



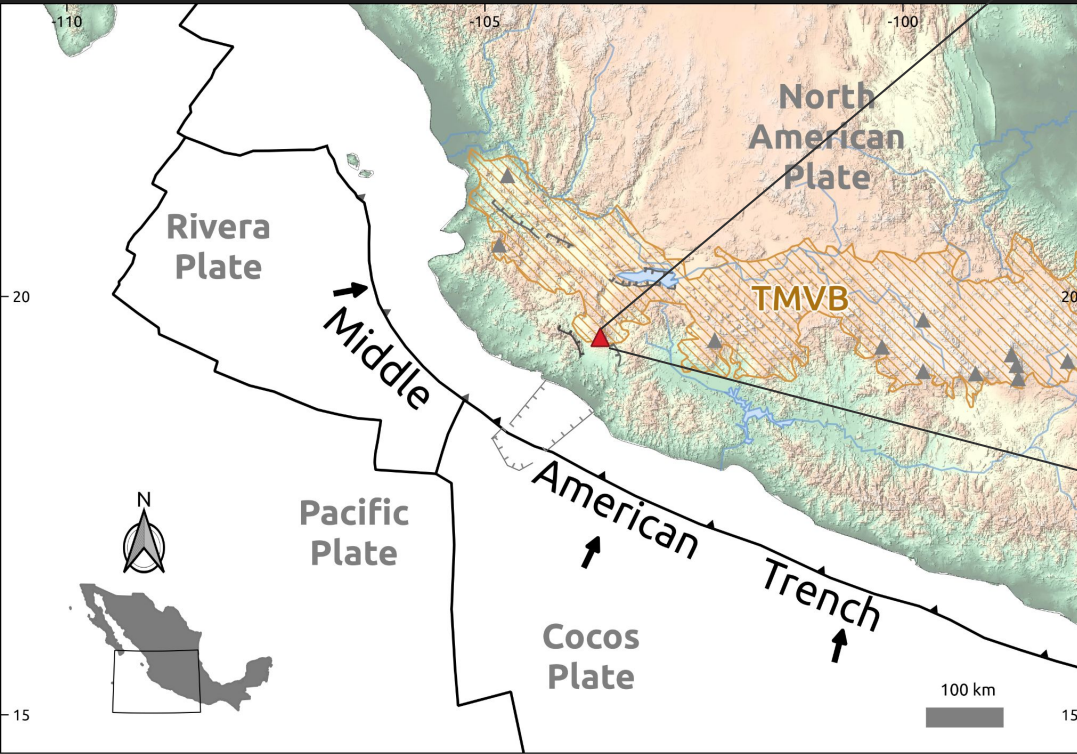
The shallow crustal structure of Volcàn de Colima:

Evidence from ambient noise surface wave tomography

Raphael De Plaen

Aurélien Mordret, Raul Arámbula-Mendoza, Dulce Vargas-Bracamontes, Víctor Hugo Márquez-Ramírez, and Thomas Lecocq

Colima volcanic Complex



Eruptive potential

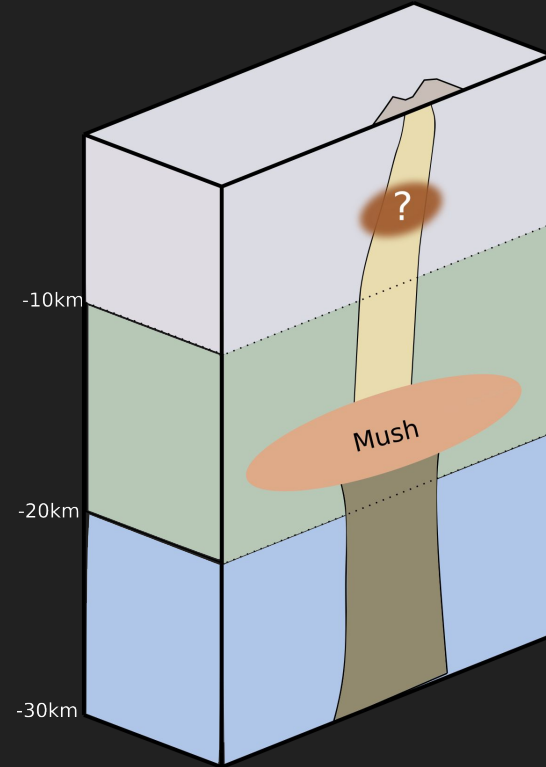
- One of the most **active** volcanoes in **North America**
- Eruptive history punctuated with **explosive Plinian** eruptions followed by long periods of **effusive** events
- 1818 CE and 1913 CE **plinian** eruptions (VEI = 4)
- Could now threaten > **300,000** inhabitants in the region
- **2005-2015** eruption generated large **pyroclastic density currents**



Reyes et al. 2015

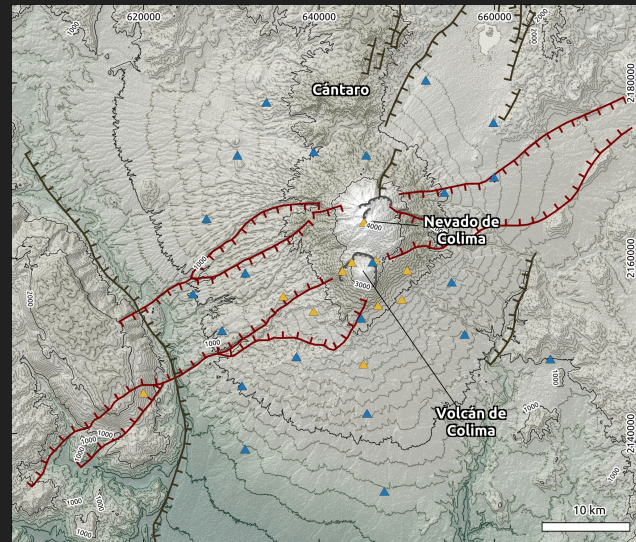
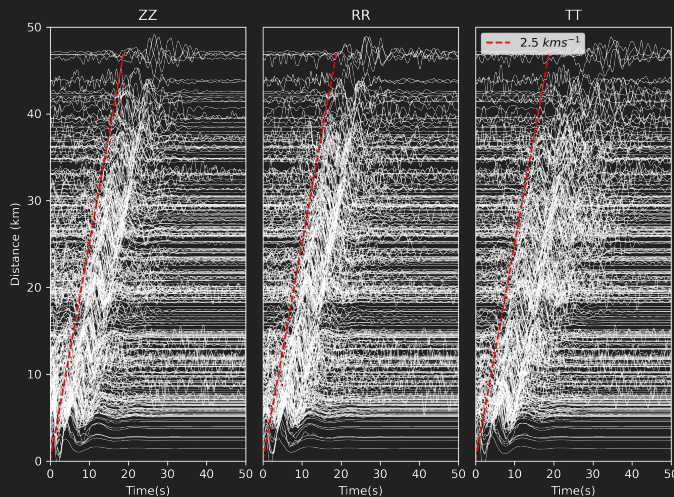
Importance of Shallow structure

- Understand how and where magmas are produced and stored at depth
- Geophysical and petrological evidence for a deep Chamber
- Suggestions of a shallow magma chamber

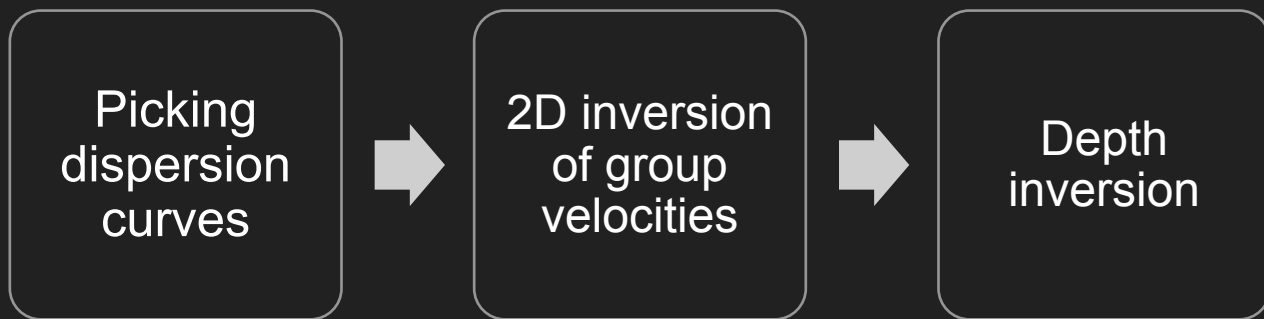


Correlation functions

- 2 distinct networks to densify the coverage
 - RESCO
 - CODEX
- Classical workflow using PWS
- Processed ZZ, RR, TT for Rayleigh and Love waves

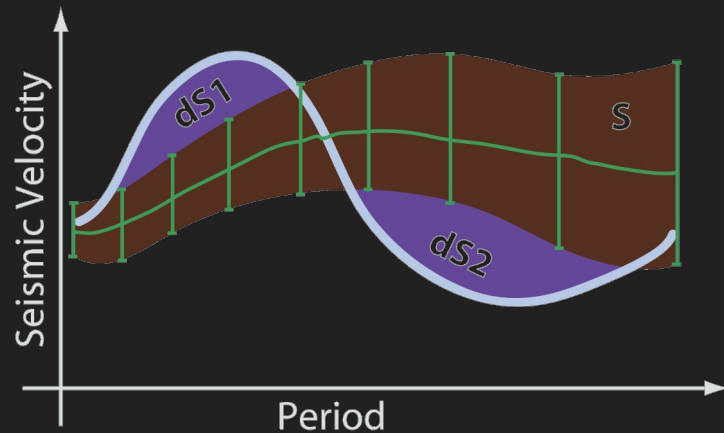
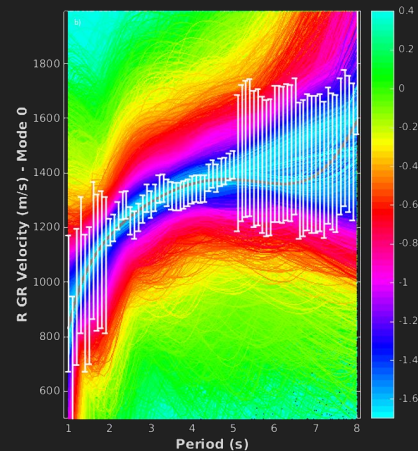
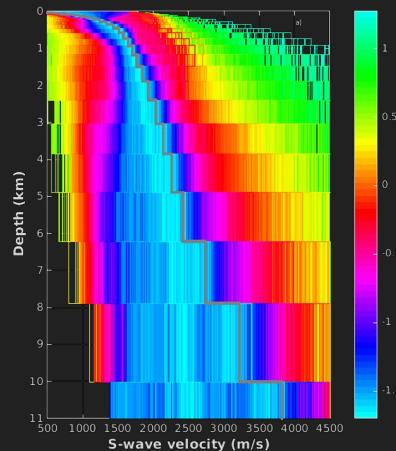


Ambient Noise Tomography



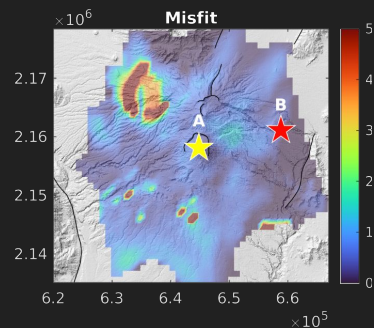
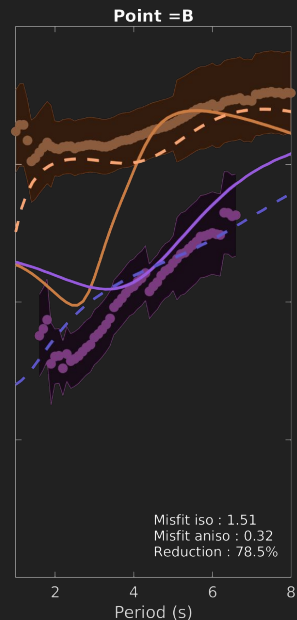
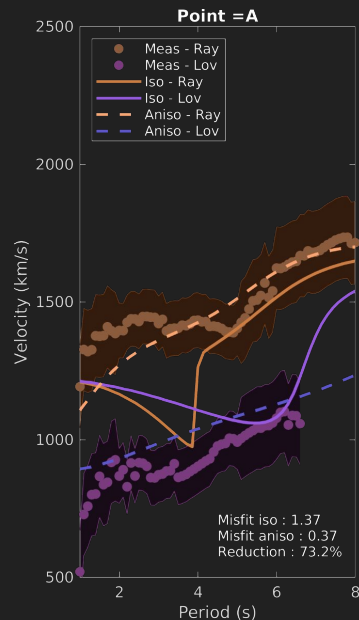
Depth inversion

- Based on the 2D Group velocity maps
- **1D** inversion for every **cell of the grid**
- Based on **Neighborhood Algorithm** by Sambridge 1999
- Try and **converge** toward the **smallest misfit**



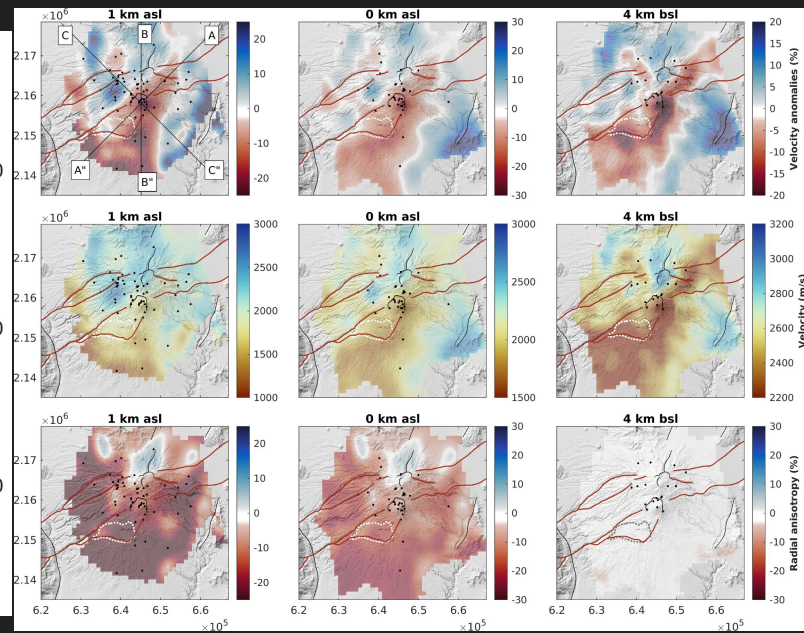
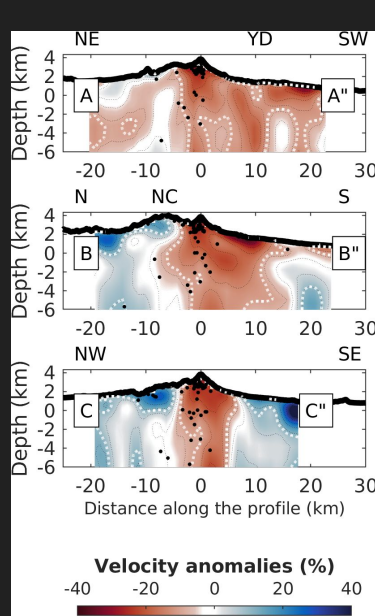
Depth inversion

- Based on the 2D Group velocity maps
- 1D inversion for every cell of the grid
- Based on Neighborhood Algorithm by Sambridge 1999
- Try and converge toward the smallest misfit
- Isotropic vs anisotropic inversion
- Anisotropic allowed for smaller misfits



Results

- **Low velocity anomaly** aligns with local structure
- **No** clear evidence for a **shallow** magma **chamber**
- Impact of soft **volcanic deposit** from past **flank collapses**
- **Negative radial anisotropy** → **Vertical structures** such as inter-fingered dikes



Conclusions and Future Perspectives

- Highest-resolution anisotropic VS model of Volcán de Colima
- Improves our understanding of volcanic structures and processes
- Better connect with
 - Regional stress field
 - Magma migration process
- Hydrothermal?

[De Plaen et al. 2022, JVGR](#)

