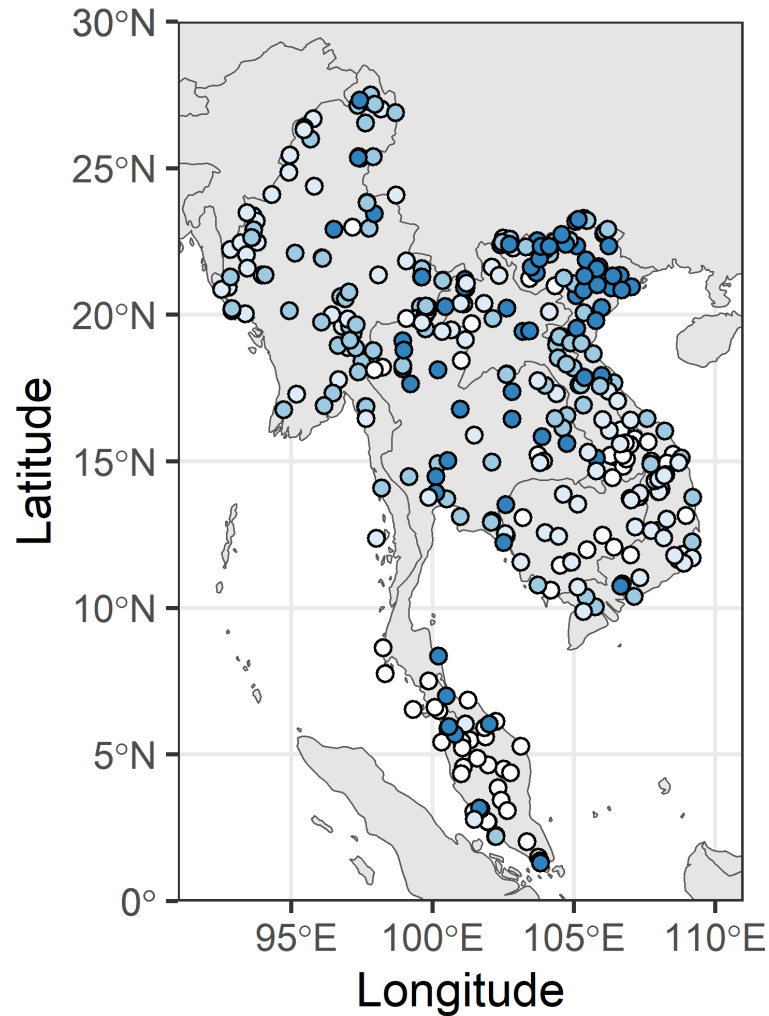
Teasing apart structure, phylogenetics and geography
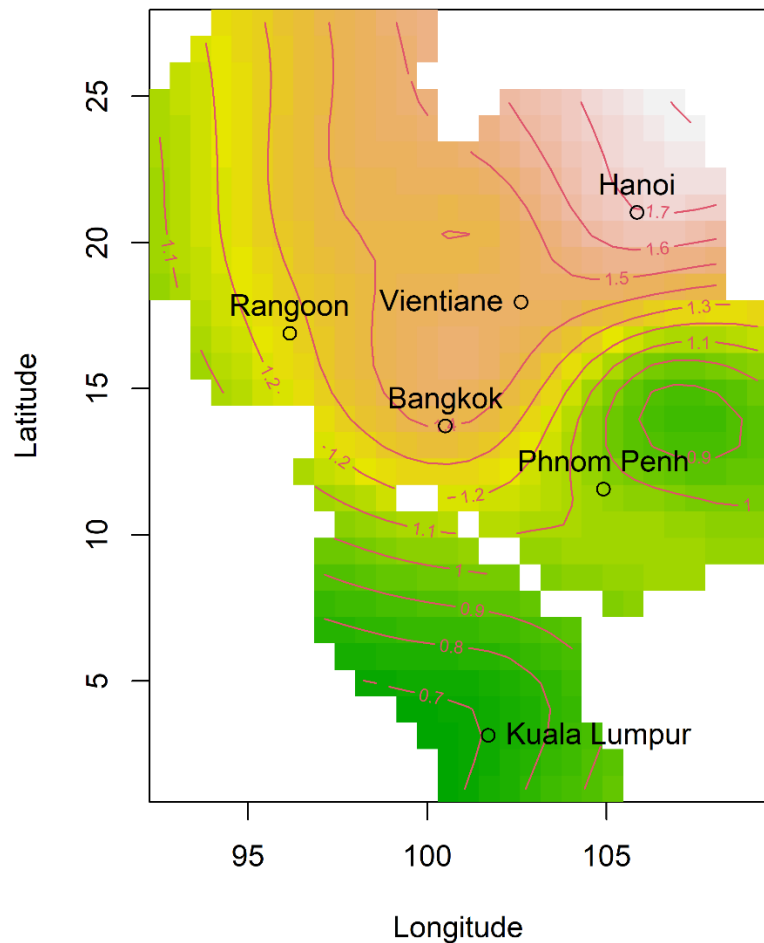
Effect of geographical smooth on
# of tones, no other independant variables

- **Generalized additive models** (Hastie and Tibshirani 1990; Wood 2000; Wieling 2012; Idiatov and van de Welde 2022)
  - Similar to a regression, but allows the use of an arbitrary function (here, non-linear geography)

- **Dependant variable: # tones**
  - Poisson distribution
  - With a link function

- **Models build bottom up by adding interactions and random effects**
  - Model criticism with functions from mgcv and istadug packages

- **No interaction between Family and Wordtype**
  - Too many gaps in distribution (eg., no polysyllabic Hmong-Mien language)

Number of tones

Best model: #tones ~ Family + Wordtype + s(Longitude, Latitude) + s(Longitude, Latitude, by = Family)

```
Parametric coefficients:
                   Estimate Std. Error z value Pr(>|z|)
(Intercept)         0.81364    0.07224  11.264  < 2e-16 ***
FamilyAustronesian -0.04593    0.48674  -0.094   0.9248
FamilyHmong-Mien    0.69477    0.32412   2.144   0.0321 *
FamilySino-Tibetan  0.45282    0.11403   3.971 7.15e-05 ***
FamilyTai-Kadai     0.49981    0.11922   4.192 2.76e-05 ***
Wordtypemono        0.41904    0.08941   4.687 2.77e-06 ***
Wordtypepoly        0.13547    0.10655   1.271   0.2036
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
                                            edf   Ref.df Chi.sq p-value
s(Longitude,Latitude)                  2.000e+00 2.00e+00  0.053   0.974
s(Longitude,Latitude):FamilyAustroasiatic 2.000e+00 2.00e+00  1.541   0.463
s(Longitude,Latitude):FamilyAustronesian 2.000e+00 2.00e+00  0.672   0.715
s(Longitude,Latitude):FamilyHmong-Mien  4.255e-06 8.51e-06  0.000   0.500
s(Longitude,Latitude):FamilySino-Tibetan 2.000e+00 2.00e+00  0.199   0.905
s(Longitude,Latitude):FamilyTai-Kadai   2.000e+00 2.00e+00  0.148   0.929

Rank: 179/181
R-sq.(adj) =  0.687   Deviance explained = 69.3%
-ML = 602.92   Scale est. = 1          n = 362
```
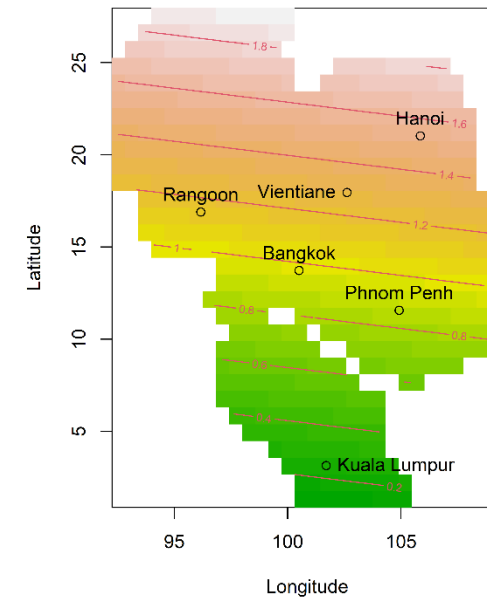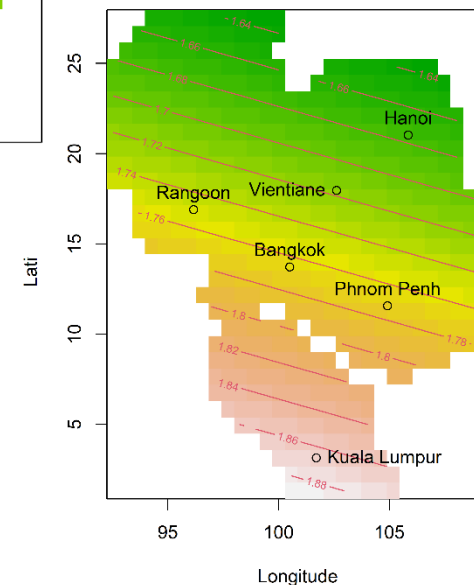
Predicted values without geography

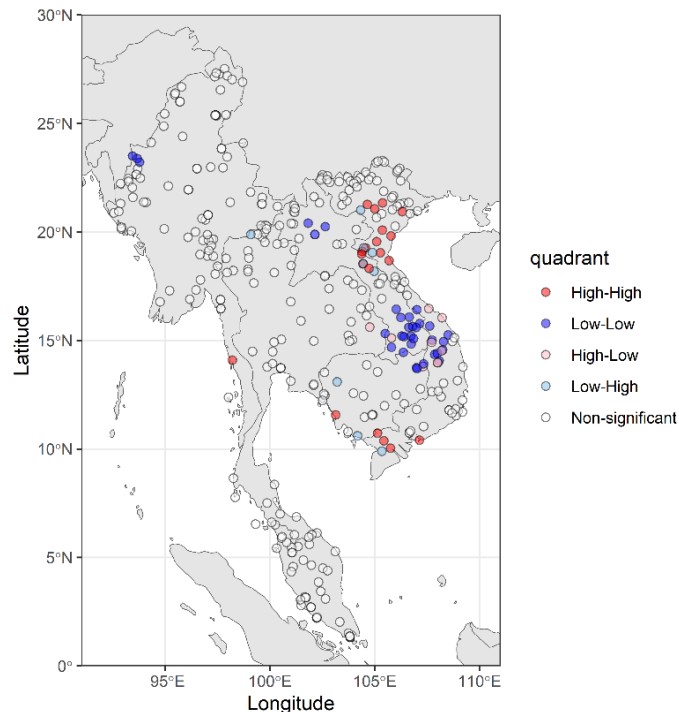|	Mono*	Sesqui*	Poly
AA*	3.4	**2.3**	2.6
AN	3.3	2.2	2.5
HM*	6.9	4.5	
ST*	5.4	3.5	3.8
TK*	5.7	3.7	

Sino-Tibetan mono

Tai-Kadai mono

Residual effects (Moran I and LISA)

- By looking at the geographical correlation of residuals, we can detect **local effects** that the model does not capture

Autocorrelations of residuals for best model

Autocorrelations of residuals, after removing the effect of branch
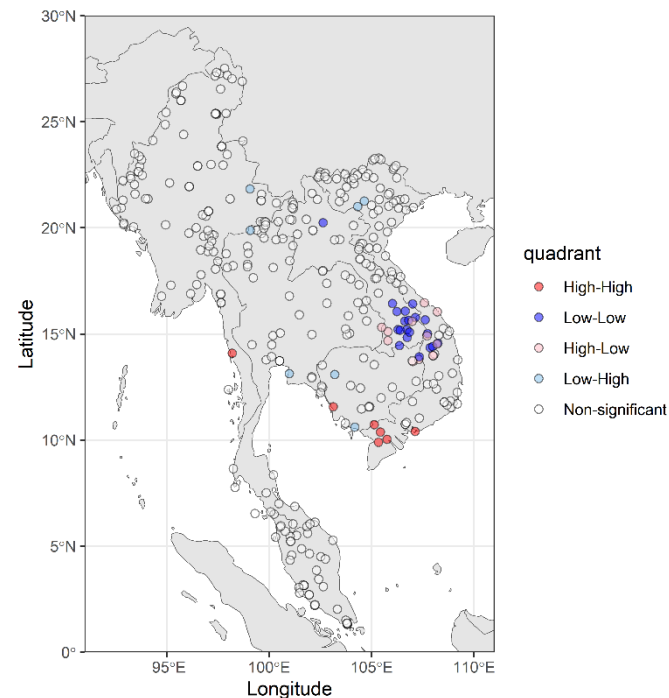
Annamite range: West Bahnaric, North Bahnaric and Katuic languages that are less tonal than their sisters

Mekong Delta: Khmer and Vietic dialects that are more tonal than their sisters

A less granular model: tonality

- Perhaps what is being borrowed is contrastive pitch
  - Eastern Cham makes more use of pitch in its register contrast than other Cham dialects, possibly because its speakers are fluent in tonal Vietnamese (Brunelle 2009)

- Let's test this idea
  - Generalized logistic additive model (logit function)
  - How do Family, Wordshape and Geography affect the probabilty of being tonal?

Tonality = any form of pitch that is not redundant with VQ
Best model: Tonality ~ Family + Wordtype + s(Latitude, Longitude)

```
Parametric coefficients:
                   Estimate Std. Error z value Pr(>|z|)
(Intercept)        -1.655e+00  4.199e-01  -3.941 8.10e-05 ***
FamilyAustronesian -2.759e+01  1.484e+05   0.000  0.99985
FamilyHmong-Mien    2.594e+01  2.264e+05   0.000  0.99991
FamilySino-Tibetan  5.964e+00  1.865e+00   3.198  0.00138 **
FamilyTai-Kadai     2.487e+01  1.120e+05   0.000  0.99982
Wordtypemono        5.251e+00  1.233e+00   4.258 2.06e-05 ***
Wordtypepoly        1.973e+00  1.333e+00   1.480  0.13879
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


Approximate significance of smooth terms:
                      edf Ref.df Chi.sq p-value
s(Latitude,Longitude) 8.661  11.8  24.97  0.0116 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


R-sq.(adj) =  0.825   Deviance explained = 80.3%
UBRE = -0.65727  Scale est. = 1         n = 362
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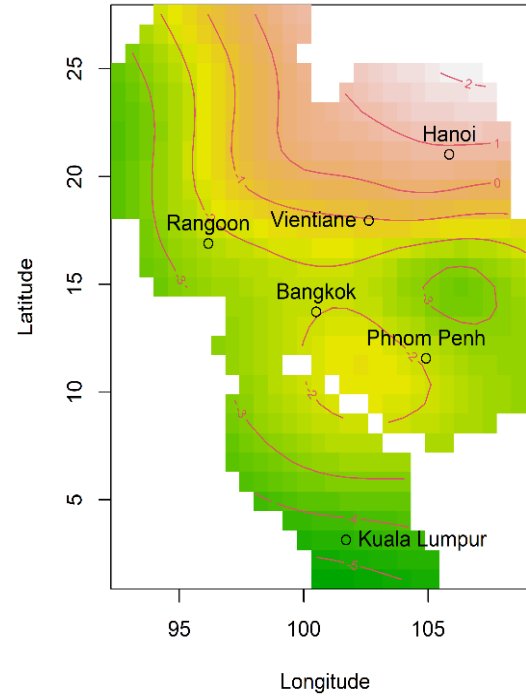
Geographical smooth

LISA

Predicted Values without geography

	Mono*	Sesqui*	Poly
AA*	0.97	**0.16**	0.58
AN	<0.01	< 0.01	< 0.01
HM	1	1	
ST*	1	0.99	1
TK	1	1	
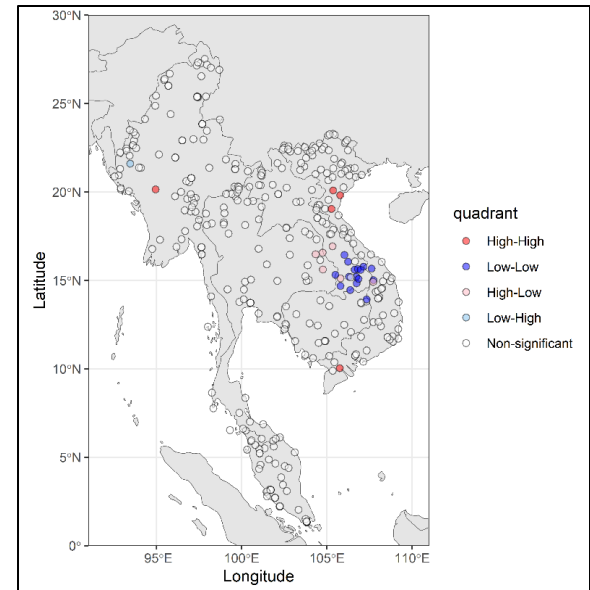
Q2: What are the predictors of #tones and tonality?

- Phyla
  - Some families are more tonal than others

- Word type
  - Monosyllabicity is strongly correlated with tonality
    - Matisoff (1973)'s observation seems confirmed
    - Syllabe loss could result in more complex laryngeal contrasts in remaining syllables (Ferlus 1999)

Q3: Geography and contact

- **No global effect** of geography on the *number of tones* (or pitch/VQ)

- **Local effects**: Geographically concentrated residuals could reveal areas where intensive contact biased internal developments

- **Weak global effect** of geography on **tonality** *(i.e., contrastive pitch)*

How could « contrastive pitch » spread?

Giao Châu (in green) in 264 AD
https://nguoikesu.com/dia-danh/bo-giao-chi

- Did Vietnamese develop 6 tones because of contact with Chinese?

  - Register likely reconstructible to Proto-Vietic (Gregerson & Thomas 1976, Tạ 2023)
    - Limited role of pitch

  - Mixed bilingual elite in the Red River Delta in the 1st millenium AD (Taylor 1983, Phan 2013)

    - Pitch component of Vietic register boosted in bilinguals' speech because of tonogenesis in Chinese

    - Once pitch contrastive, other laryngeal properties could have been reinterpreted as tonal

How could « contrastive pitch » NOT spread?

- ## Atonal pocket in the Annamite range

  - Katuic and Bahnaric languages: often atonal or registral with limited pitch component

  - Geographically isolated (moutainous area) and in a buffer zone between different polities

  - Limited direct contact with tonality resulting in more conservative tonal structure


Wang et al. 2025, *Nature*
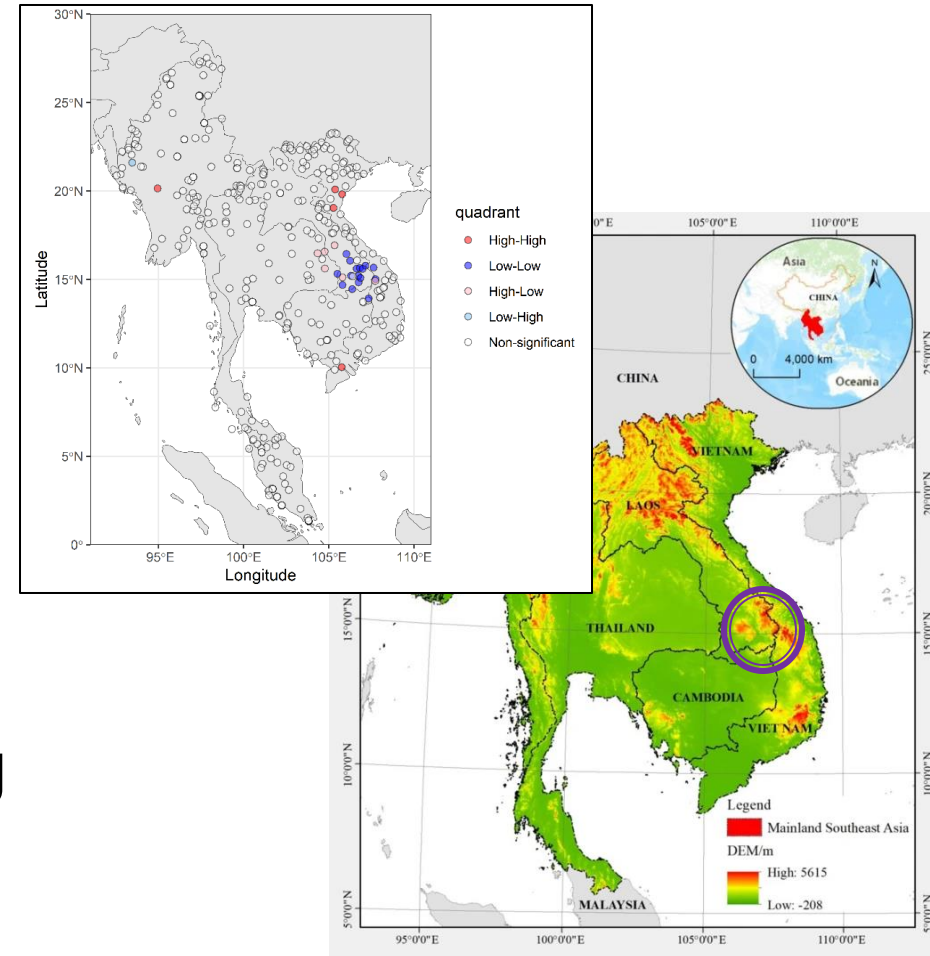
Limitations and alternative models

- Information included in the database but not modeled
  - Laryngeal contrasts and consonant clusters
  - Language status/prestige (national and regional vs. local languages)
  - Number of speakers

- Sources of noise
  - Travel time between locations (evolving over time)
  - Migration patterns
  - Intensity of contact
  - Structural changes over time

- Status and number of speakers could be factored in as part of a gravity model (as in Pfeiler and Skopeteas 2022)
  - However, decisions about the weighting of each factor need to be made
  - The outcome of the model is extremely sensitive to weights

Additional slides

Geographical distribution of pitch units

- Similar to tones

- More pitch units in the north

- Largely due to a lower number of pitch contrasts in Austroasiatic and Austronesian

- Tai-Kadai and Hmong-Mien have the largest number of pitch contrasts
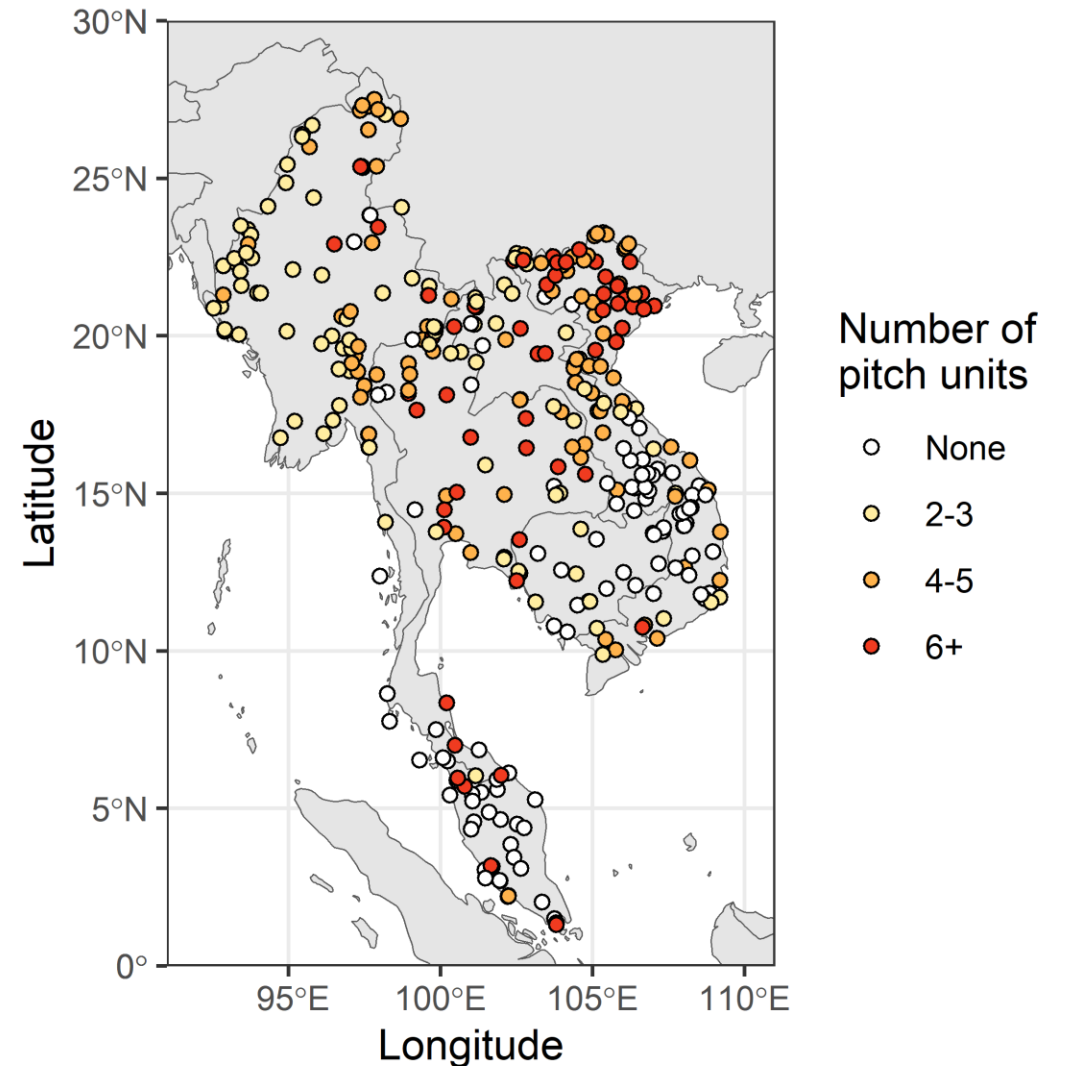
Could register propagate in the same way?

- Chamic (Austronesian)

  - Mounting evidence that all Chamic languages (except N. Raglai?) have register (Brunelle et al. 2020; 2022; 2024; 2025)

  - Modern Chamic speakers are the offshoots of Austronesian-speaking men and Austroasiatic-speaking women (Y chromosomes and mitochondrial DNA - Peng et al.2010, Dong et al. 2012)

  - Influx of Austroasiatic L2 speakers who reinterpreted Austronesian voicing as register, as it is the closest thing they had to voicing.