Simon Fraser University
Engineering Geology and Resource Geotechnics
Research Group

CENTRE FOR NATURAL HAZARD RESEARCH

CRESCENT
CASCADIA REGION EARTHQUAKE SCIENCE CENTER

INSIGHTS OF GROUND FAILURES FROM RECENT CHILEAN EARTHQUAKES

Sergio A. Sepúlveda
Department of Earth Sciences, Simon Fraser University

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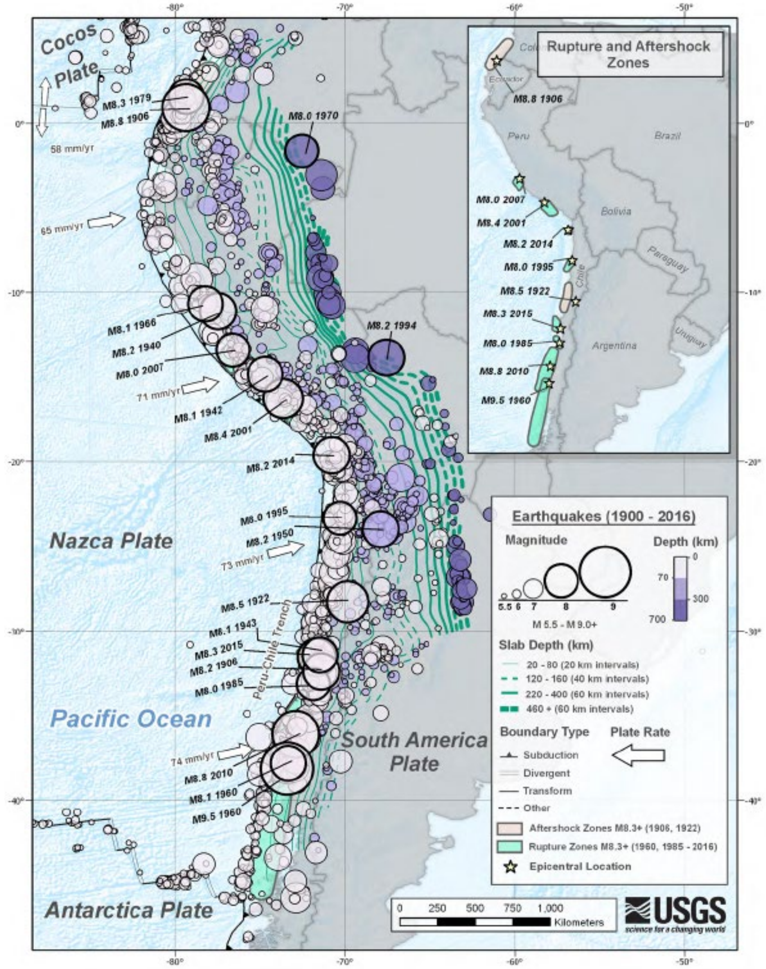
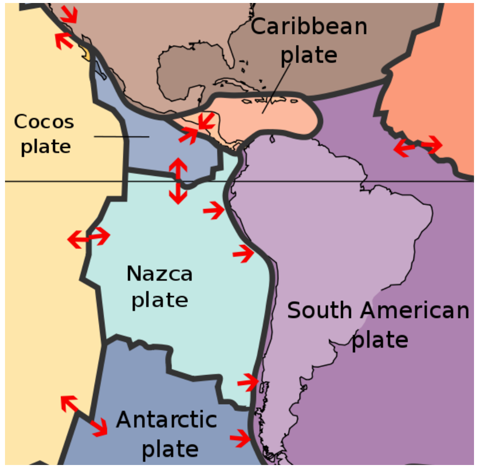
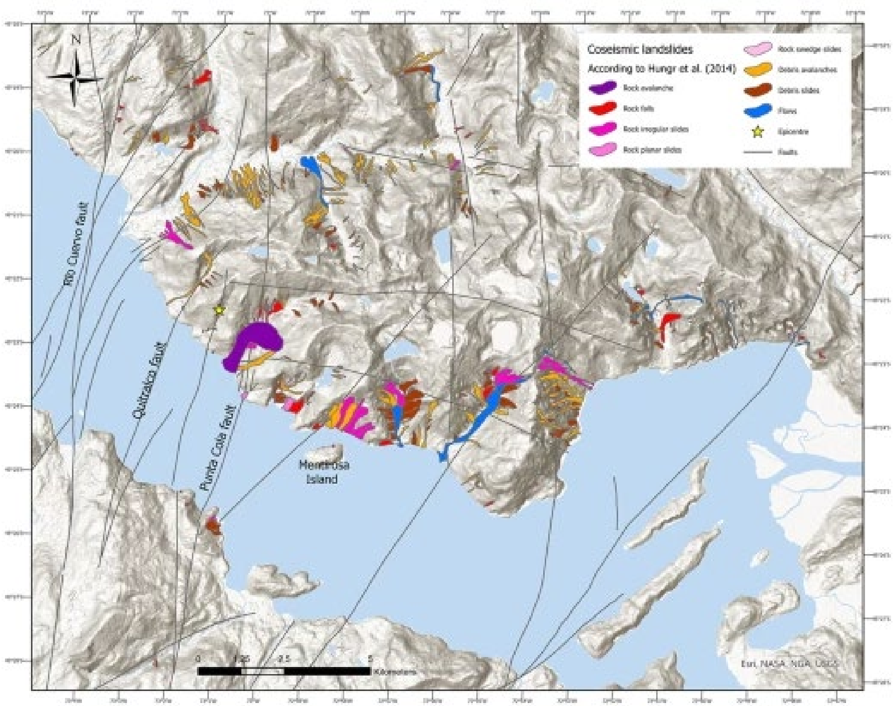
Chile

- Recent examples, for different earthquake source mechanisms
- Convergent boundary
- Nazca plate subduction, about 7 cm/year, underneath South American Plate



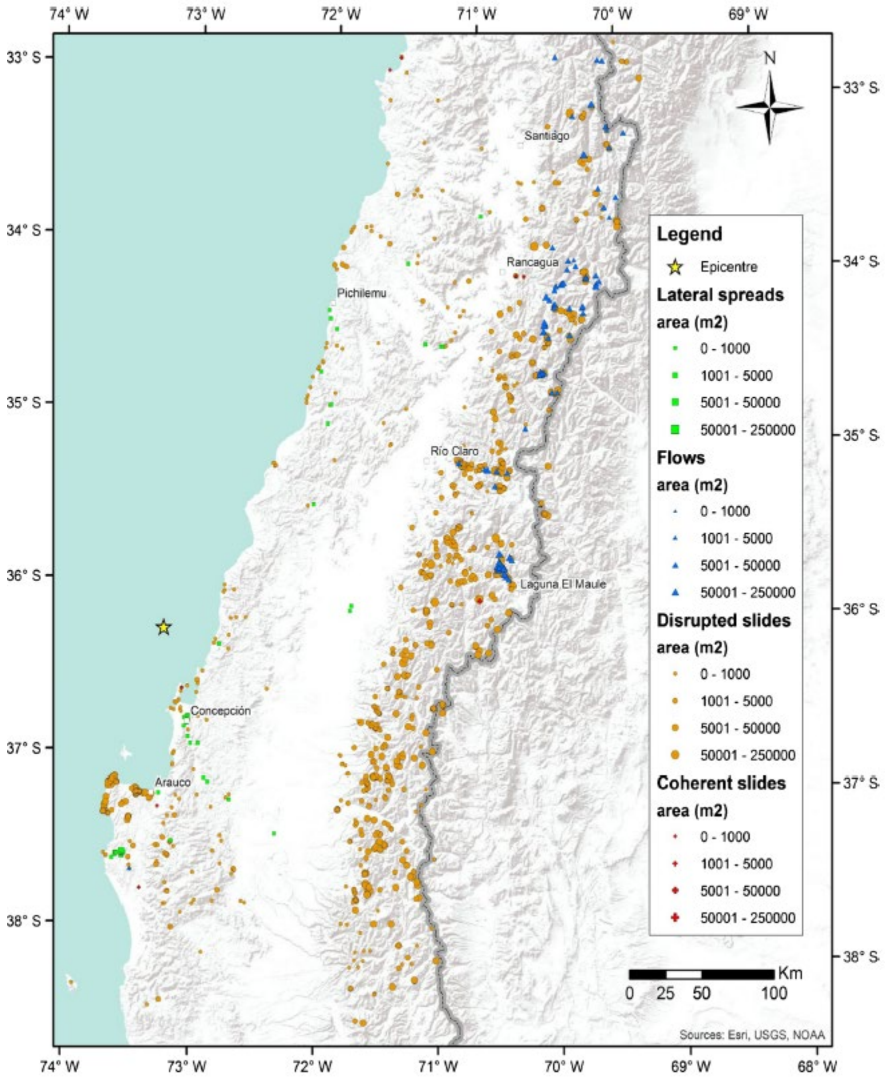


Mw 6.2 Aysen Fjord earthquake 2007 (shallow crustal)

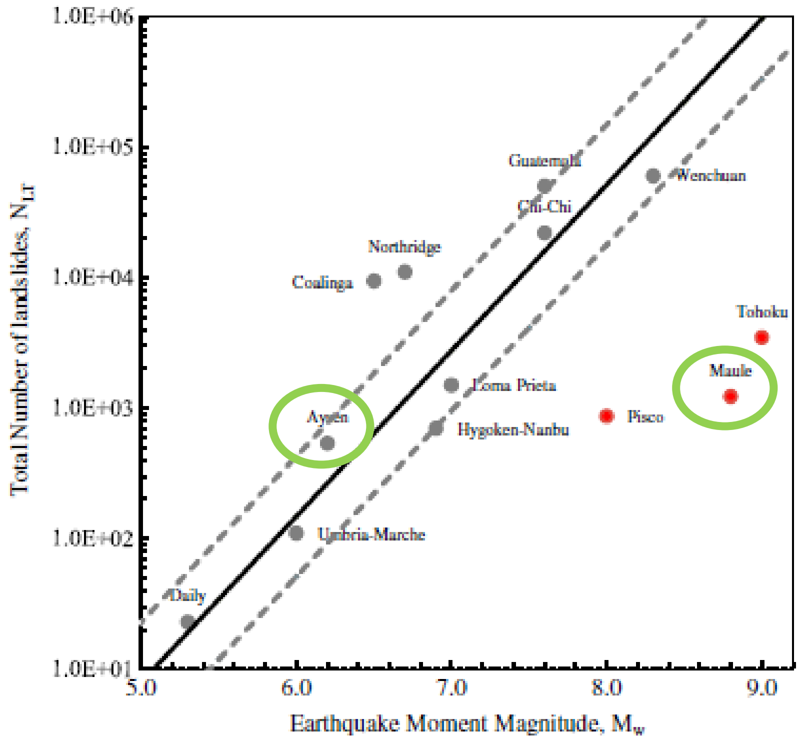


Sepúlveda et al., Landslides 2010; Serey et al., BOEG 2025

2010 Mw 8.8 Maule Earthquake (subduction)

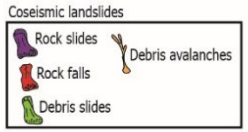


Serey et al., Landslides, 2019

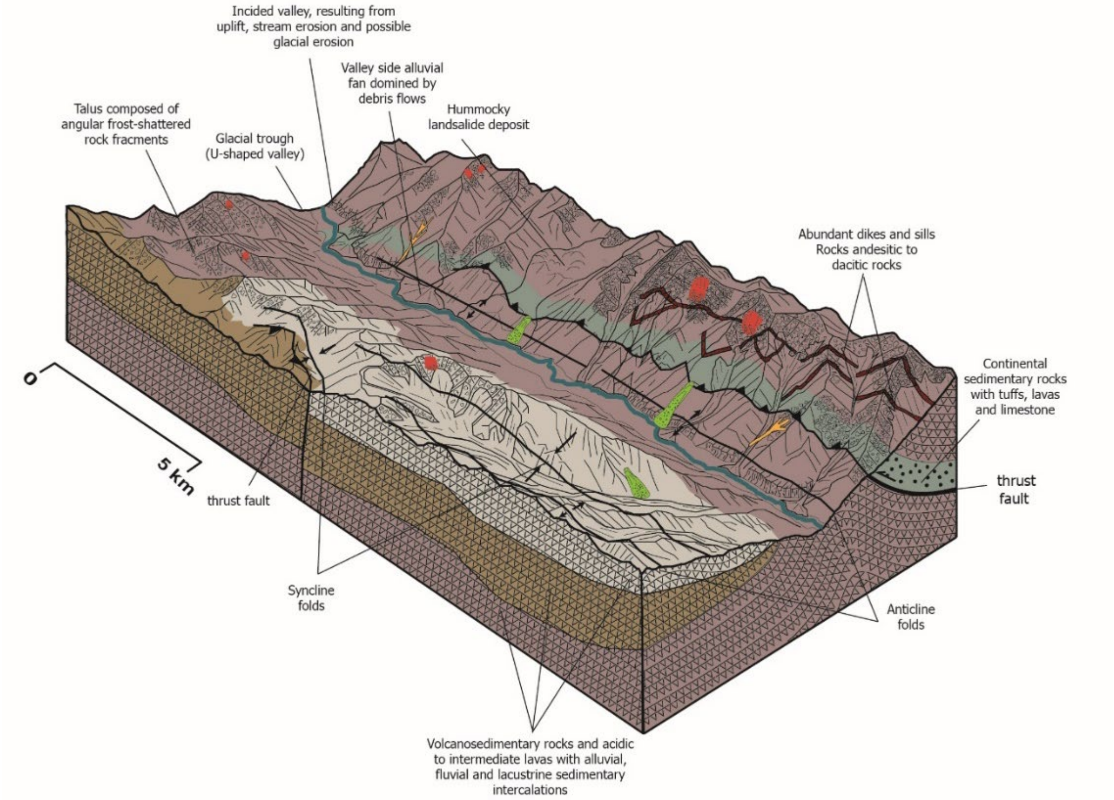


Serey et al. 2019, 2021

- **The number, size, type and geographic distribution of landslides seem to largely depend on the earthquake source mechanism**, with distinction between megathrust and shallow crustal earthquakes.
- Landslides triggered by moderately large **(M 6.0-7.0), inland shallow crustal earthquakes tend to have <u>higher landslide density and larger volumes</u> than those induced by large magnitude (M 7.5-9.0+), megathrust earthquakes** along the subduction plate boundary.
- These findings can be applied in other mountain ranges in subduction zones such as the Cascadia subduction zone.

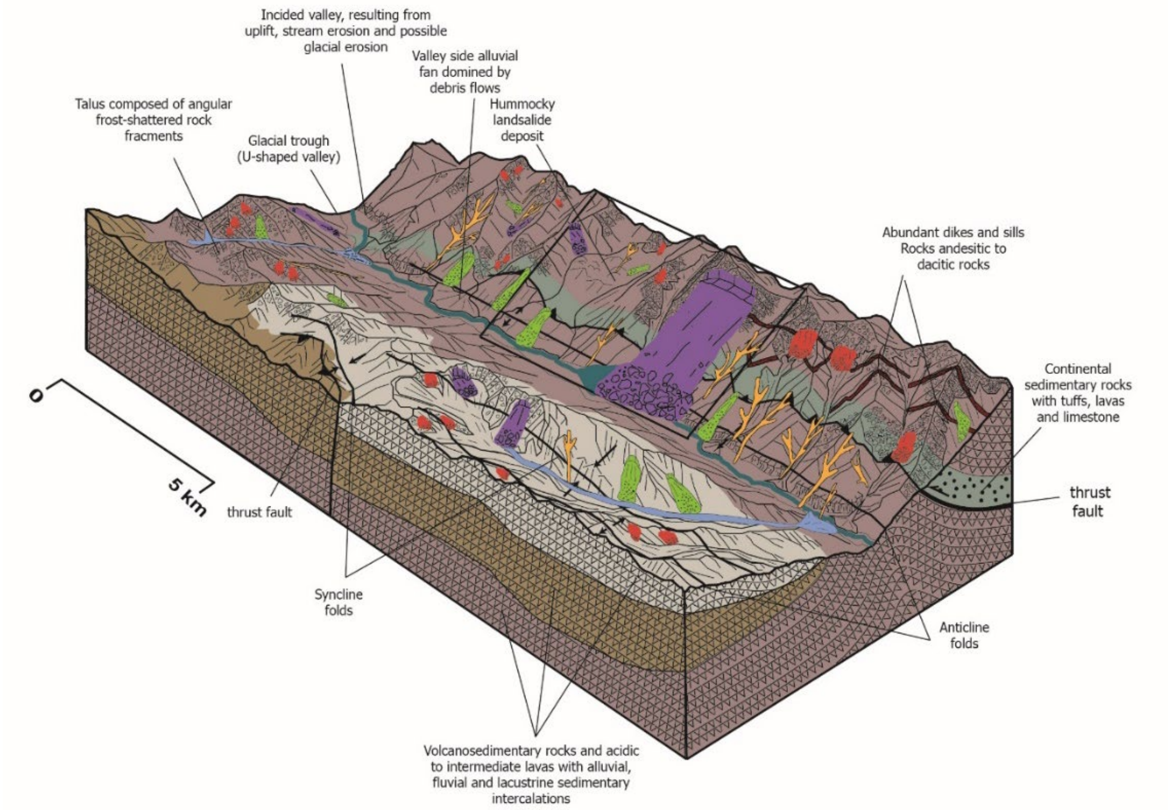


Earthquake-induced landslides conceptual geomodels



Glacial environment, megathrust EQ

Glacial environment, shallow crustal EQ



Serey et al., Quart. Journal of Engineering Geology and Hydrogeology, 2020

And liquefaction?

After the 1985, M 8.0, central Chile earthquake, many believed liquefaction was not an issue ("too many earthquakes have densified the soil").

- However, the 2010, M 8.8 earthquake showed widespread liquefaction, up to 300 km from the epicenter:
  - (1) flat areas in where significant settlements were induced,
  - (2) tailing dams,
  - (3) lateral spreading,
  - (4) failure of pile foundations due to lateral spreading

Sepúlveda et al. (2022), Verdugo & Gonzalez (2015)

THANK YOU

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