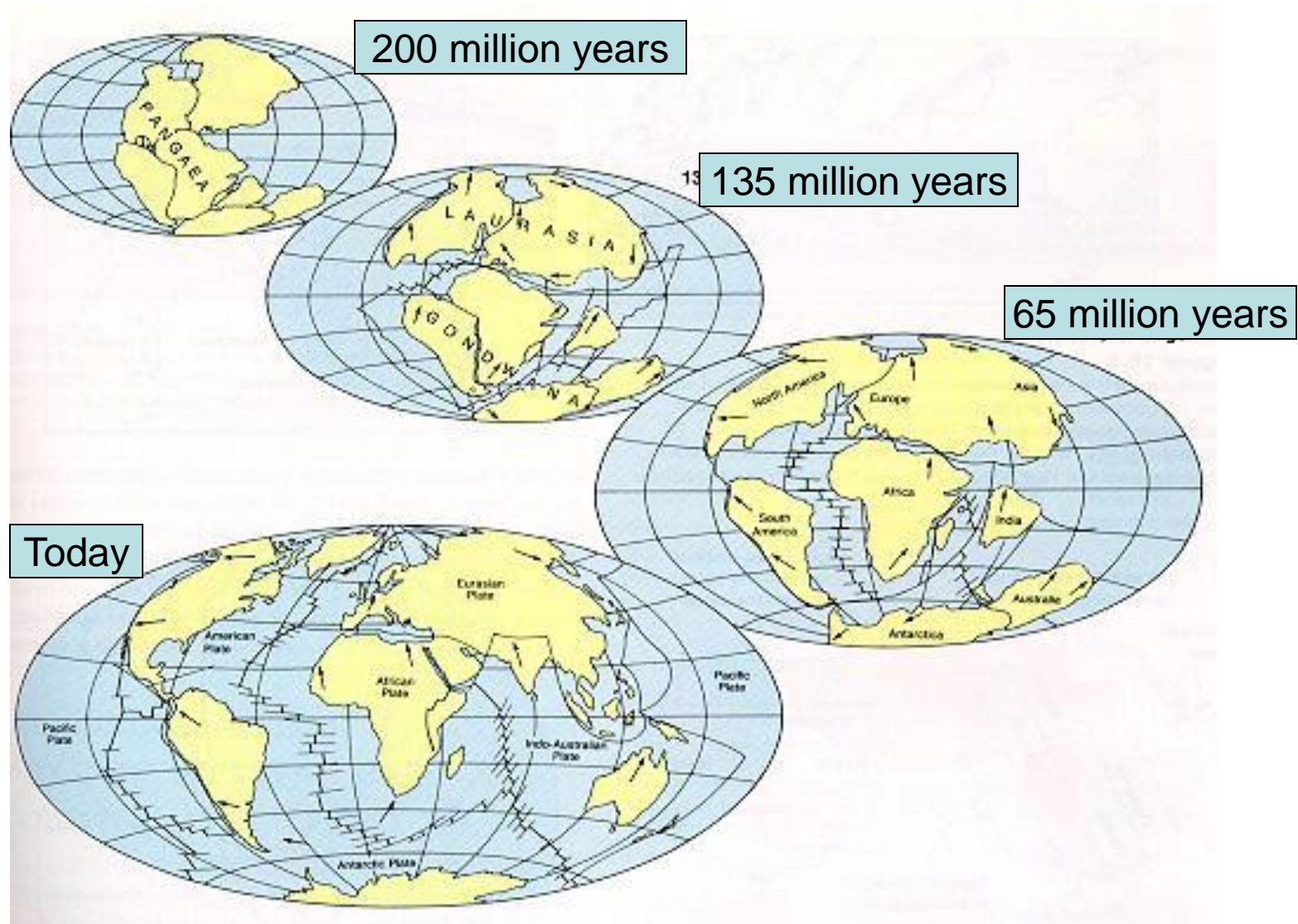
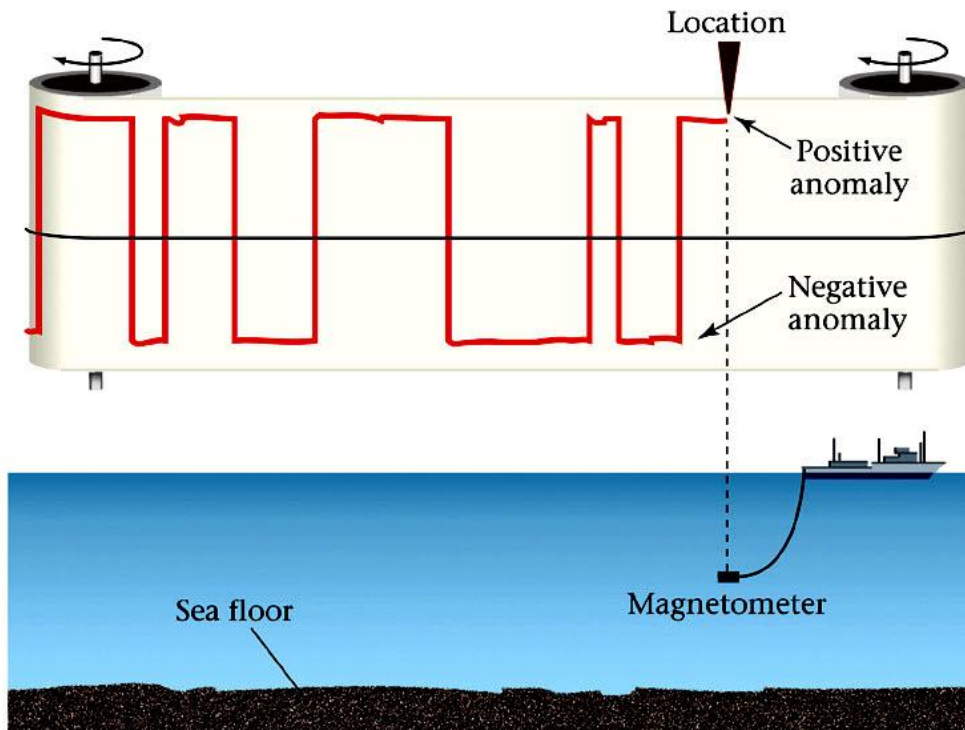


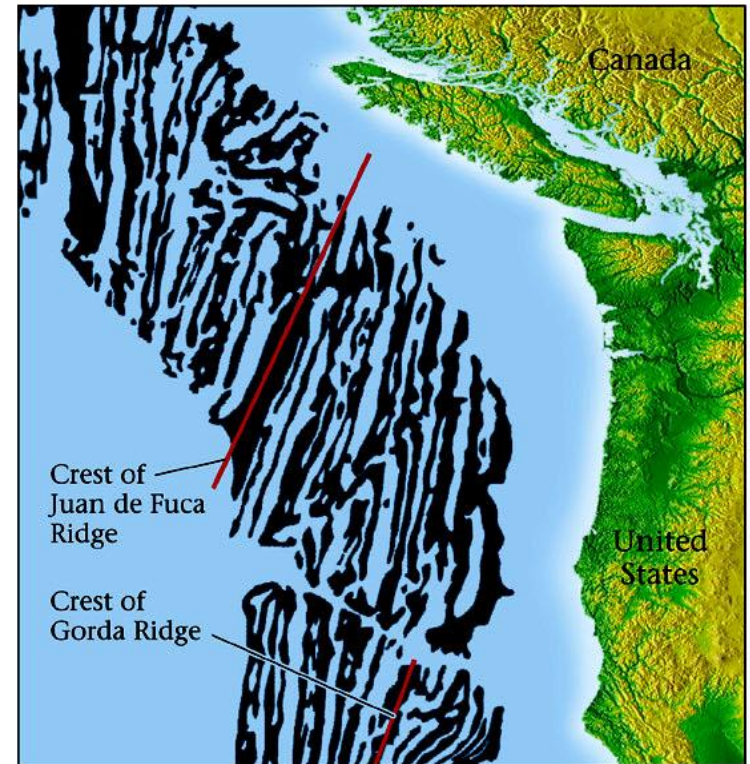
Plate tectonics – the theory for how Continental Drift works



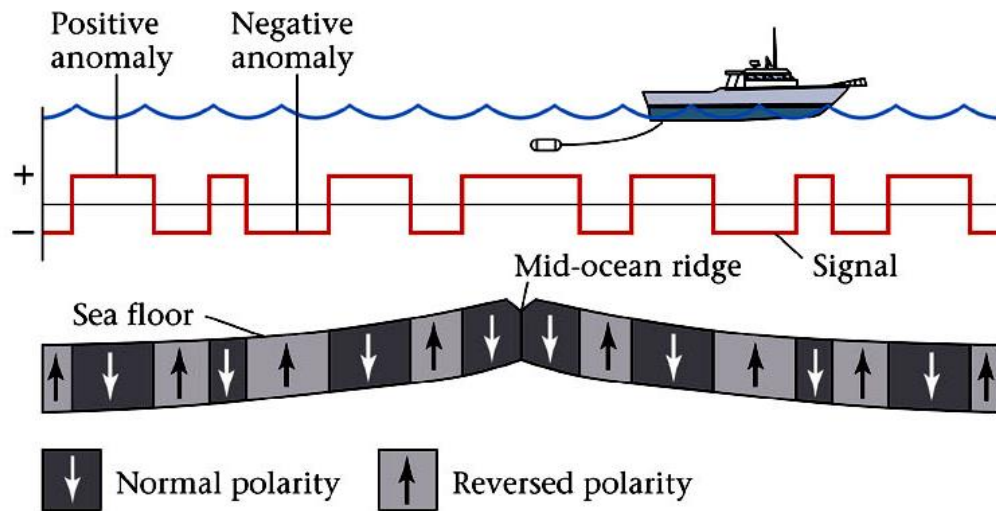
Seafloor magnetic anomalies and Plate Tectonics



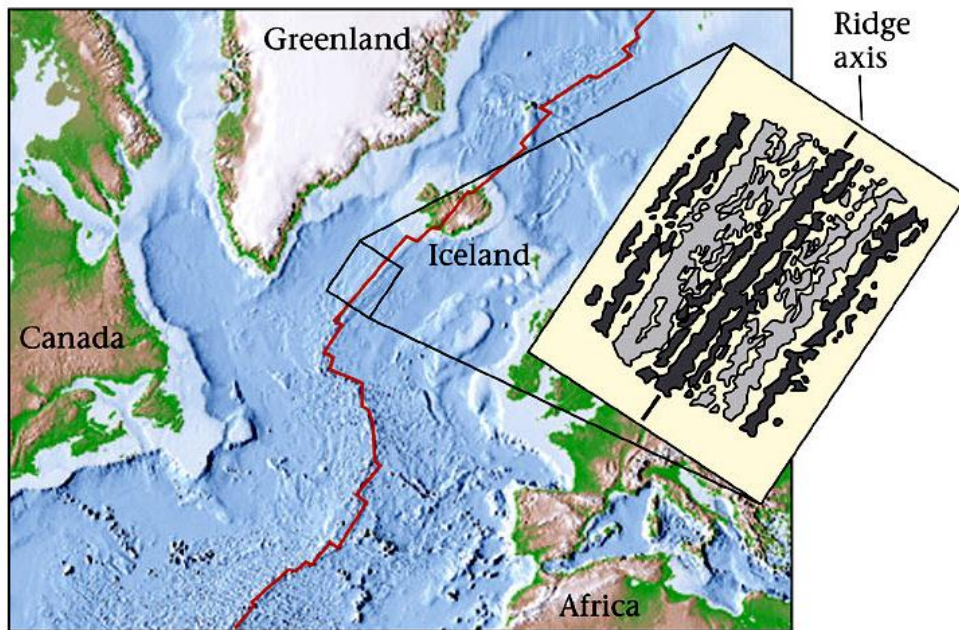
(a)



(b)



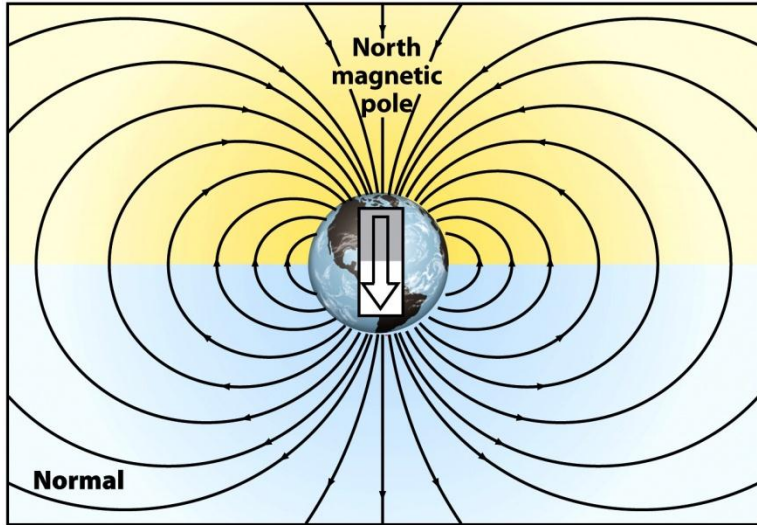
(a)



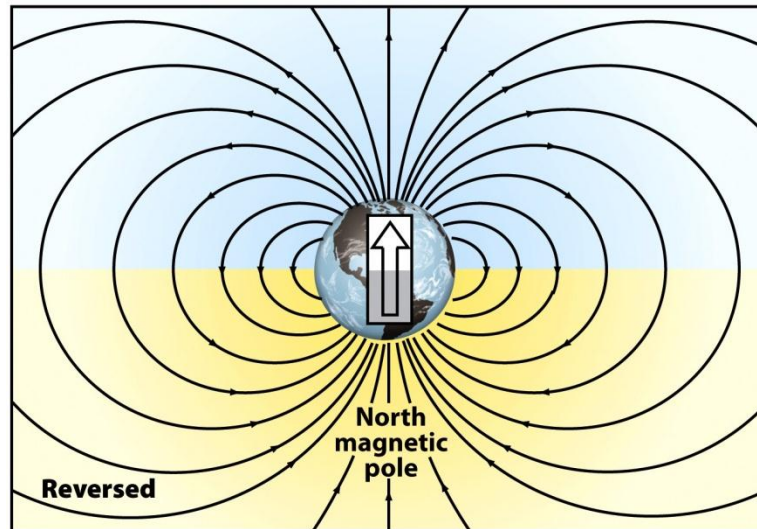
(b)

The origin of seafloor magnetic anomalies - reversals of the Earth's magnetic field.

Reversals of Earth's magnetic field

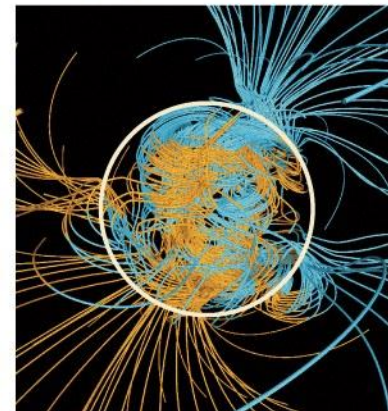
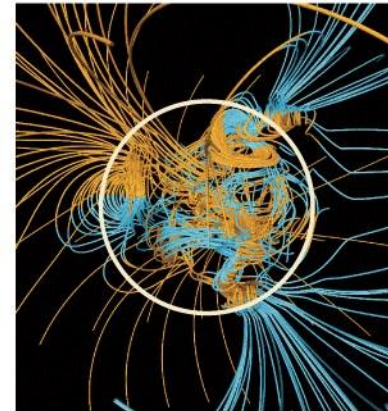
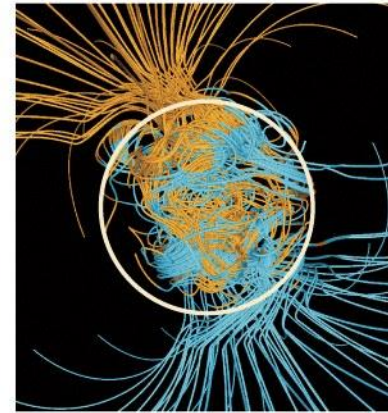


Normal polarity

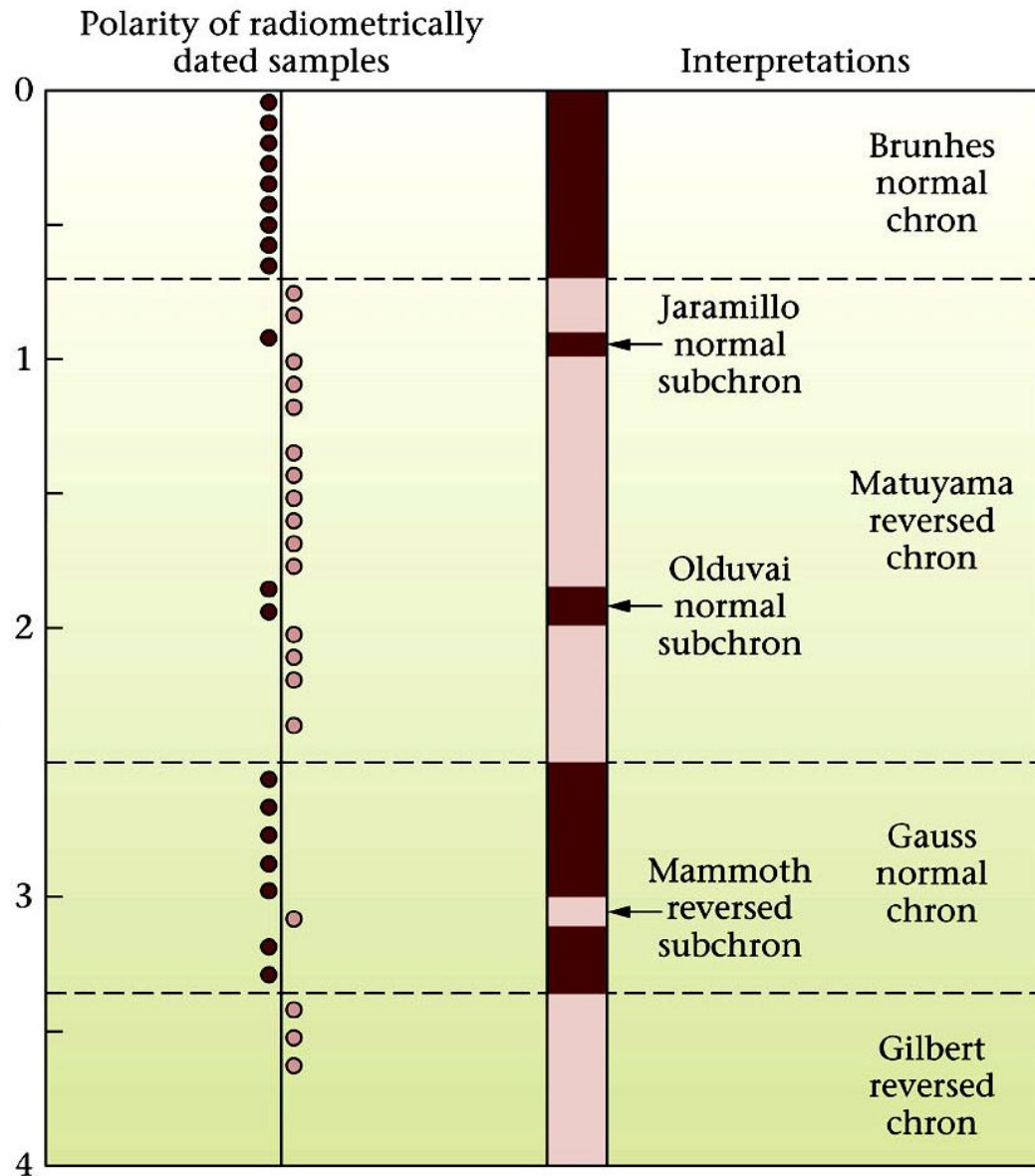
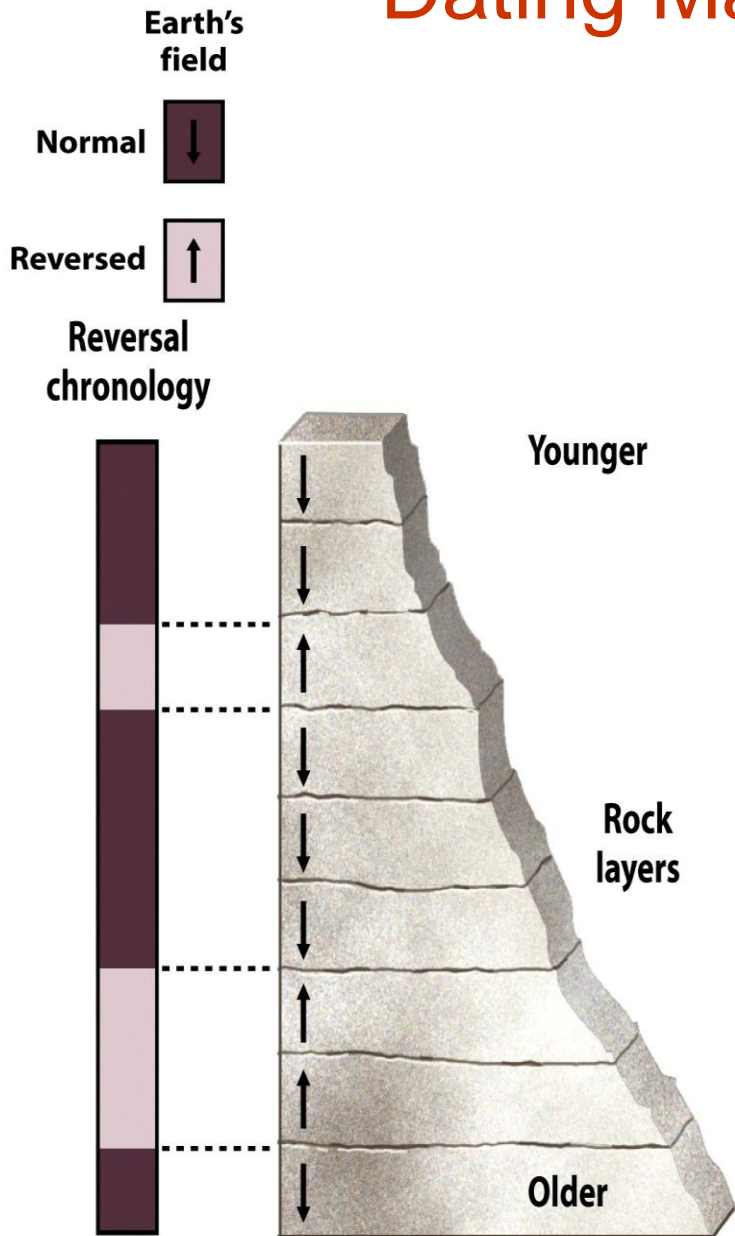


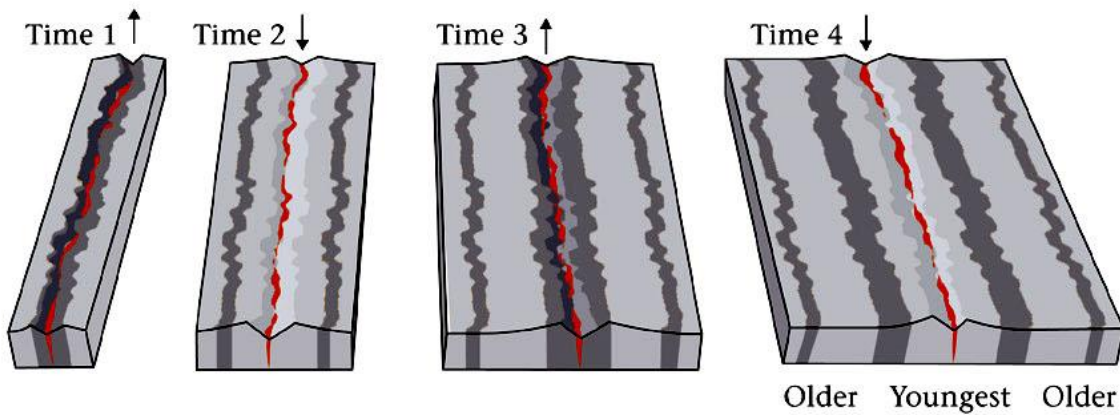
Reversed polarity

Time

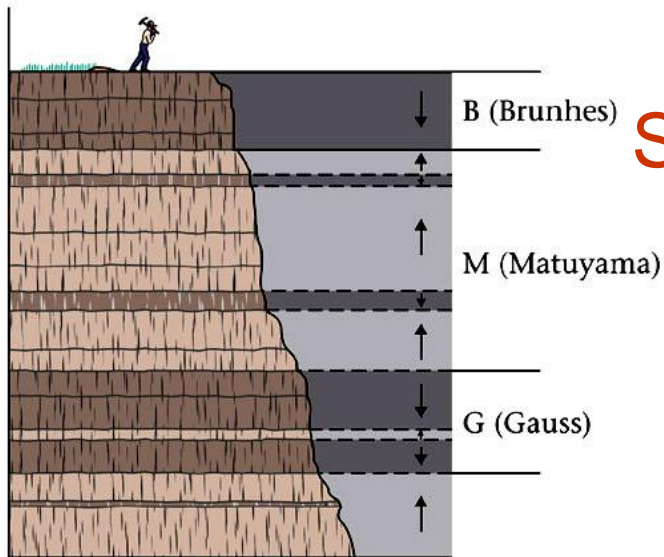
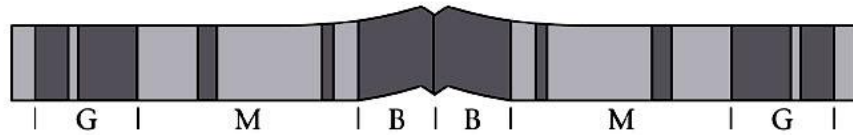


Dating Magnetic reversals



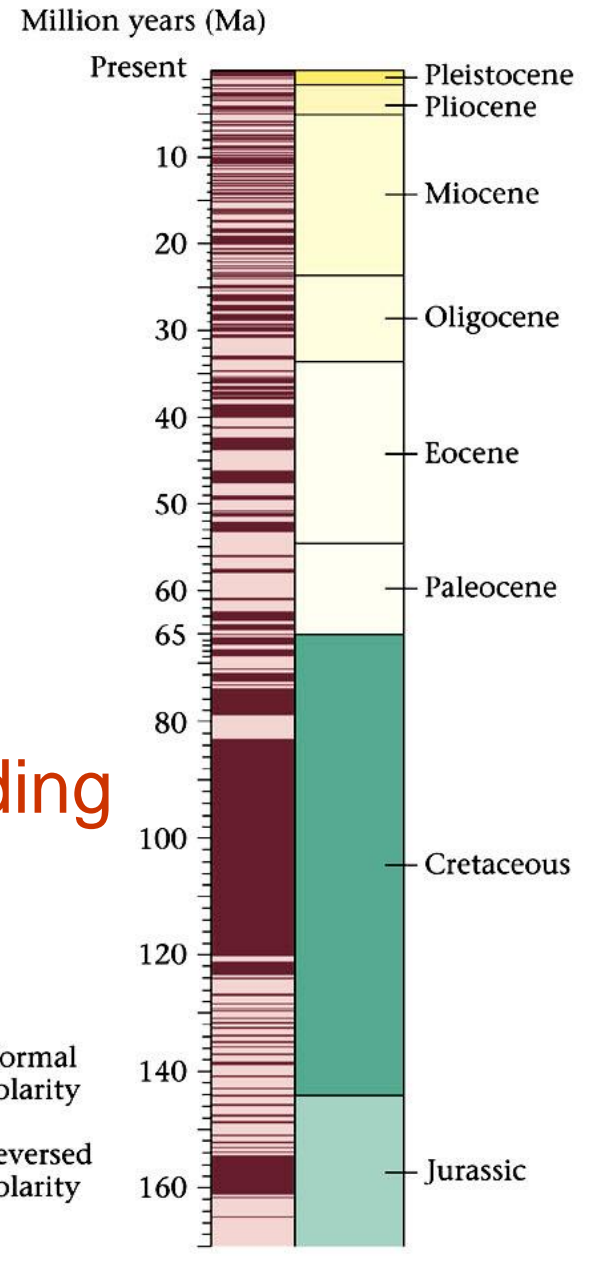


(a)

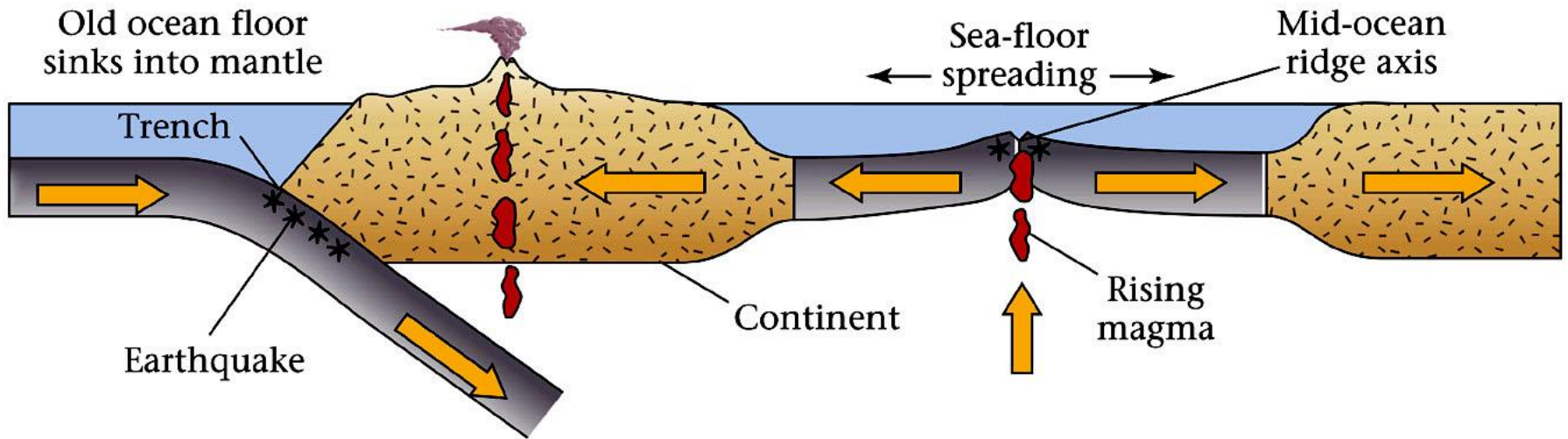


(b) Vertical sequence of basalt flows on continent

Sea-floor spreading

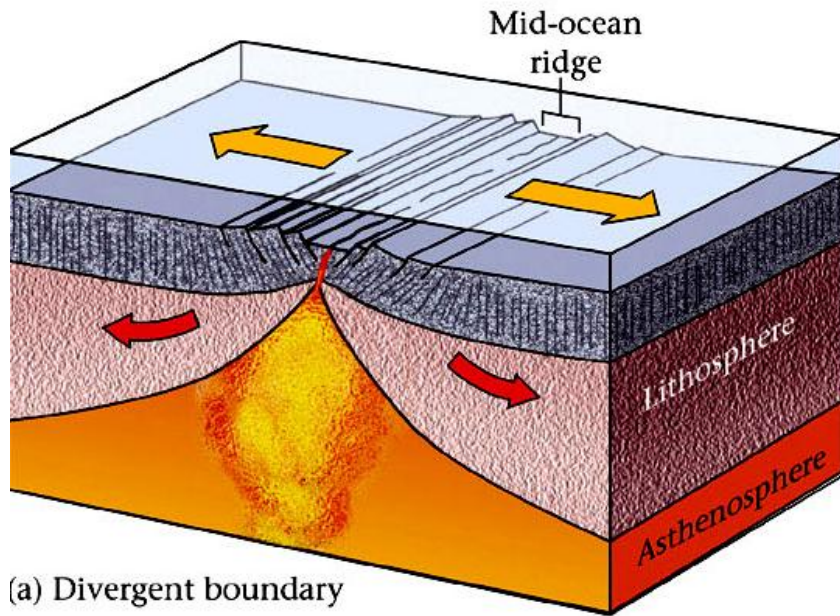


Sea-floor spreading

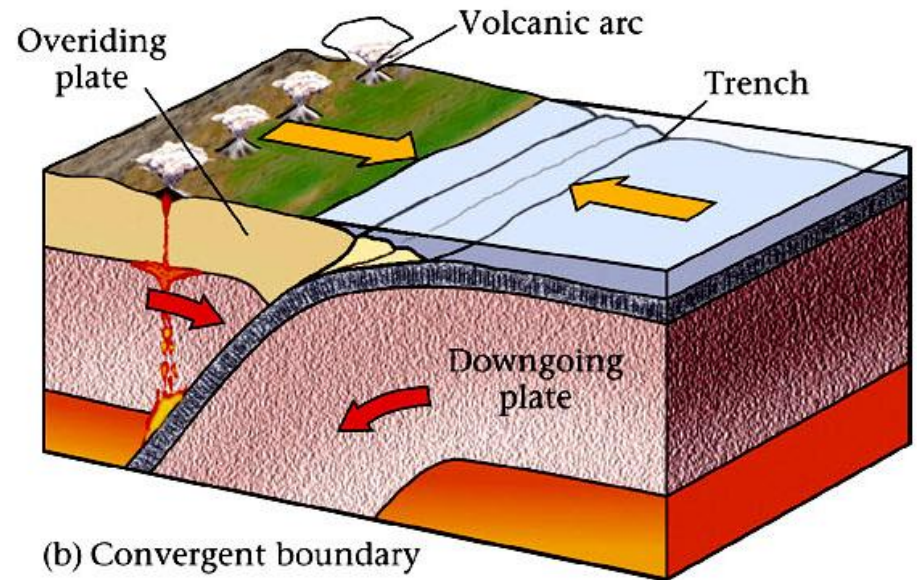


Subduction

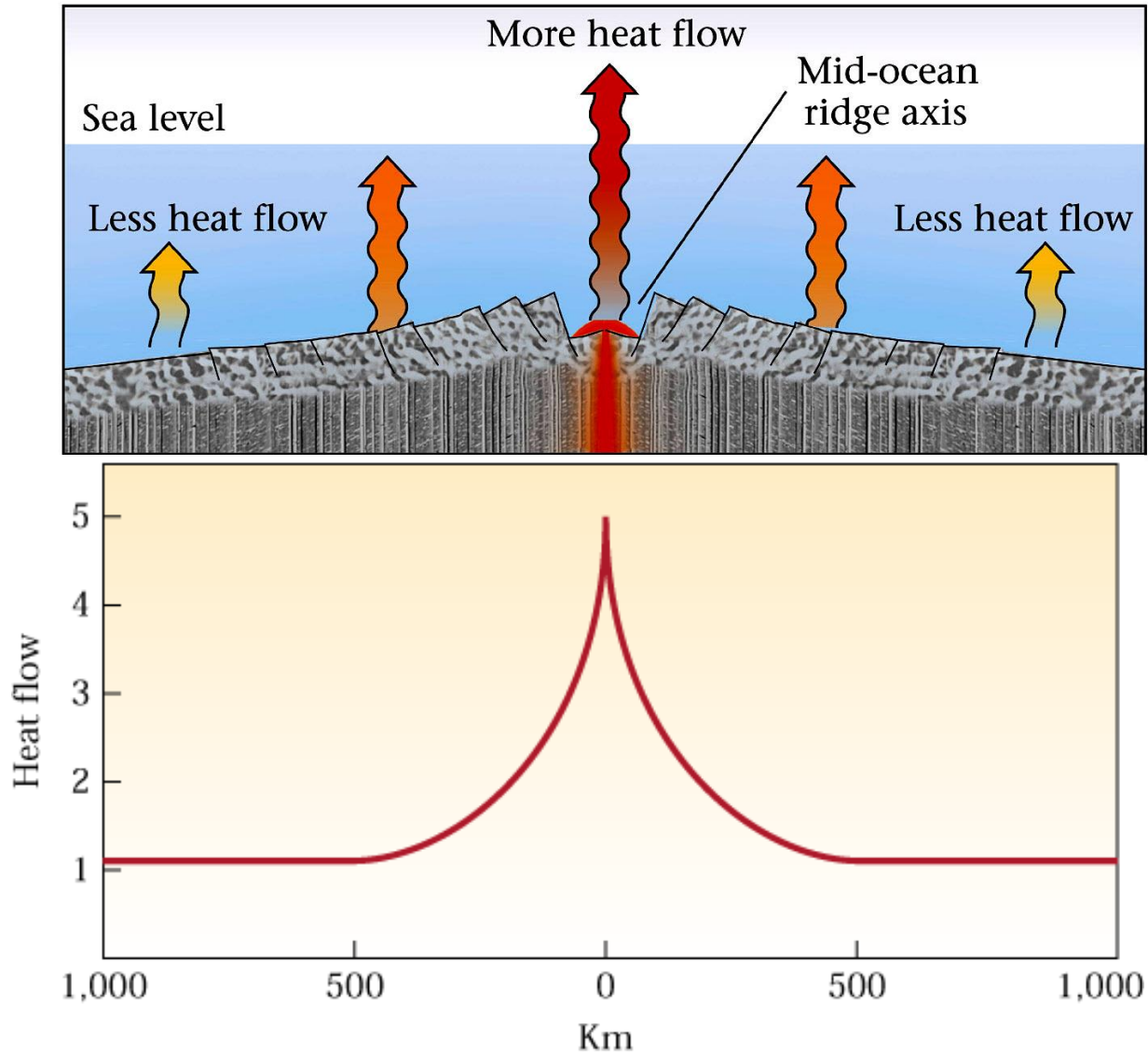
Divergent plate boundaries and mantle up-welling



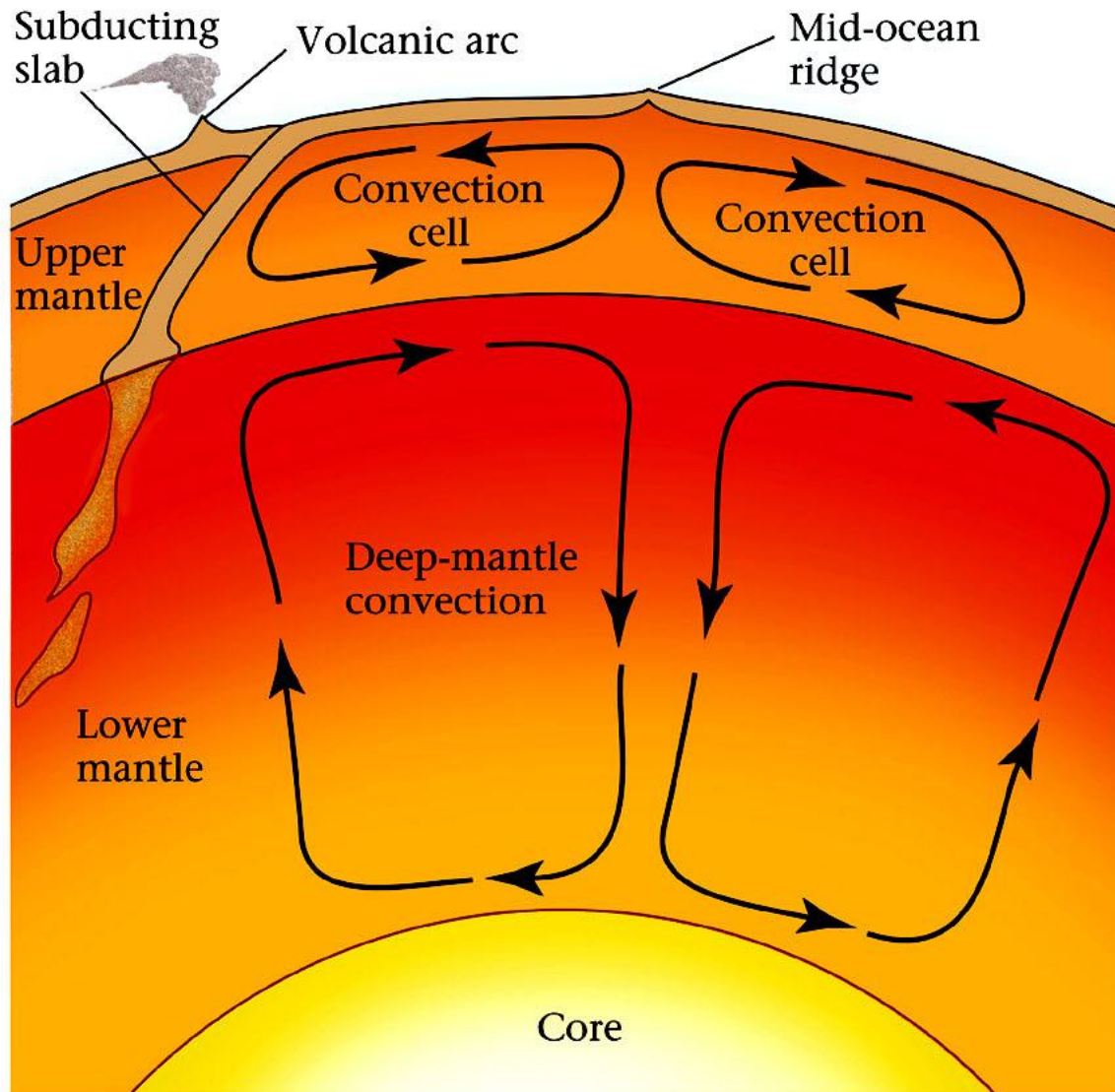
Convergent plate boundaries and subduction



Heat-flow: Evidence for mantle up-welling

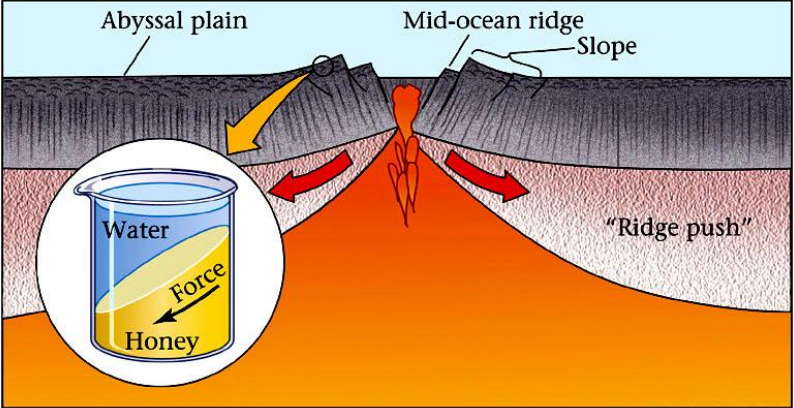


Mantle convection and Plate Tectonics

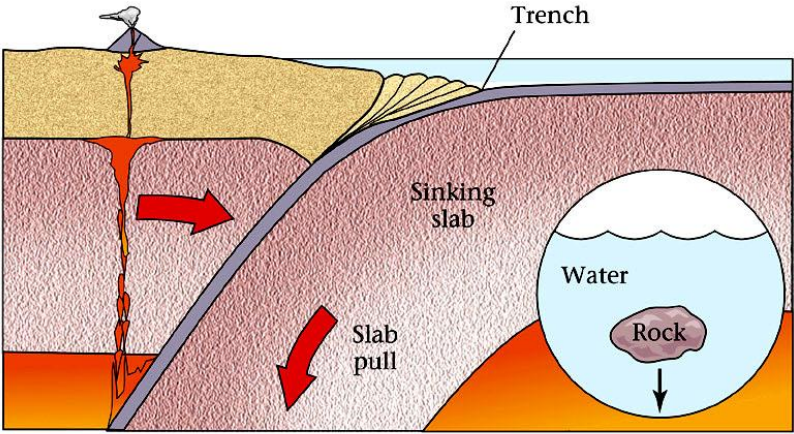


Controls on spreading and subduction

Slab push and slab pull

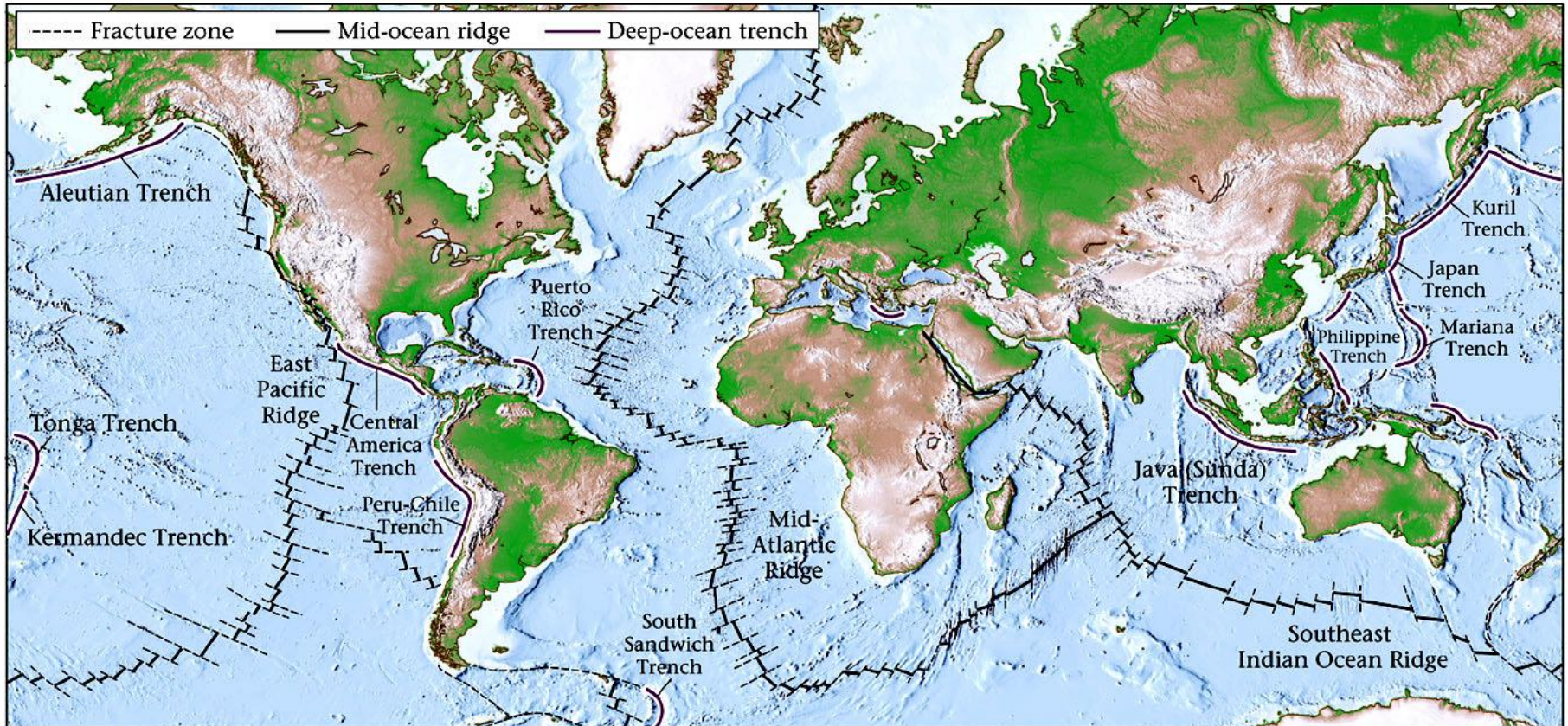


(a)

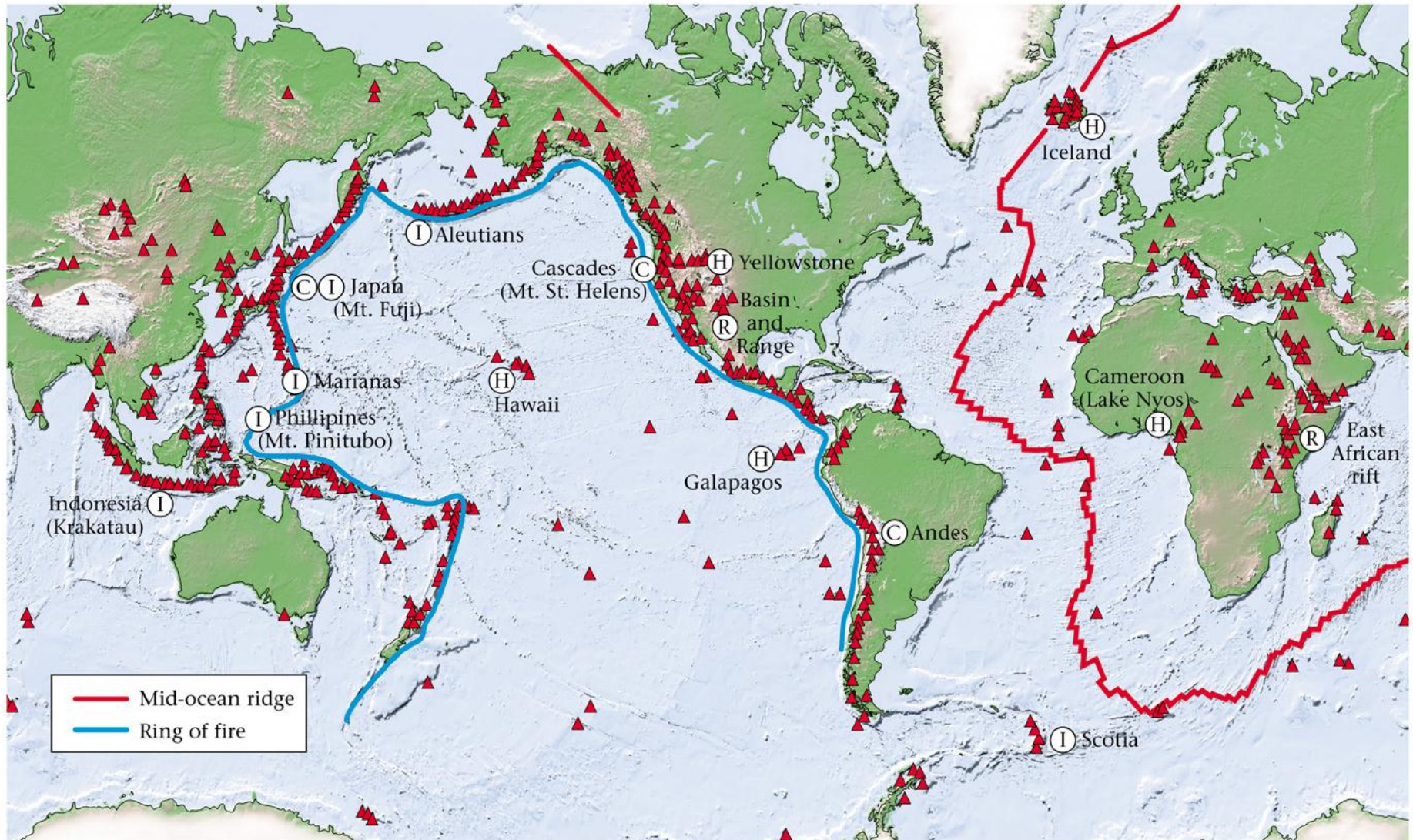


(b)

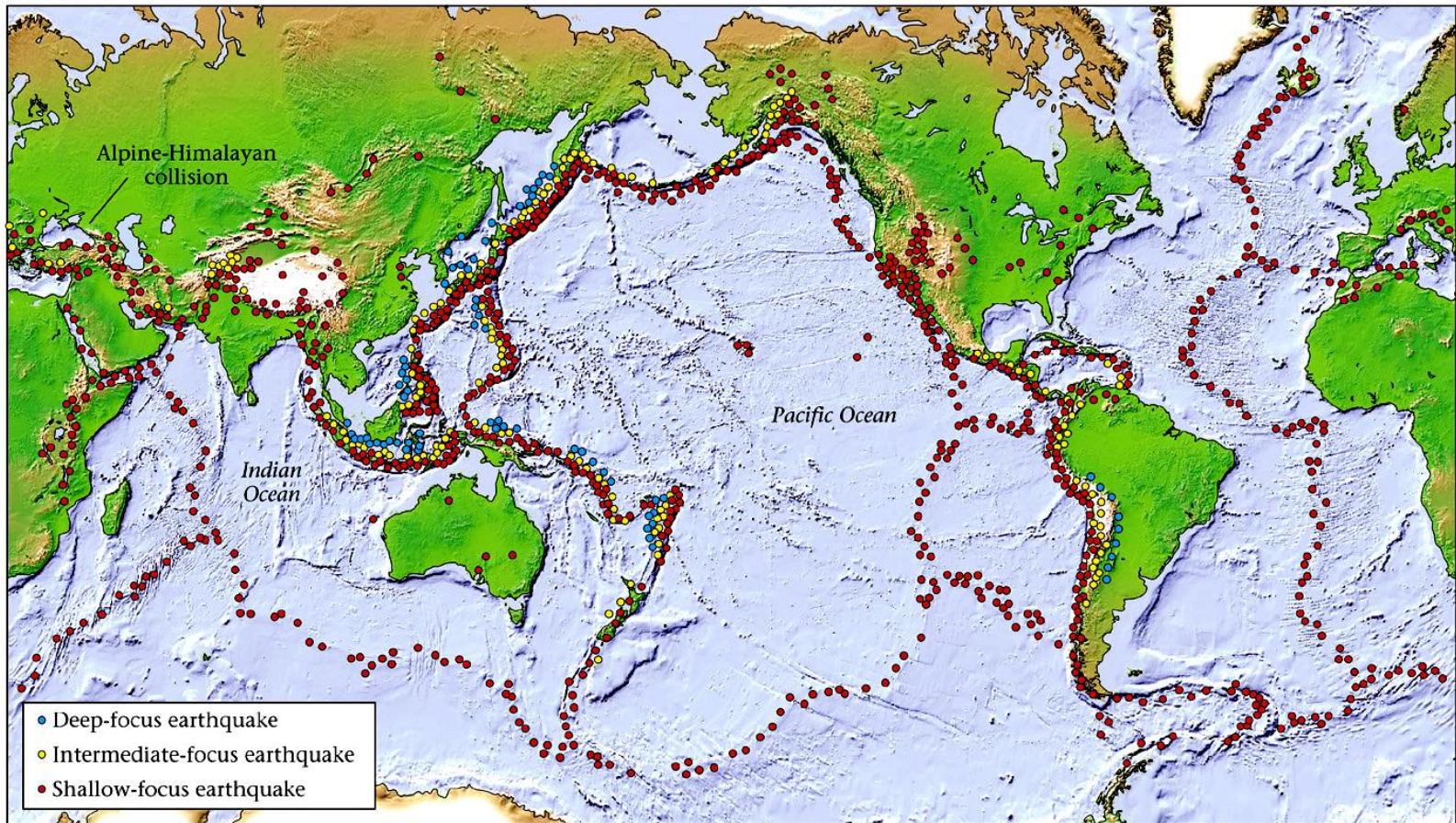
Distribution of Mid-ocean ridges, fractures and trenches



Distribution of World's Volcanoes

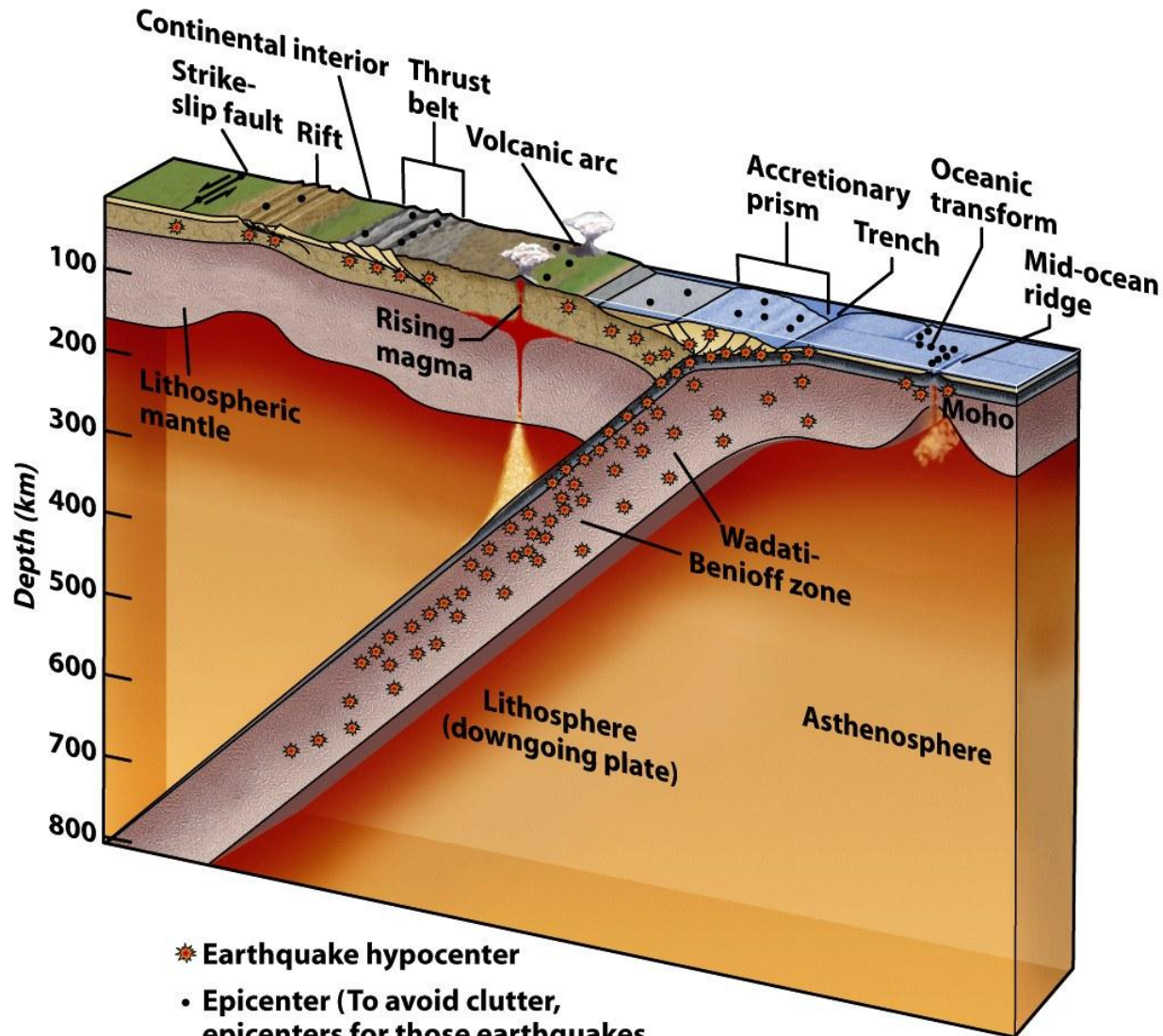


Distribution of Earthquake foci



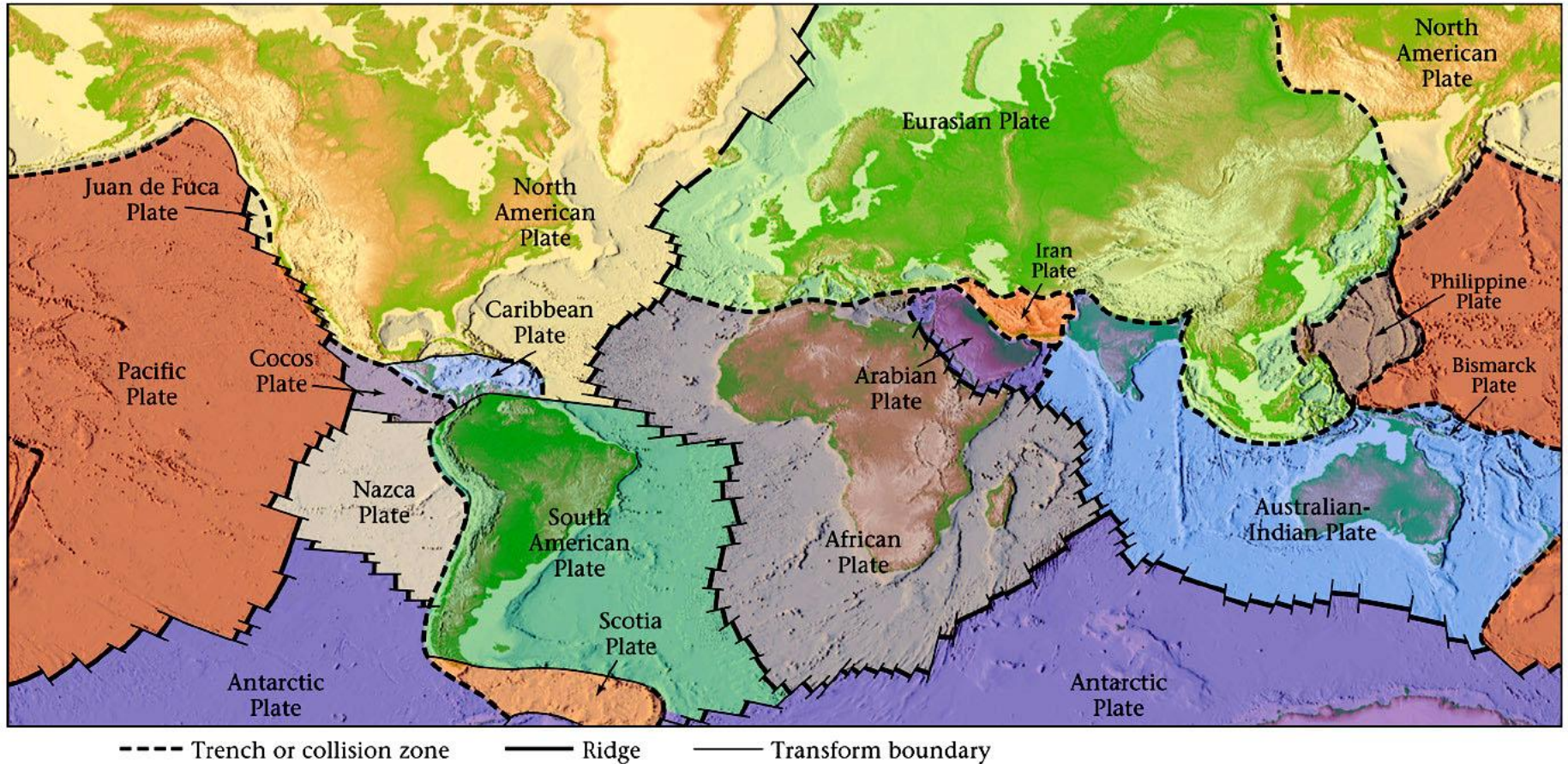
Trend from shallow to deep focus earthquakes - subduction

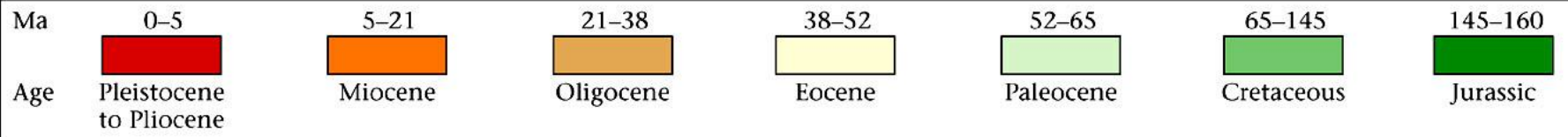
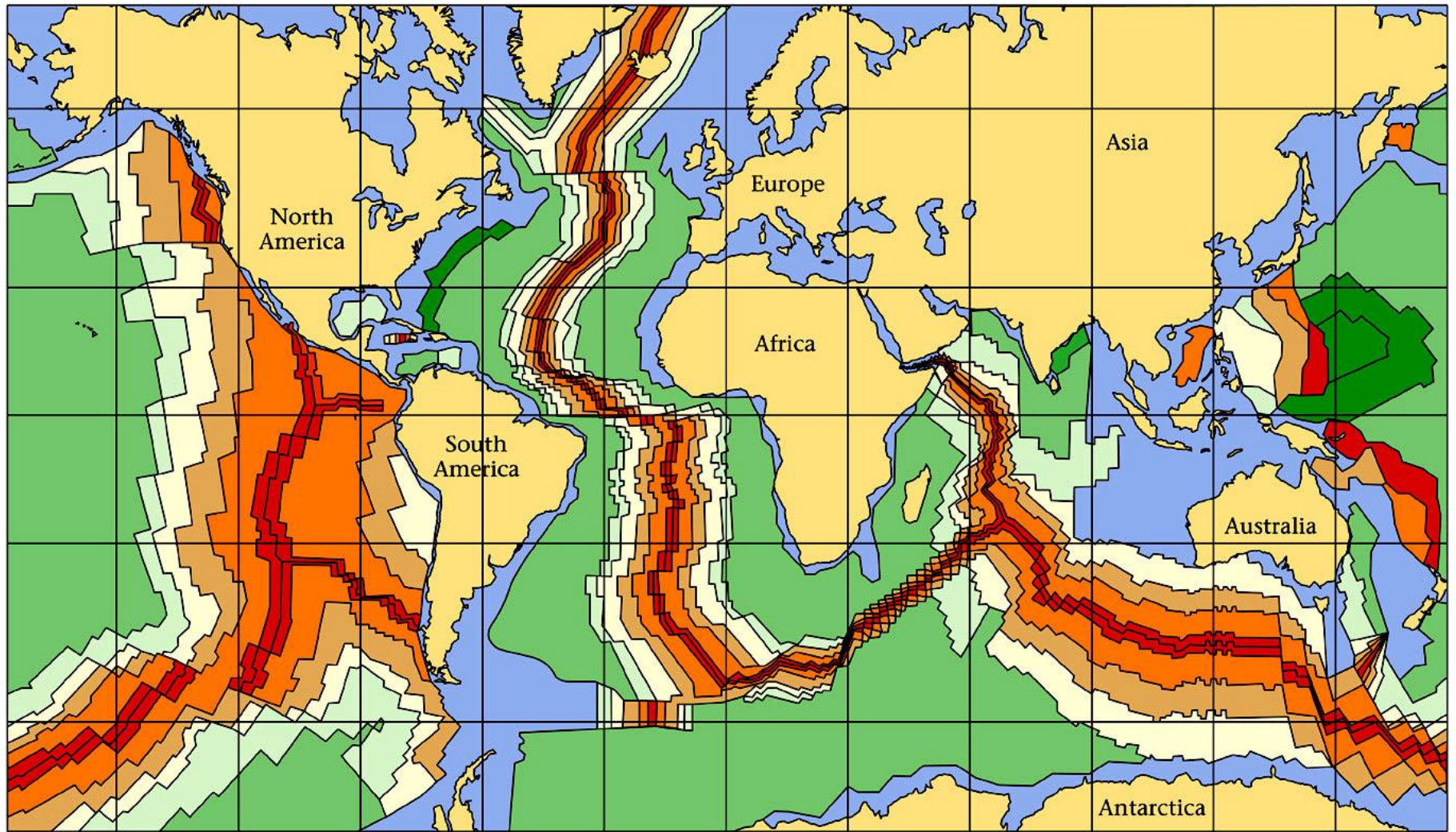
Distribution of earthquakes along a subduction zone



- ★ Earthquake hypocenter
- Epicenter (To avoid clutter, epicenters for those earthquakes indicated in the cross-section are not shown.)

Crustal plates

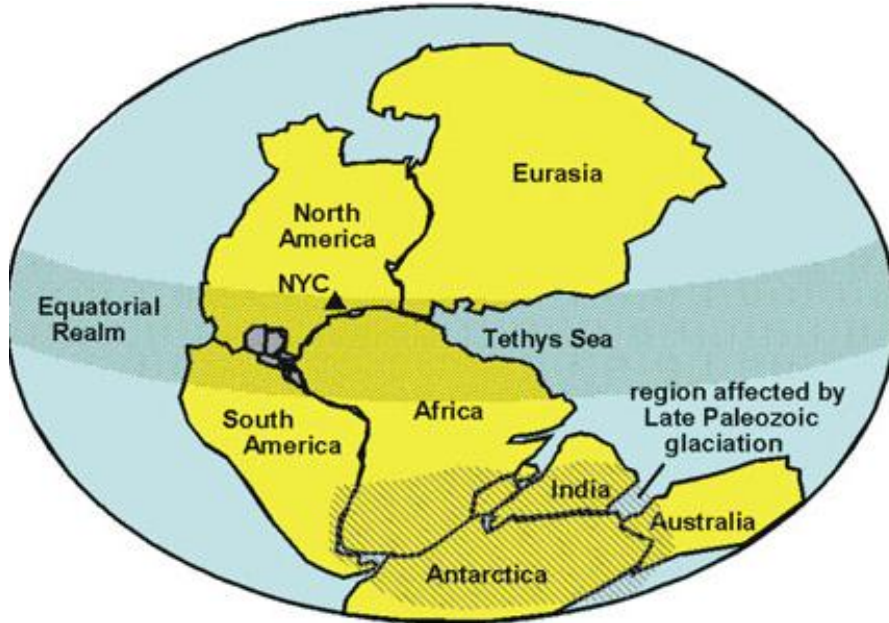




Supercontinents

Pangea

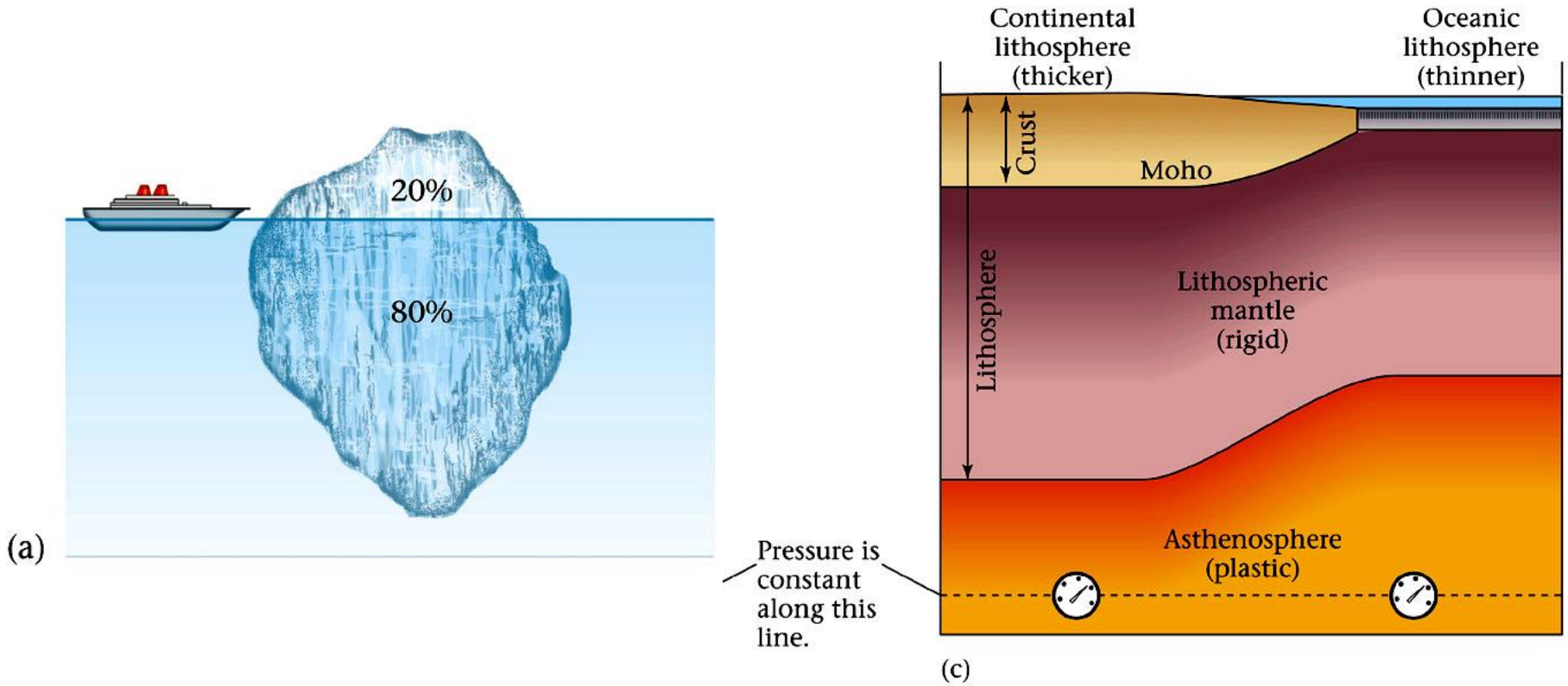
400 Ma – 180 Ma



Rodinia

1100 Ma – 700 Ma

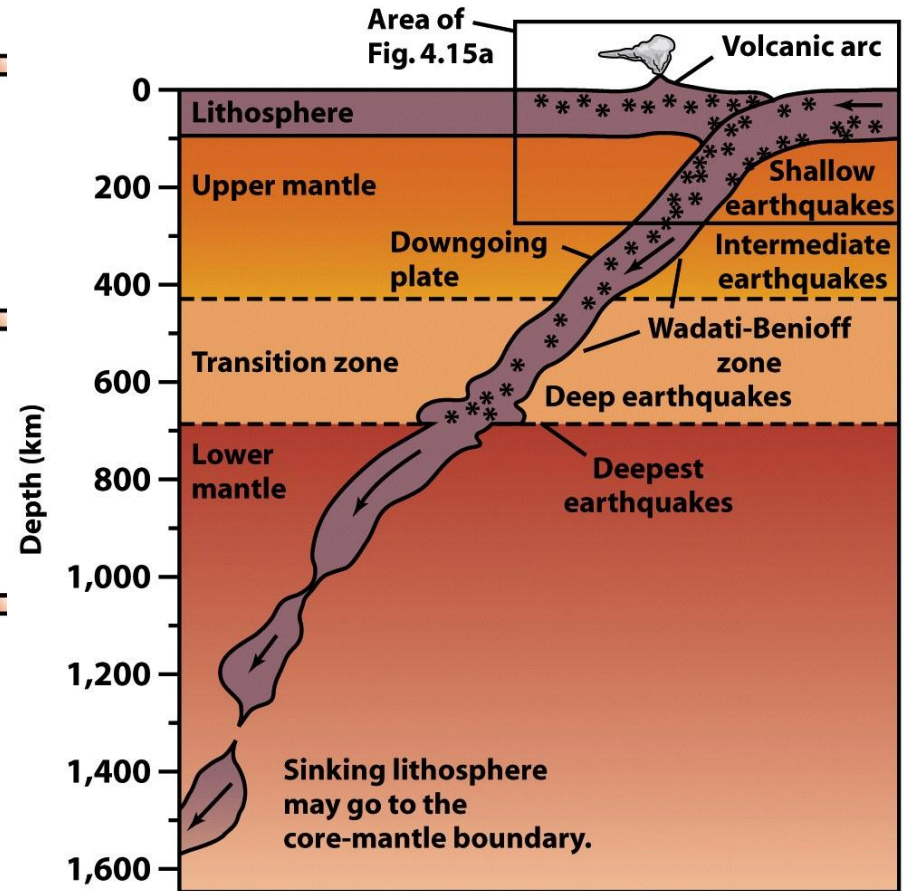
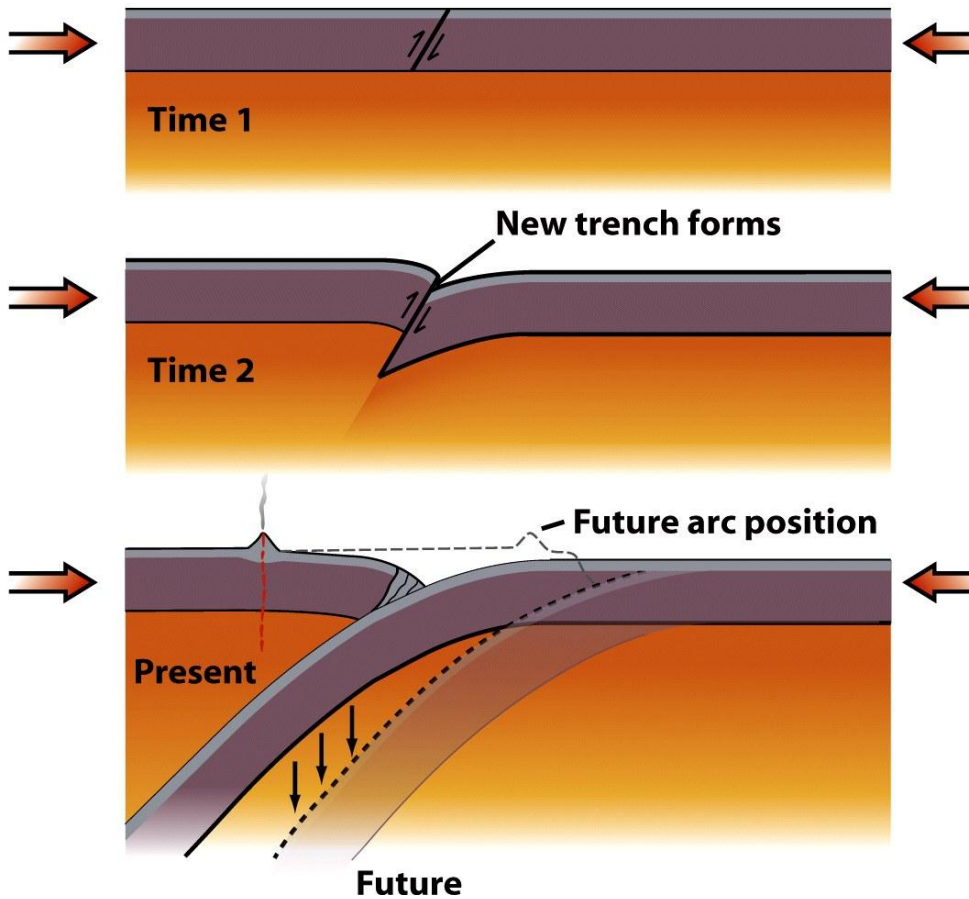
Continents float in Mantle



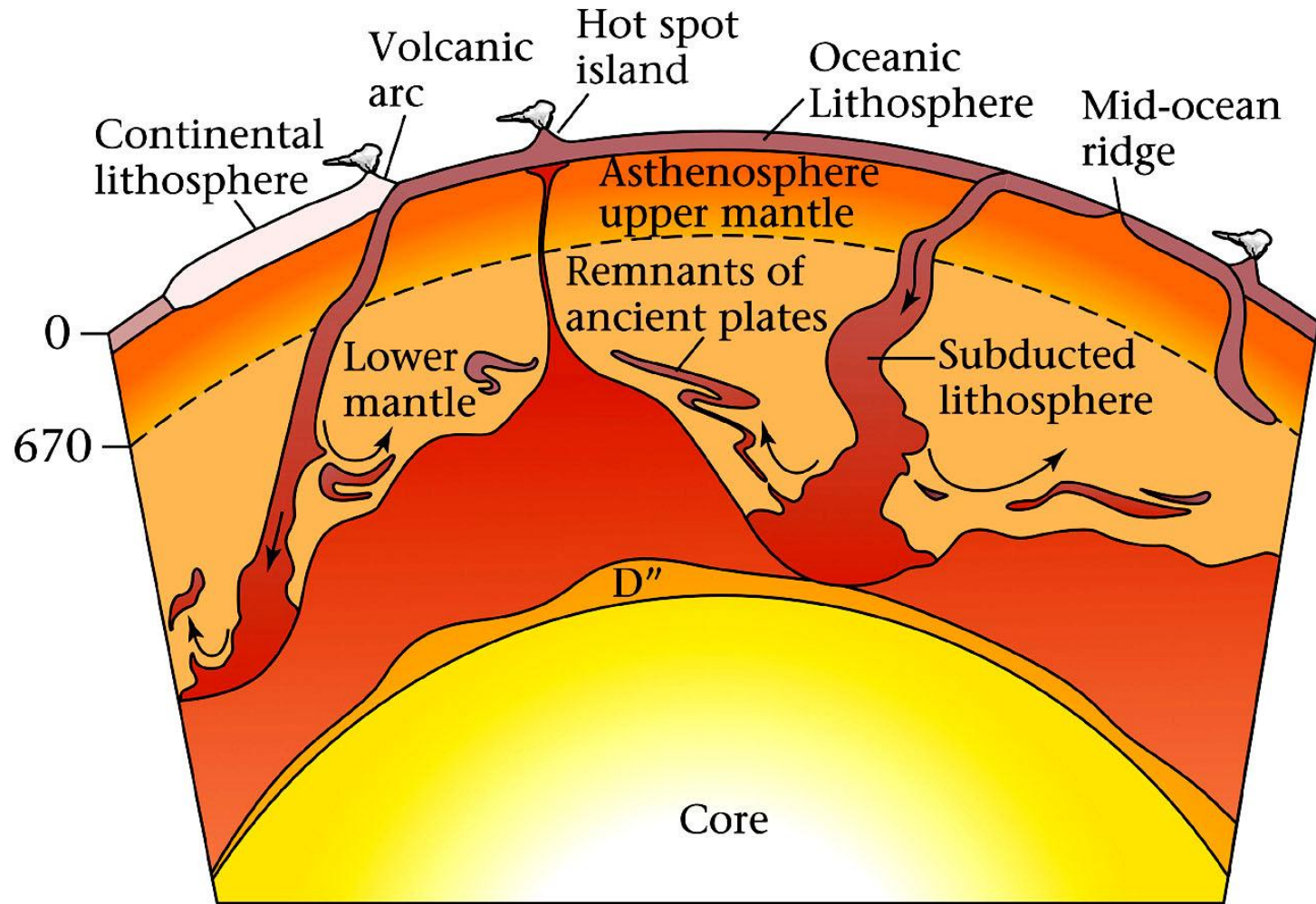
Density of continental crust = 2.7

Density of oceanic crust = 3.1

Initiation of subduction

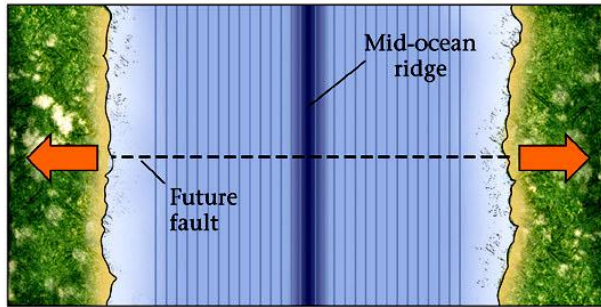


The fate of subducted slabs

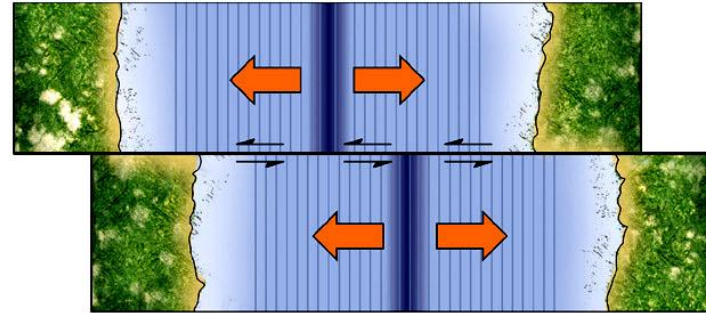


(b)

Transform faults



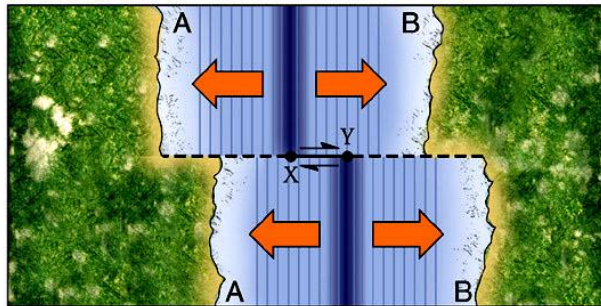
(b)



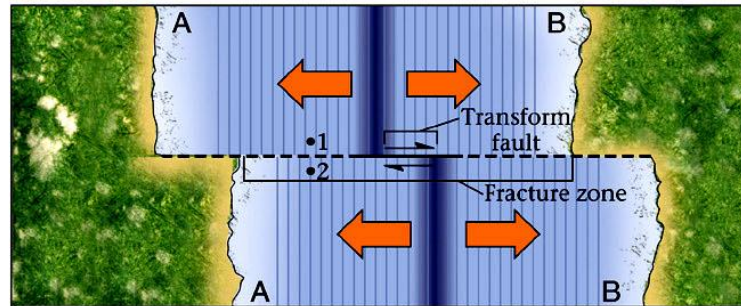
Time →

(c)

Old
idea



(d)



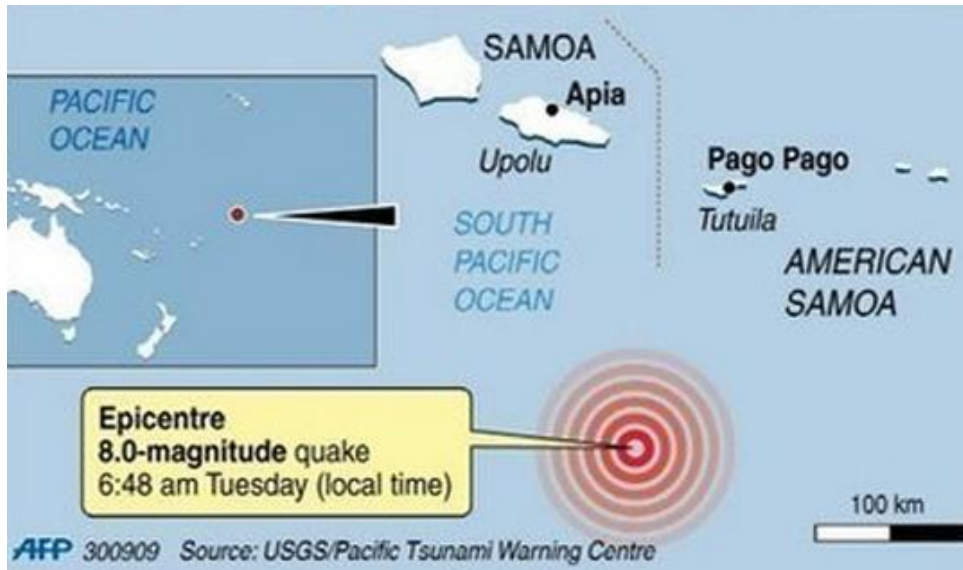
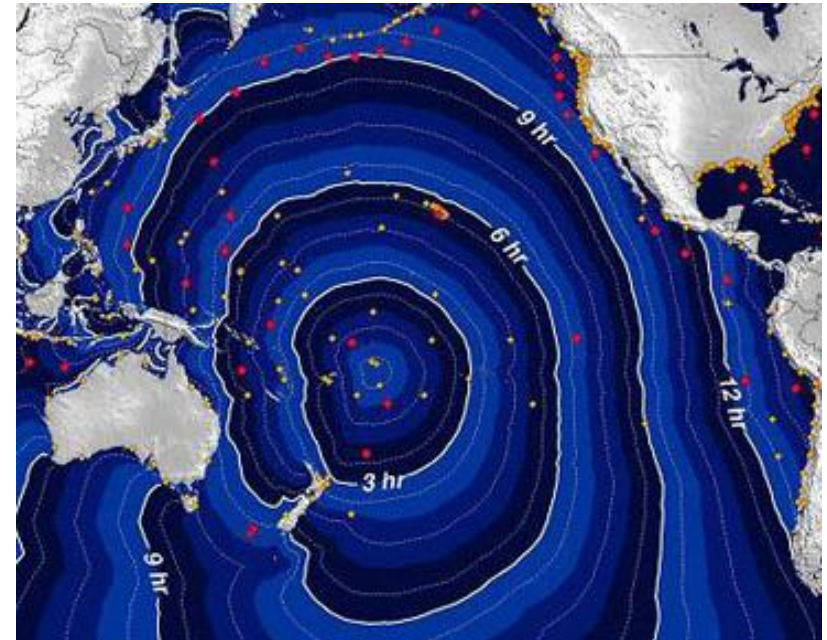
Time →

(e)

New
idea
(transform
faults)

Samoa Tsunami September 29, 2009

Earthquake magnitude 8.3 strikes Kermadec-Tonga subduction zone generates tsunamis up to 6.6 m high >150 people killed in Samoa and American Samoa



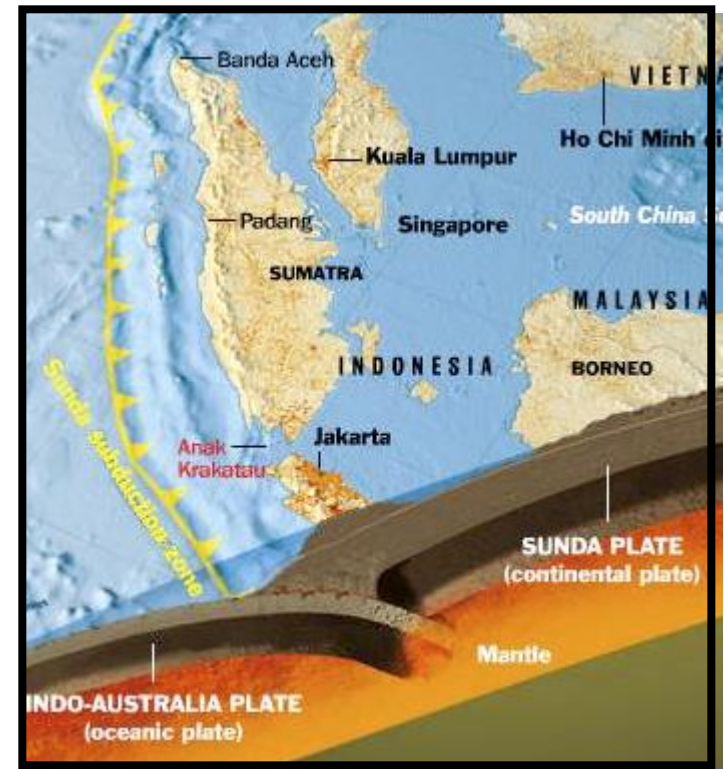
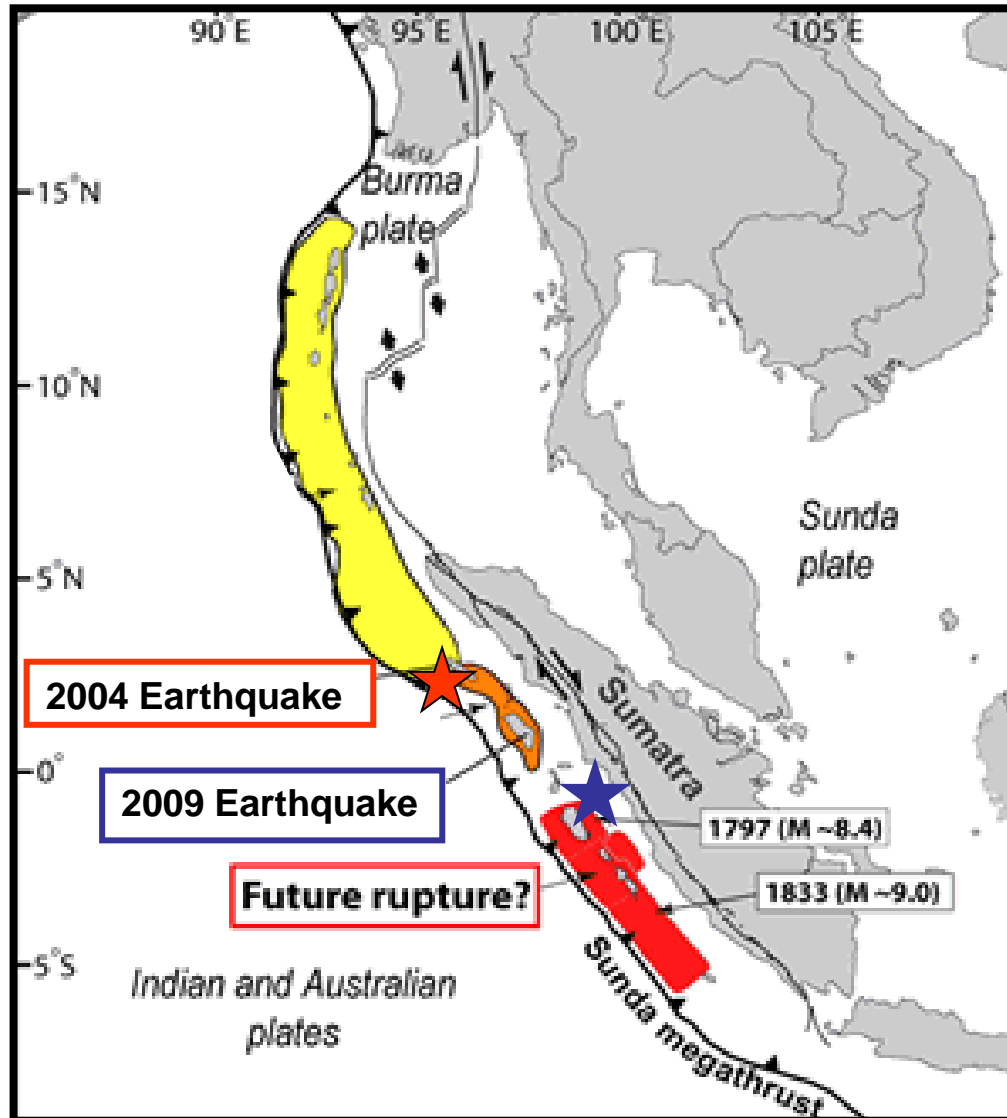
Padang Earth Quake October 1 2009

Magnitude 7.6

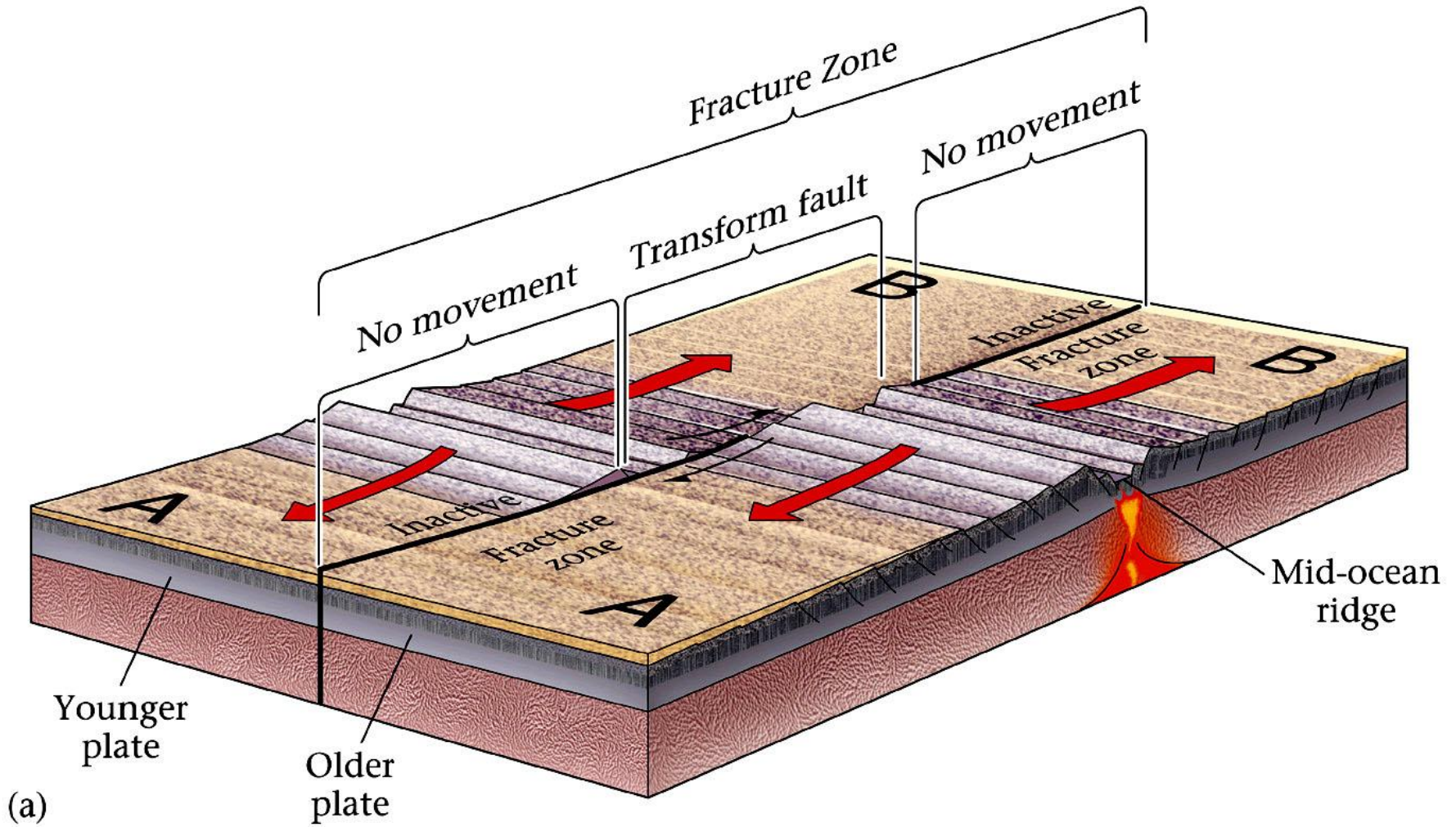
500 Buildings collapse
(hospitals, schools)

Thousands of people trapped

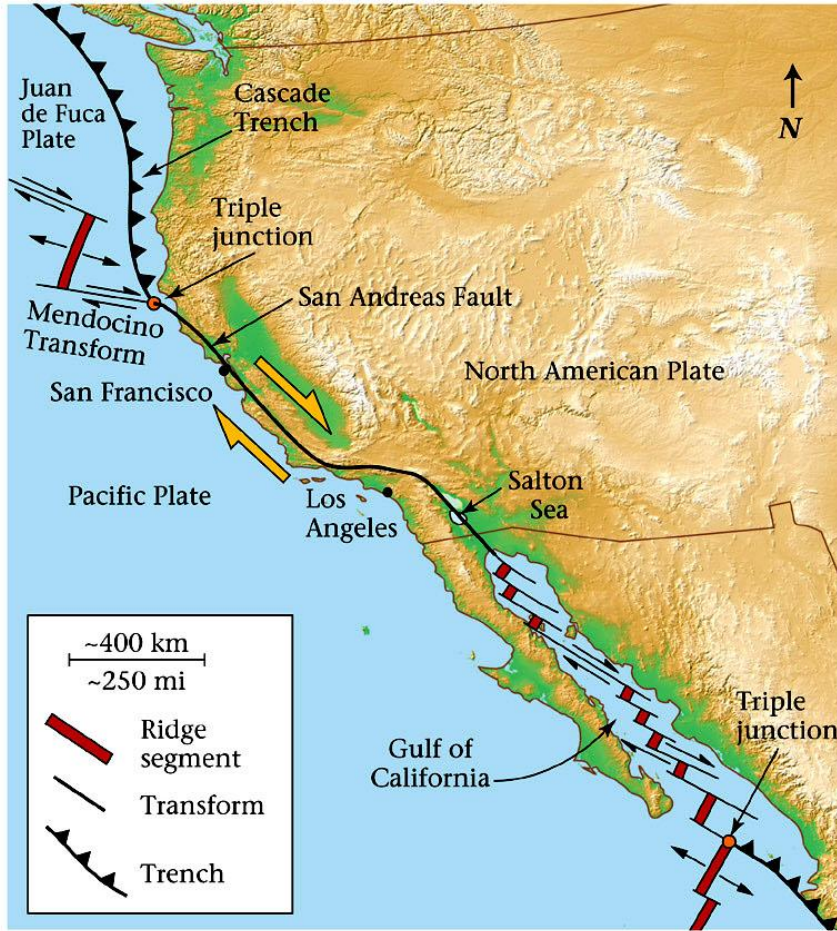
Death toll >1115



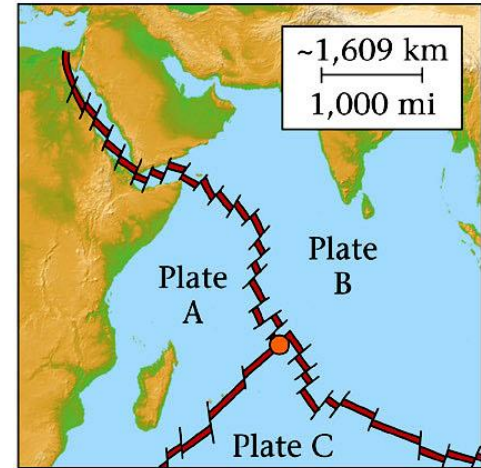
Transform faults



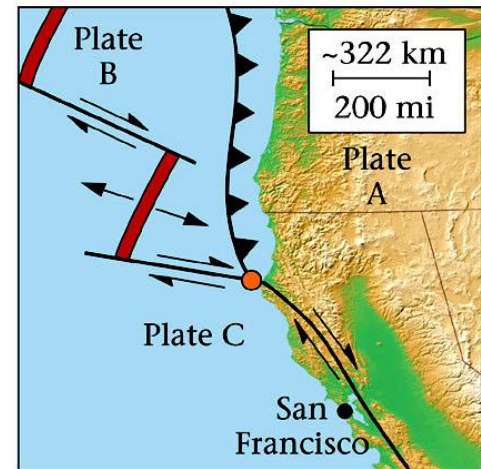
Transform faults and plate boundaries



(a)

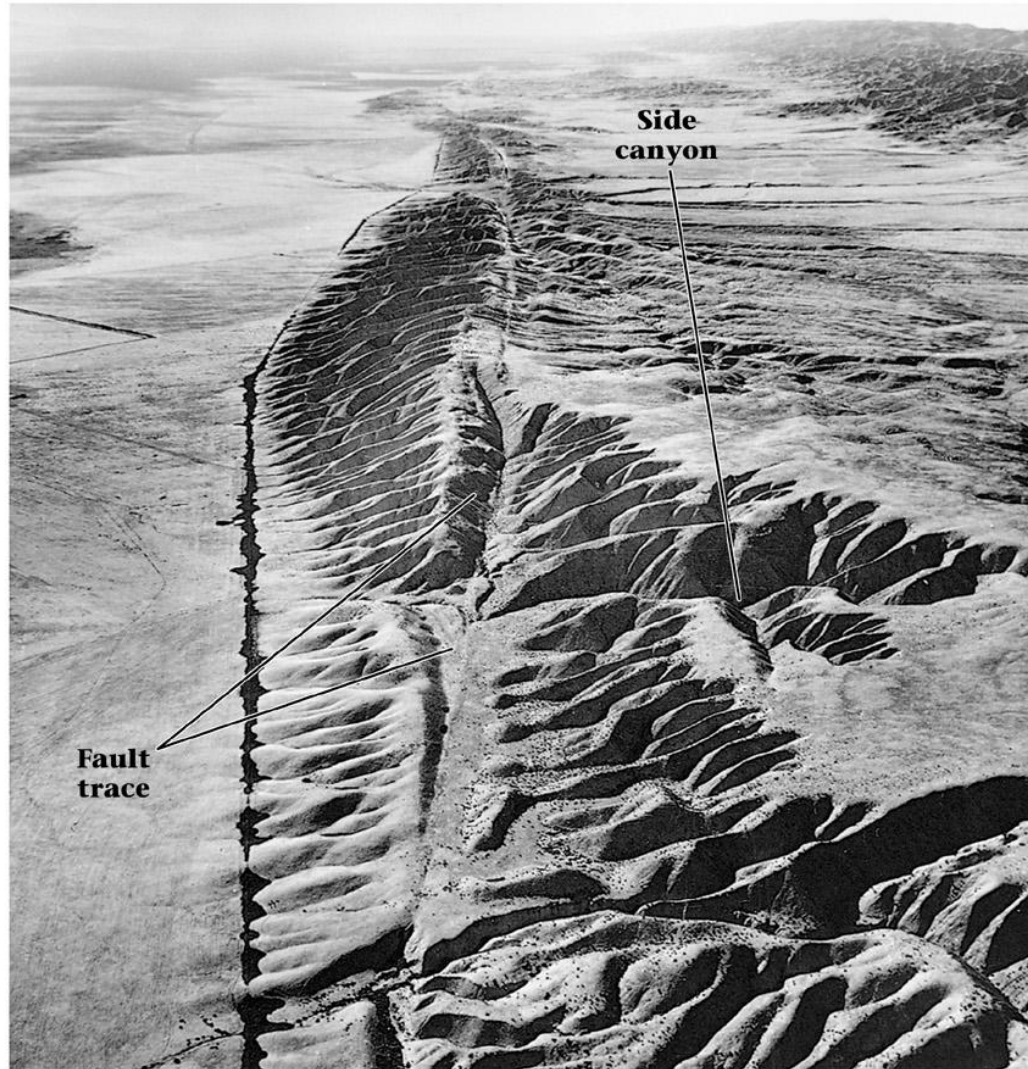


(a)



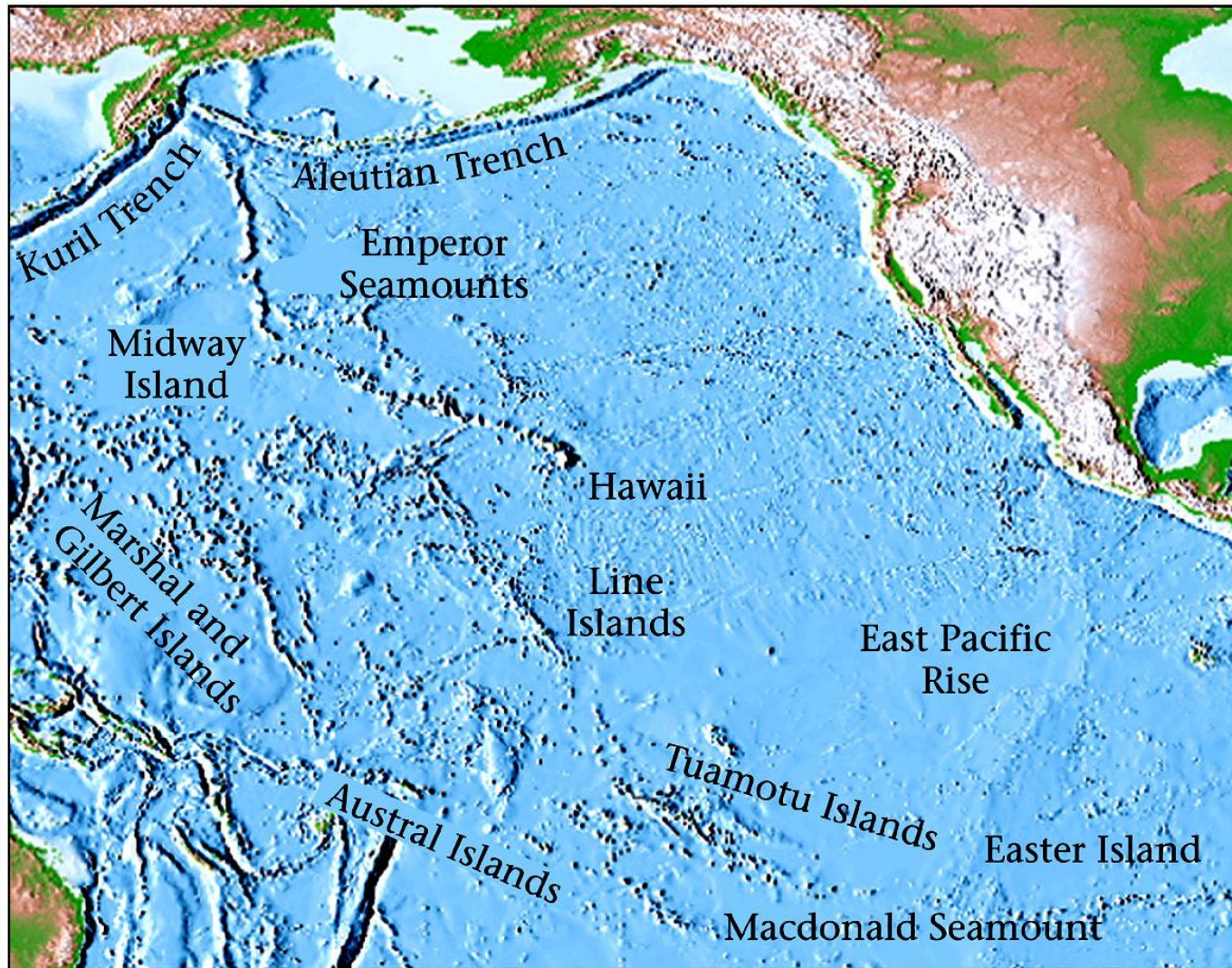
(b)

The San Andreas transform fault

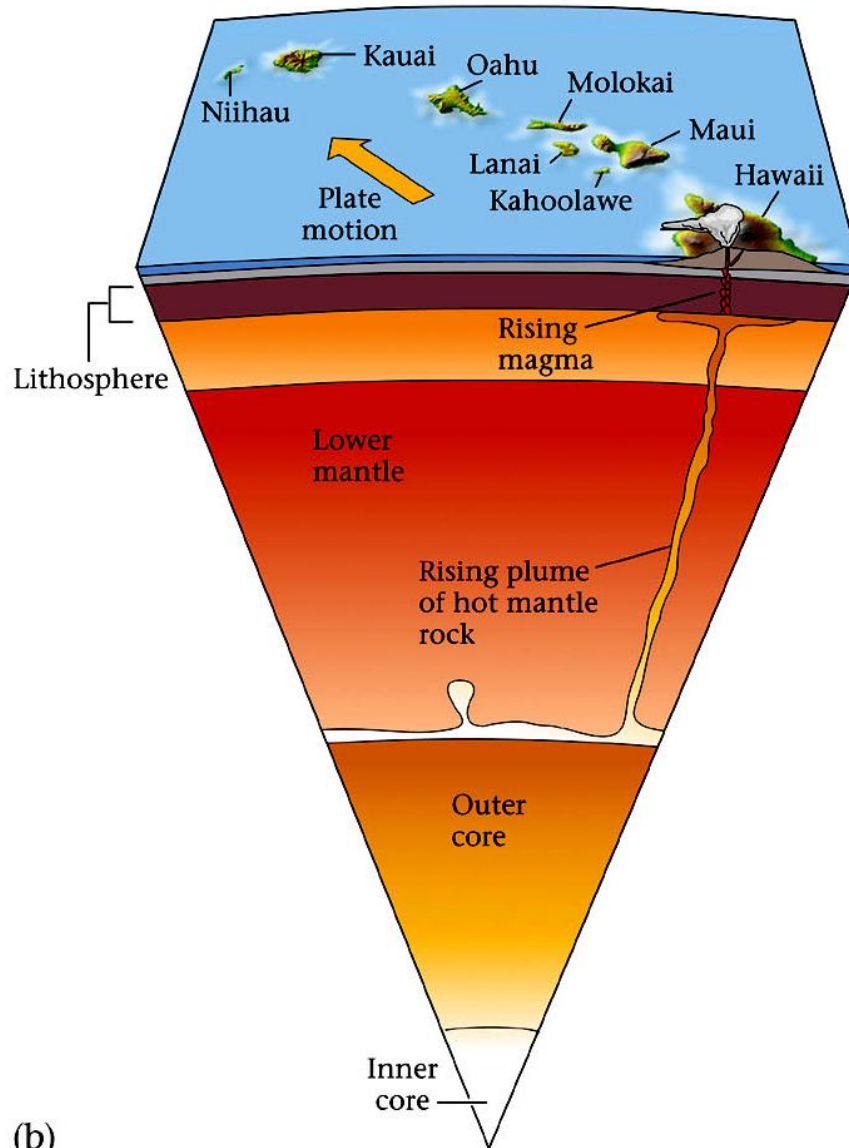


(b)

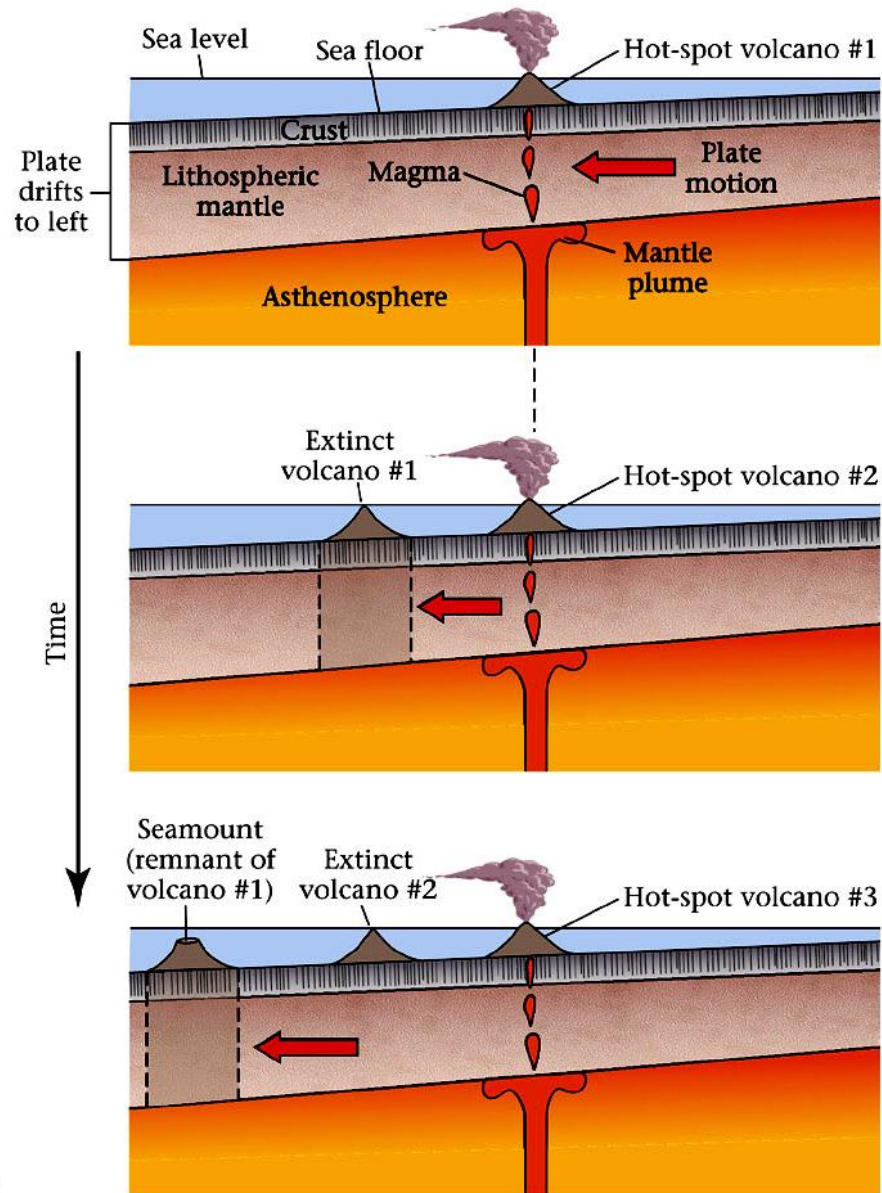
Hot spot volcanoes



Hot spots and mantle plumes

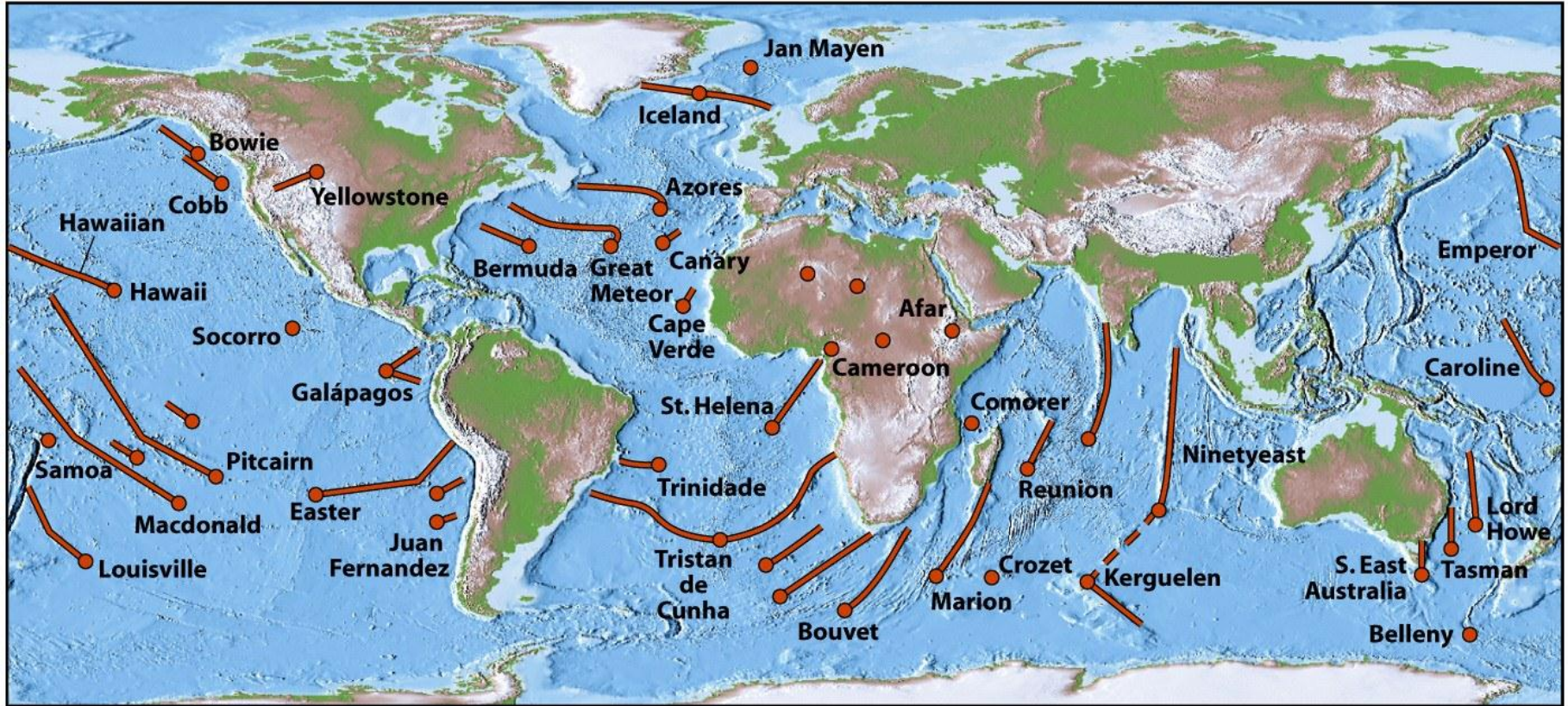


Hot spots and mantle plumes

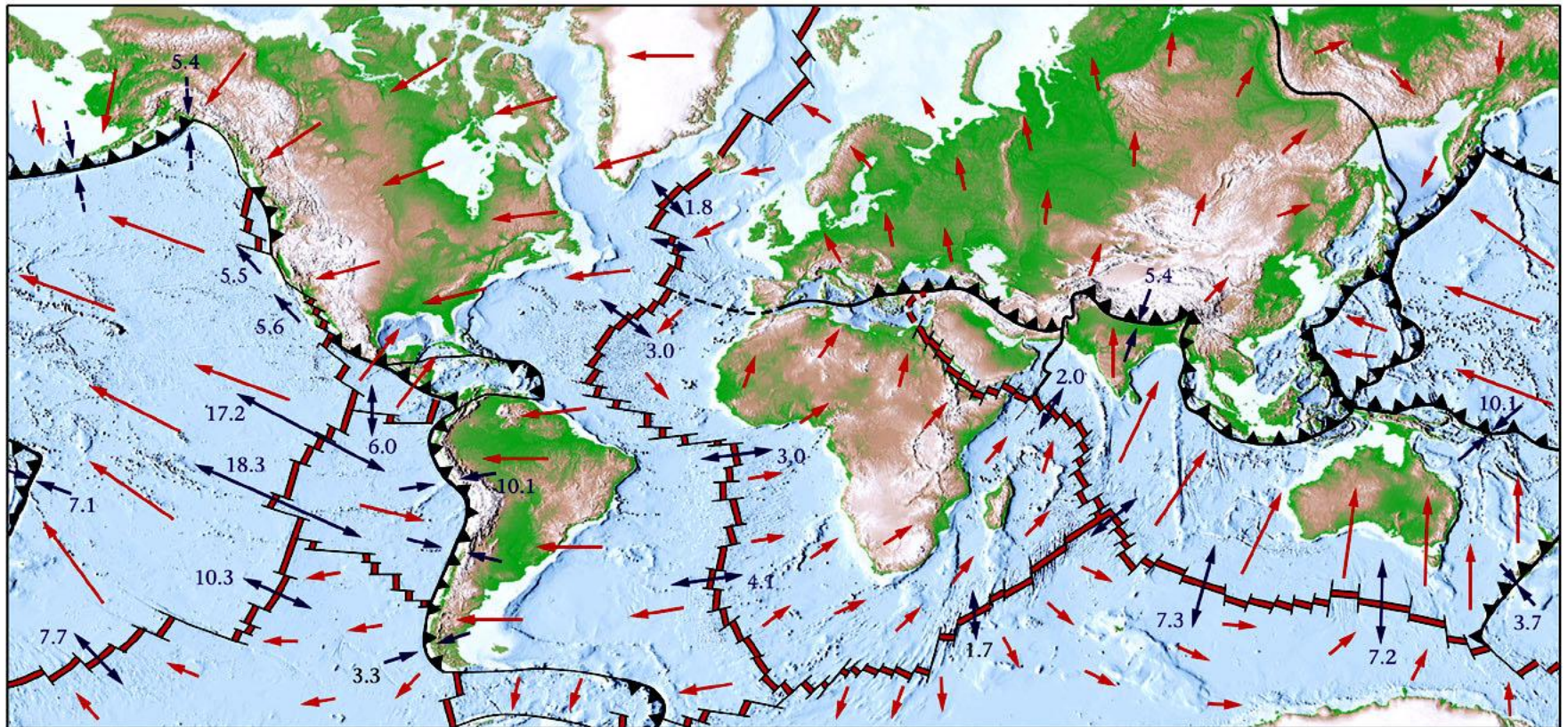


(a)

Interpretation of plate motion from hot spots

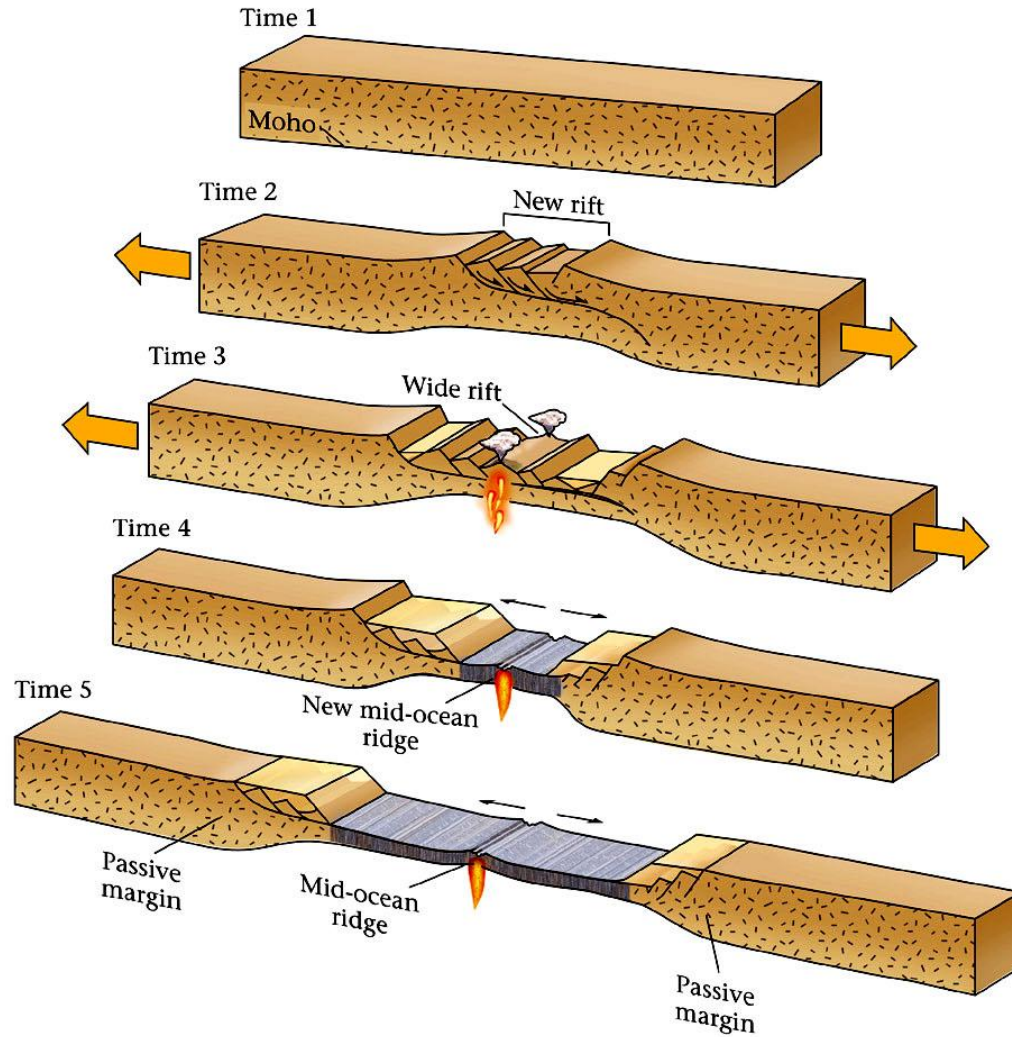


Rates of plate motion



▲▲▲ Convergent boundary - - - Ridge — Transform ← Absolute plate motions ⇄ Relative plate motions (5.5 cm per year)

Continental Rifting



The African Rift Valley

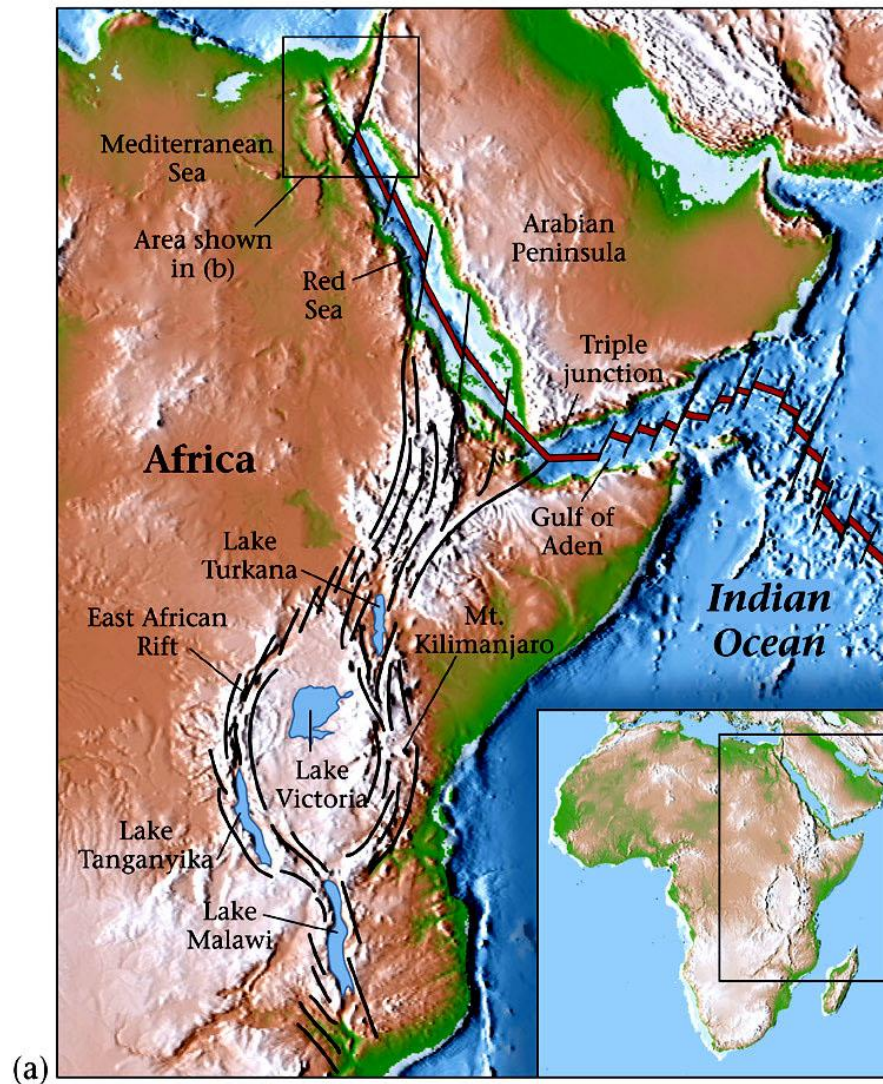


Plate tectonic summary

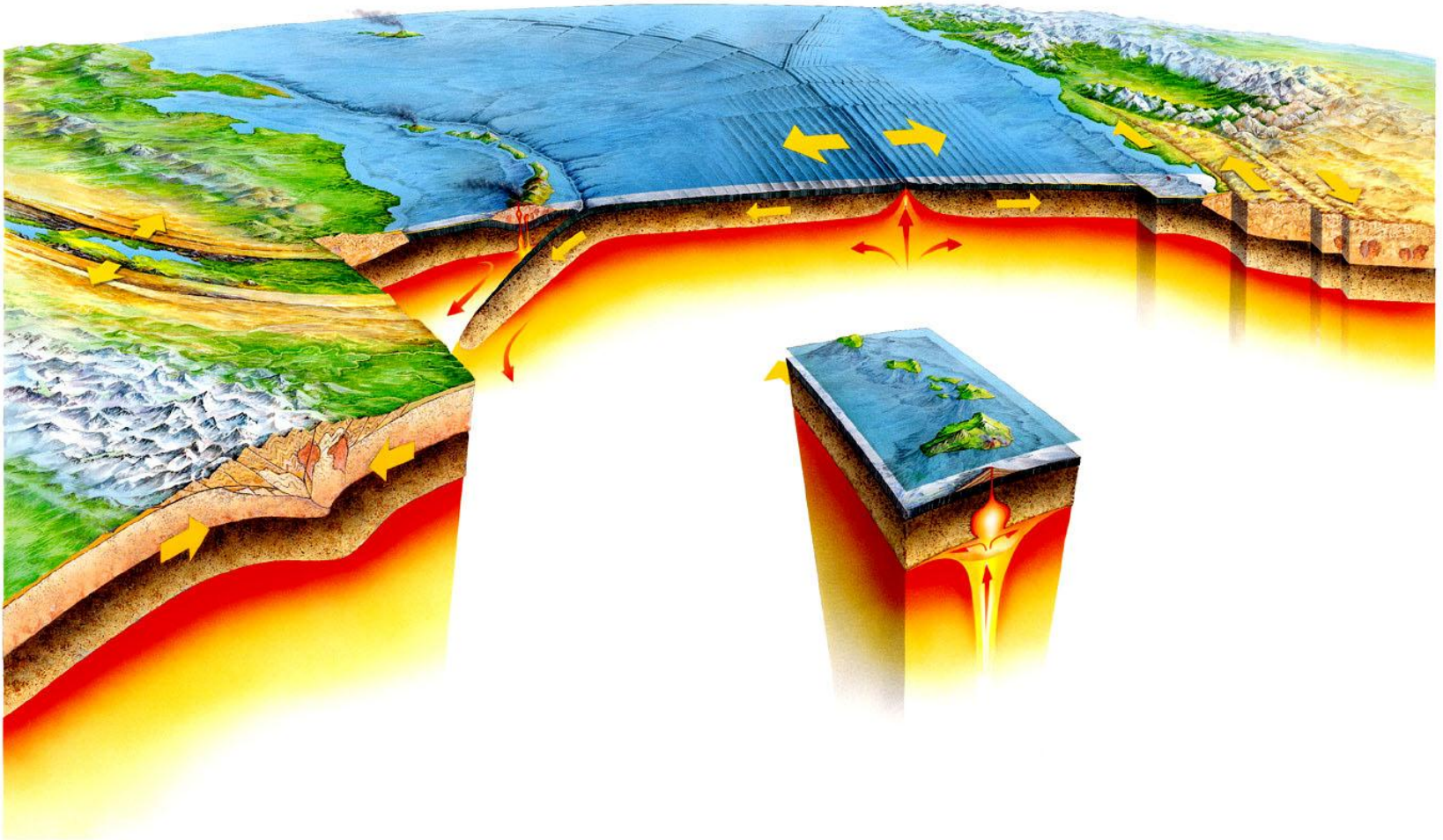


Plate tectonic summary

