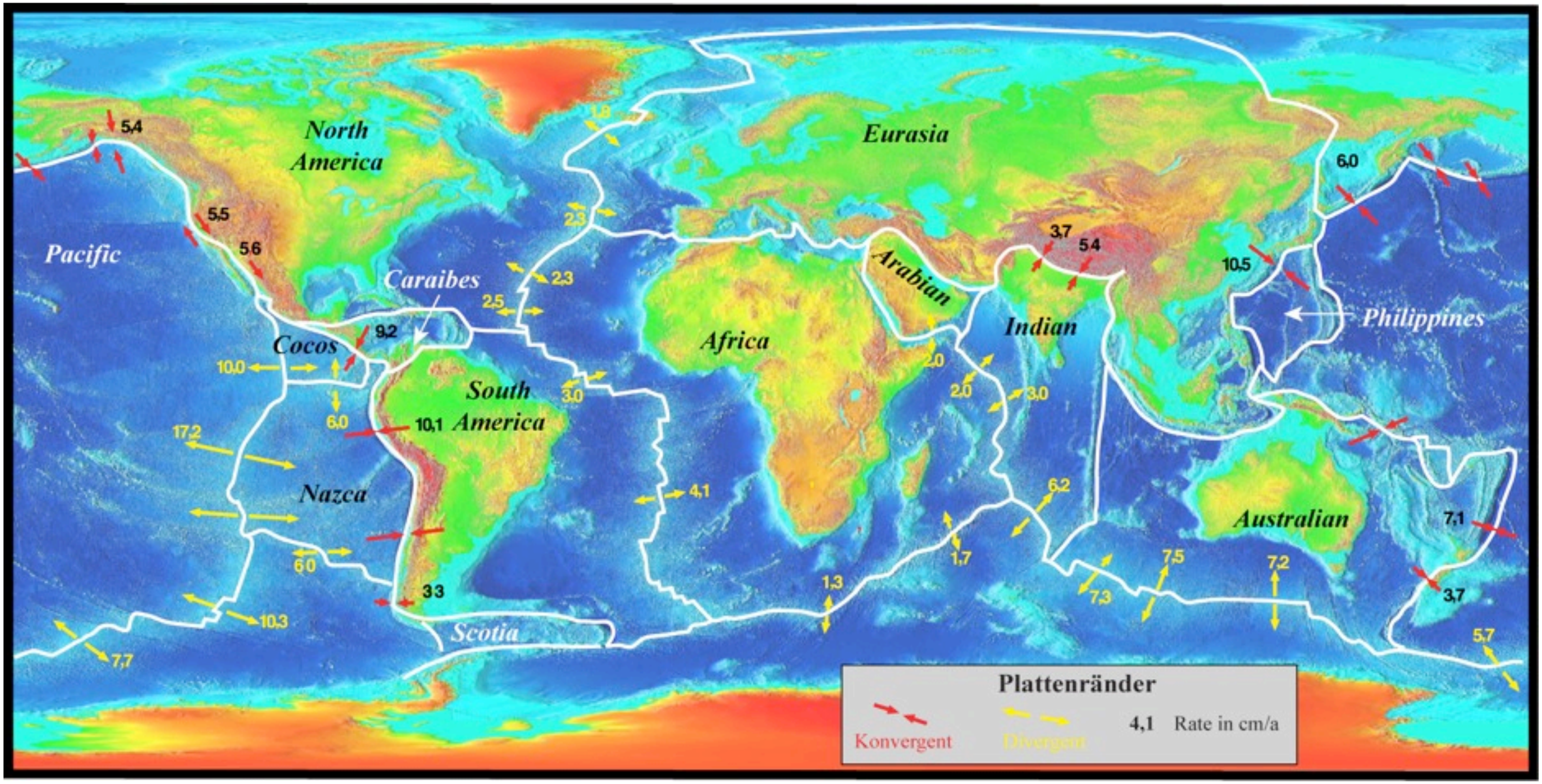
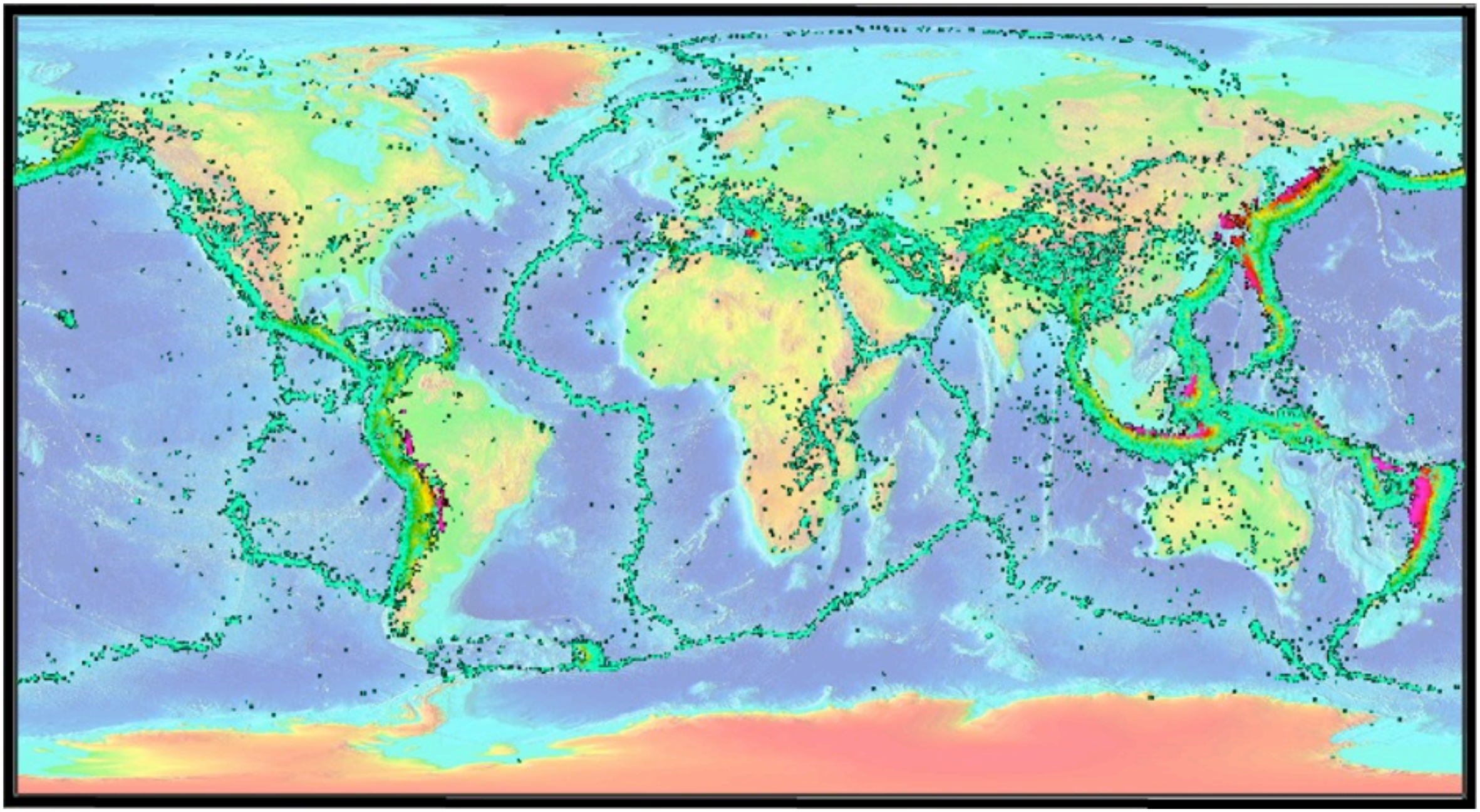
10-
Subduktion zonen

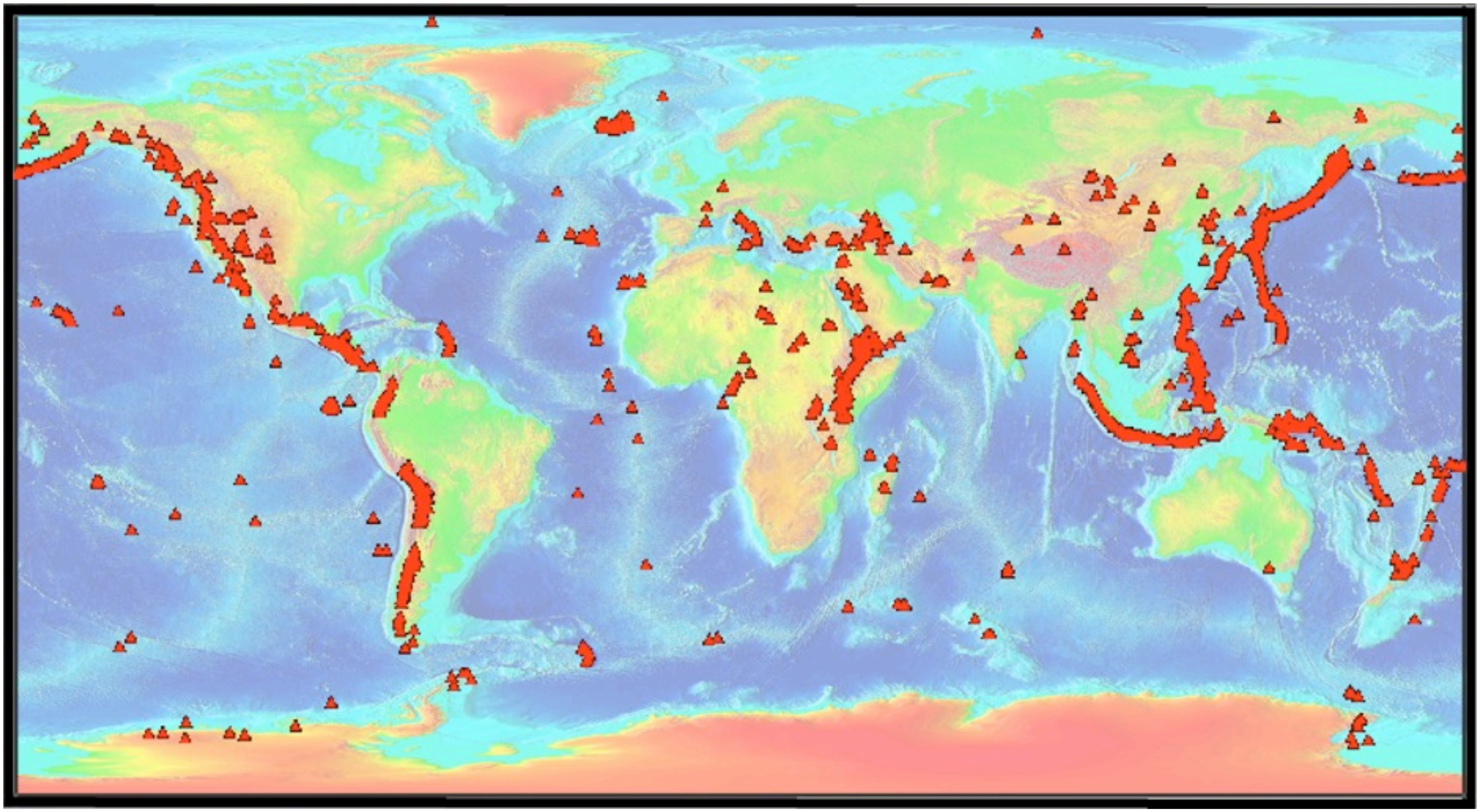
Konvergente Plattenräder



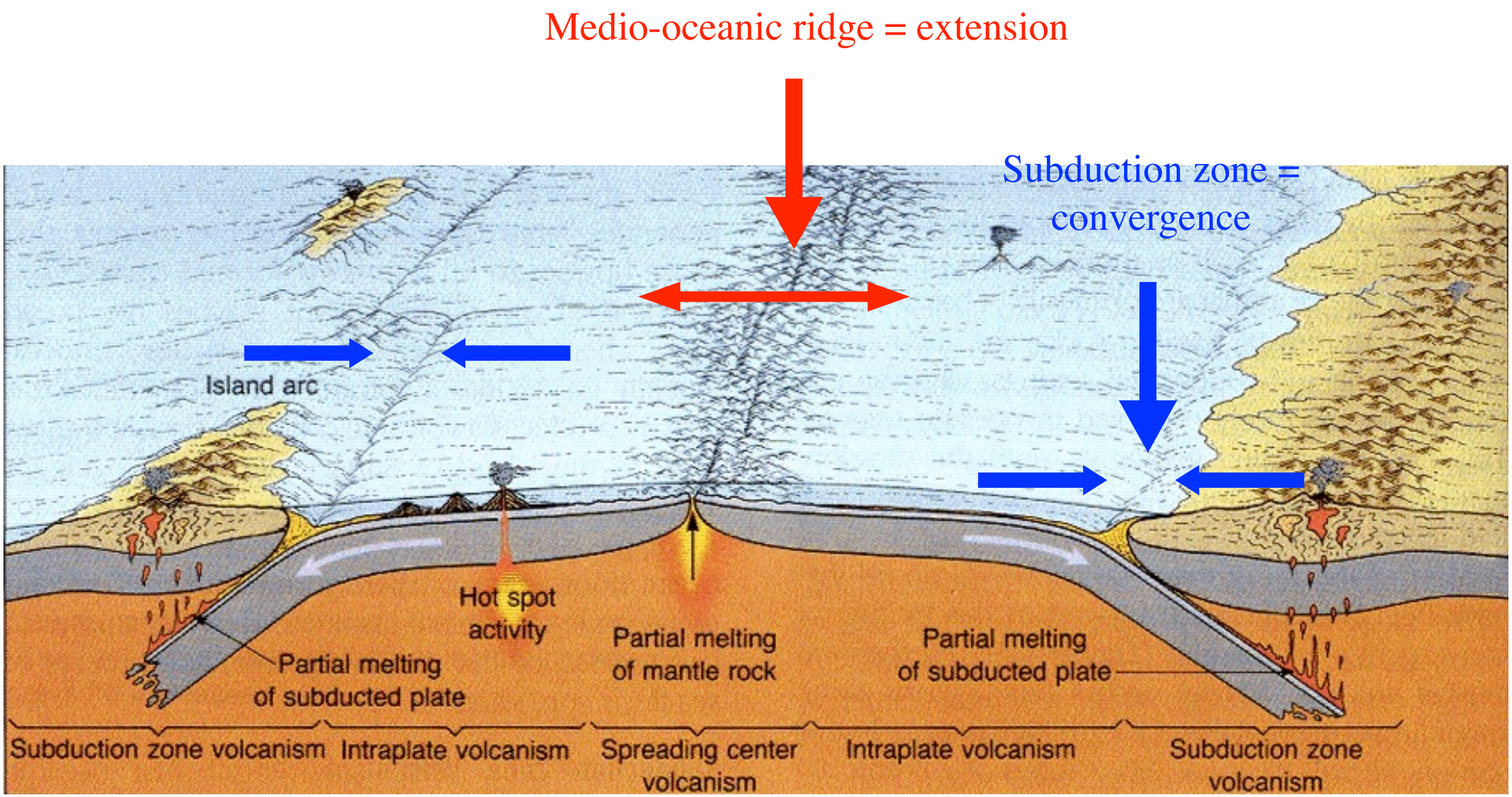
Konvergente Plattenräder: Erdbeben



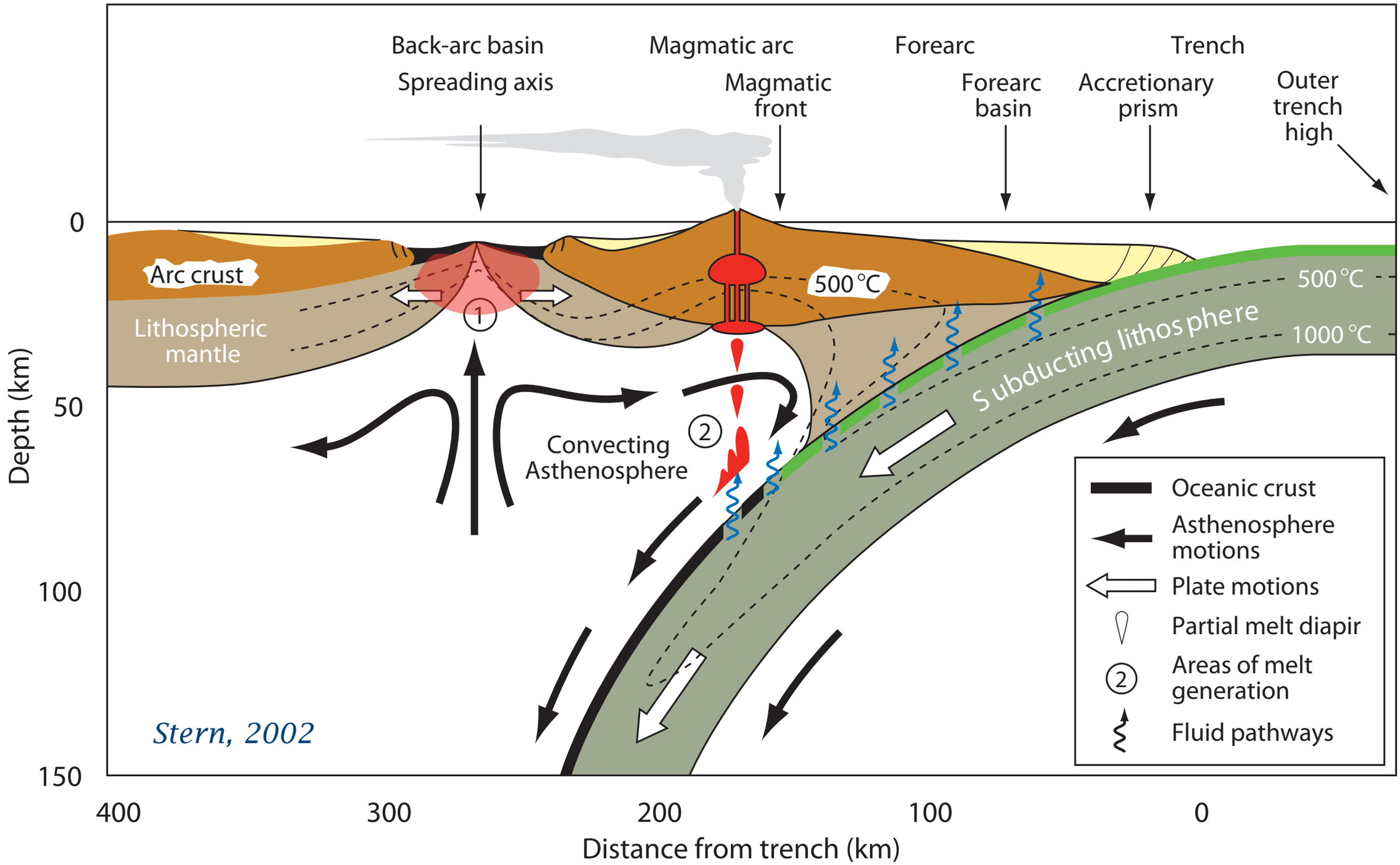
Konvergente Plattenräder: Vulkanismus



Plattenräder



Subduction cartoon



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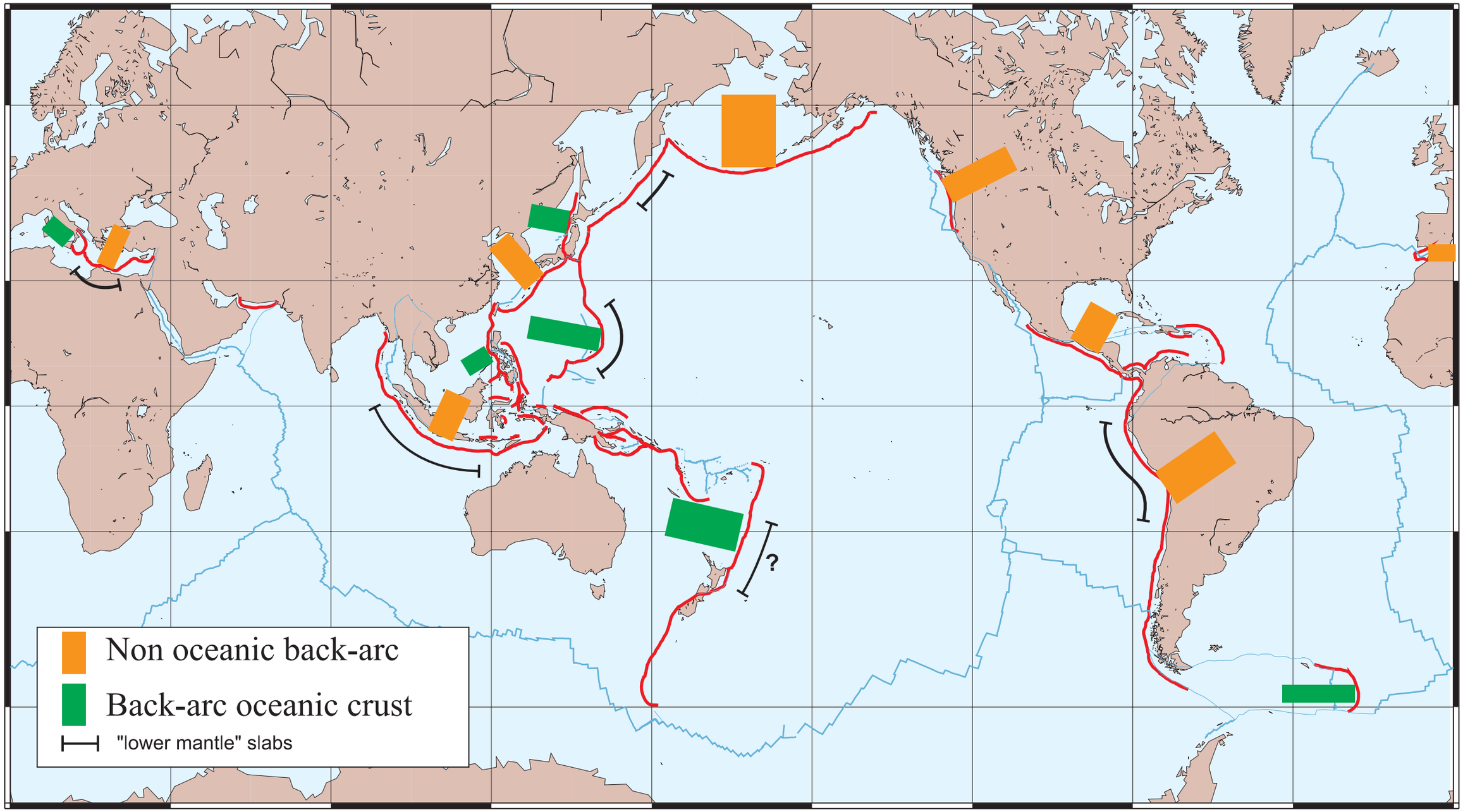
Different types of back-arcs



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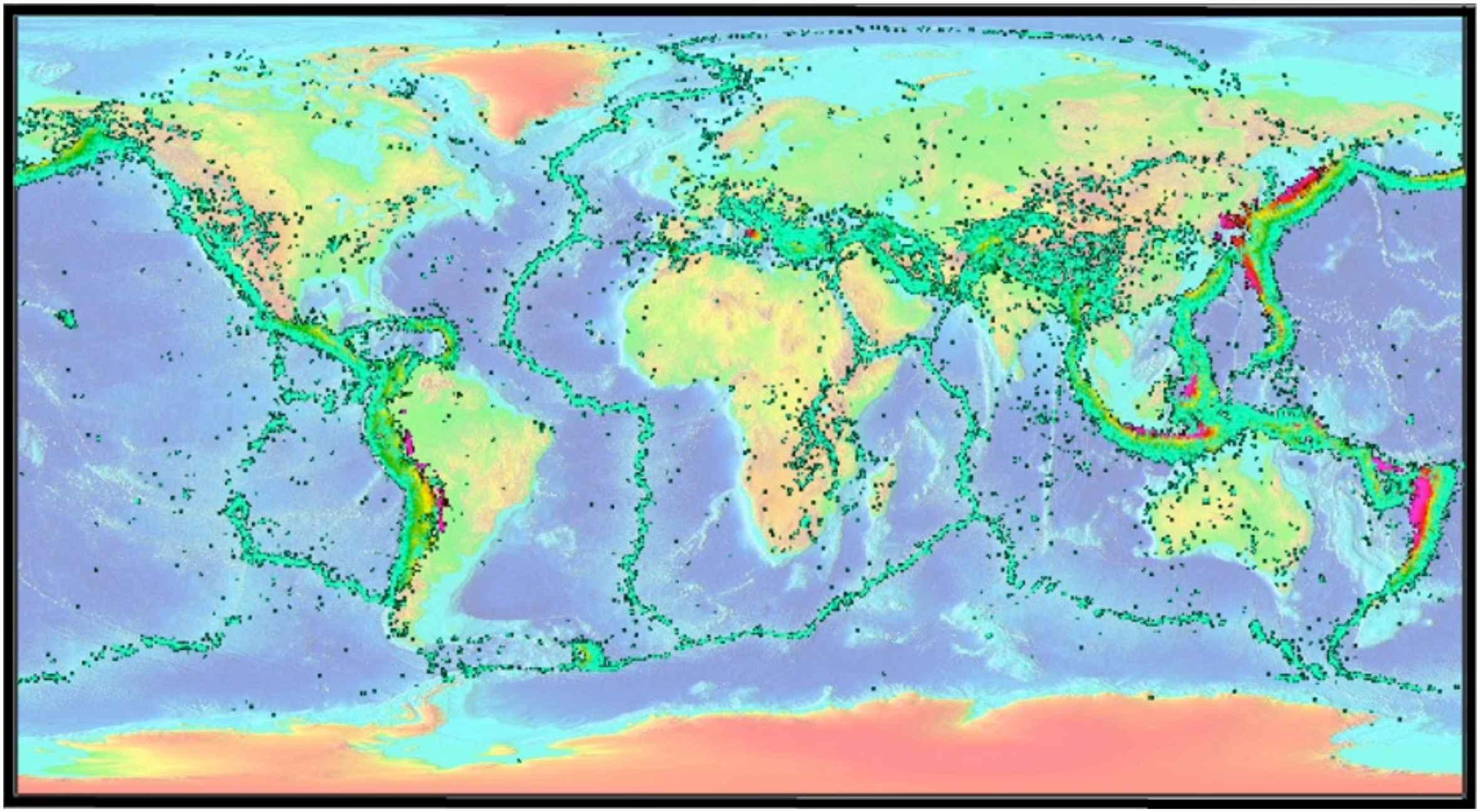
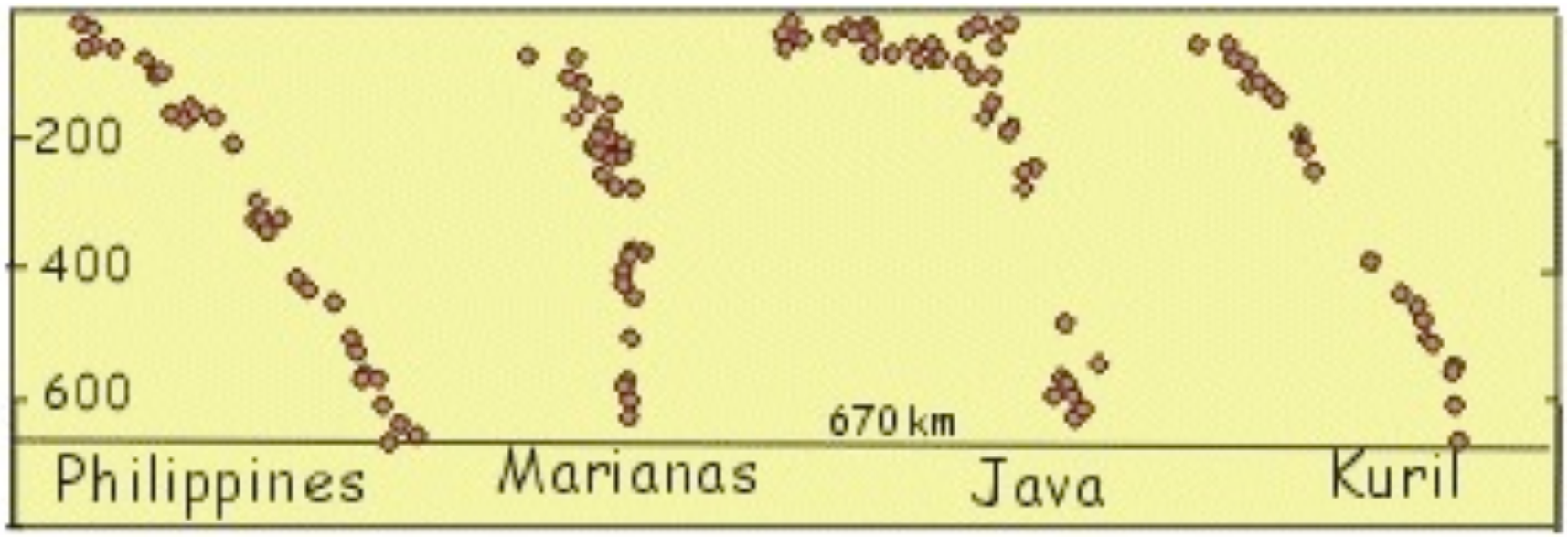
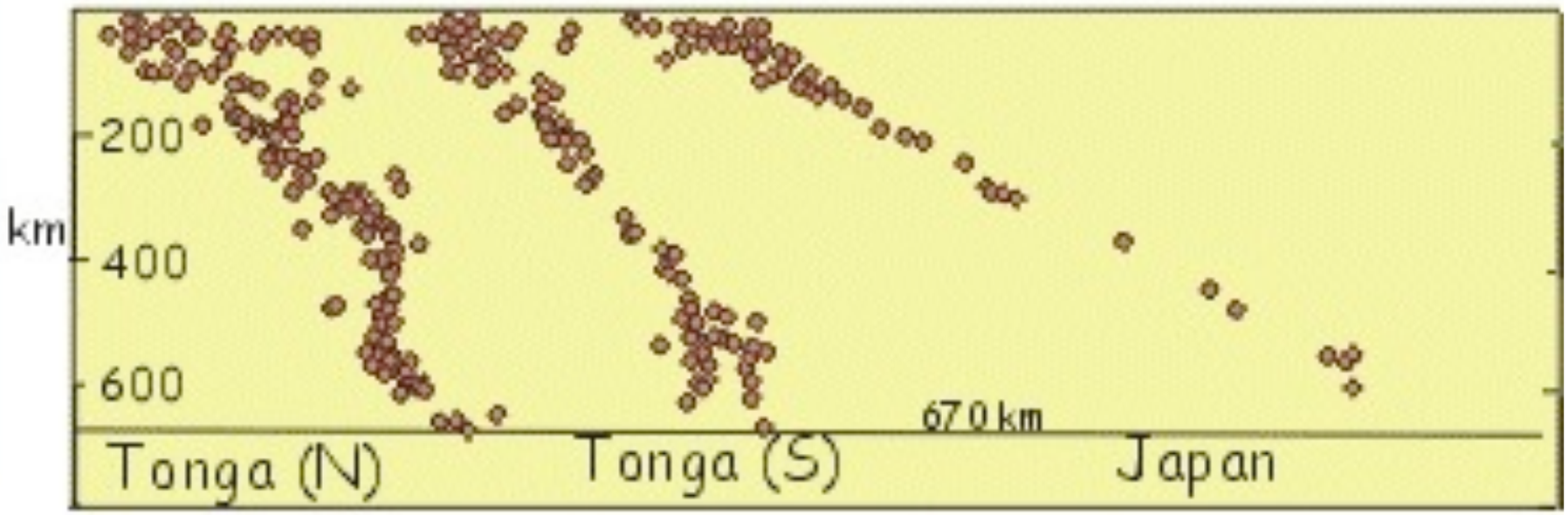
Konvergente Plattenräder: Erdbeben



Wadati-Benioff zones

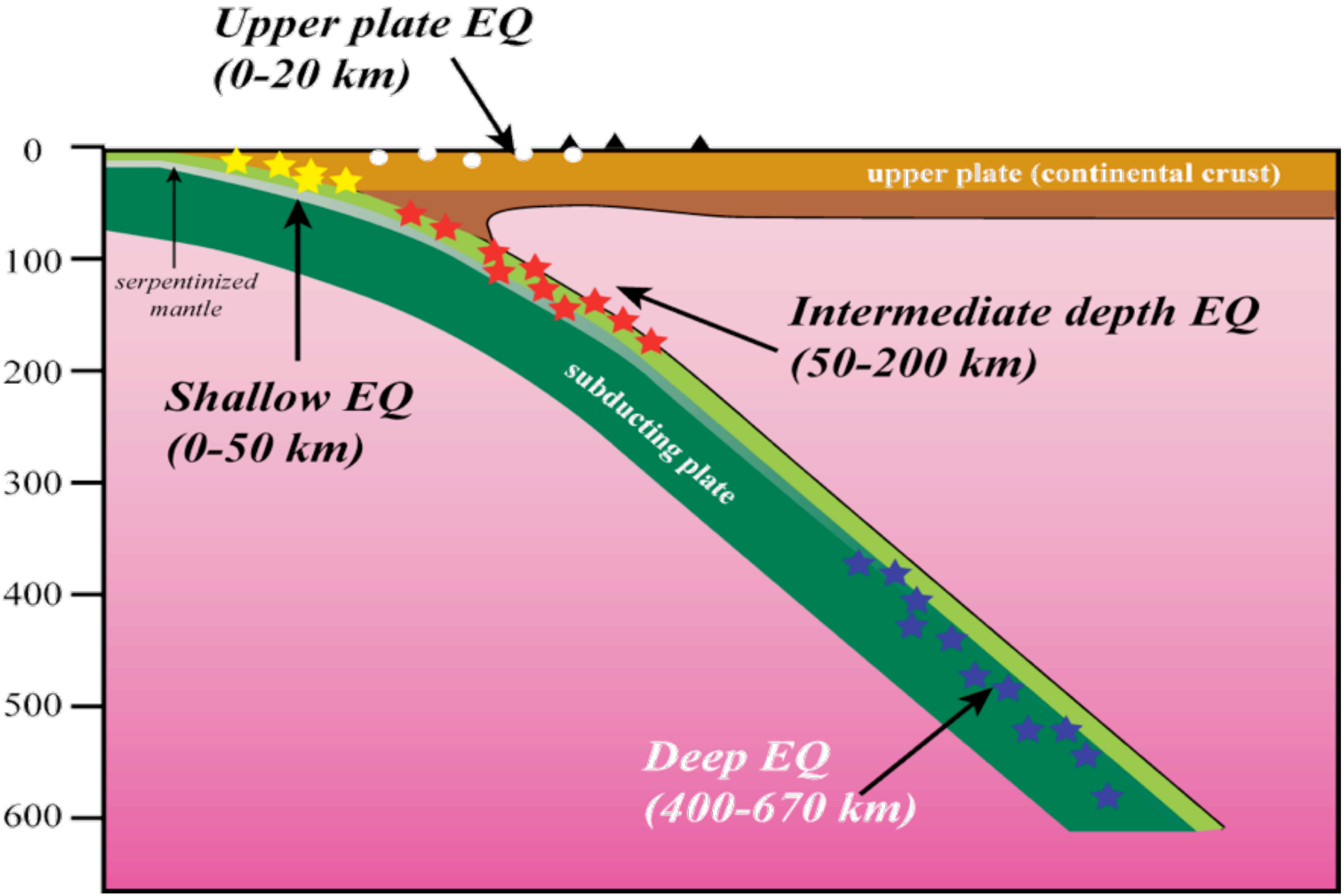
Earthquakes and the dip of Wadati-Benioff seismic zones



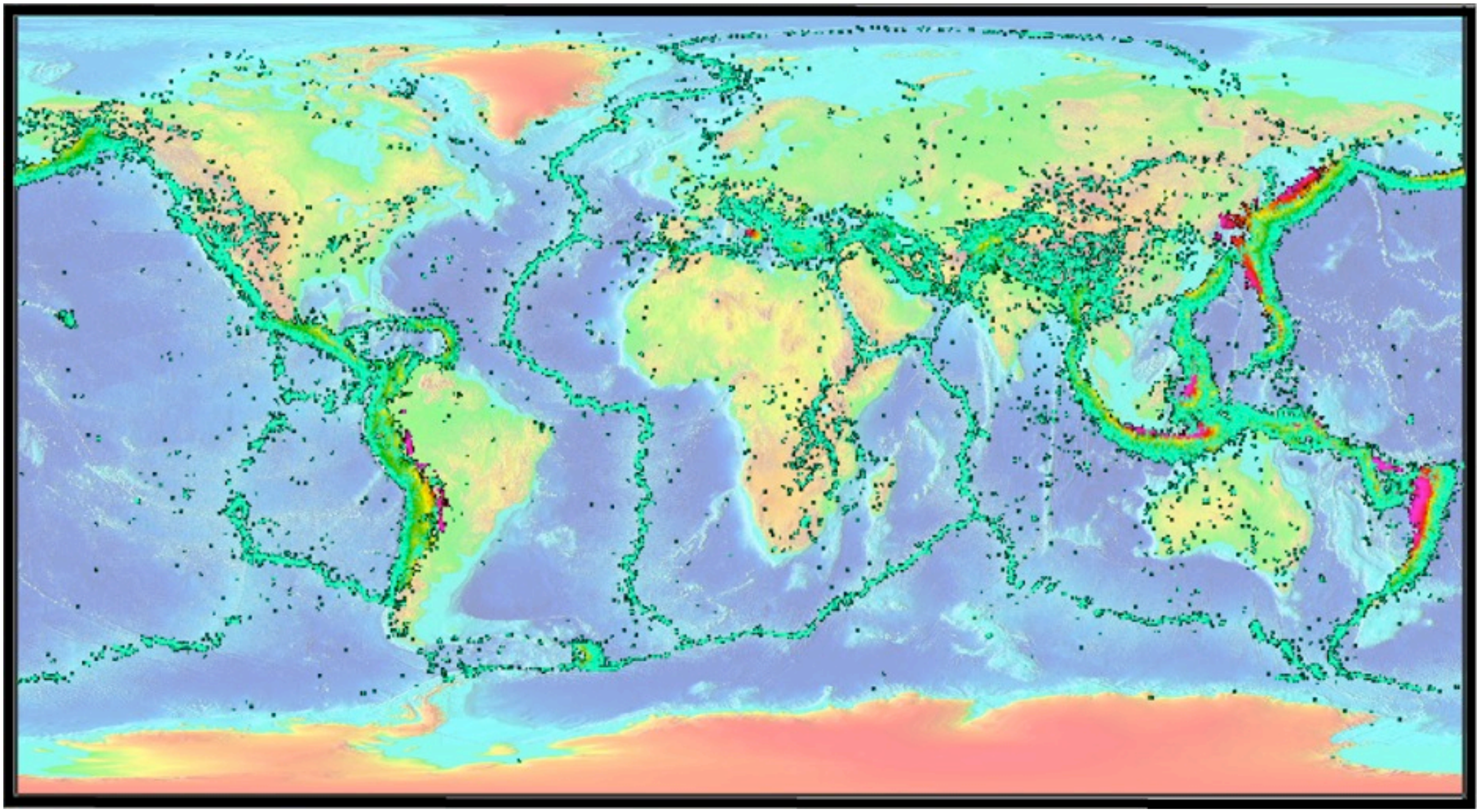


vertical and horizontal scales equal

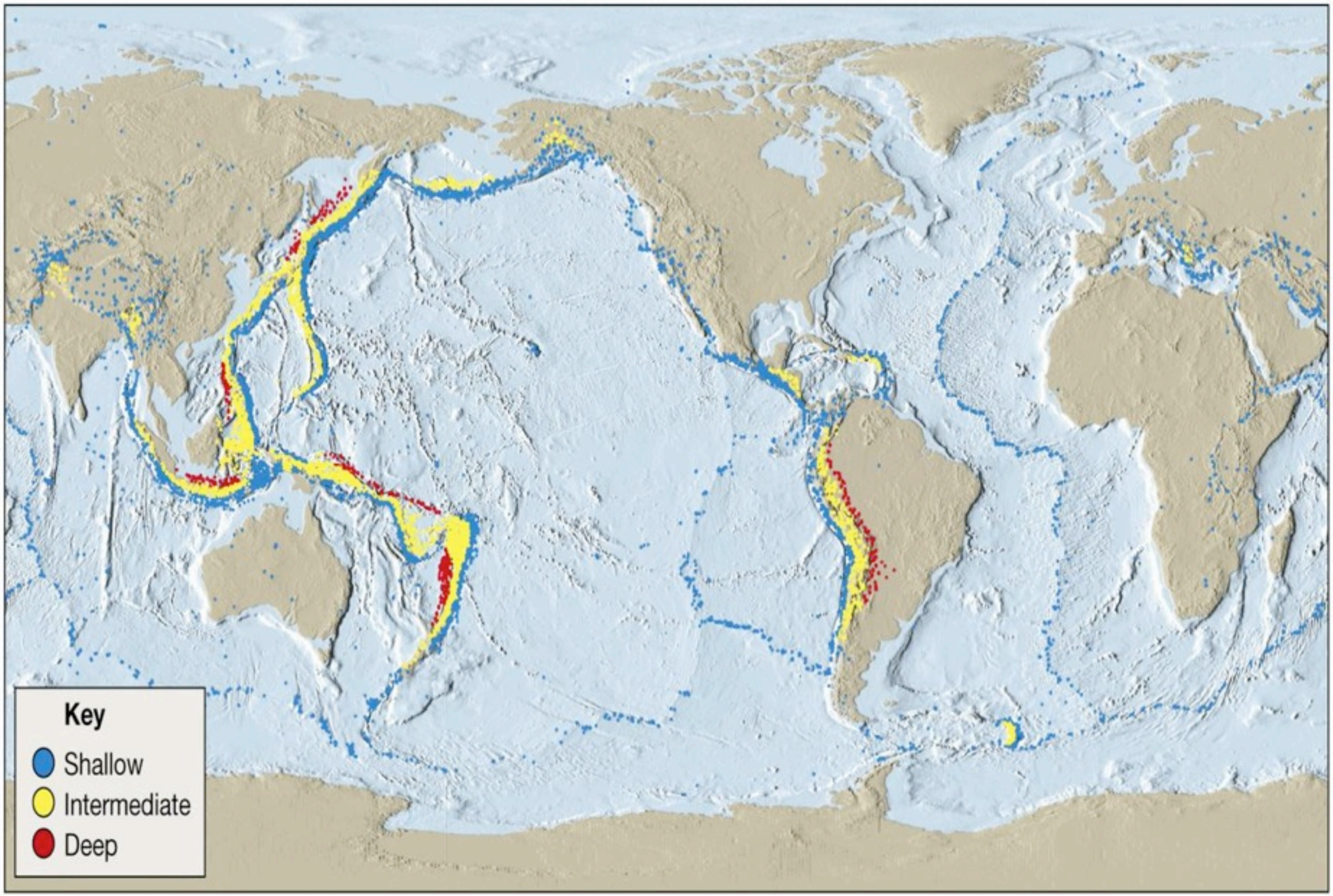
Subduction & earthquake location



Konvergente Plattenräder: Erdbeben



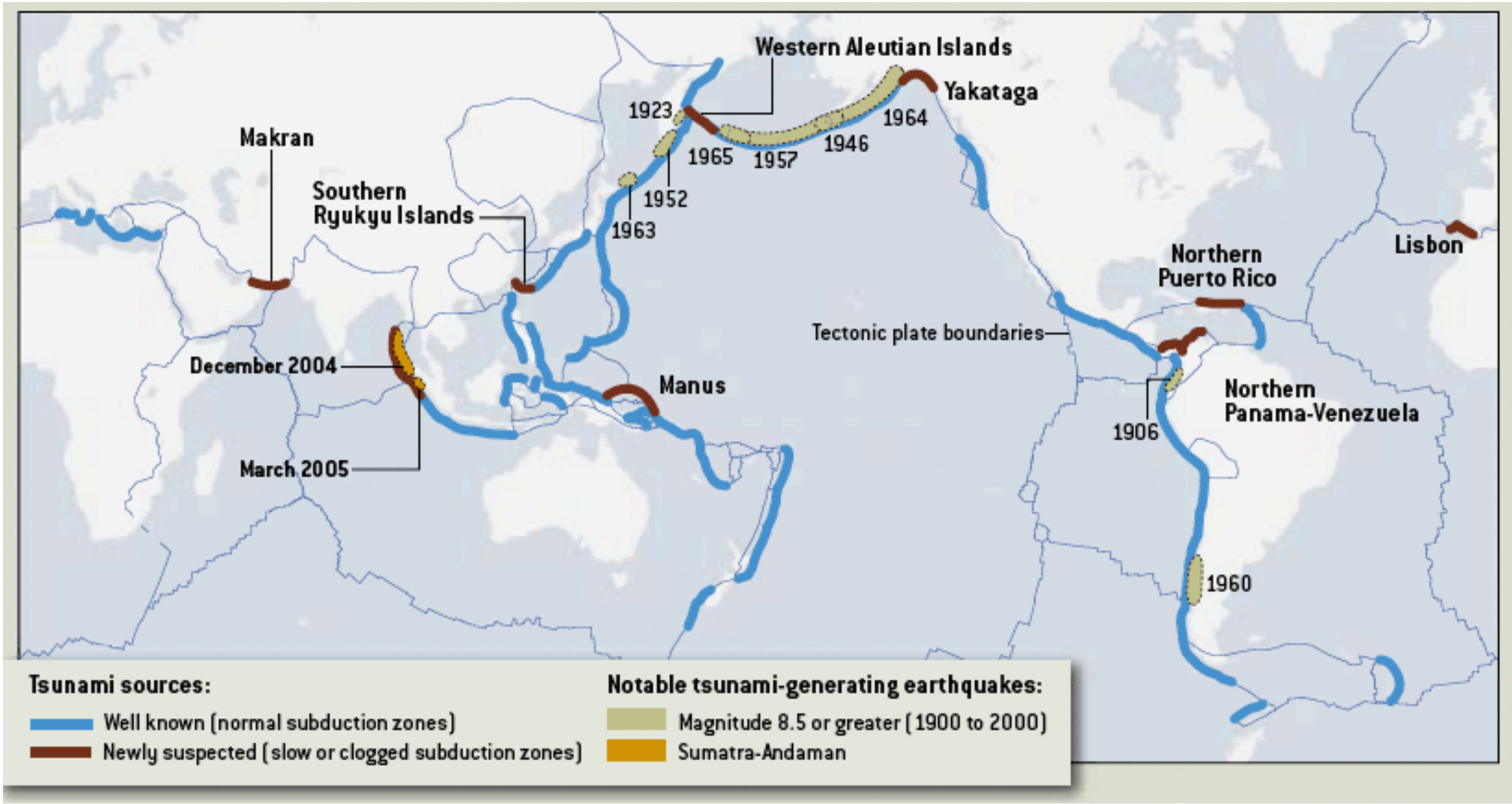
Deep of earthqukes



Big earthquakes distribution

The largest interplate thrust earthquakes in the instrumental era to 2005

Geist, Titov, and Synolakis (2005 Sci. American)

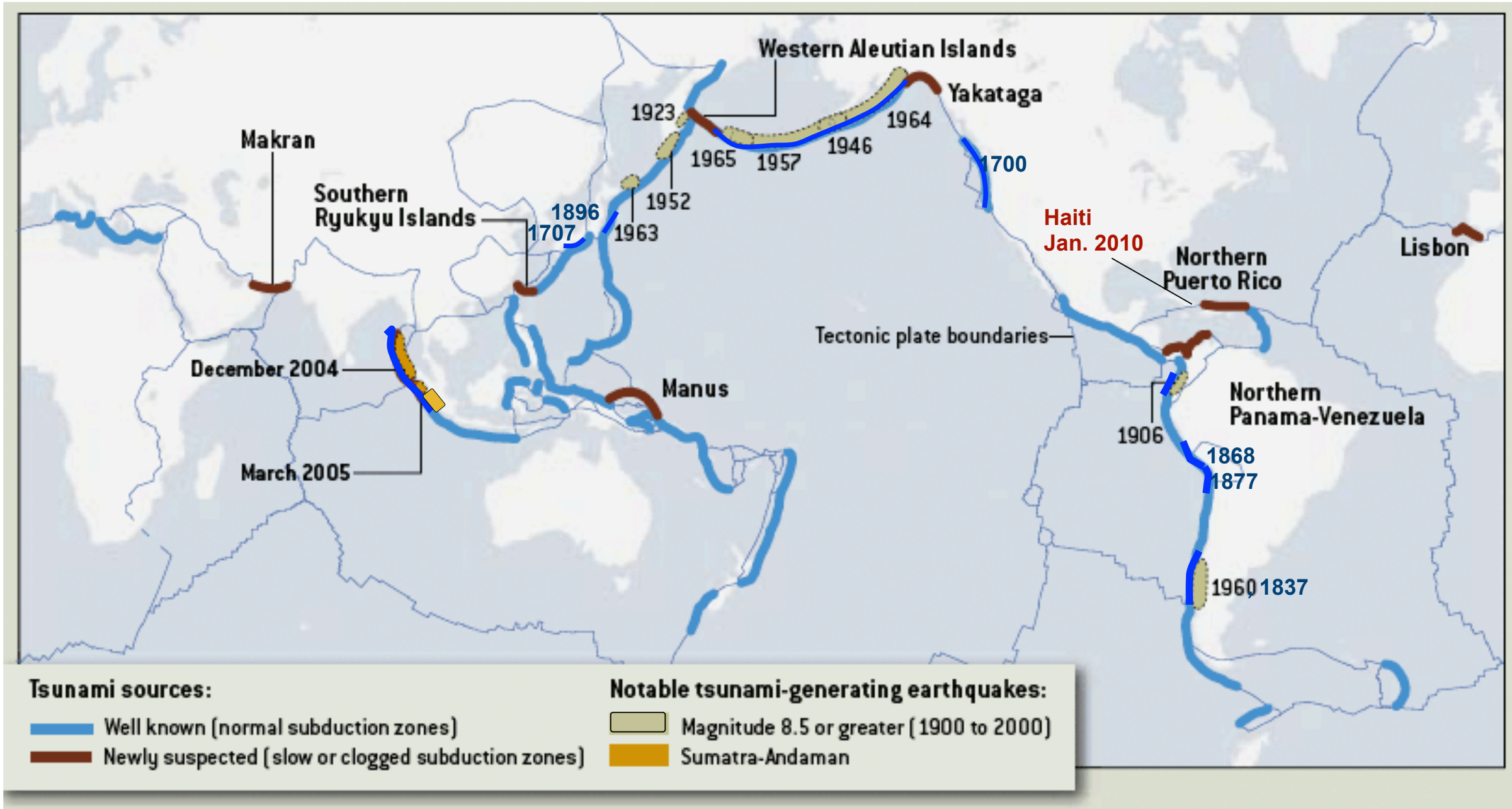


Big earthquakes distribution

Instrumental and Historical Events M ≥ 8.5 since 1700

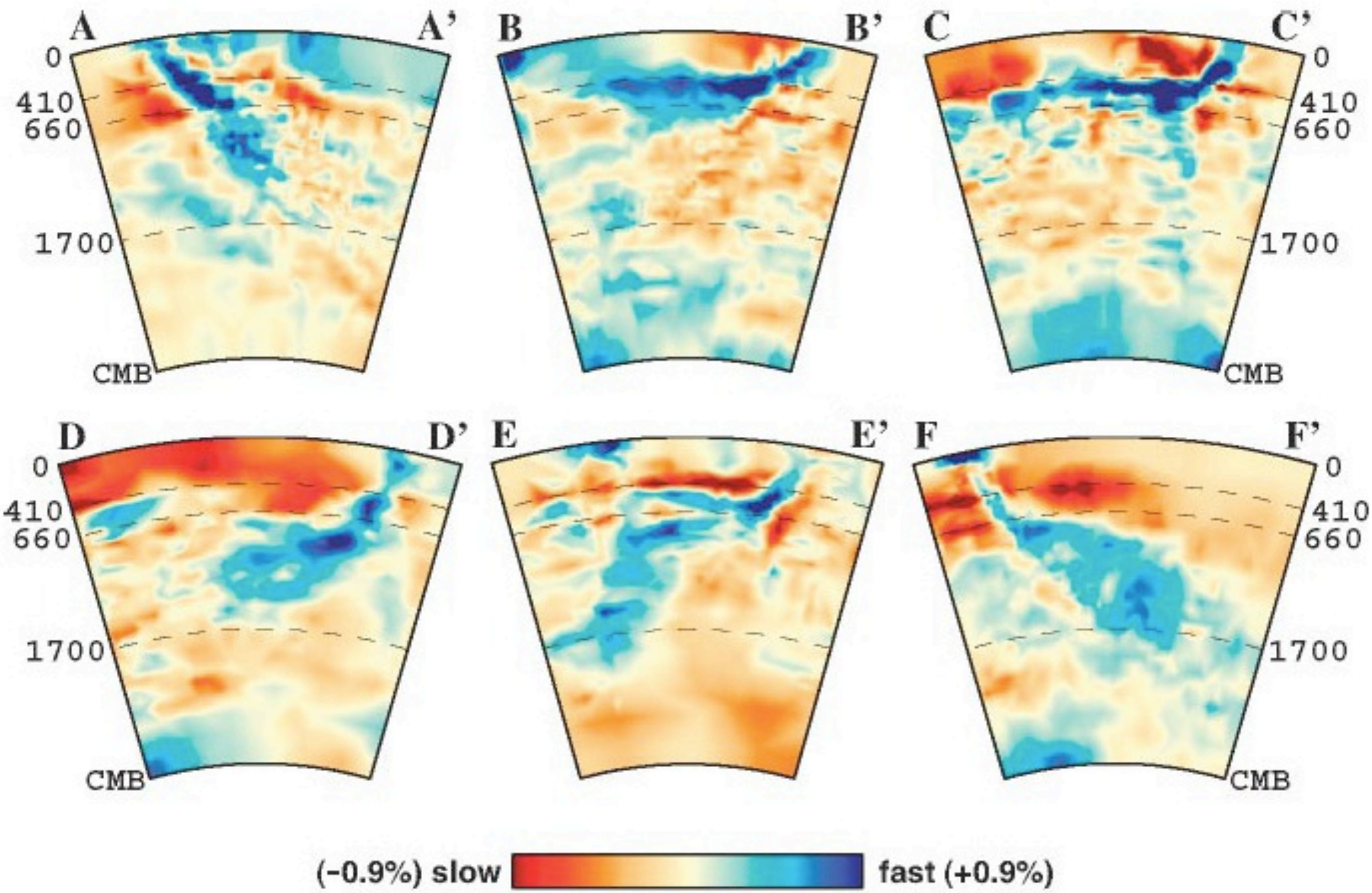
Areas of Slip Shown as "Sausages"

Subduction sectors with M≧8.5 events



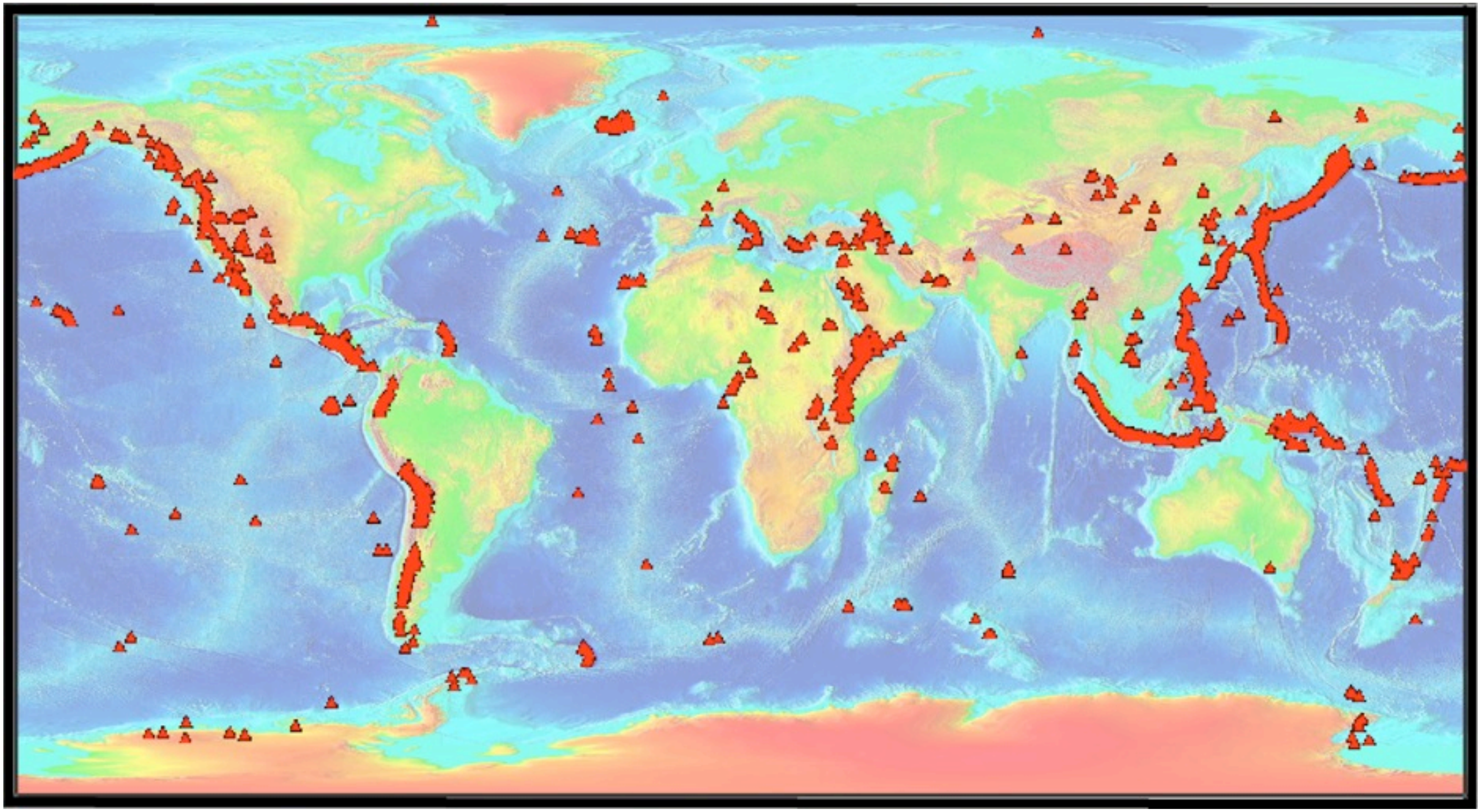
After Geist et al. (2005)

Tomography of subduction zones



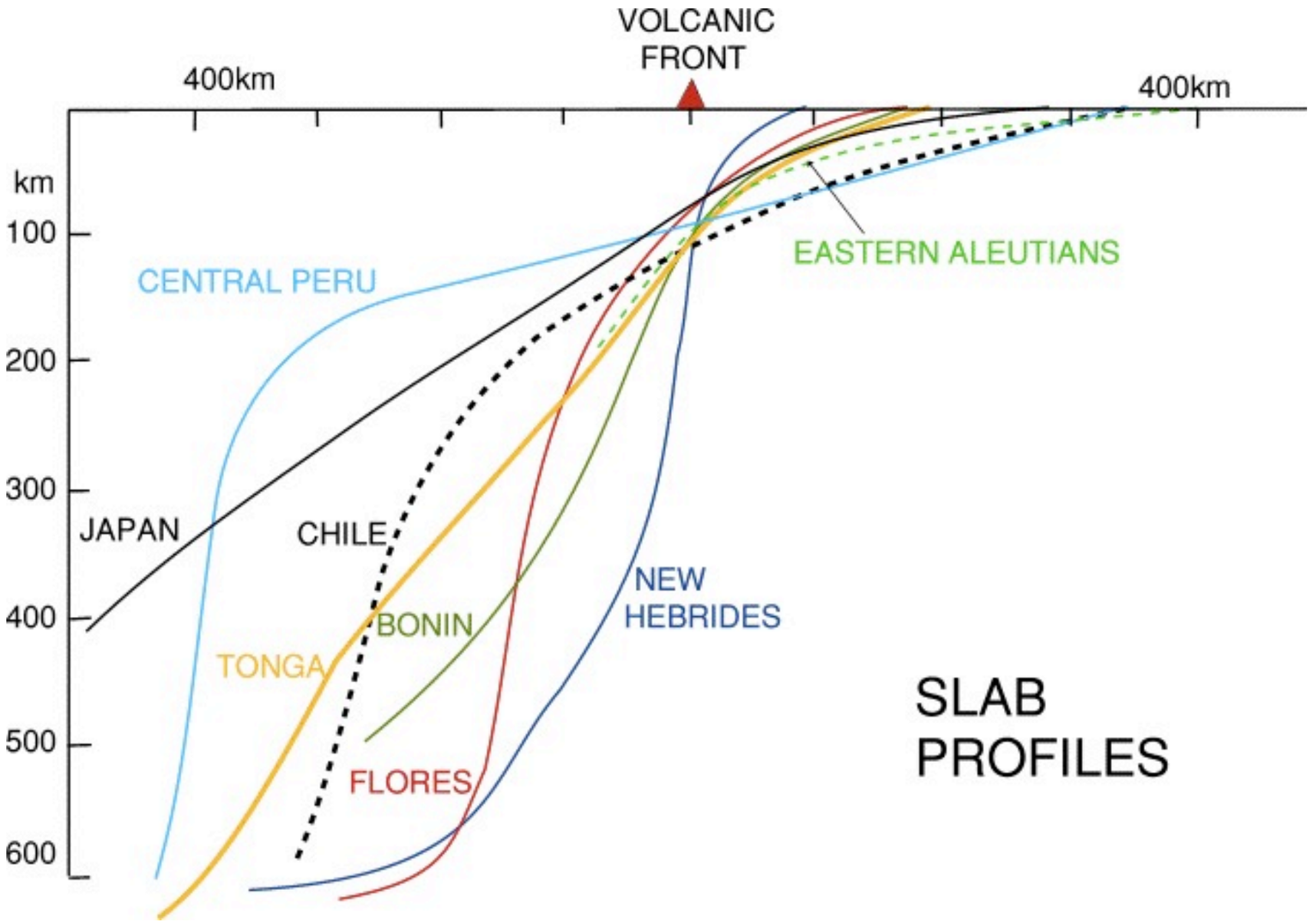
After Spakman

Main volcanos



Volcanic arcs

They commonly occur close to 100 km above the slab



SLAB
PROFILES

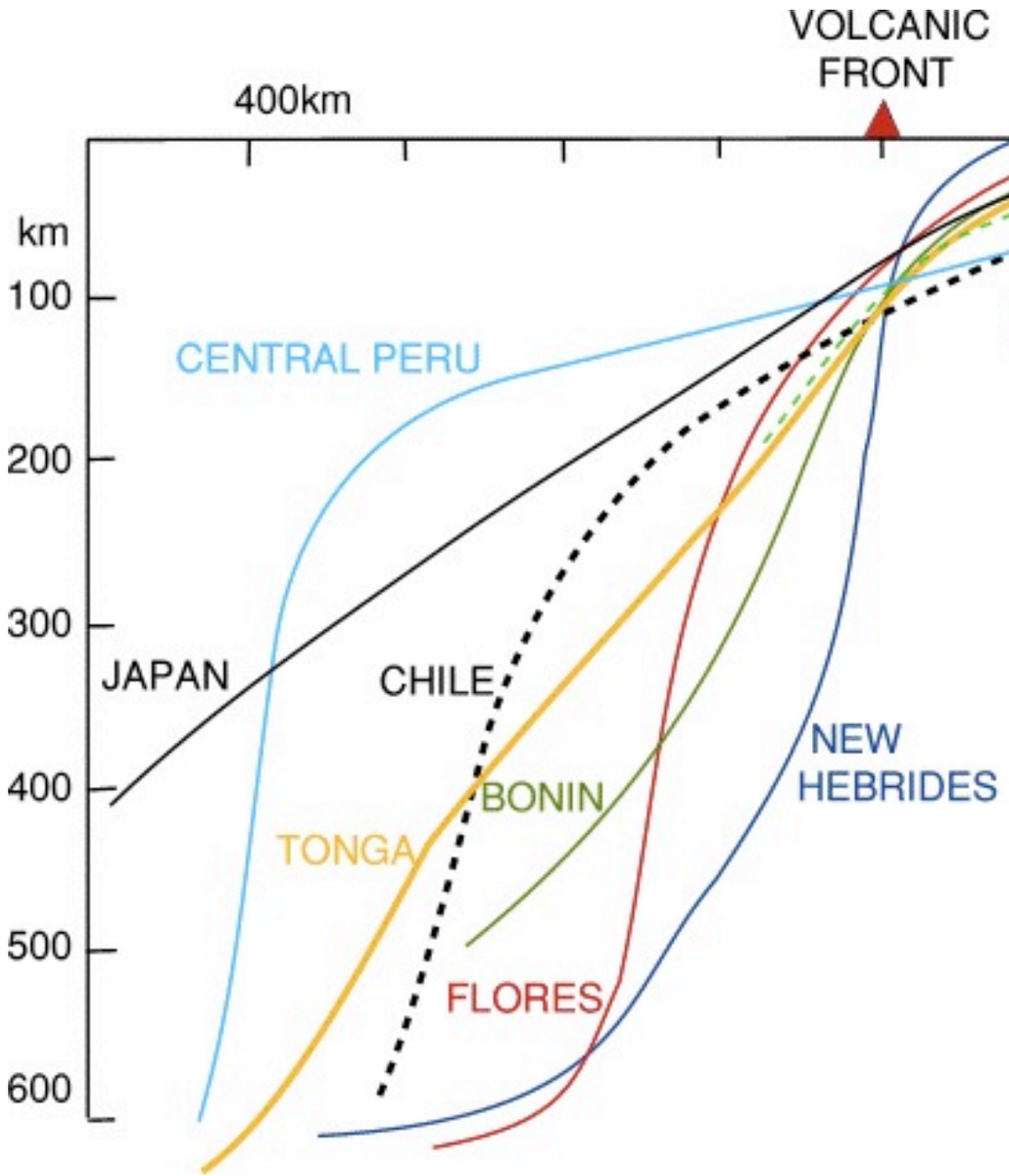
Y.Tatsumi Fig.

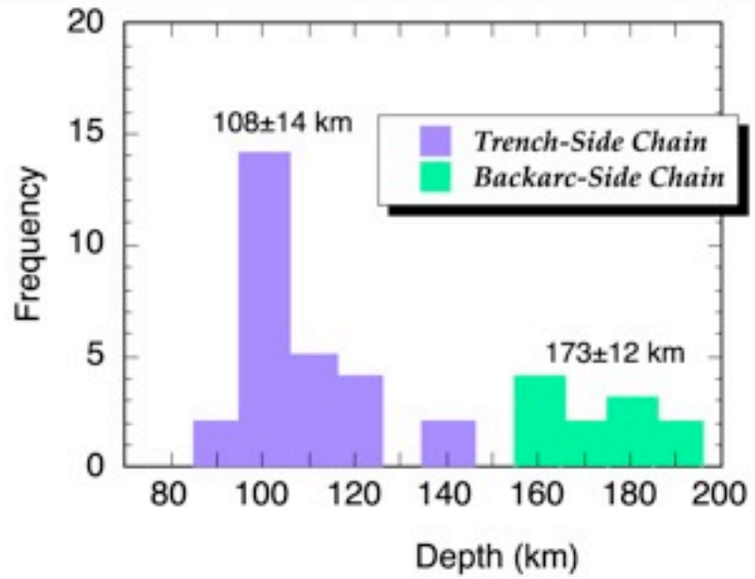
but, there are exceptions

(see England et al., 2004)

Volcanic arcs

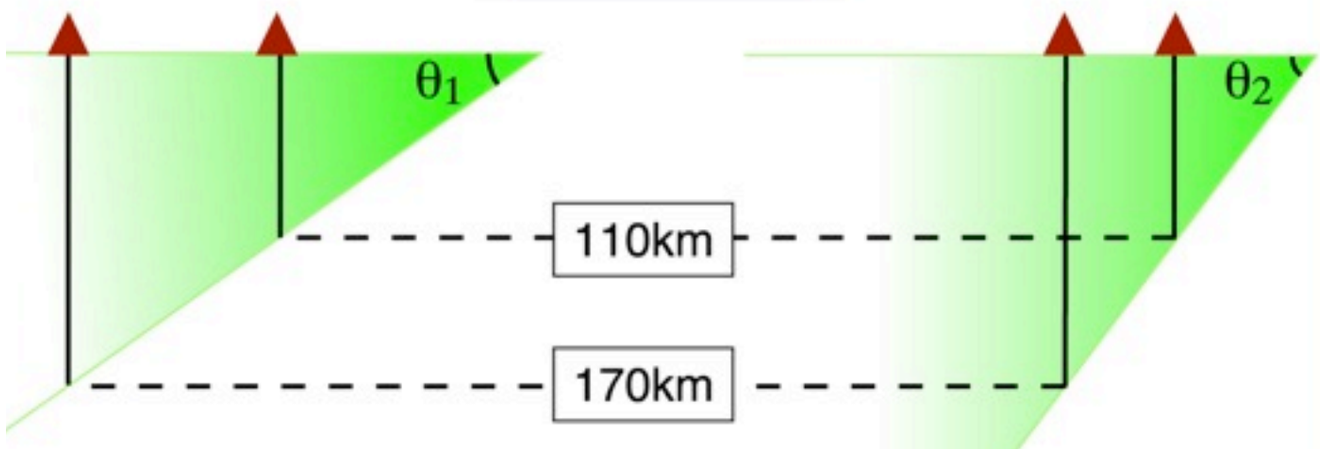
They commonly occur close to 100 km above the slab





Y.Tatsumi Fig.

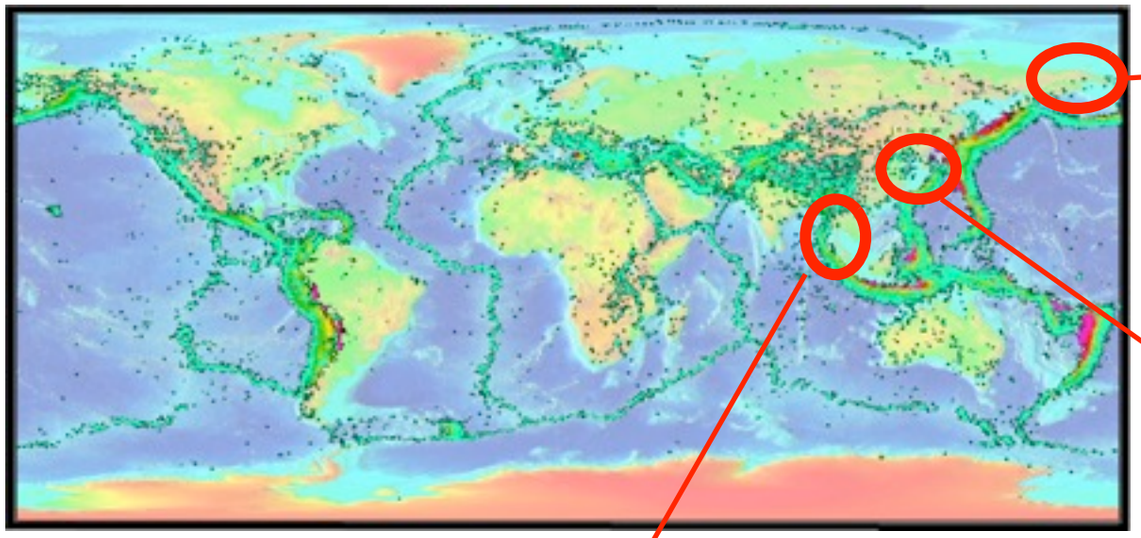
$$w \propto \theta^{-1}$$



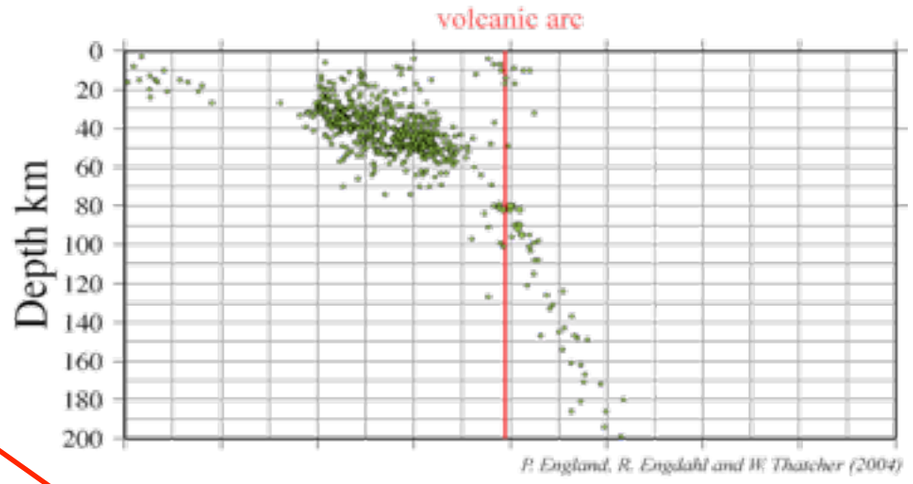
but, there are exceptions

(see England et al., 2004)

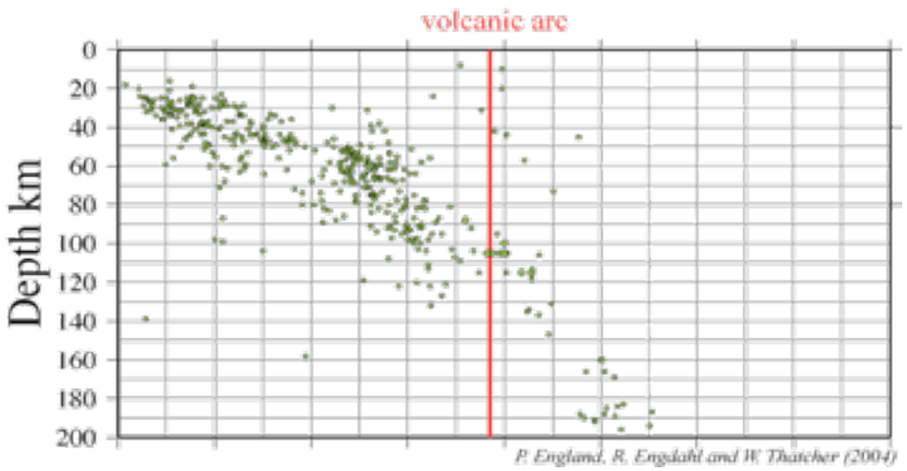
Erdbebenverteilung



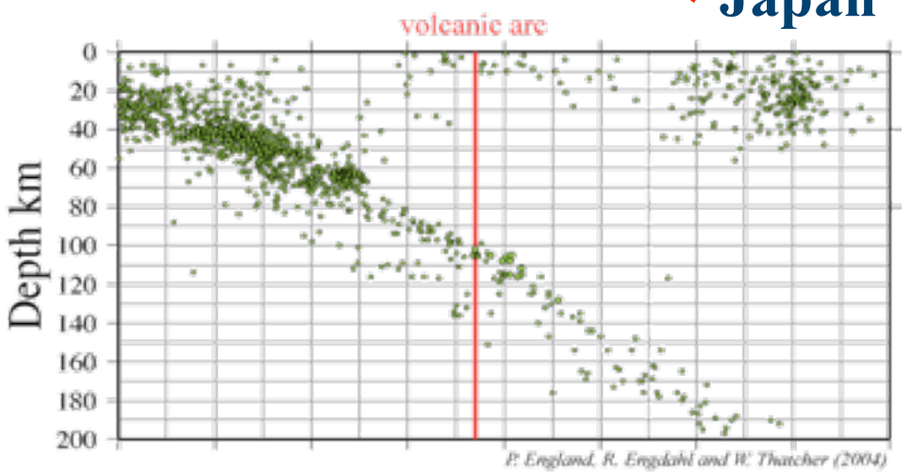
Aleutian



Sumatra



Japan



(England et al., 2004)

Heat budget in subductions zones

Heat flow

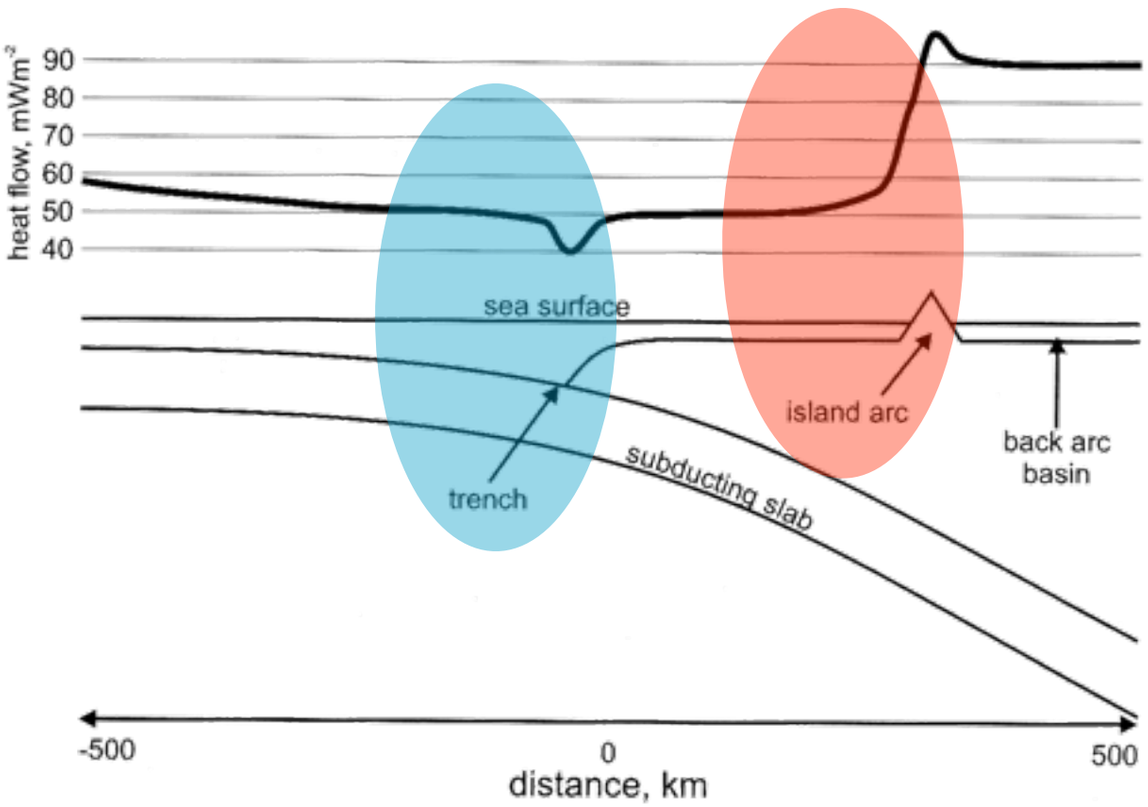
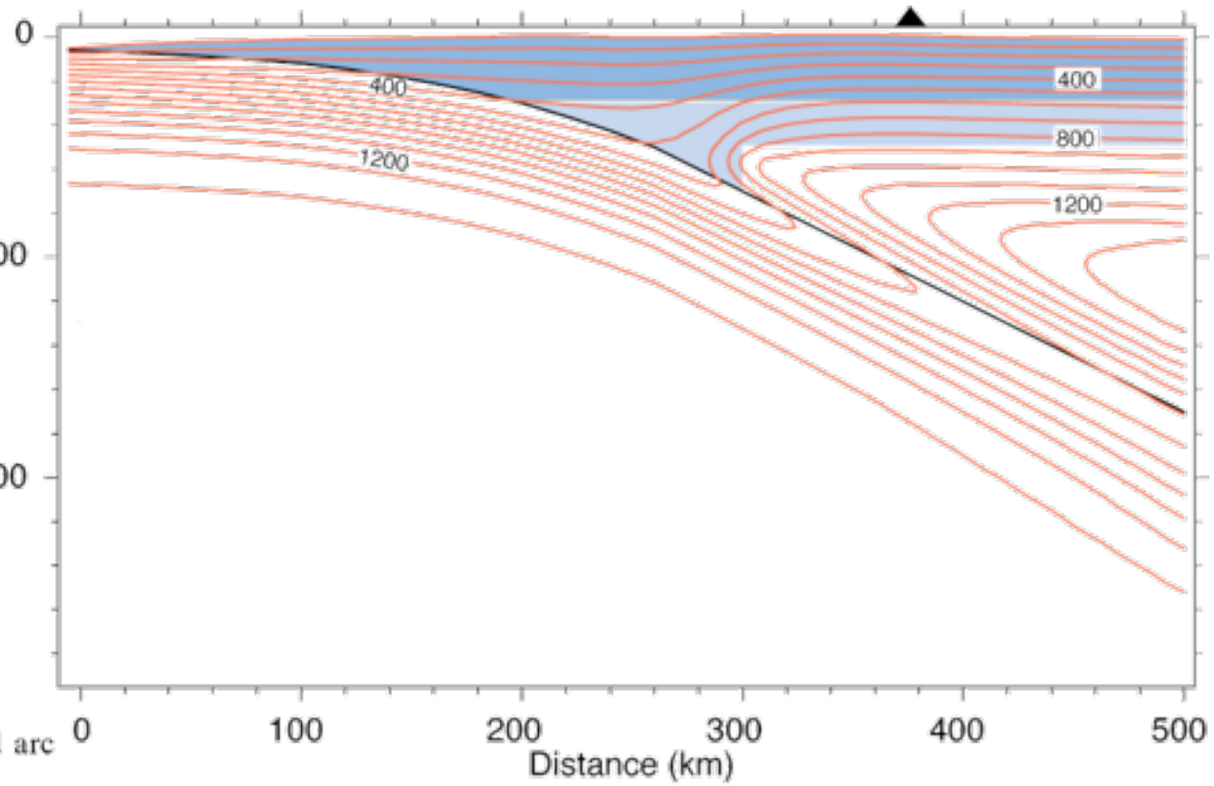
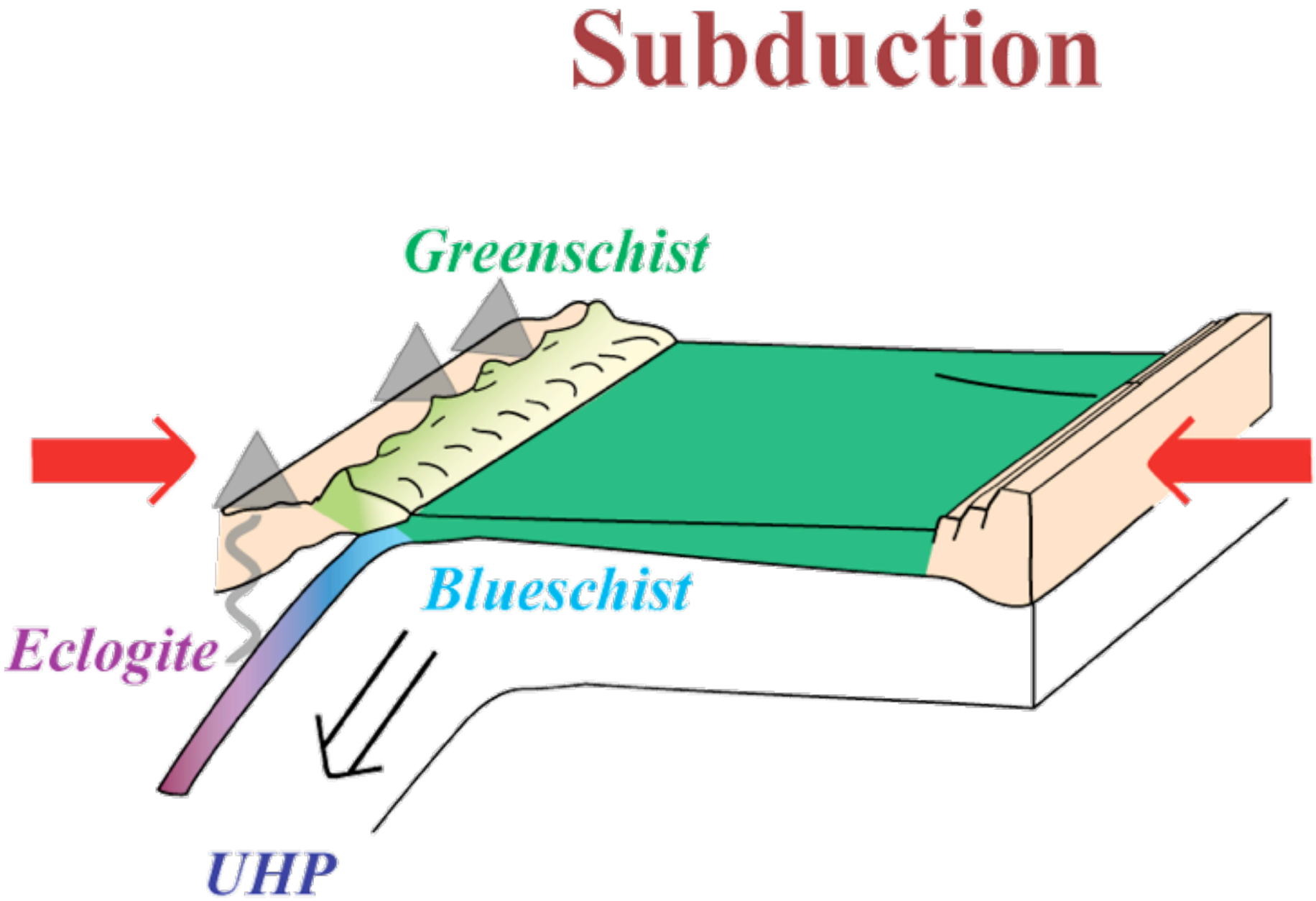


Figure 7.13. Idealised heat flow profile across a subduction zone, showing the trench, island arc volcanism and back-arc basin.

Isotherms



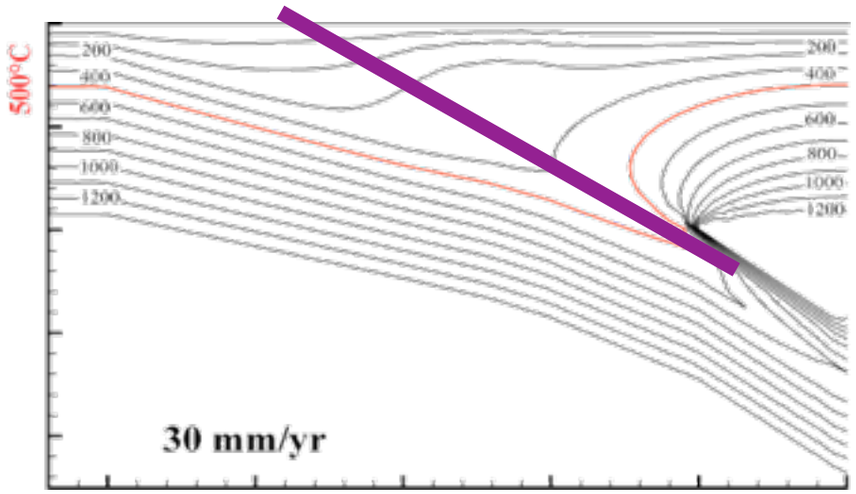
Metamorphism & subduction

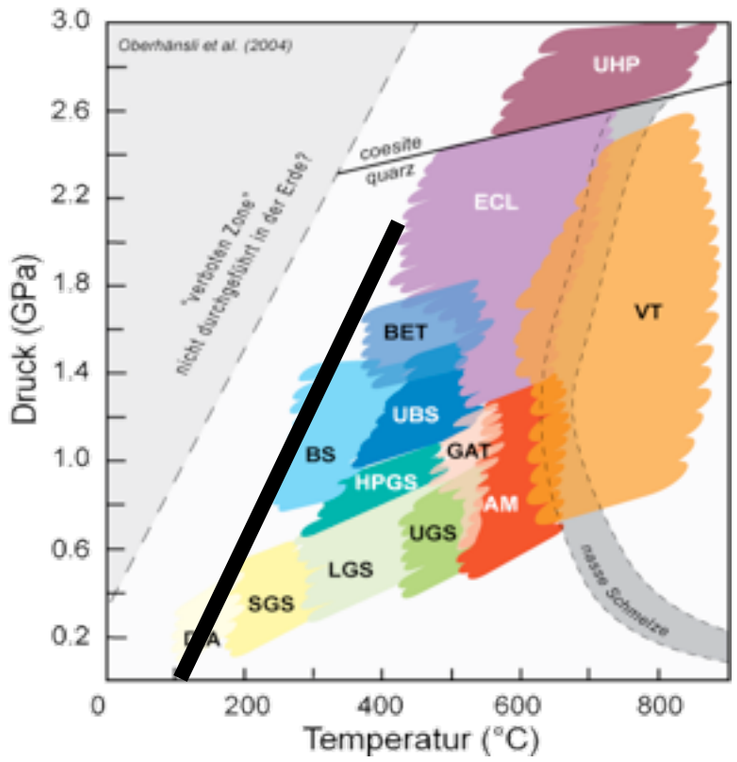


Metamorphism & subduction

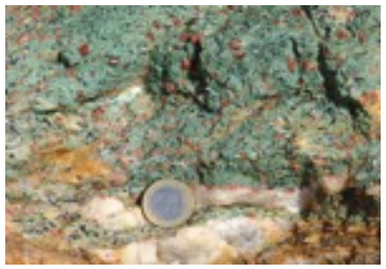
Fast subduction

Very "Cold" Gradient HP-LT ~ 6°C/km





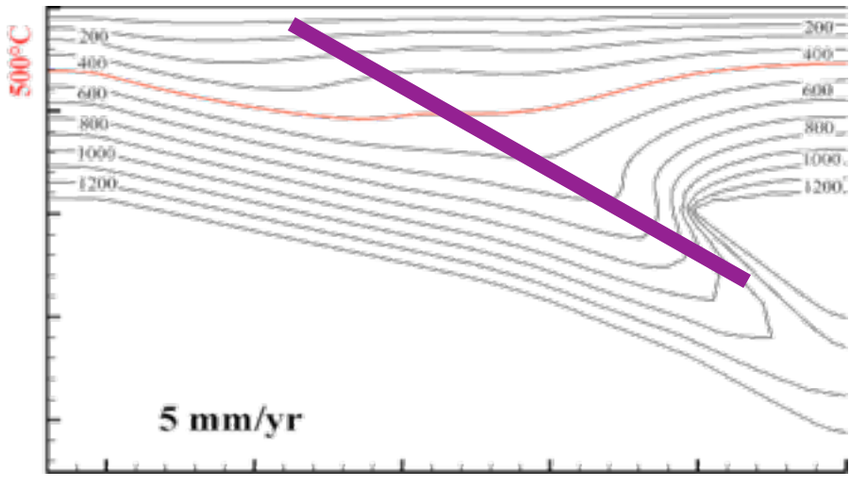
Eclogite

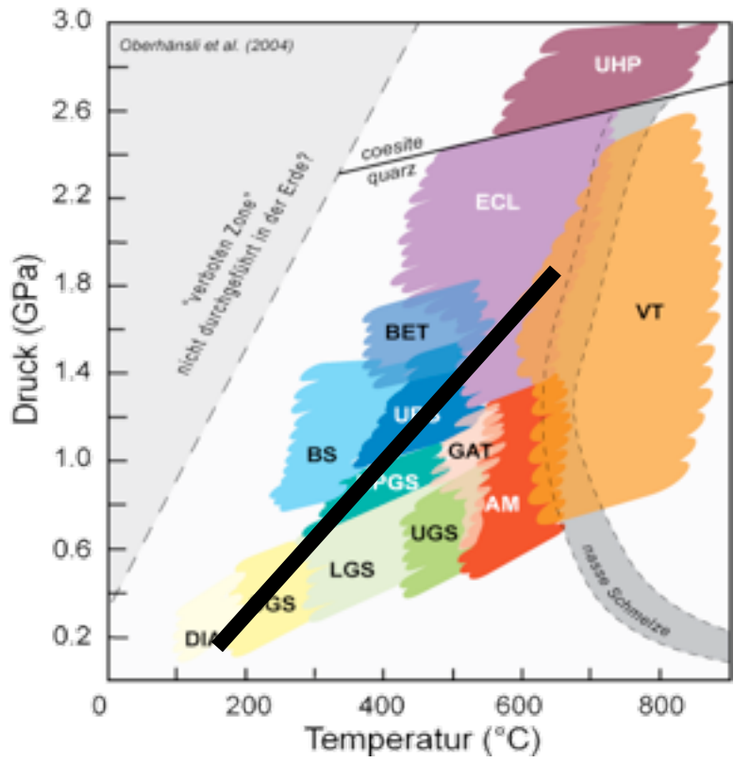


Blueschist

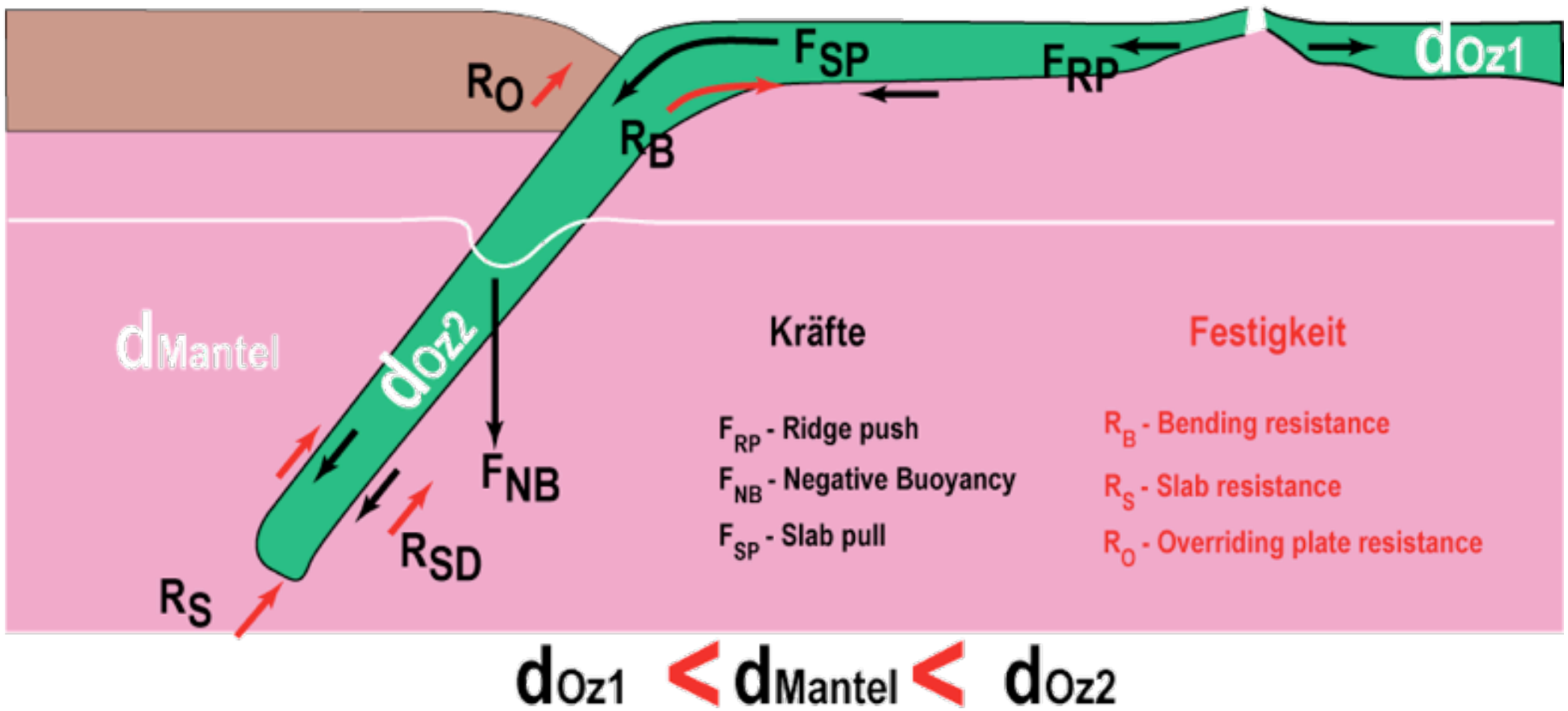
Slow subduction

"Cold" Gradient HP-LT ~ 15°C/km



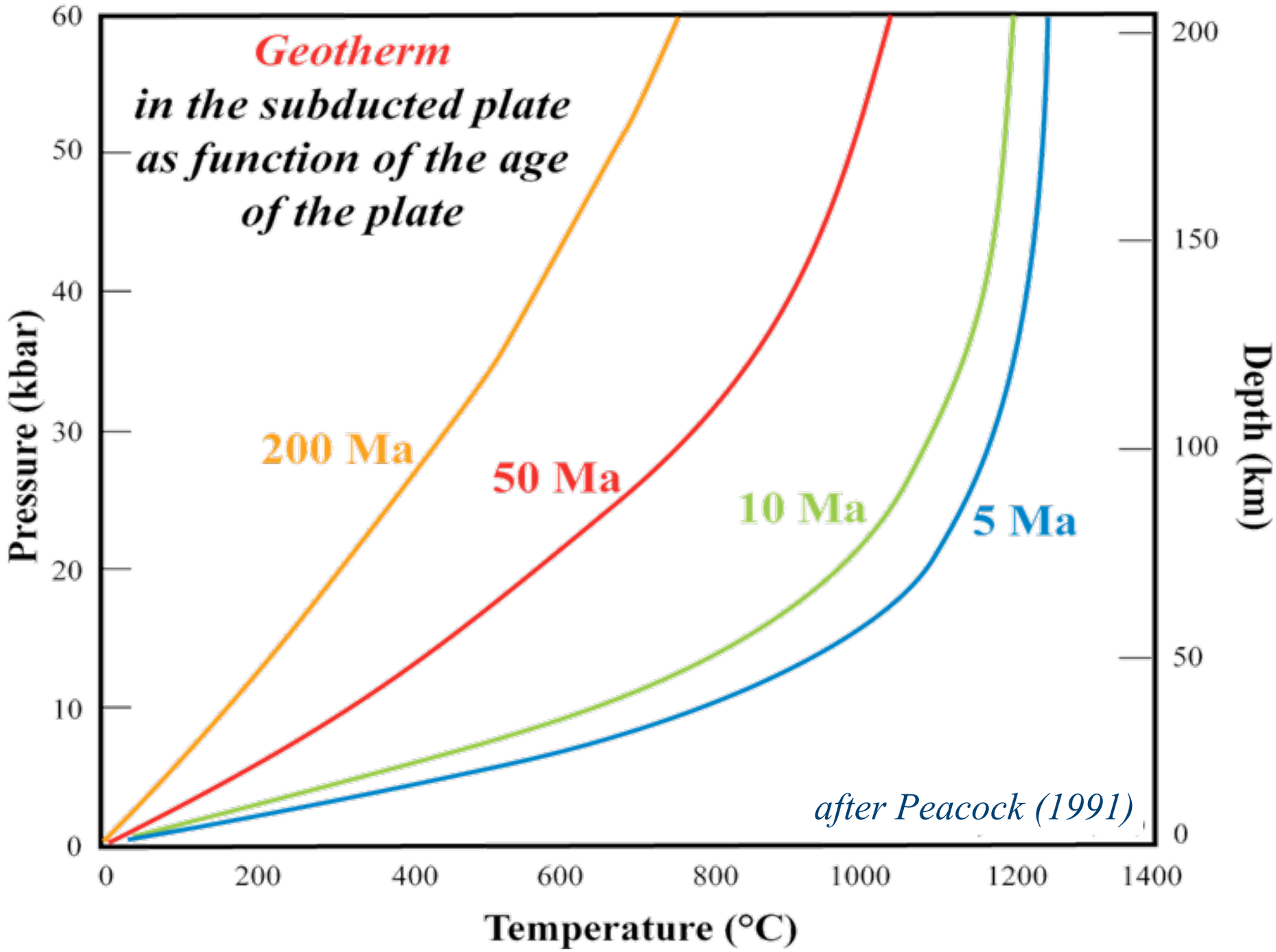


Treibende Kräfte der Plattentektonik

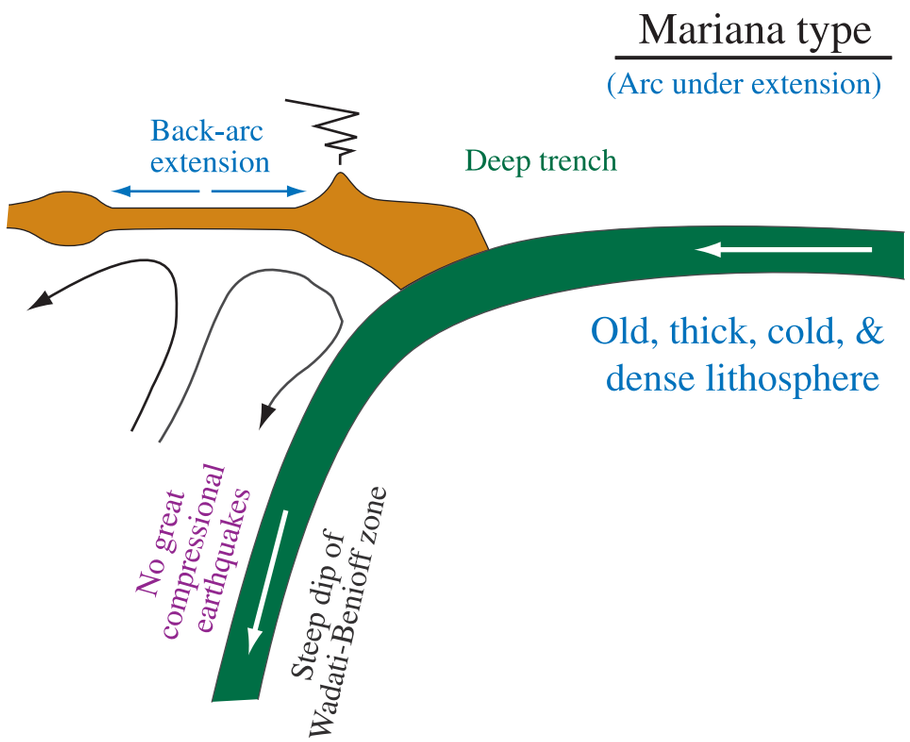


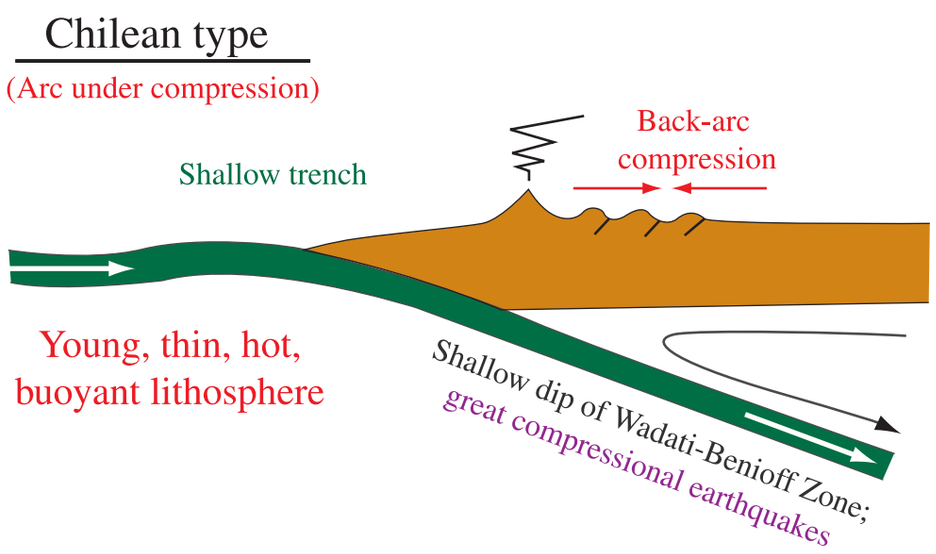
$$d_{Oz1} < d_{Mantel} < d_{Oz2}$$

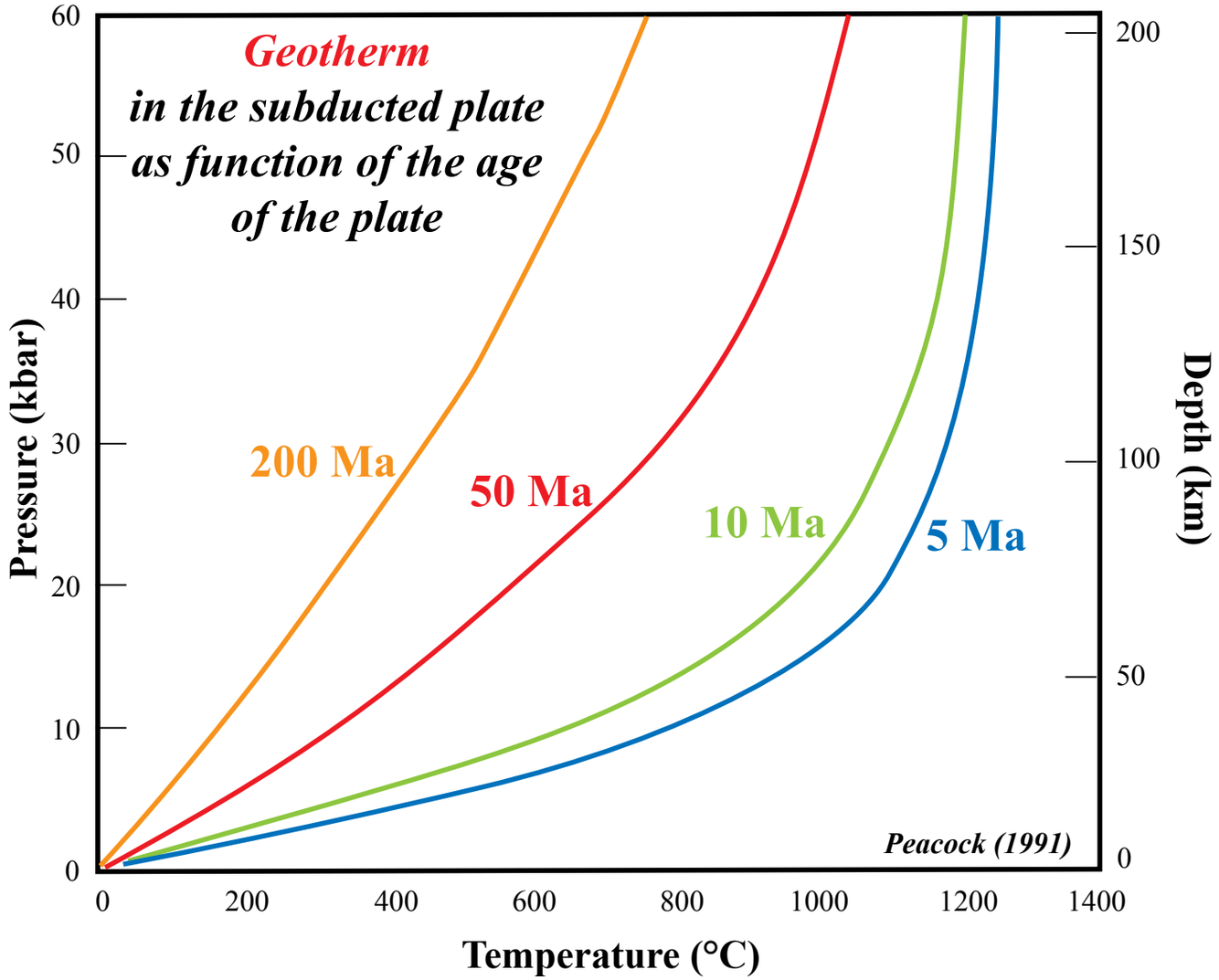
Slab-pull & Age



Slab pull







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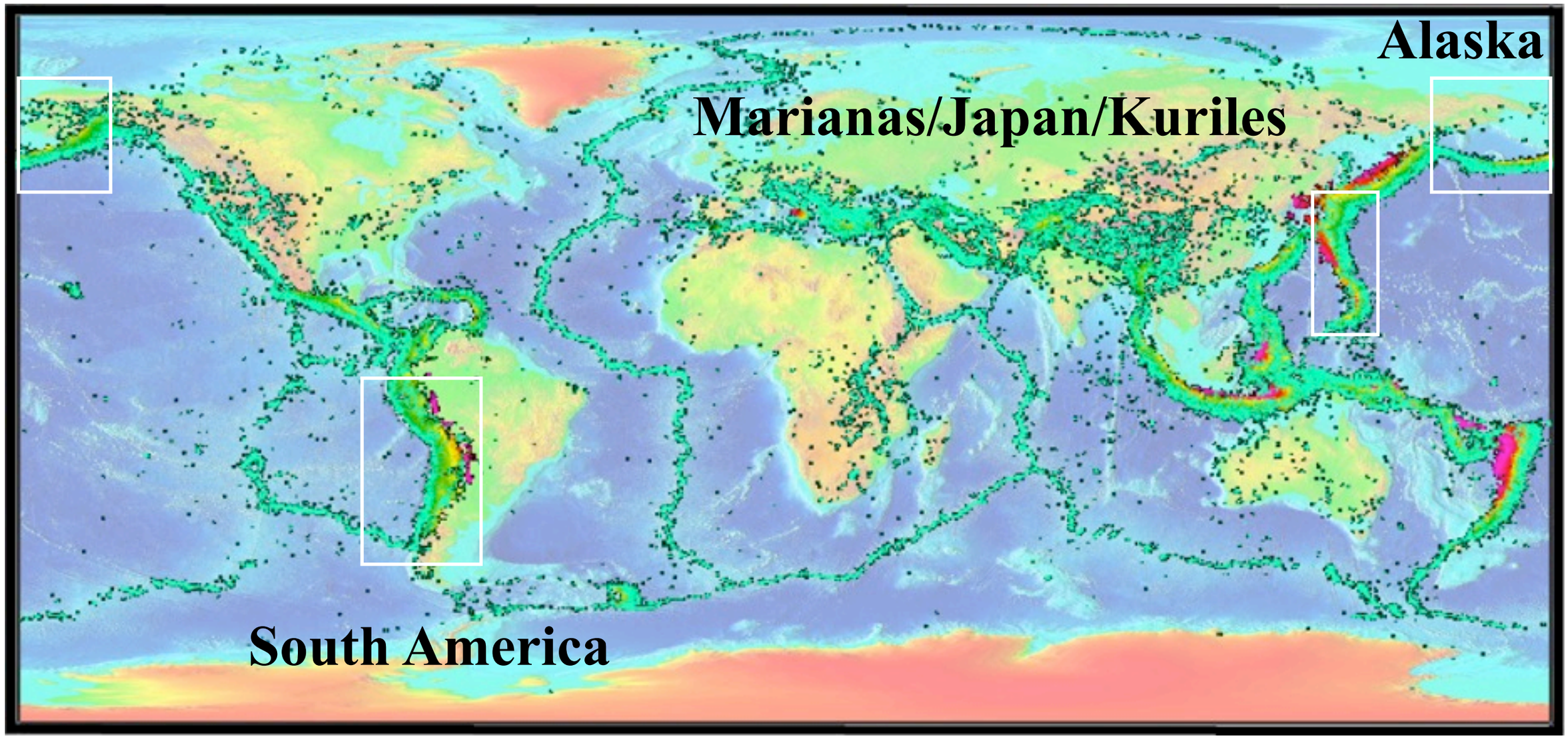
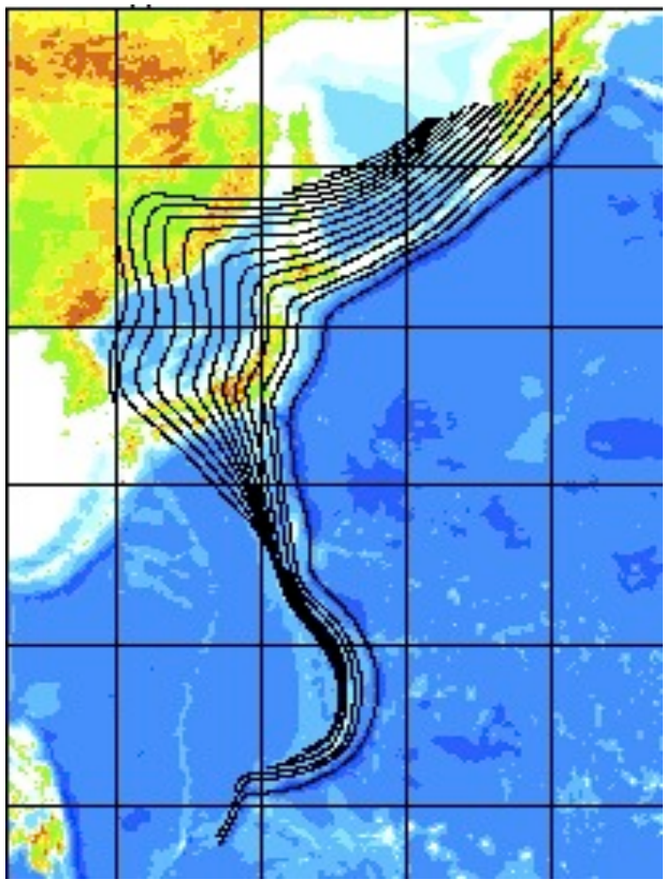
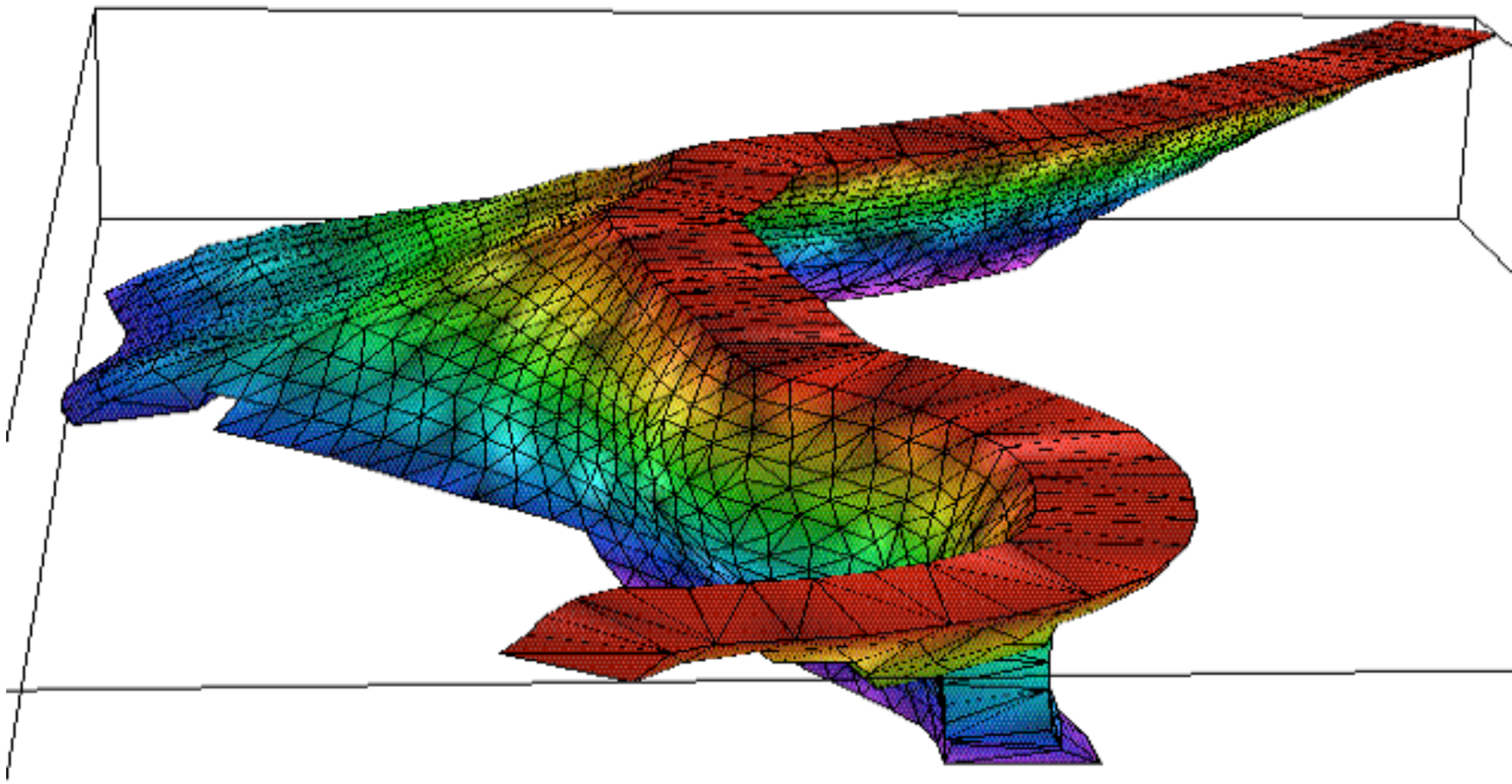
Subduction slabs



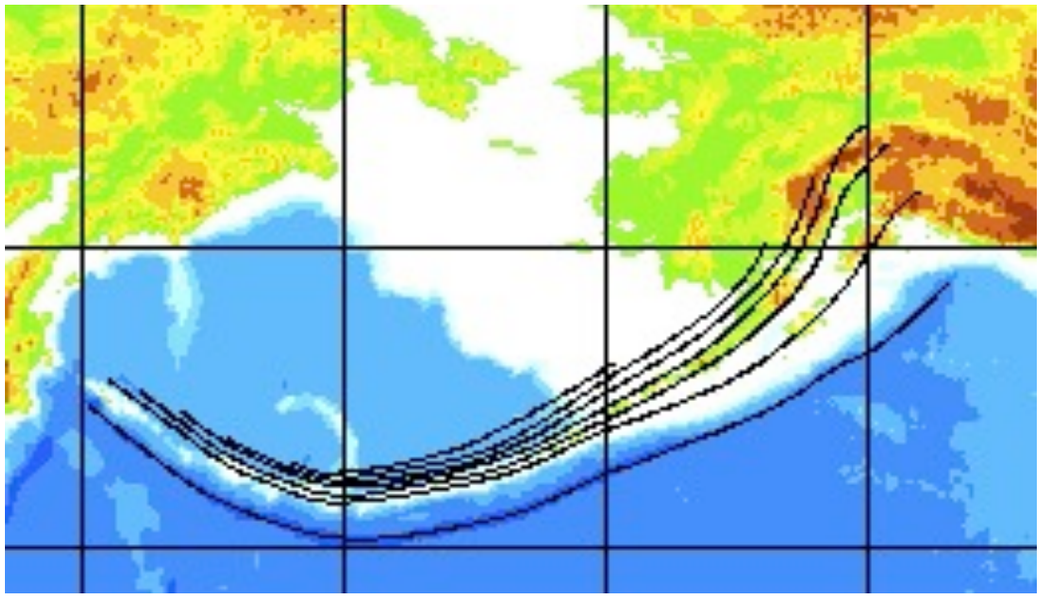
Marianas/Japan/Kuriles subduction zone

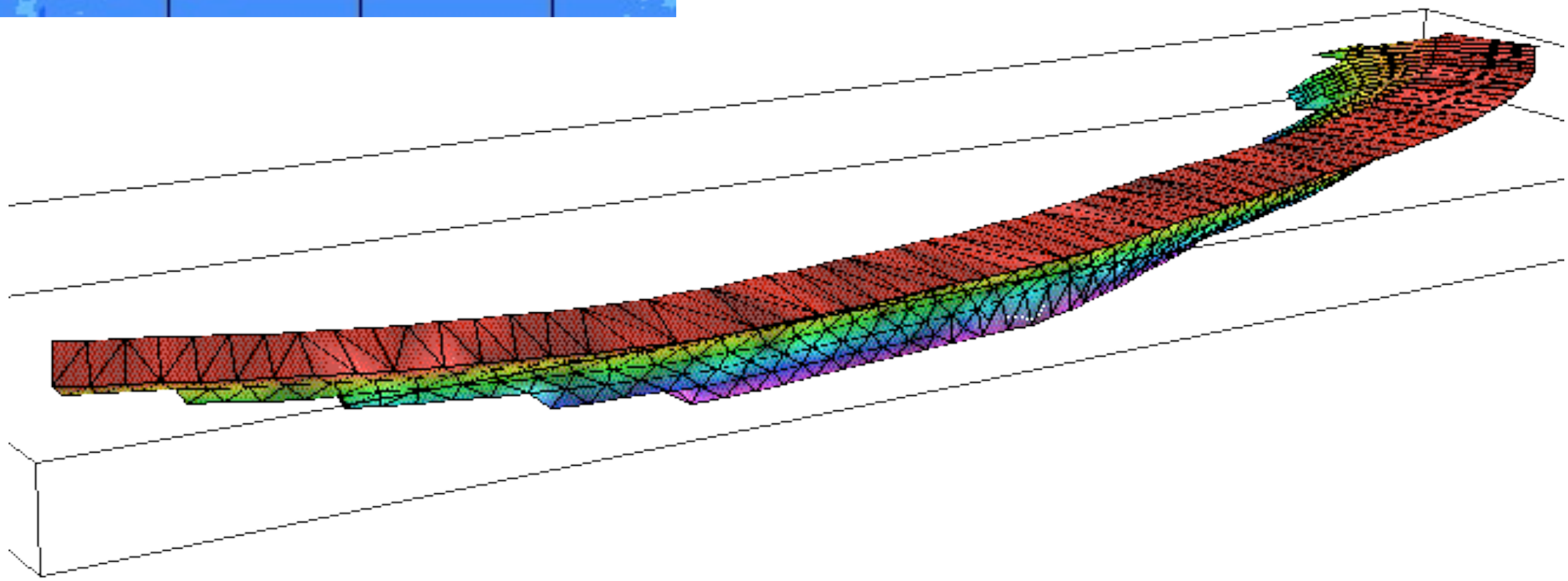




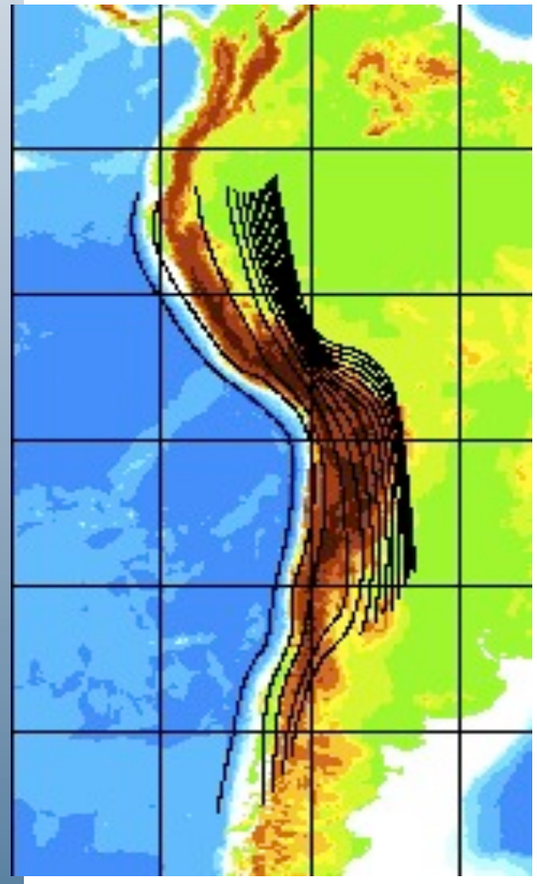
http://rses.anu.edu.au/seismology/projects/RUM/slabs/slabs.htm

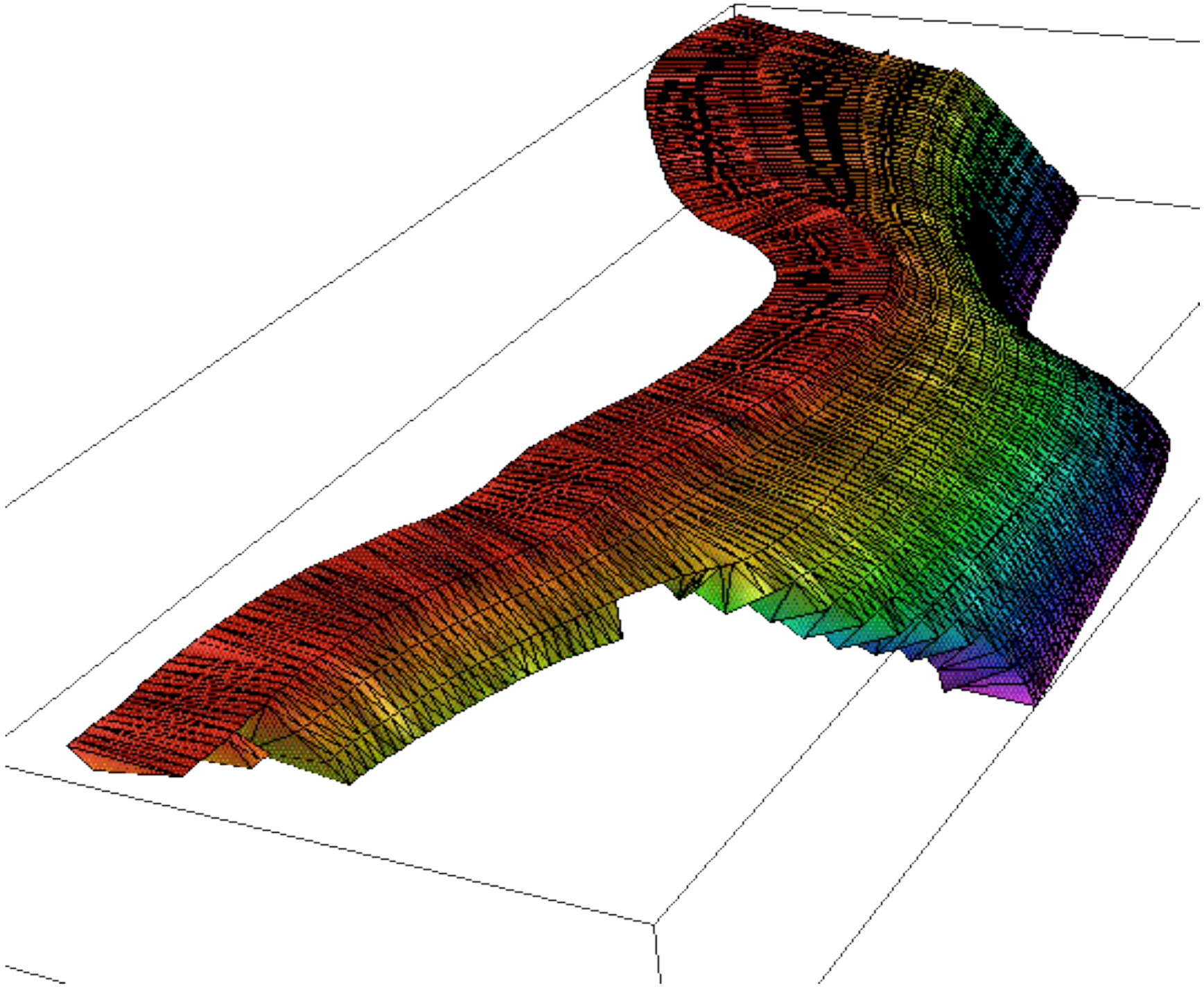
Alaska



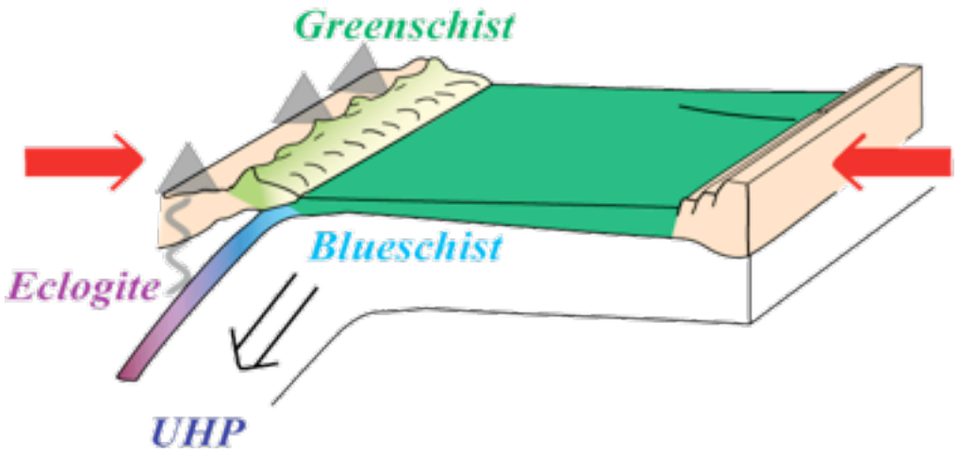


South America

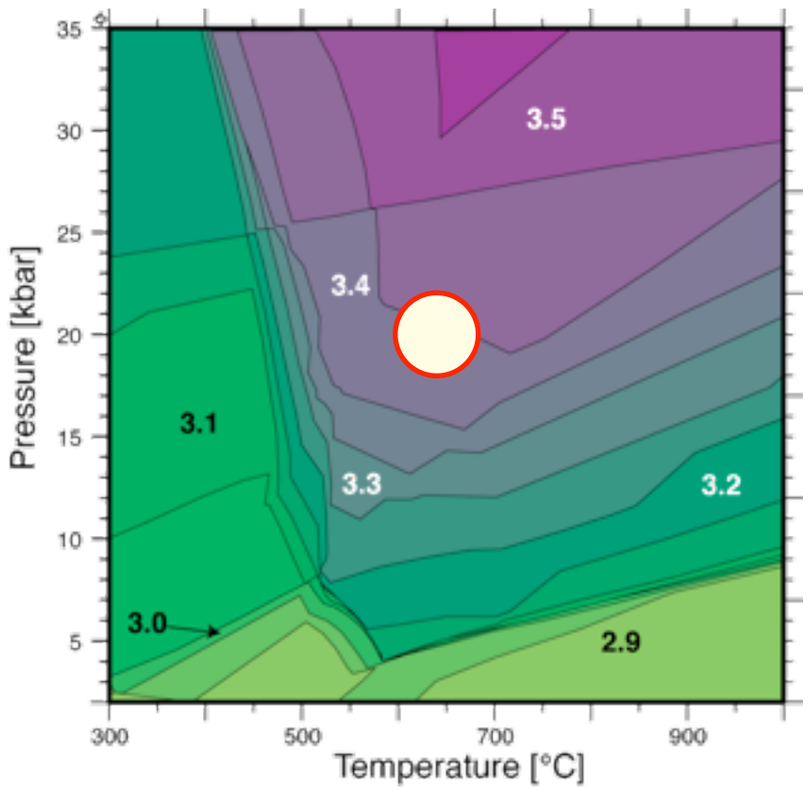




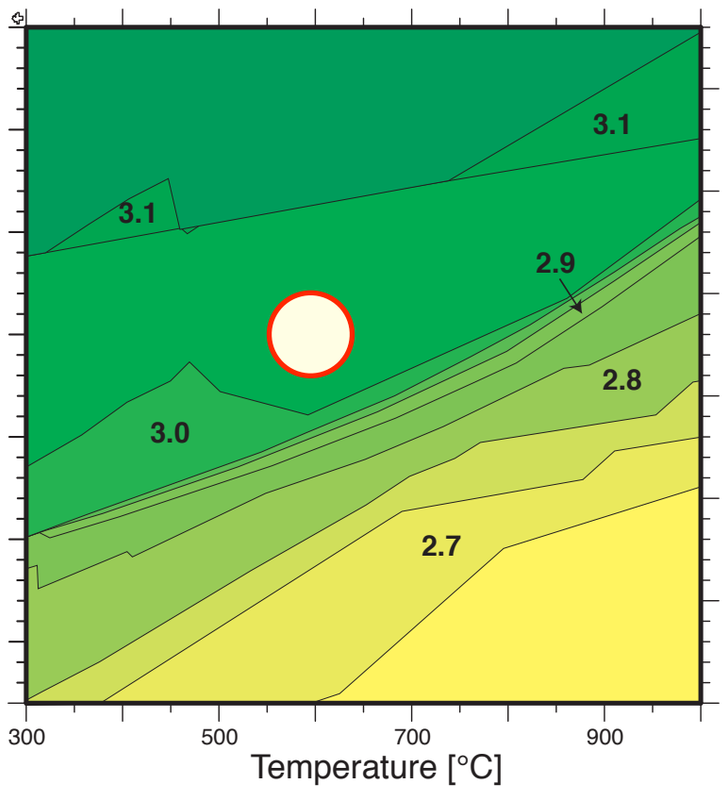
Subduction



Basalt chemistry

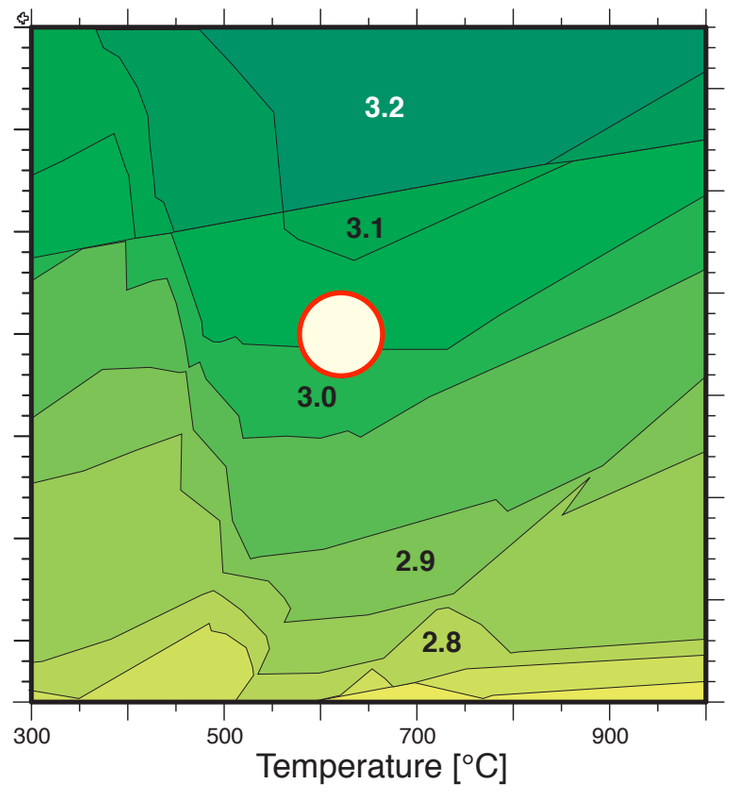


Granite chemistry



Pelites chemistry

Shaw, 1956



excess of water, absence of melting

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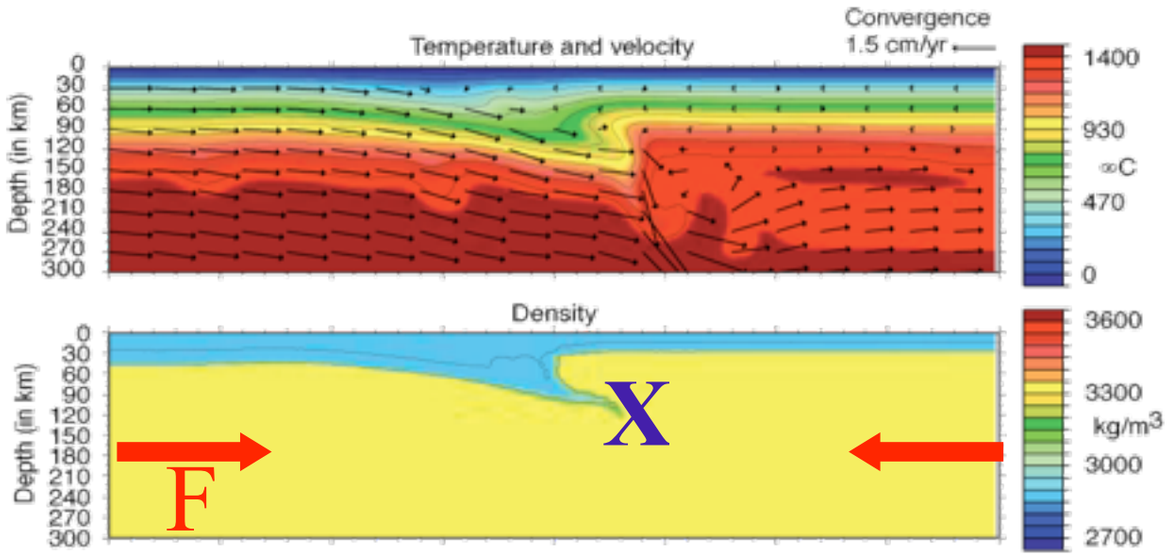
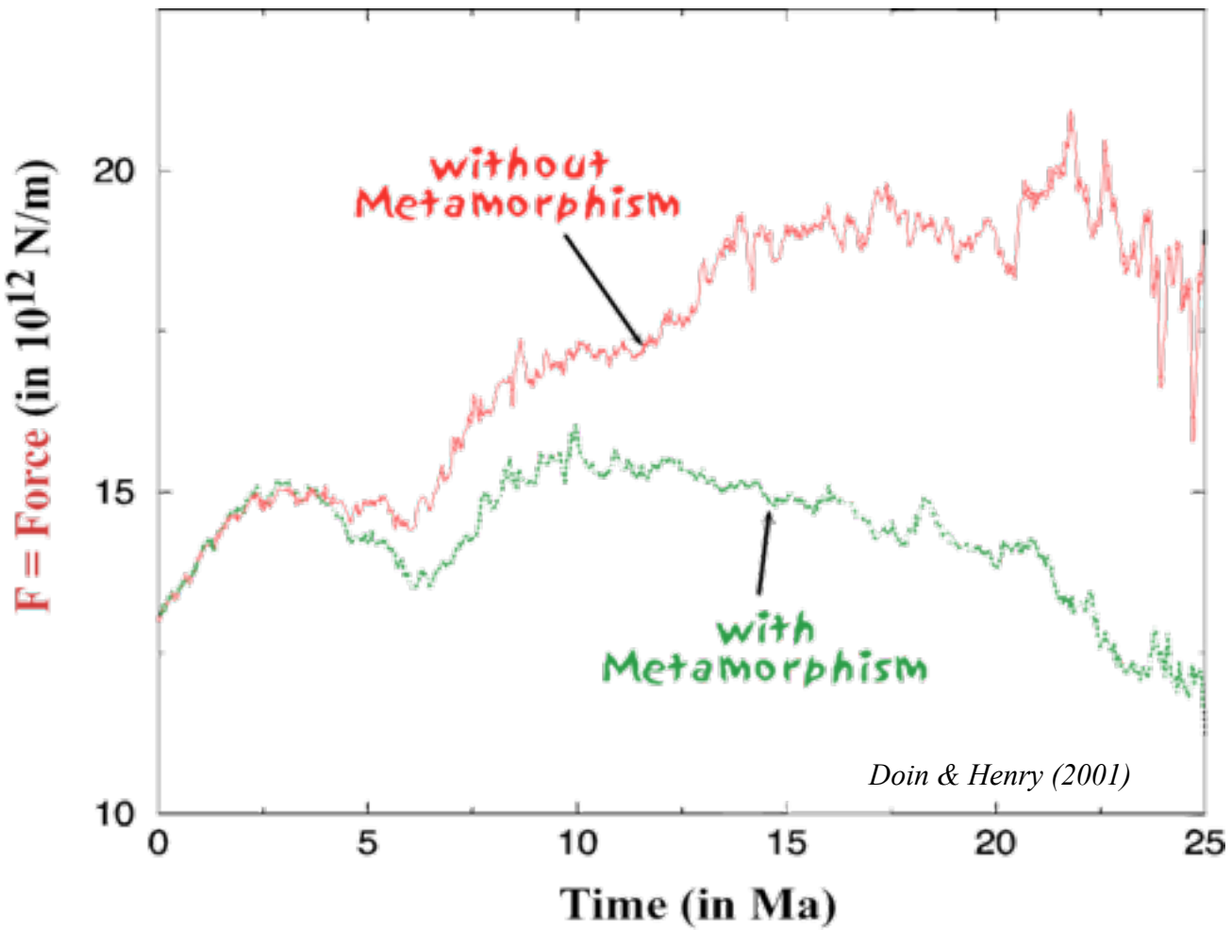
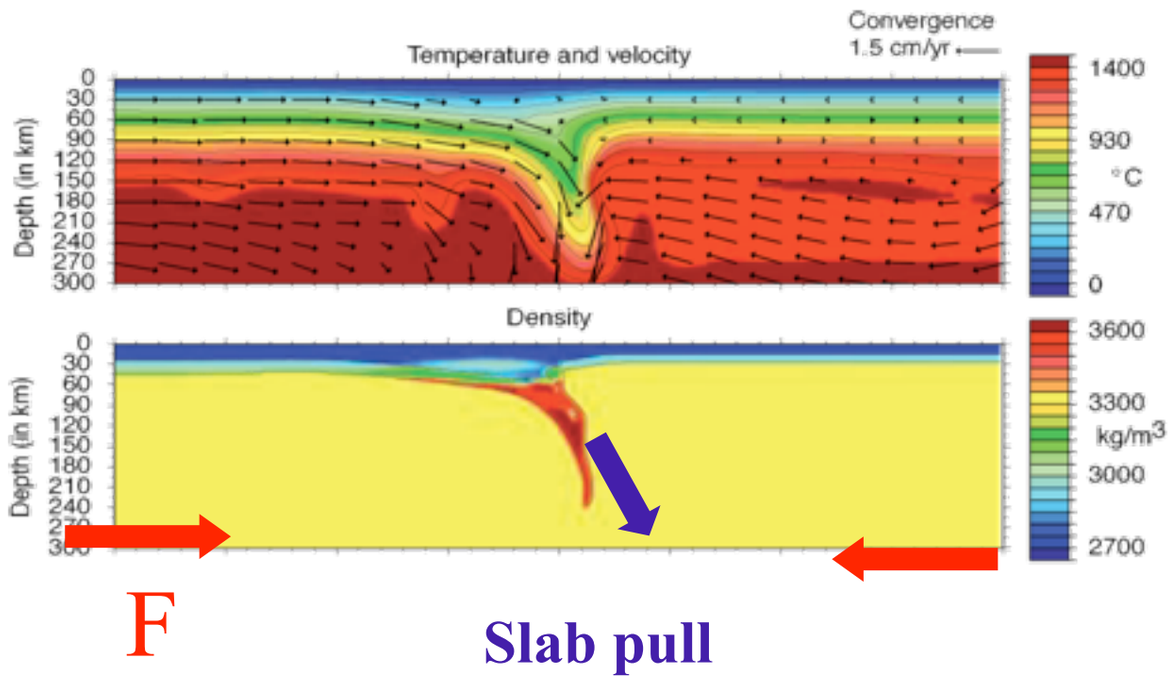
Metamorphose & Slab pull

No slab pull

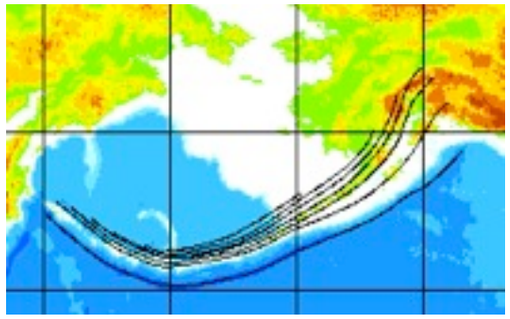






Slab pull

Metamorphism: dynamic modeling & subduction

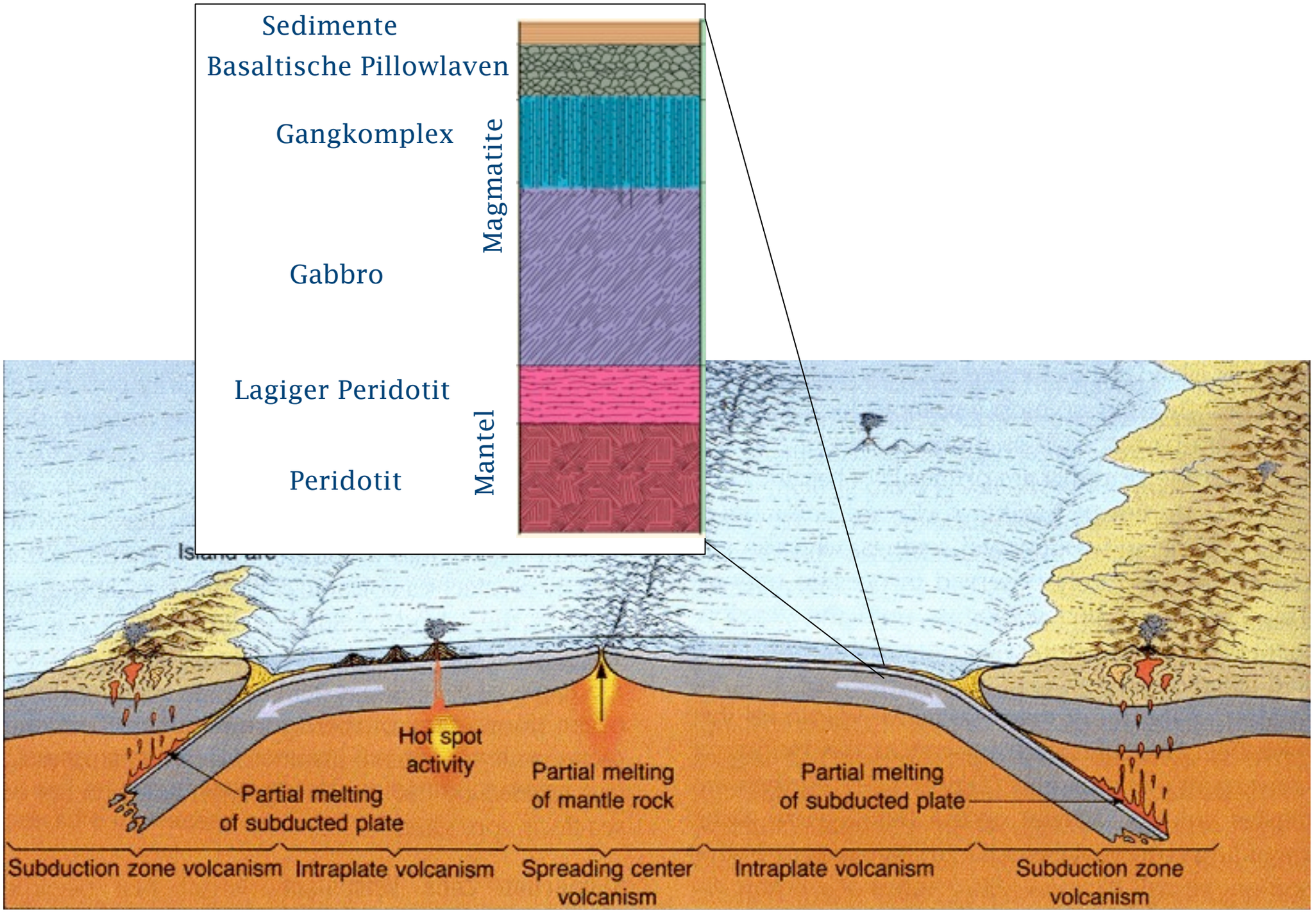


Gudmundsson and Sambridge (1998)

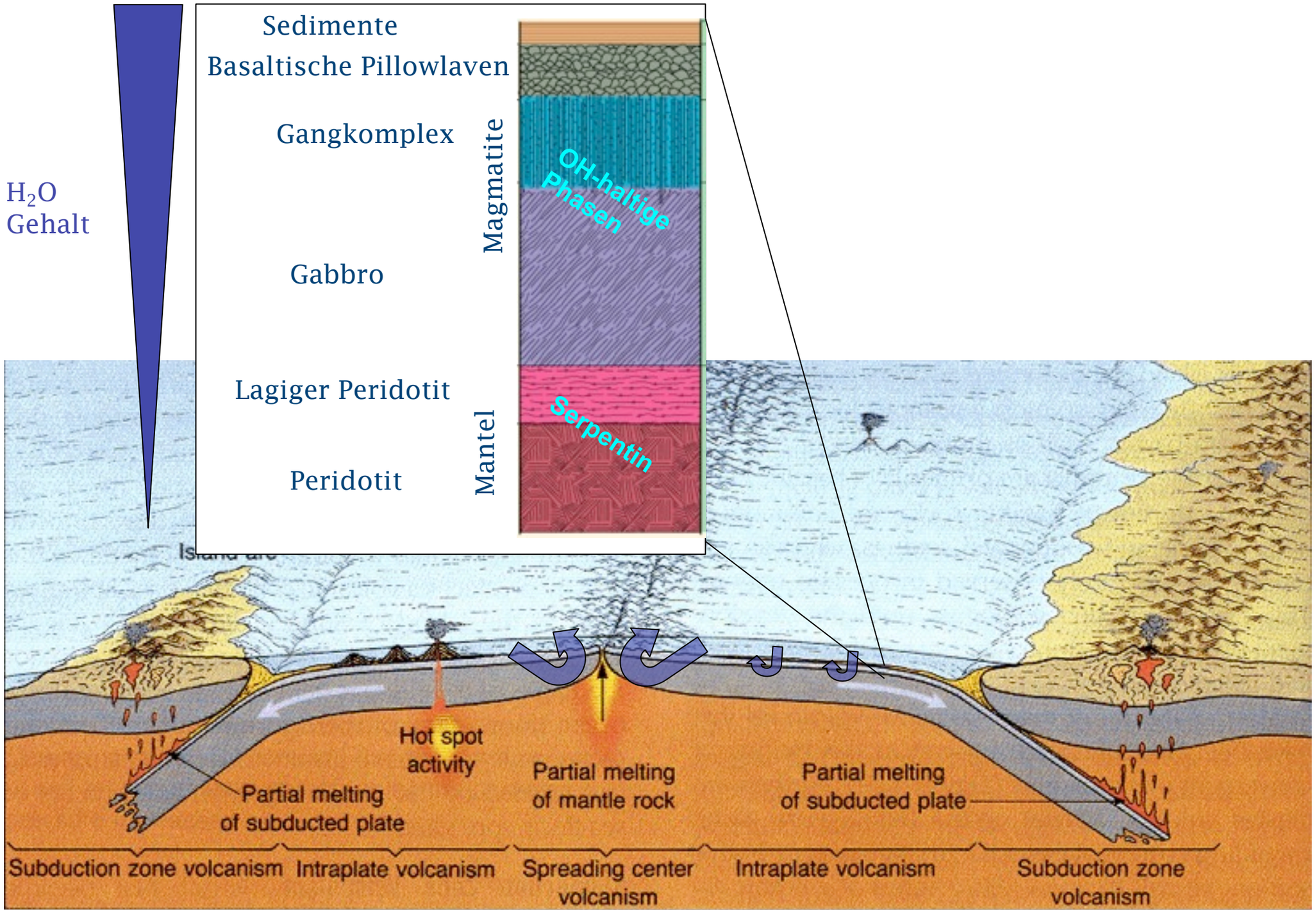
Excess weight of old slabs is often counterbalanced by cold temperature conditions. They inhibeted eclogitization processes

Light slab of young oceanic plate are favorizing HT that trigger eclogitization within the slab

Wie kommen Fluide in das System?

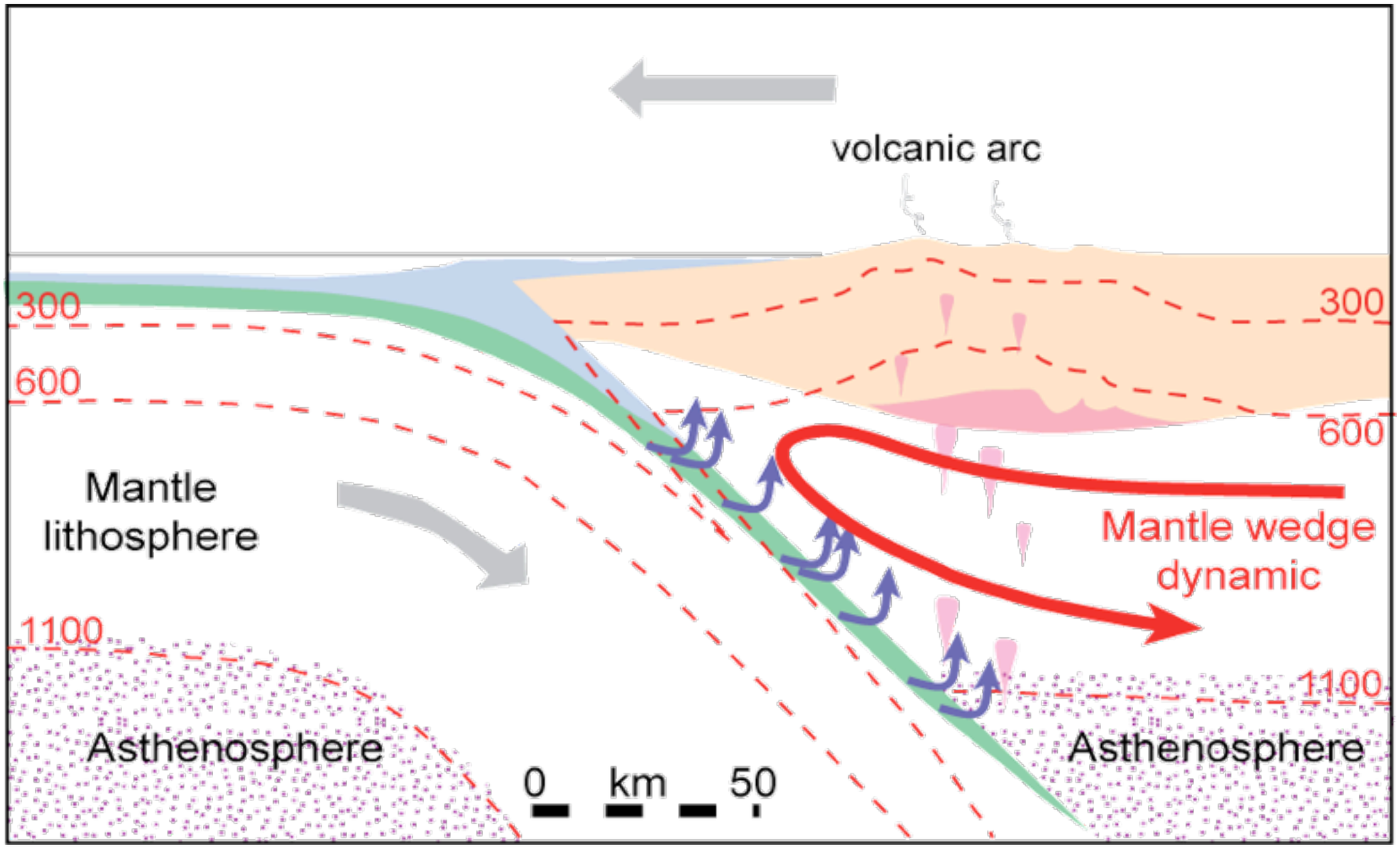


Wie kommen Fluide in das System?

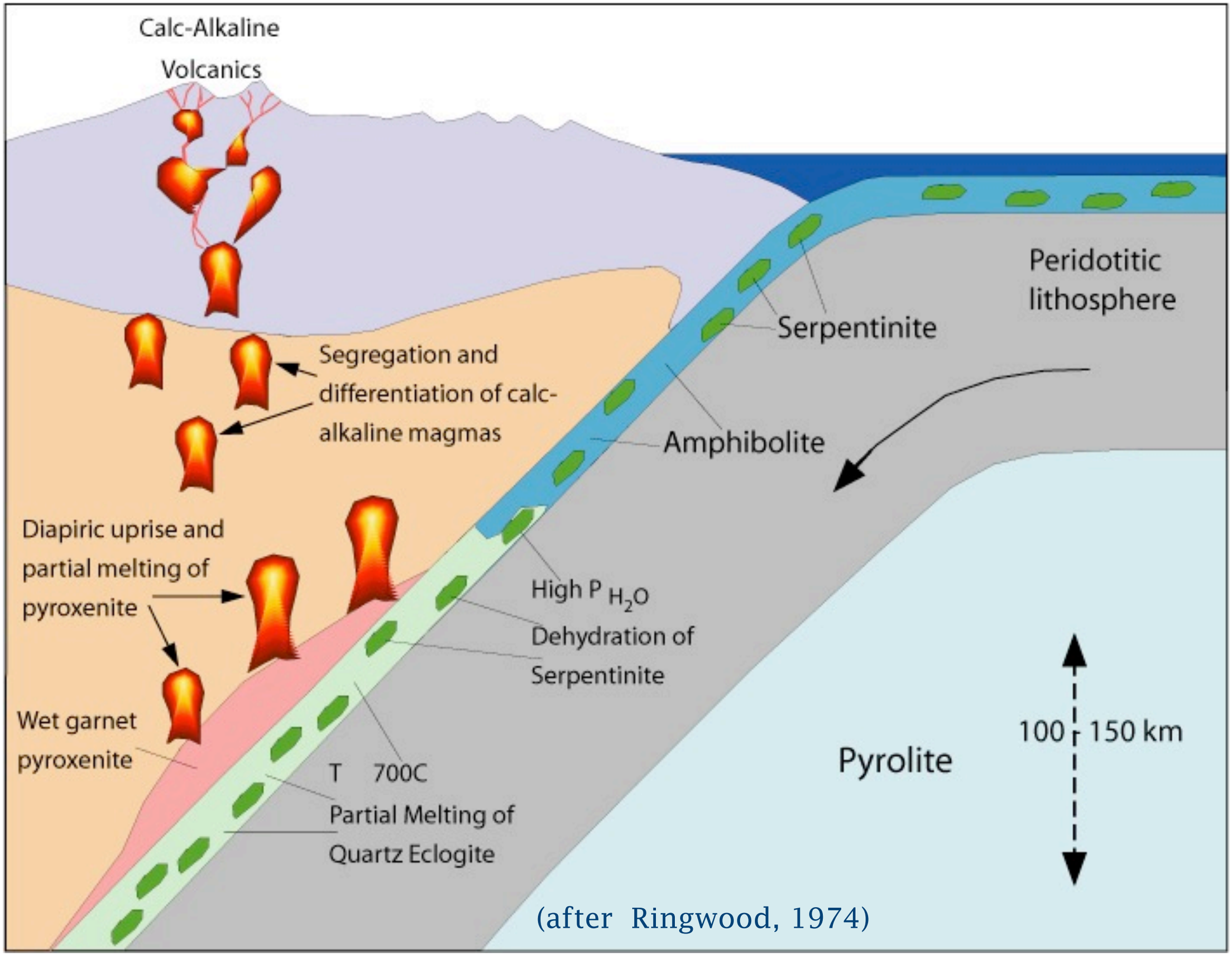


Hydratation der ozeanischen Kruste (Basalt)
des lithosphärischen Mantels

Fluids & Mantle wedge dynamic

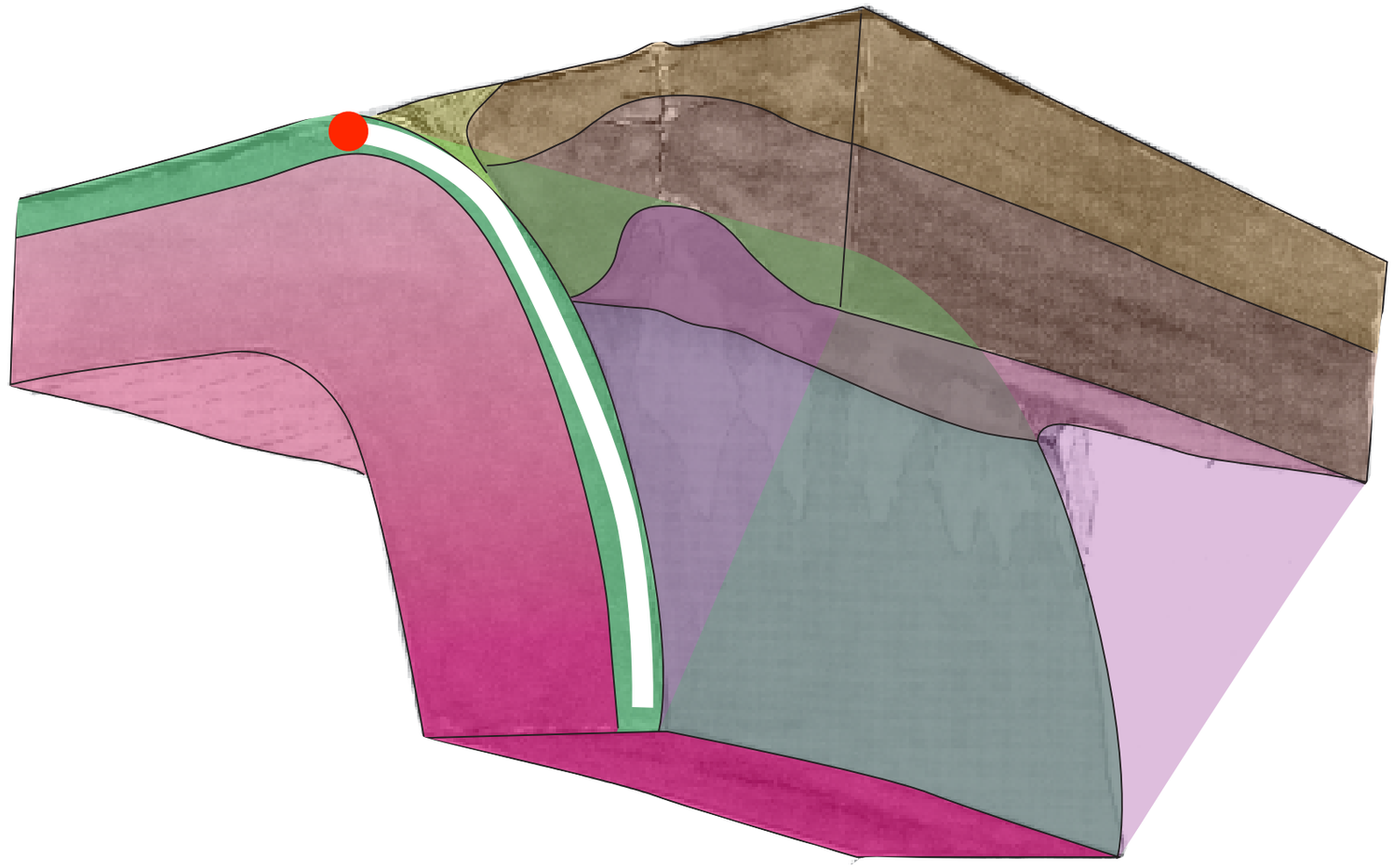


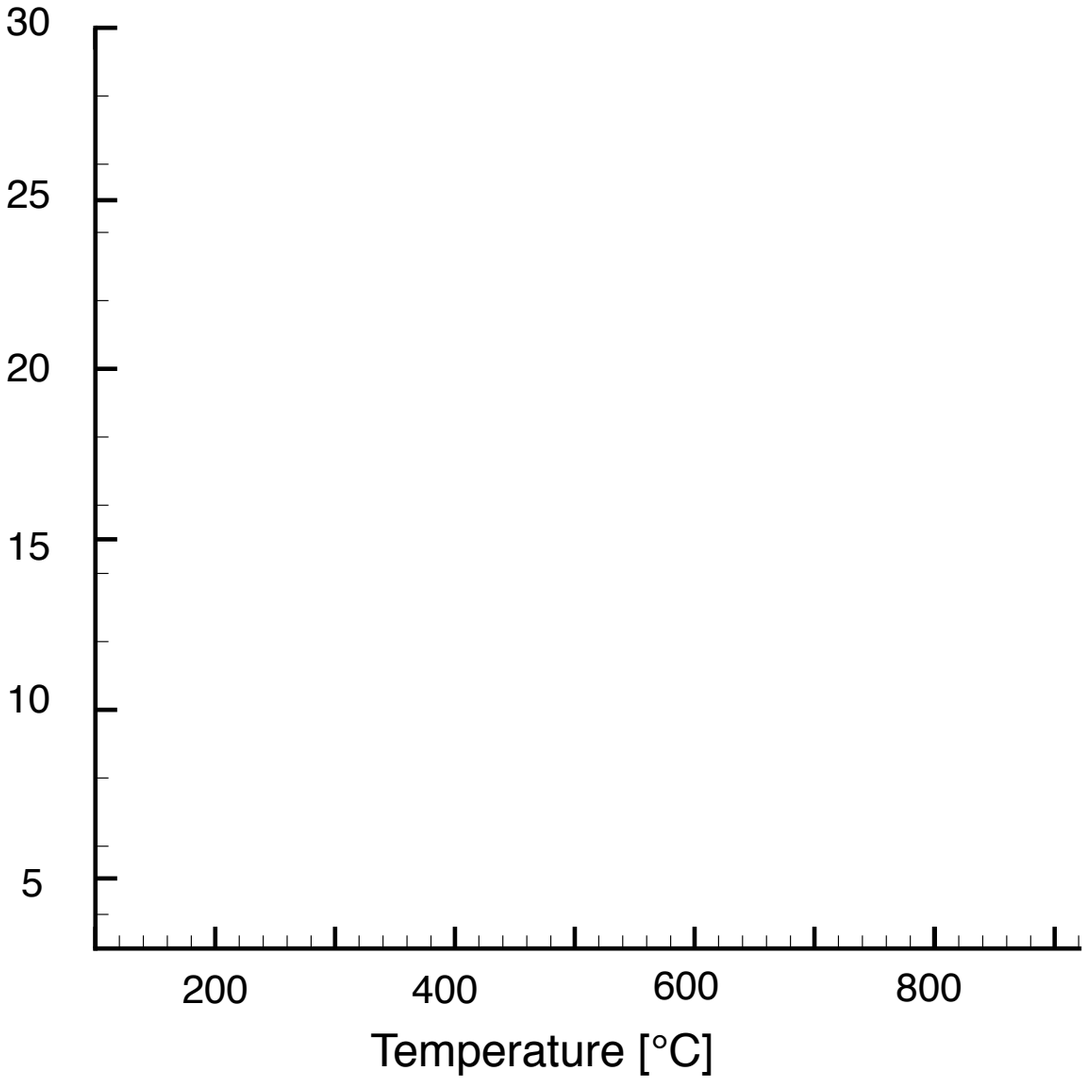
Mature Island Arc & metamorphism



(after Ringwood, 1974)

Geotherms of subduction





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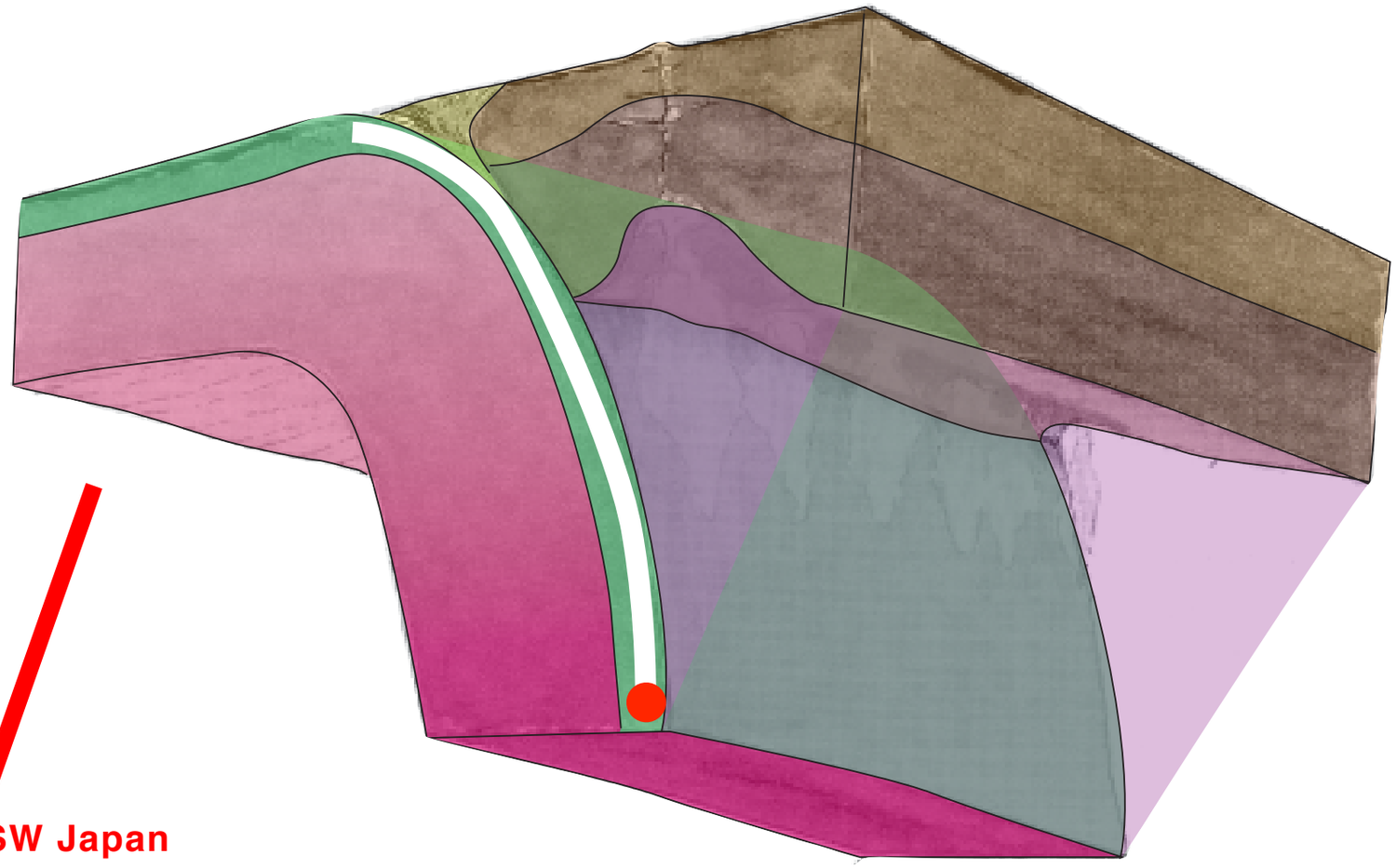
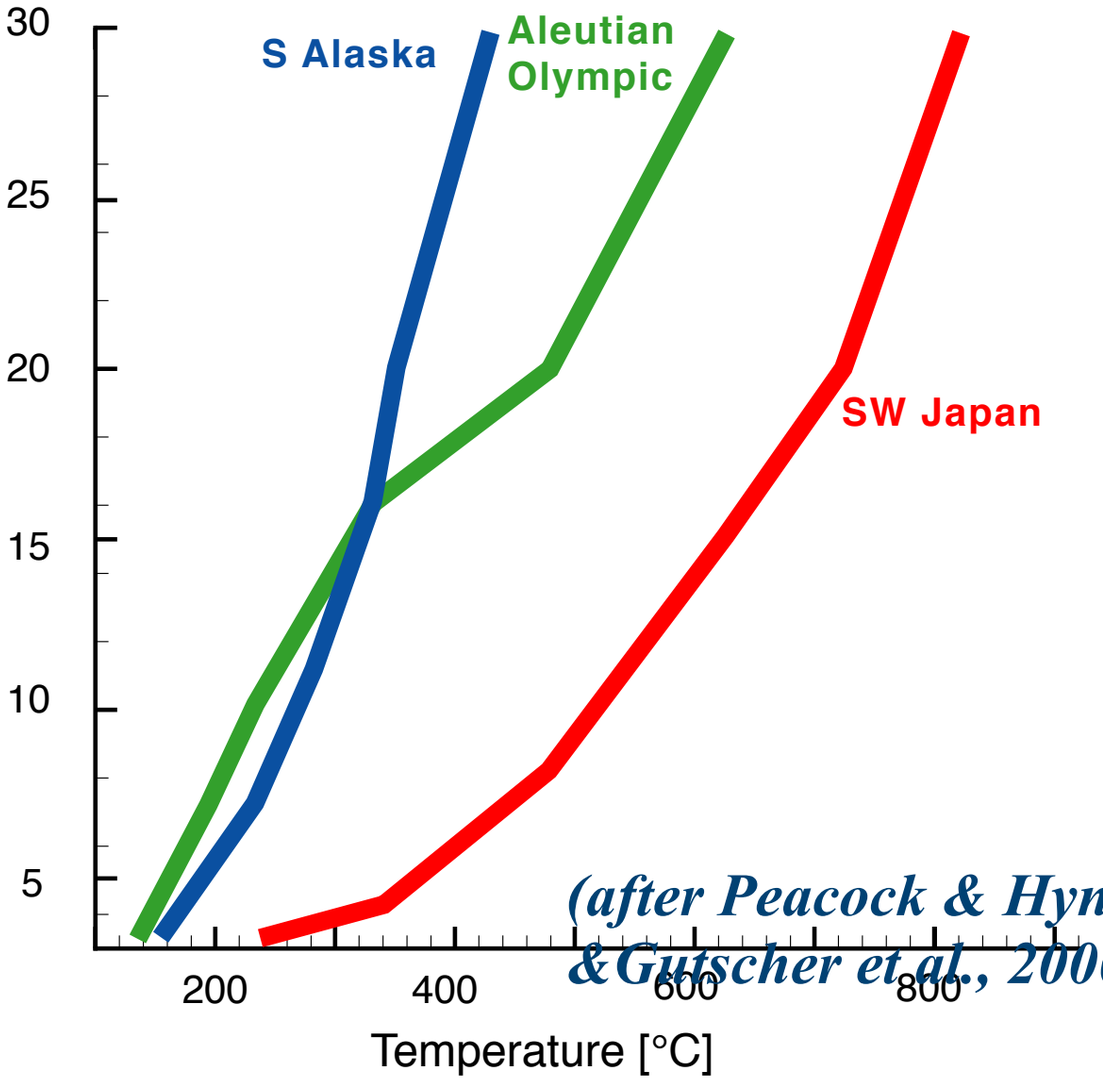
Geotherms of subduction

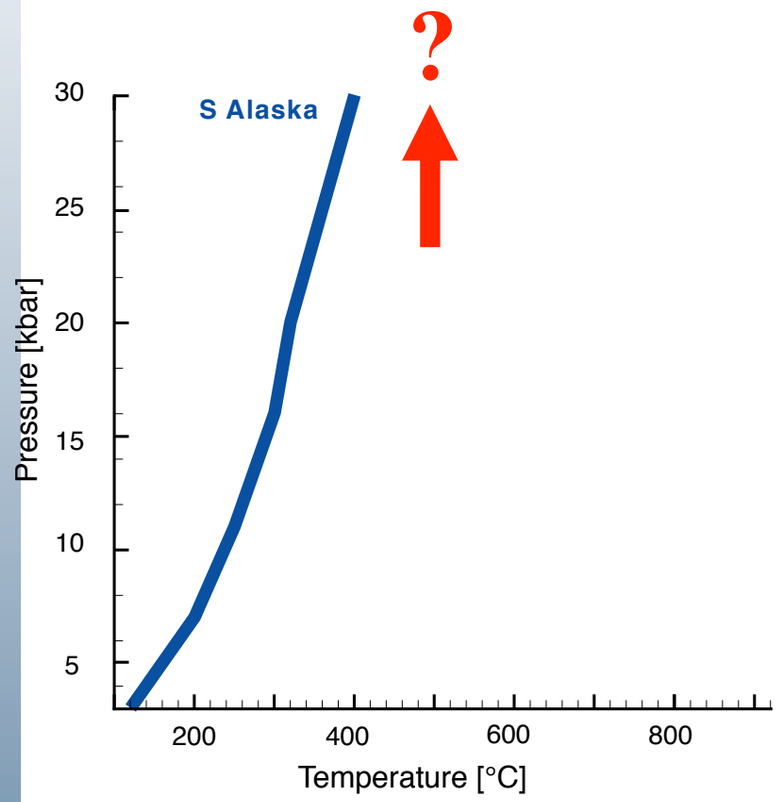




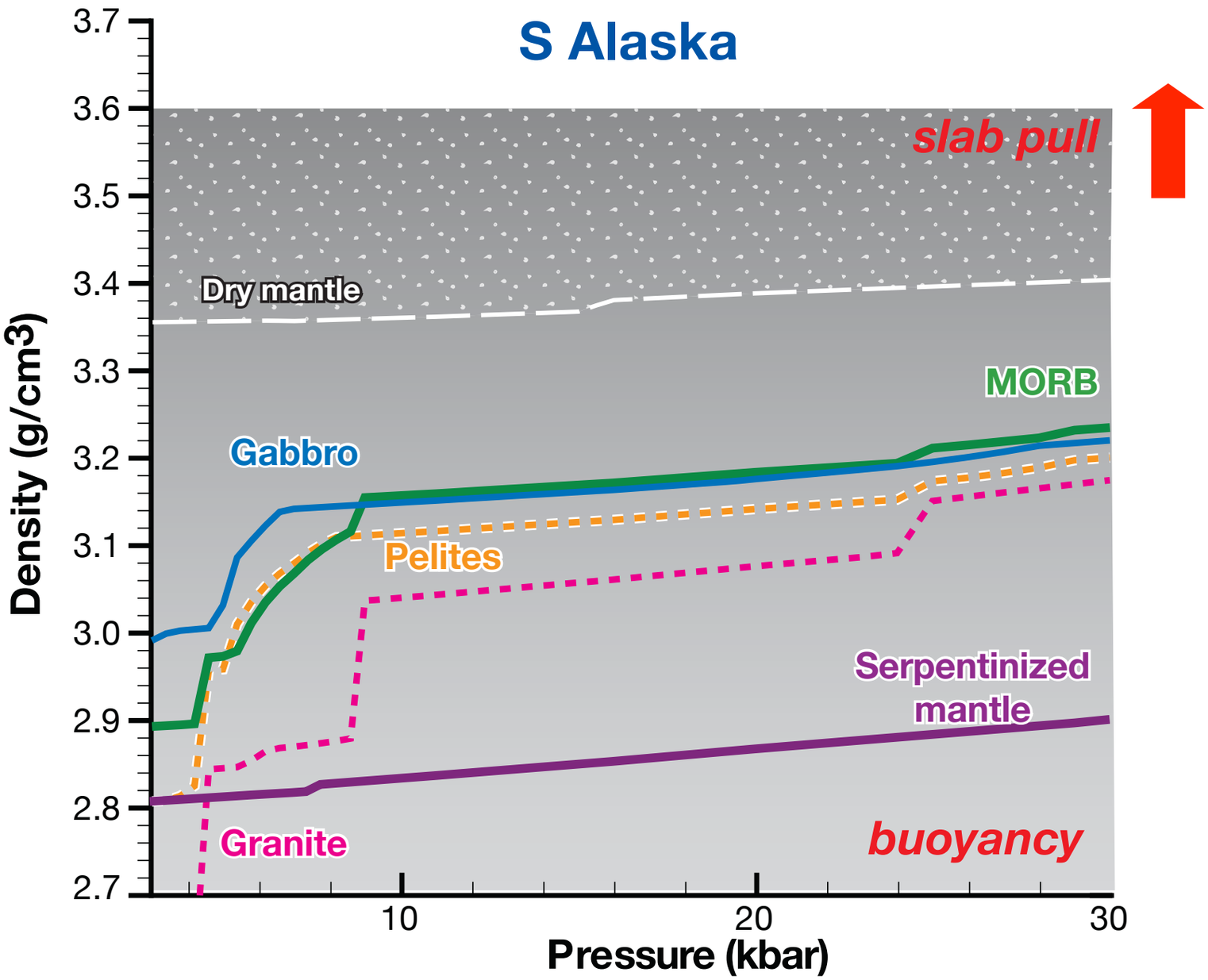
(after Peacock & Hyndman, 1999 &Gutscher et al., 2000)

Cold geotherm

South Alaska



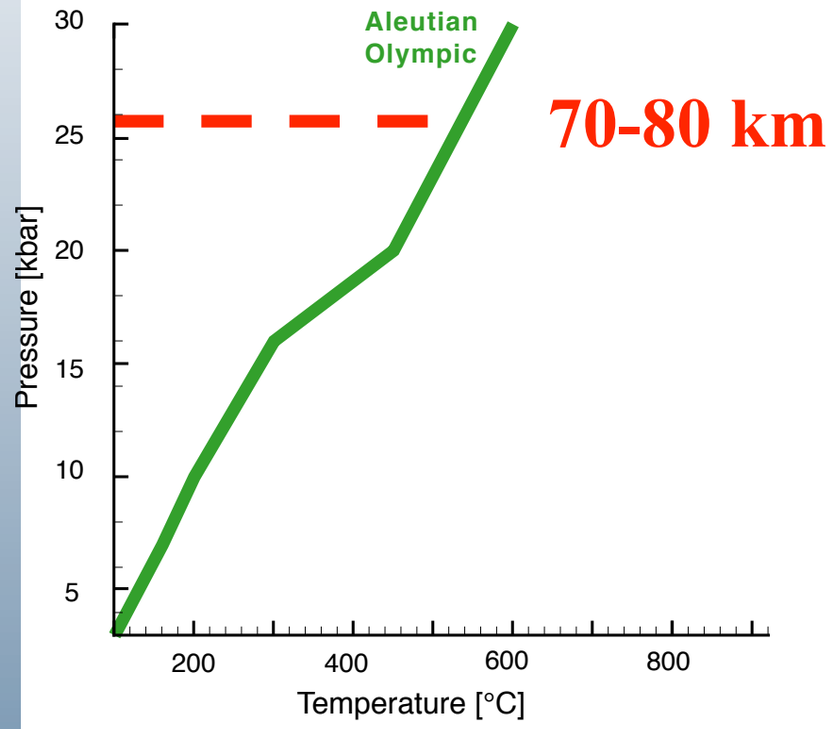
No eclogitization occurs until 30 kbar



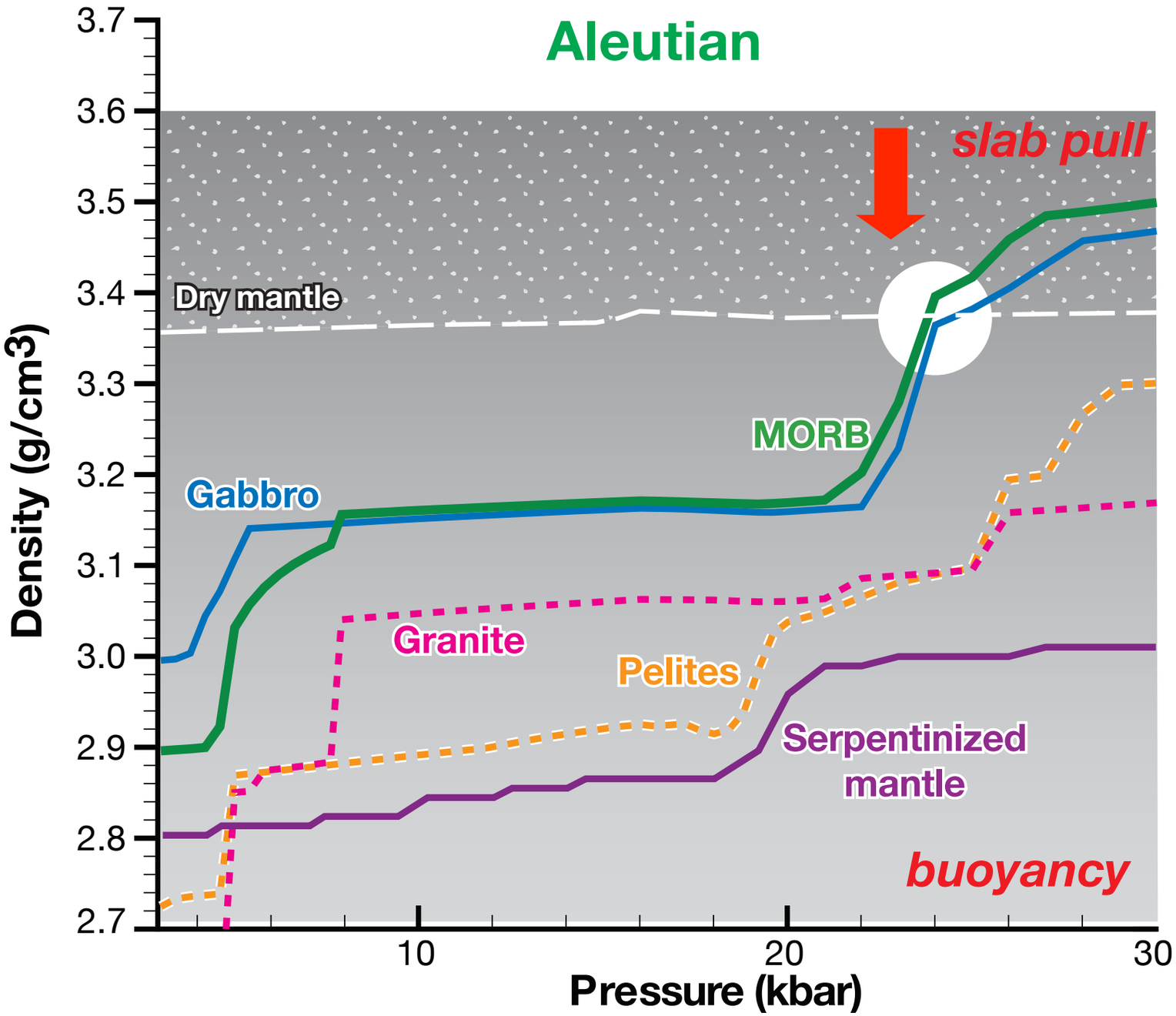
*Eclogitization = depth where crustal rocks become **denser** than mantle rocks*

Cold geotherm (late heating)

Aleutian



Eclogitization occurs with temperature increase



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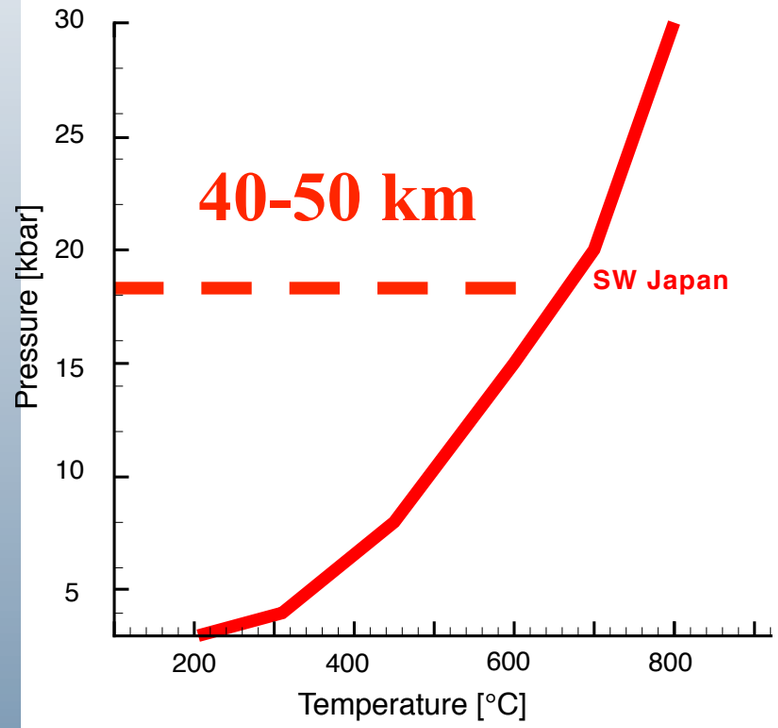
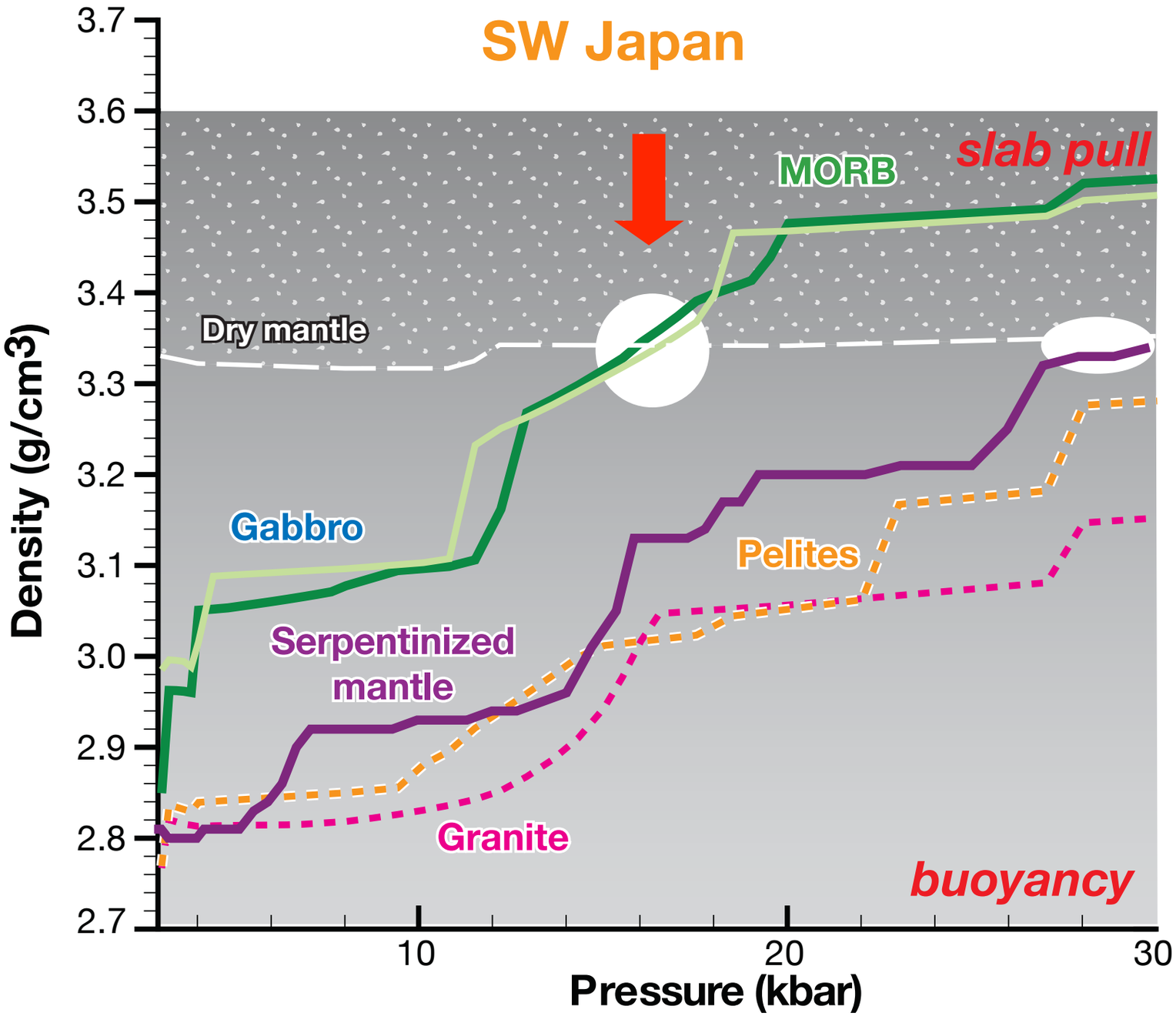
Hot geotherm

SW Japan





Eclogitization occurs at "**crustal" depths** with temperature increase