GLG494/598 (ASU) and GEOL 701J (UNR): Mapping tectonic faults from geomorphology

Compressional Tectonics:

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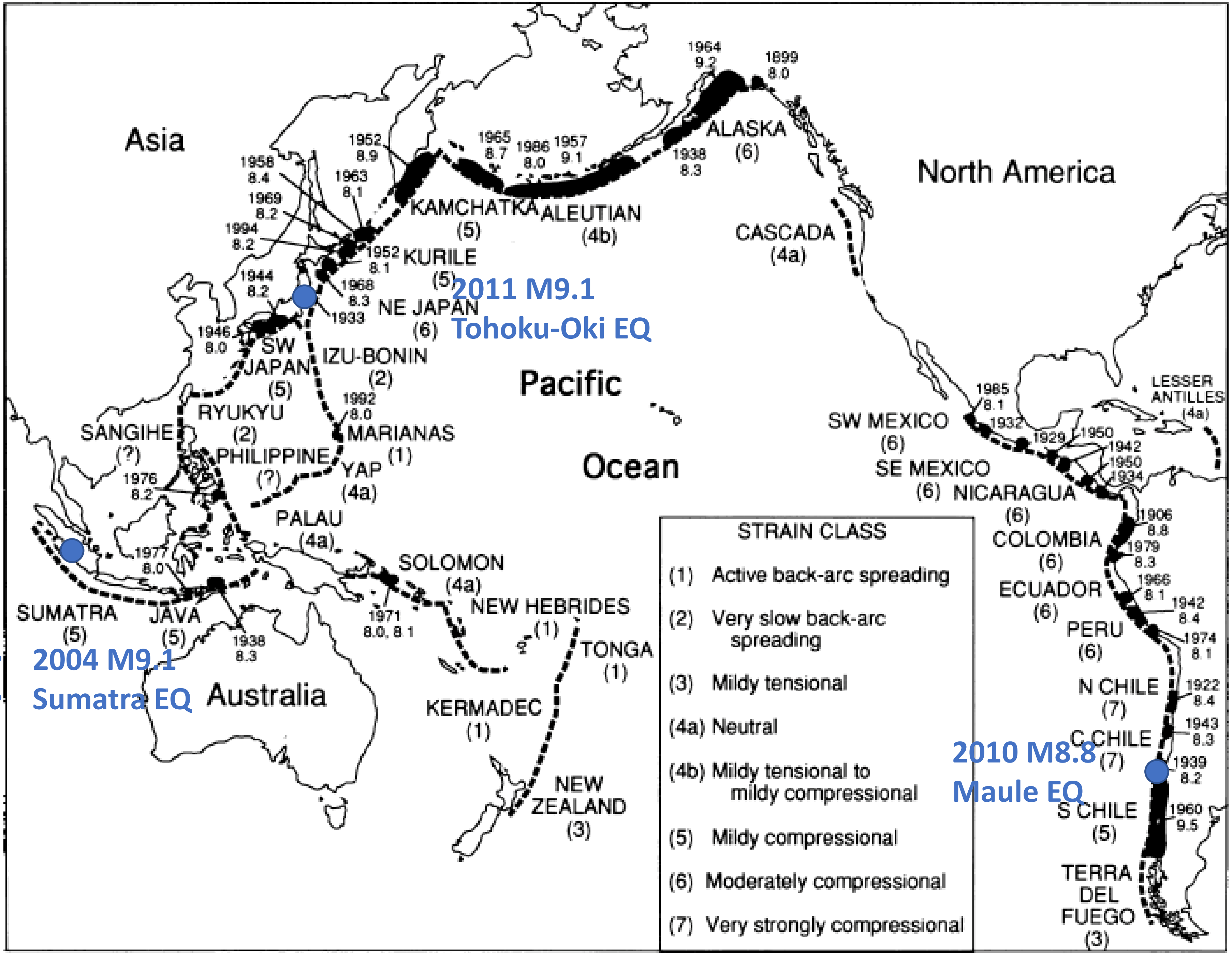


Ring of Fire

Many of the largest EQ
1960 M 9.5 Valdivia, Chile
1964 M 9.2 Great Alaska

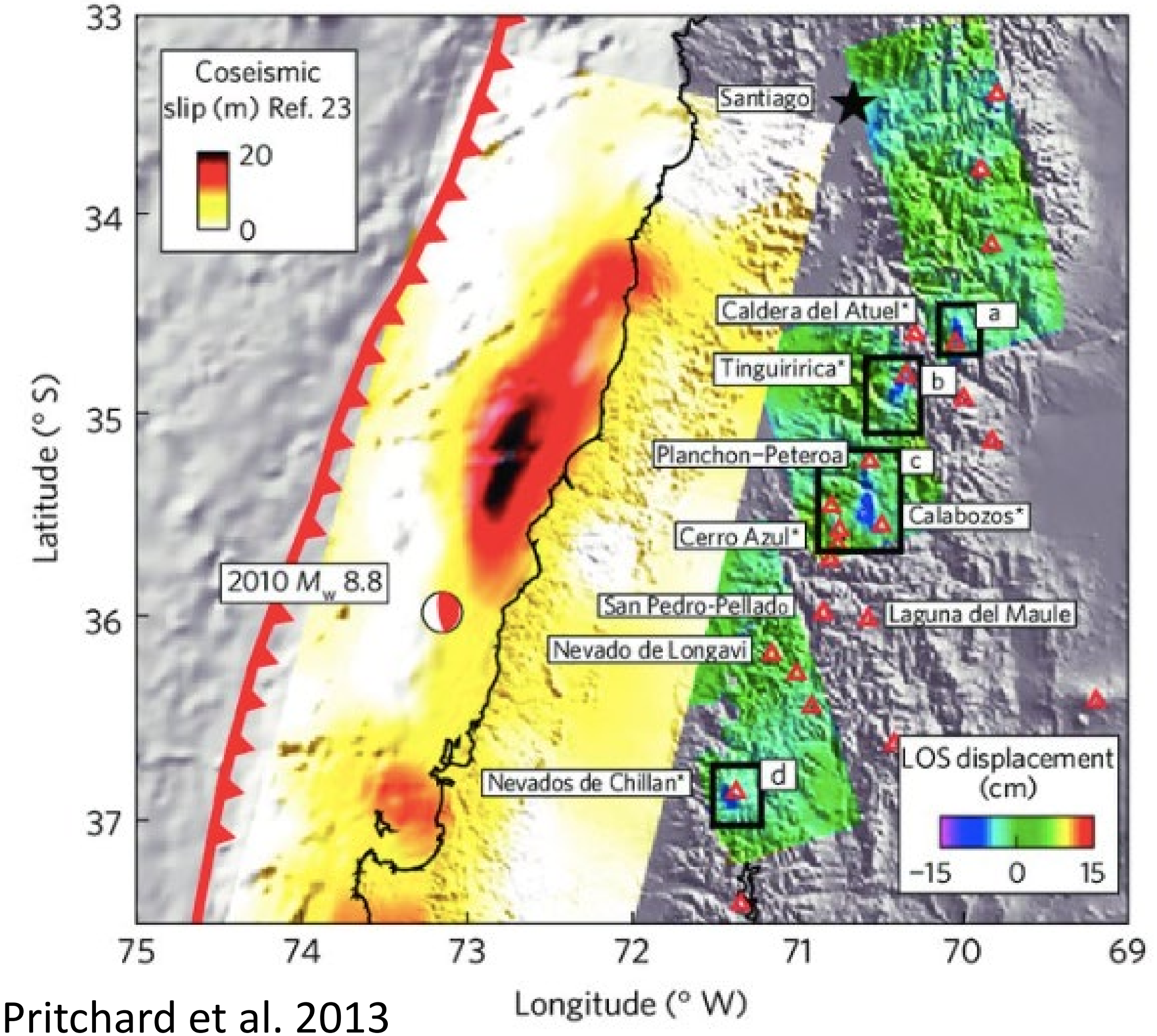
Large volcanism

EQs: relative sea level change, liquefaction, landslides

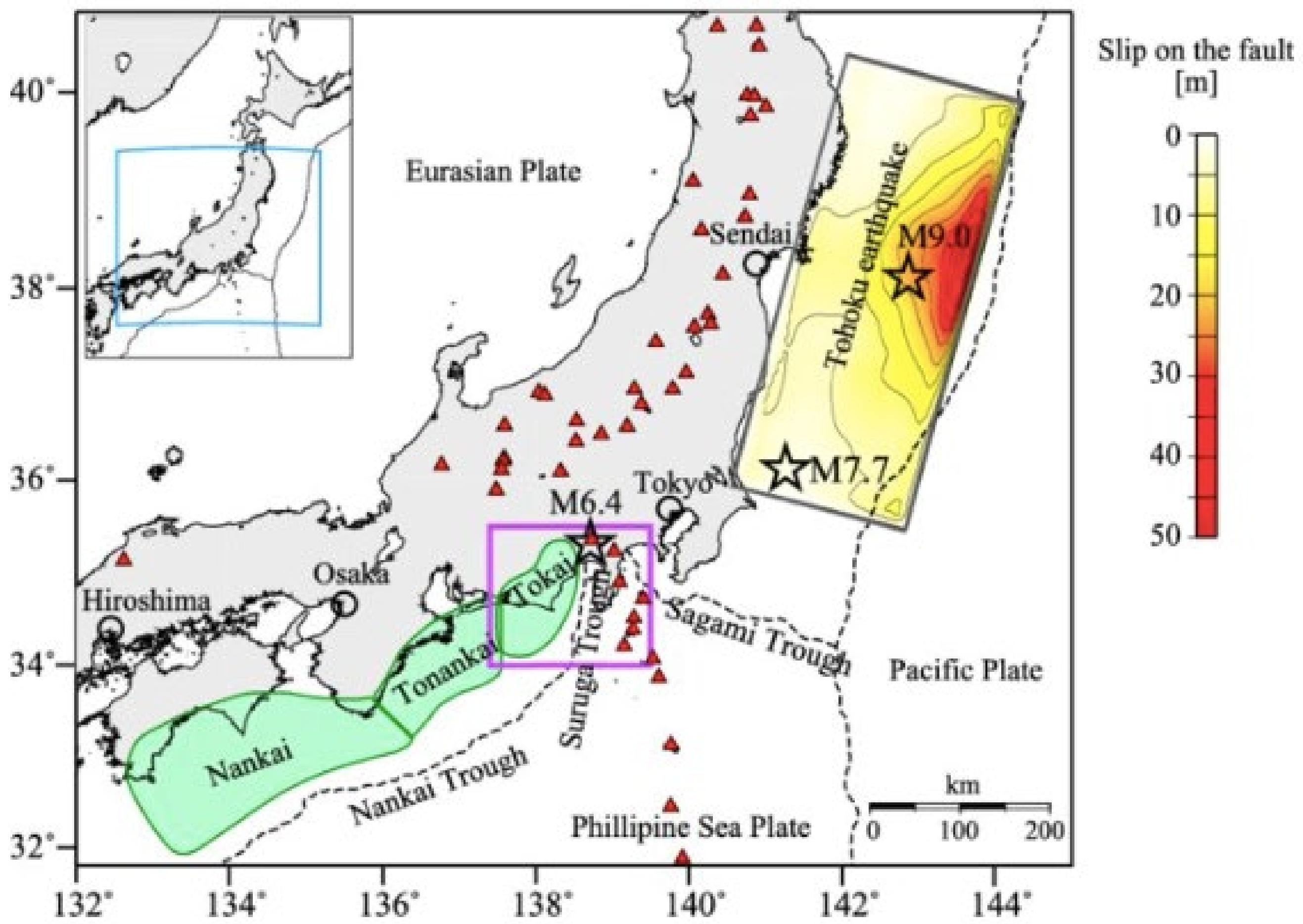
Off- and on-shore faults create significant hazard

2010 Mw 8.8 Maule EQ

2011 Mw 9.1 Tohoku EQ



Pritchard et al. 2013

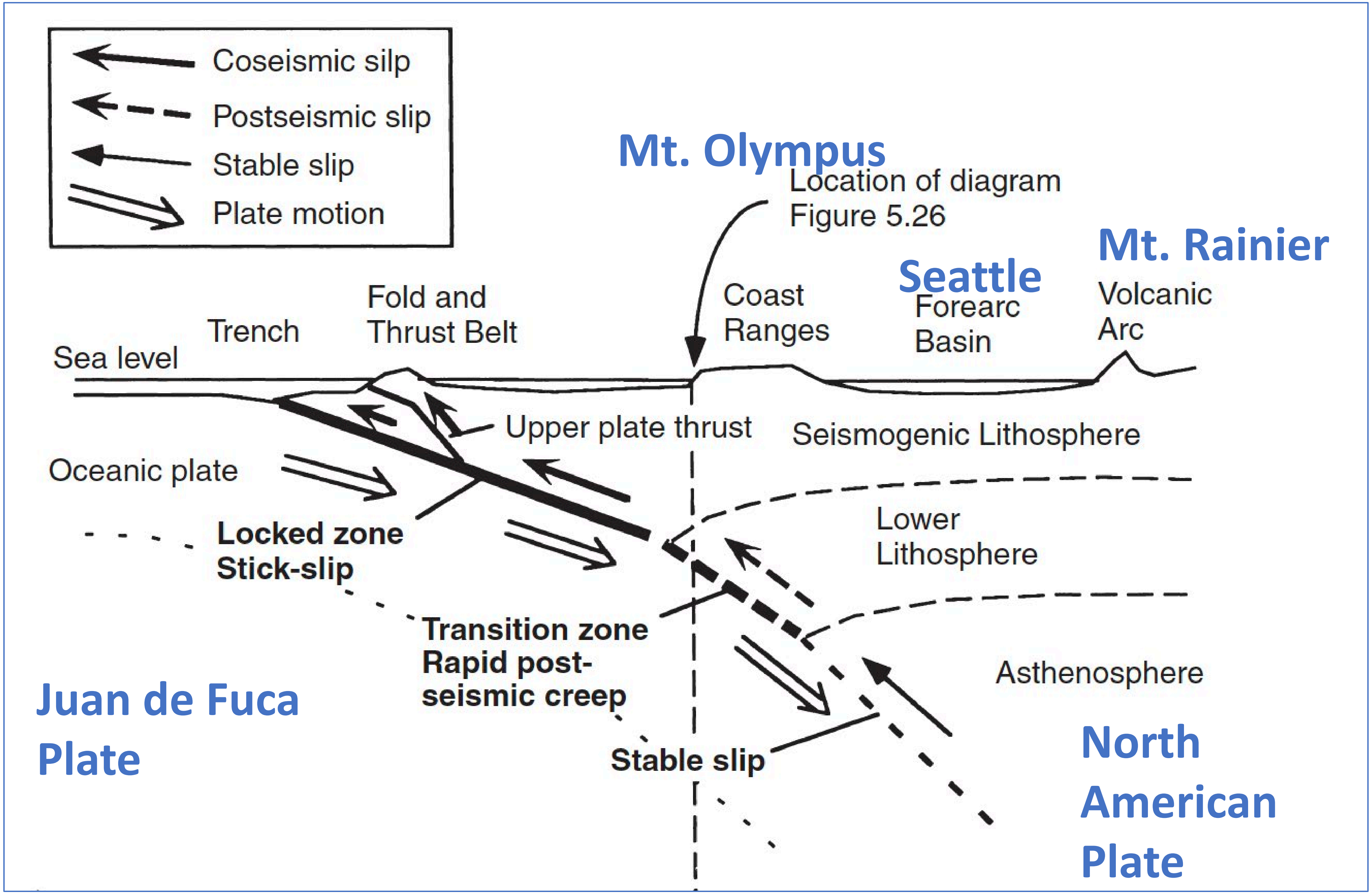


Enescu et al. 2013

Tsunami height: 40 m

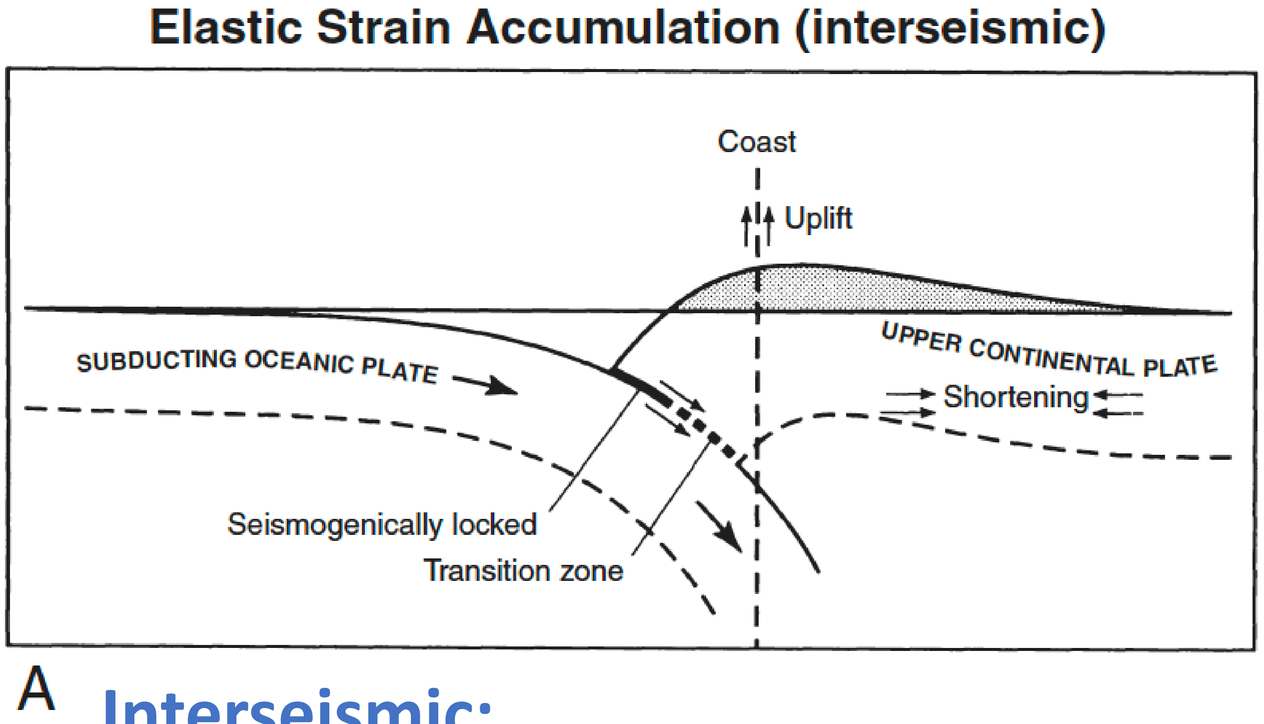
Fault slip? Rupture length?

>M8 EQs typically generate tsunamis


Coseismic silp
Postseismic slip
Stable slip
Plate motion
Mt. Olympus
Location of diagram
Figure 5.26
Mt. Rainier
Seattle
Fold and
Thrust Belt
Trench
Sea level
Coast
Ranges
Forearc
Basin
Volcanic
Arc
Upper plate thrust
Seismogenic Lithosphere
Oceanic plate
Lower
Lithosphere
Locked zone
Stick-slip
Transition zone
Rapid post-
seismic creep
Asthenosphere
Juan de Fuca
Plate
Stable slip
North
American
Plate

Seattle

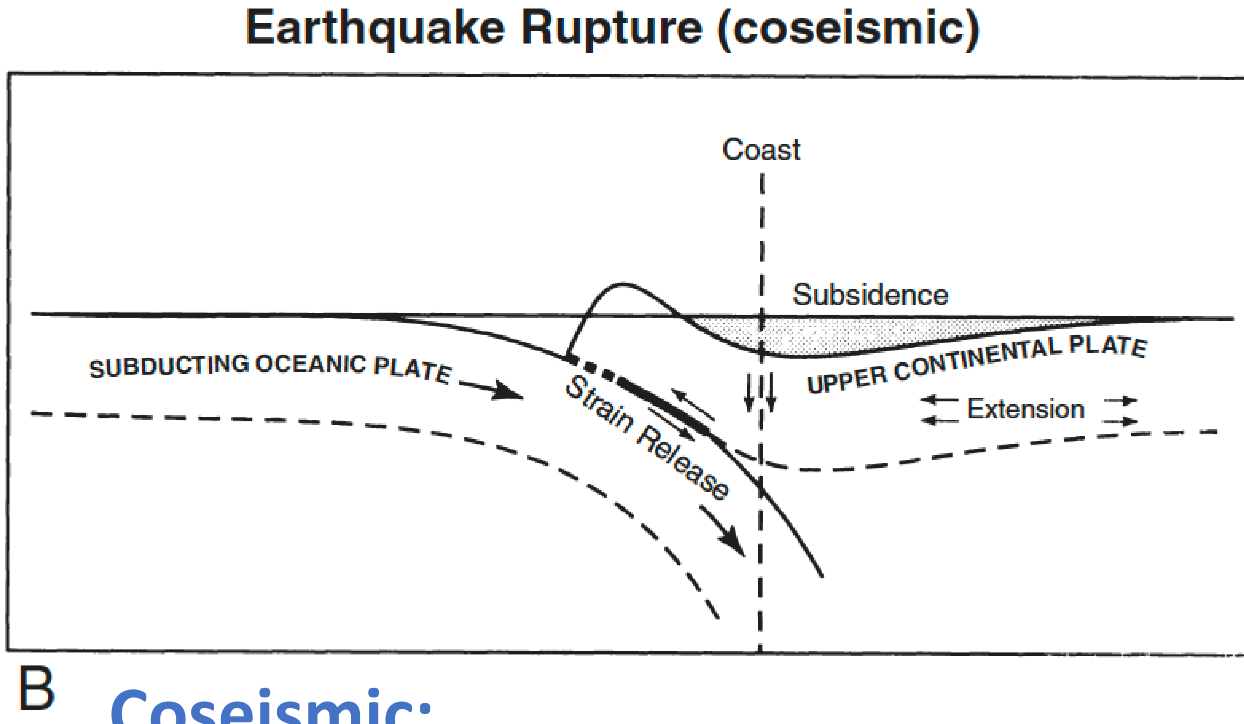
Seismic cycle



Interseismic:

Coastal uplift

Forearc upper-plate shortening



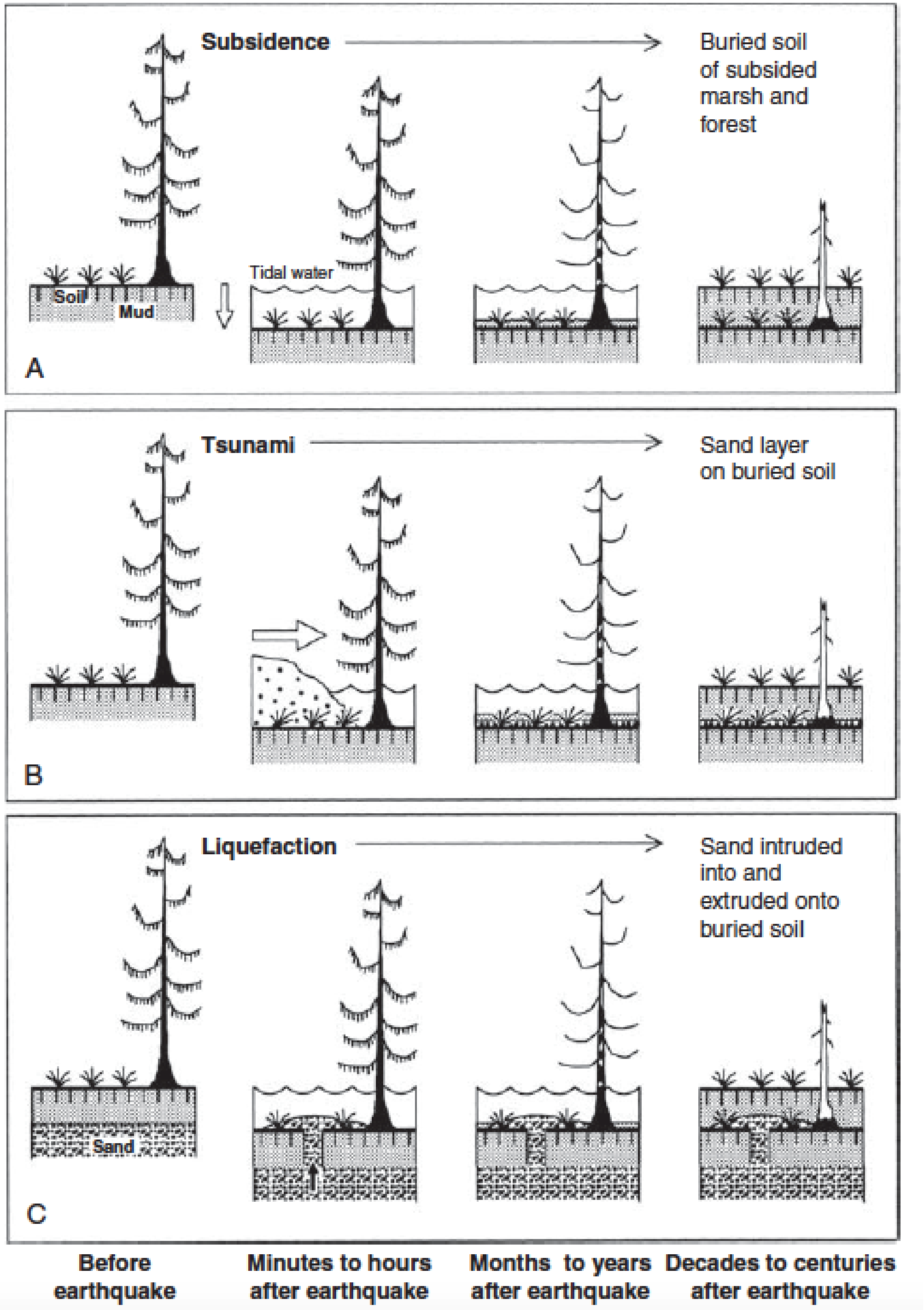
Coseismic:

Coastal subsidence

Forearc upper-plate extension

Forearc earthquakes: Can occur during the interseismic period or following a megathrust earthquake, create significant hazard

Geomorphology of subduction zone Earthquakes



Paleoseismology of subduction zone earthquakes

- Instantaneous subsidence
- Bury by sand and mud to lower intertidal zone, fossil trees for radiocarbon dating
- Tsunami sands and liquefaction features are good evidence change is coseismic
- Earthquake produce synchronous submergence over large areas.

Dendroseismology

Earthquake-killed trees

Sensitive record of subsidence

1964 Alaska Earthquake: Submerged trees survived for 1-2 growing seasons with stunted growth

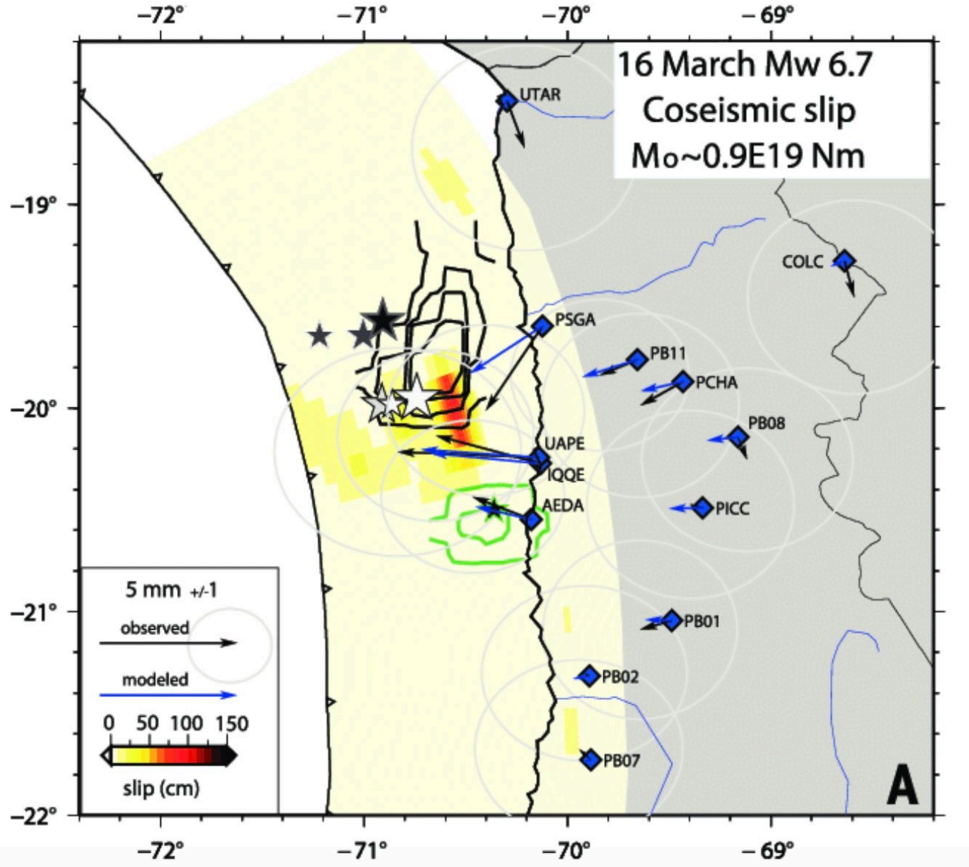
Radio-carbon dating

1700 Cascadia Earthquake:

timing, location & Mw

Ghost forest, Alaska

Extension in the Chilean Coastal Ranges: 2014 M8.1 Iquique earthquake



Geodesy/ GPS: Differential movement between stations at the coast and inland

Scott et al., 2016

Surface Fractures record extension