The definition of seismic scenarios in northern Chile:

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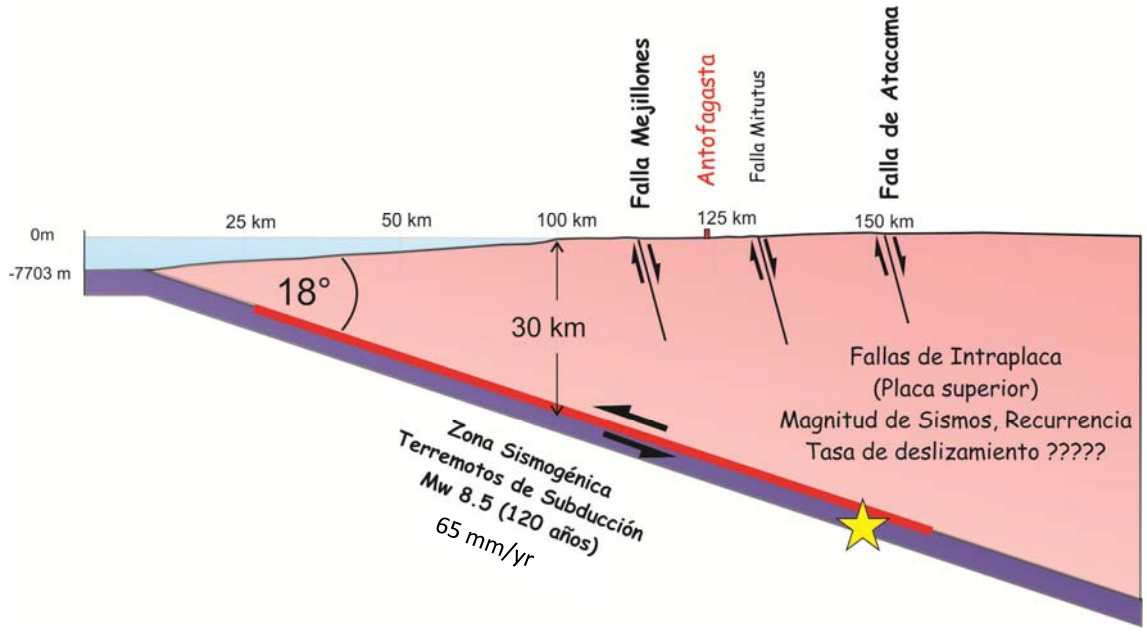
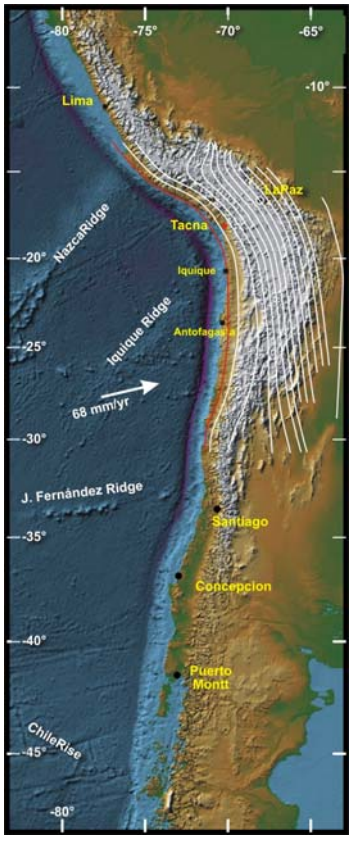
The geological approach to understand seismic energy production in the Chilean subduction margin

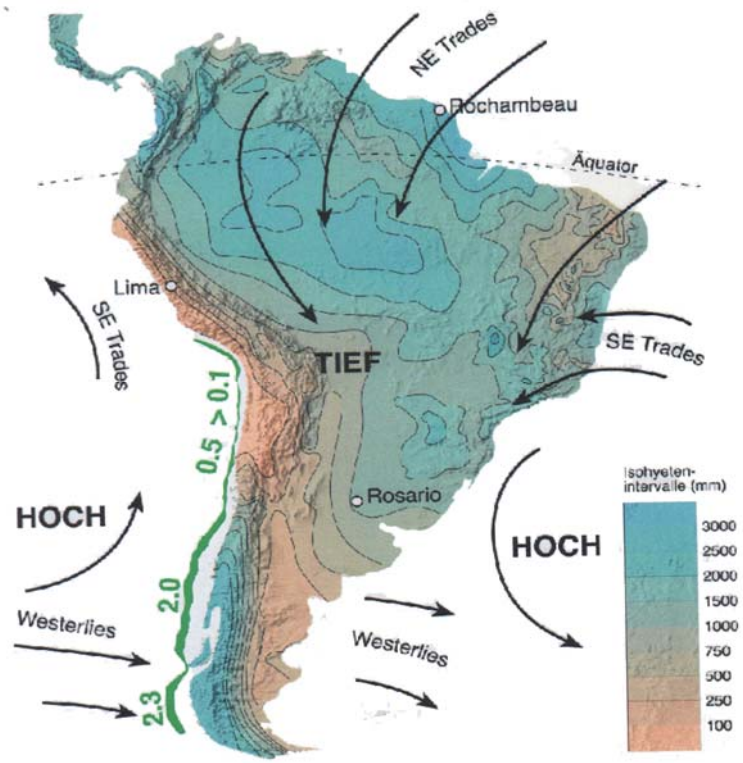


Talk outline

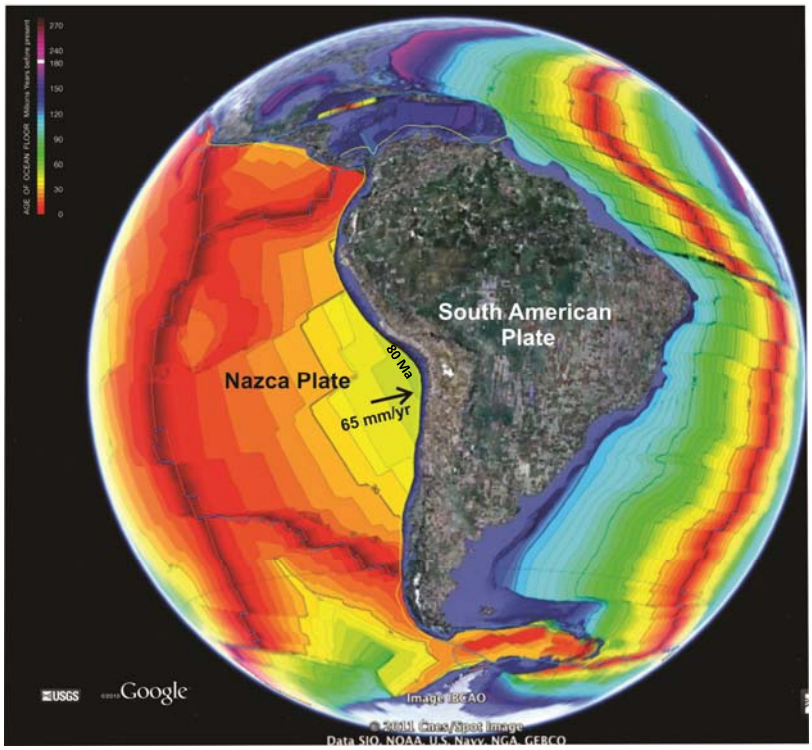
- The tectonic setting and climate scenario
- Seafloor GPS and the across view dimension of the locking zone
- The historical record of subduction earthquakes
- The instrumental record of subduction earthquakes
- The geological record of subduction earthquakes
- The geodetical image of interplate coupling and critical scenarios for tsunamis

The tectonic setting and climate scenario

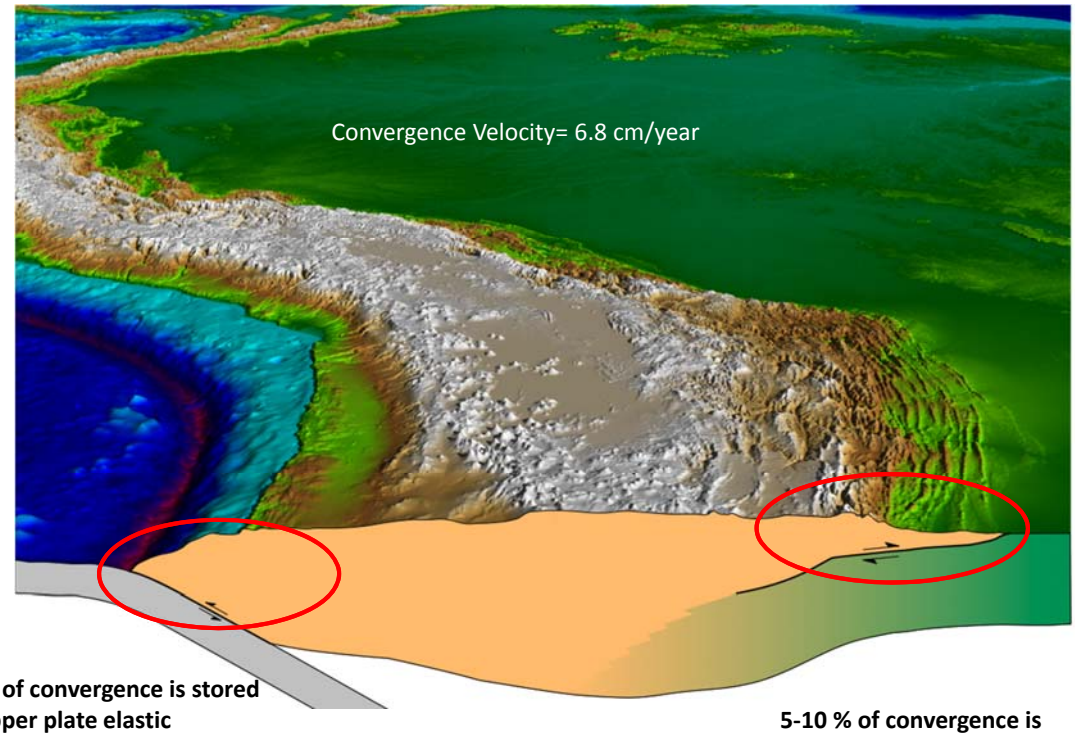




Subduction of 70 to 80 Ma old oceanic plate beneath southern Peru and northern Chile



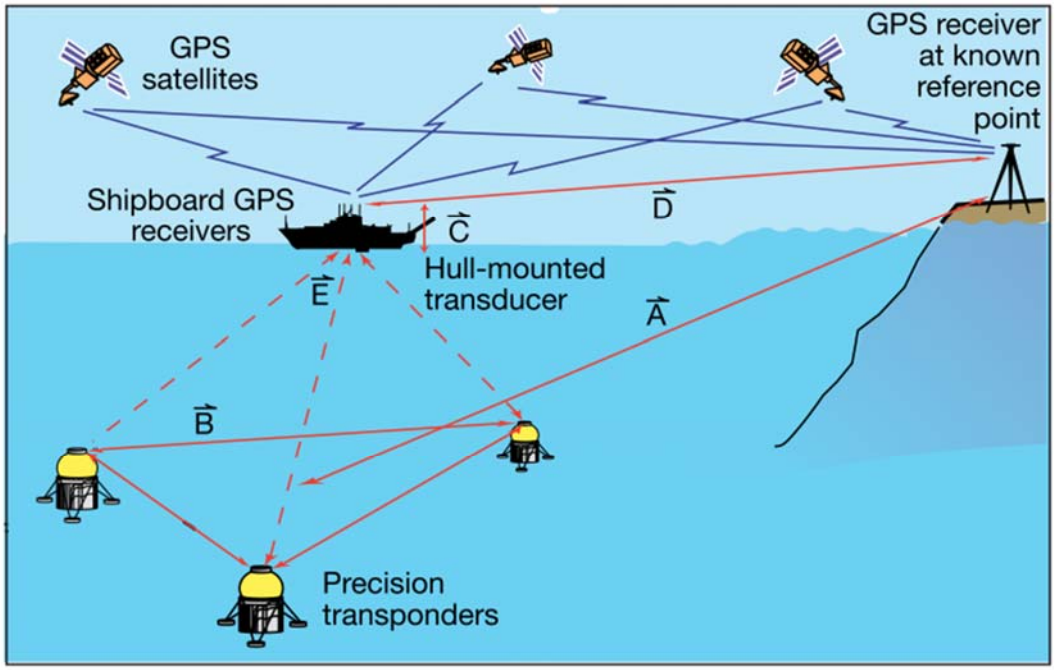
An across view of the Andean Cordillera



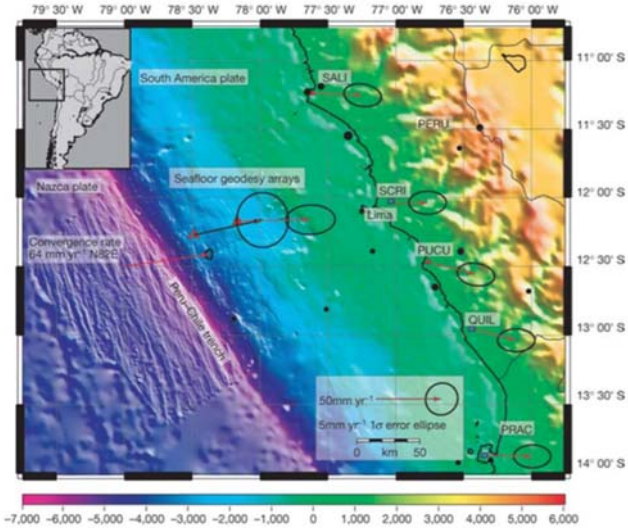
90 % of convergence is stored as upper plate elastic deformation and released during large subduction erathquake

5-10 % of convergence is accomodated as upper plate permanent deformation

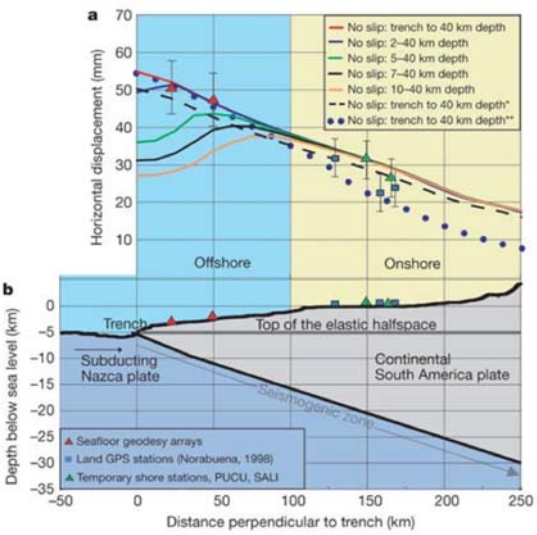
Seafloor detection of interplate coupling



Gagnon et al., (2005)

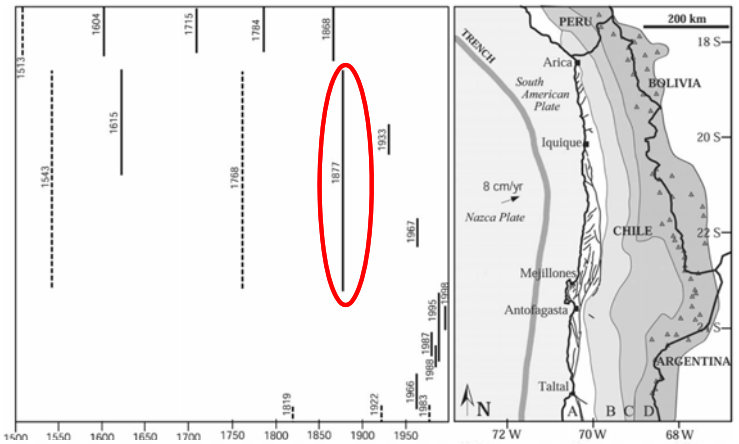


Seafloor GPS show that interplate locking extends between 2 to 40 km depth increasing the risk of tsunami processe at the margin

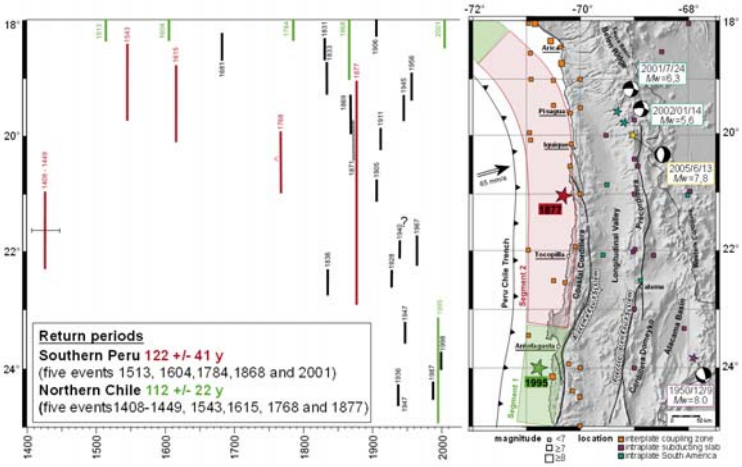


Gagnon et al., (2005)

The historical record of subduction earthquake



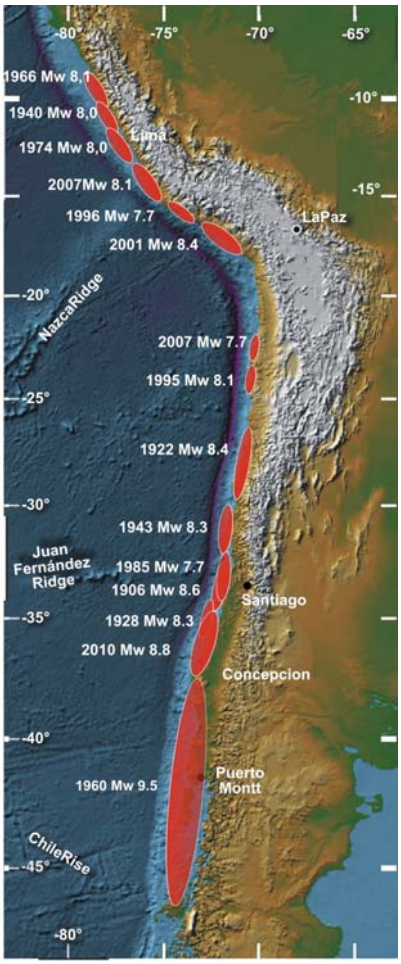
Vargas et al. (2005)

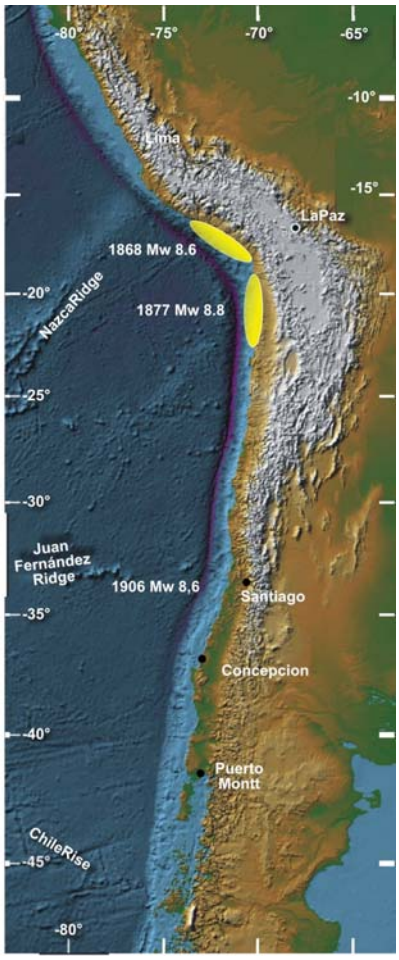


Victor et al. (2010)

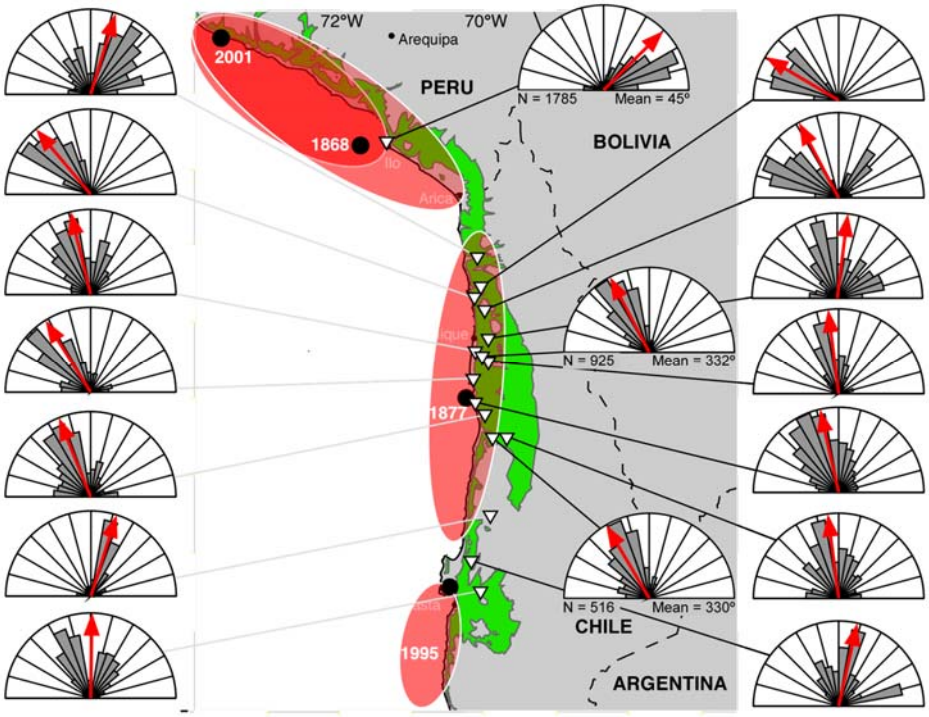
The instrumental record of subduction earthquake large than Mw 7.7 against the historical record

Northern Chile and southern Peru would represent the existence of characteristic earthquake segments.



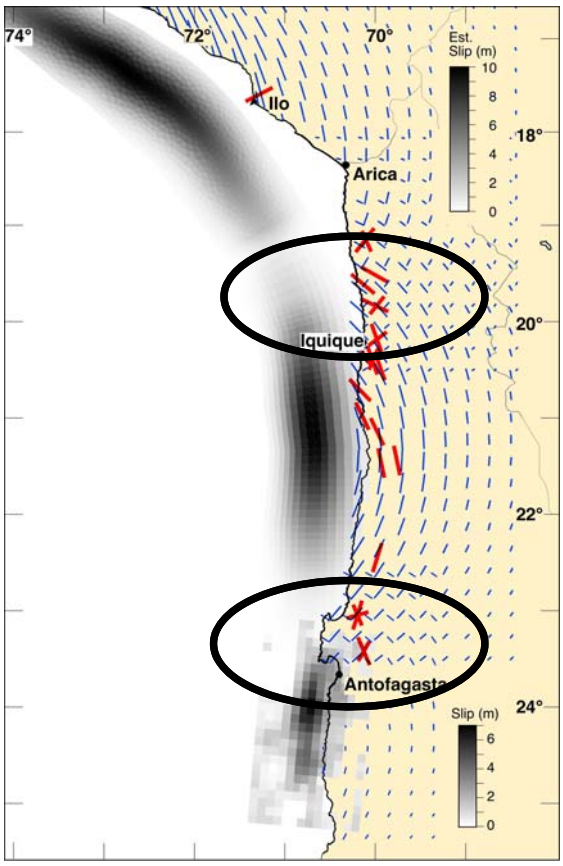


The geological record of subduction earthquakes



Loveless (2007)

Synthetic Ruptures on Arequipa and Iquique, & observed 1995 Antofagasta rupture



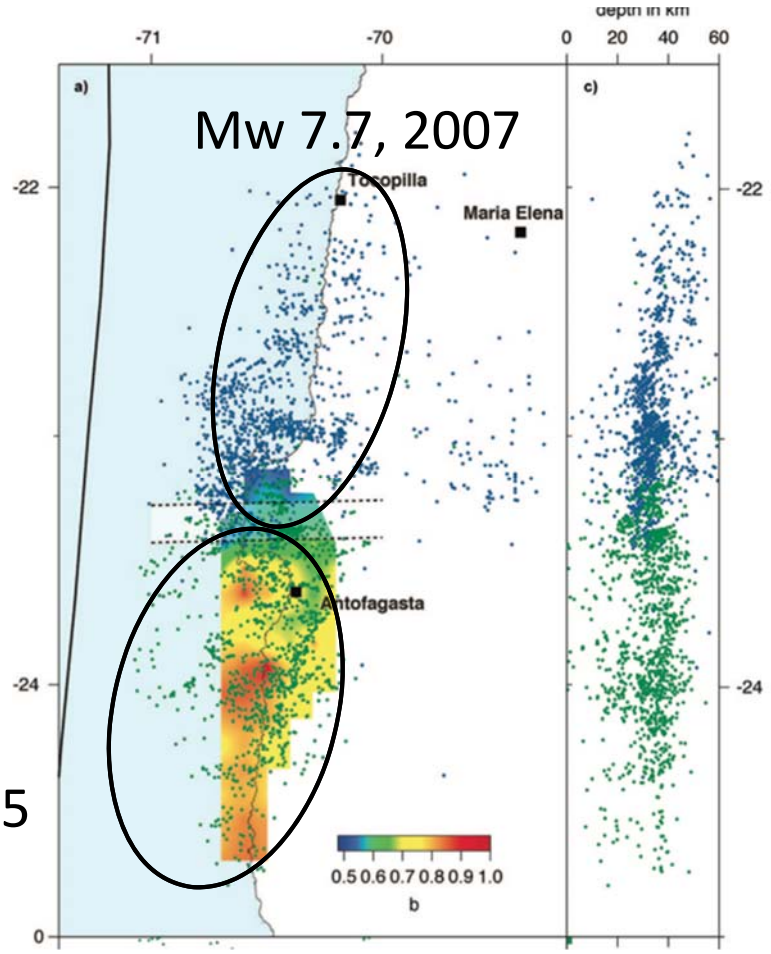
bimodal crack distribution in regions of overlap between rupture segments

obs. crack orientation

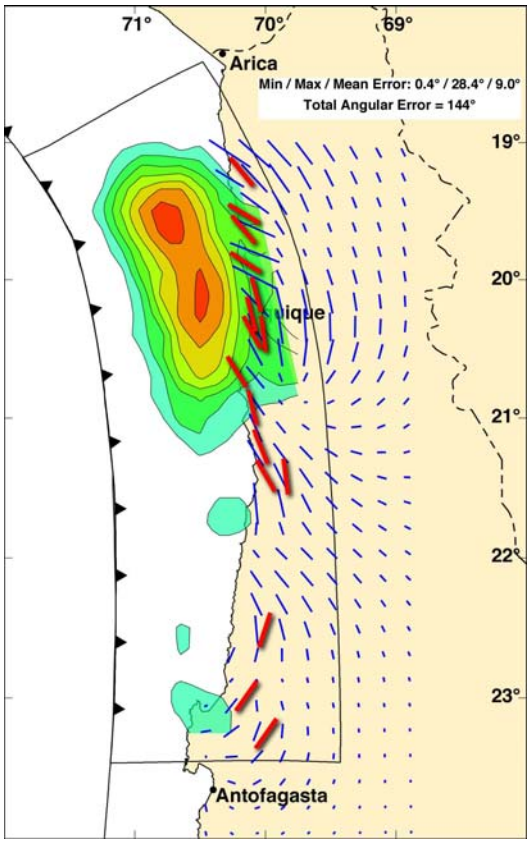
σ_1 orientation from mode slip

Loveless (2007)

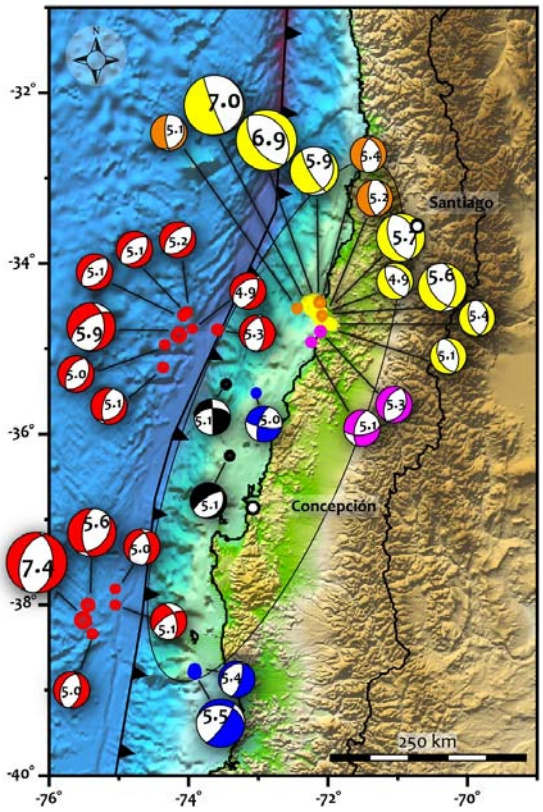
The Mejillones Peninsula as segment boundary for subduction earthquakes

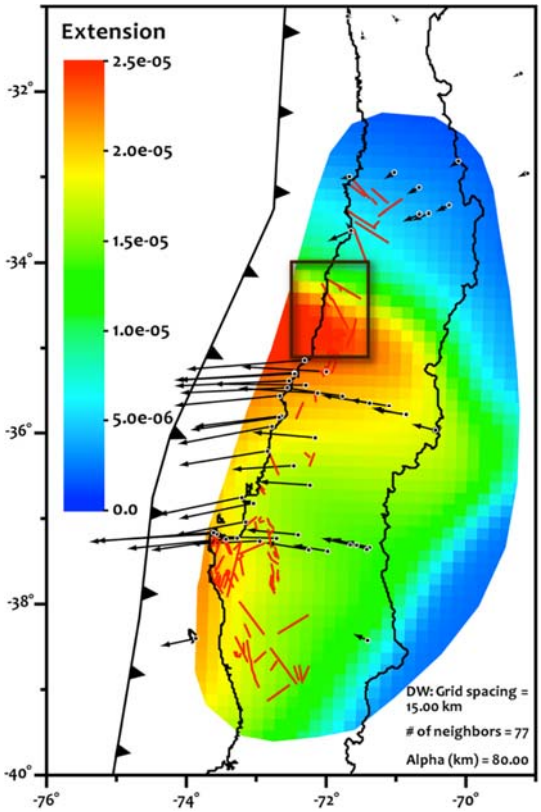


Slip Distribution Best fit to Observed Crack Populations

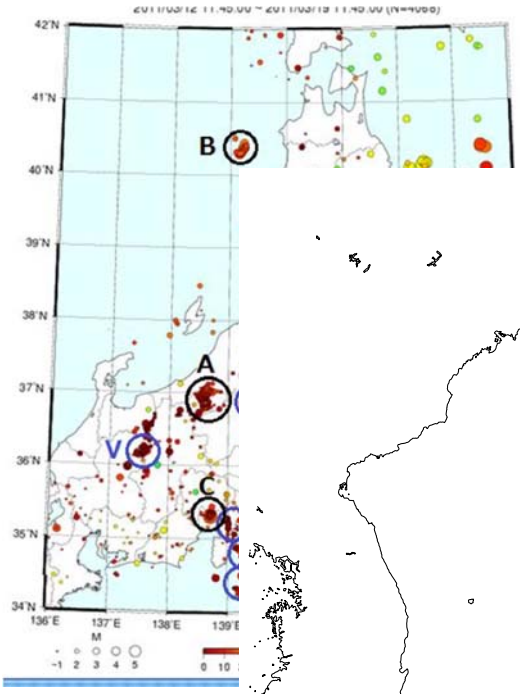


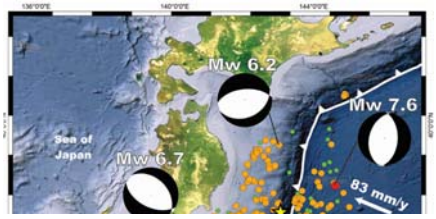
Maule earthquake and coseismic ruptures

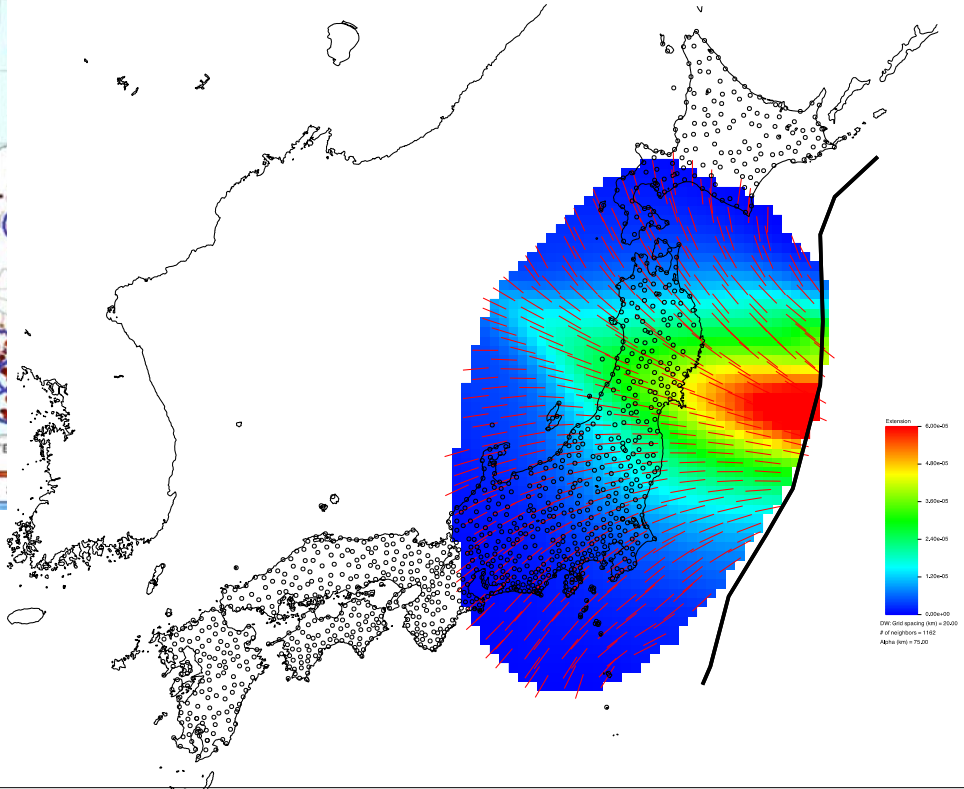




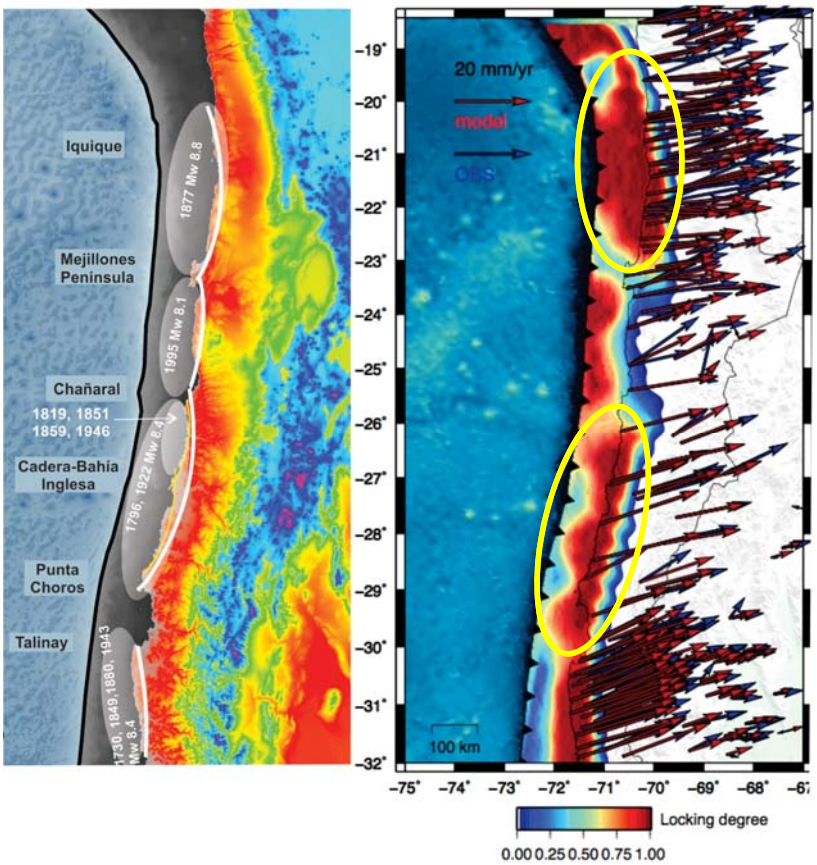
Aron et al., en prep







The geodetical image of interplate coupling and critical scenarios for tsunamis



Moreno in prep

Thank you for your attention