



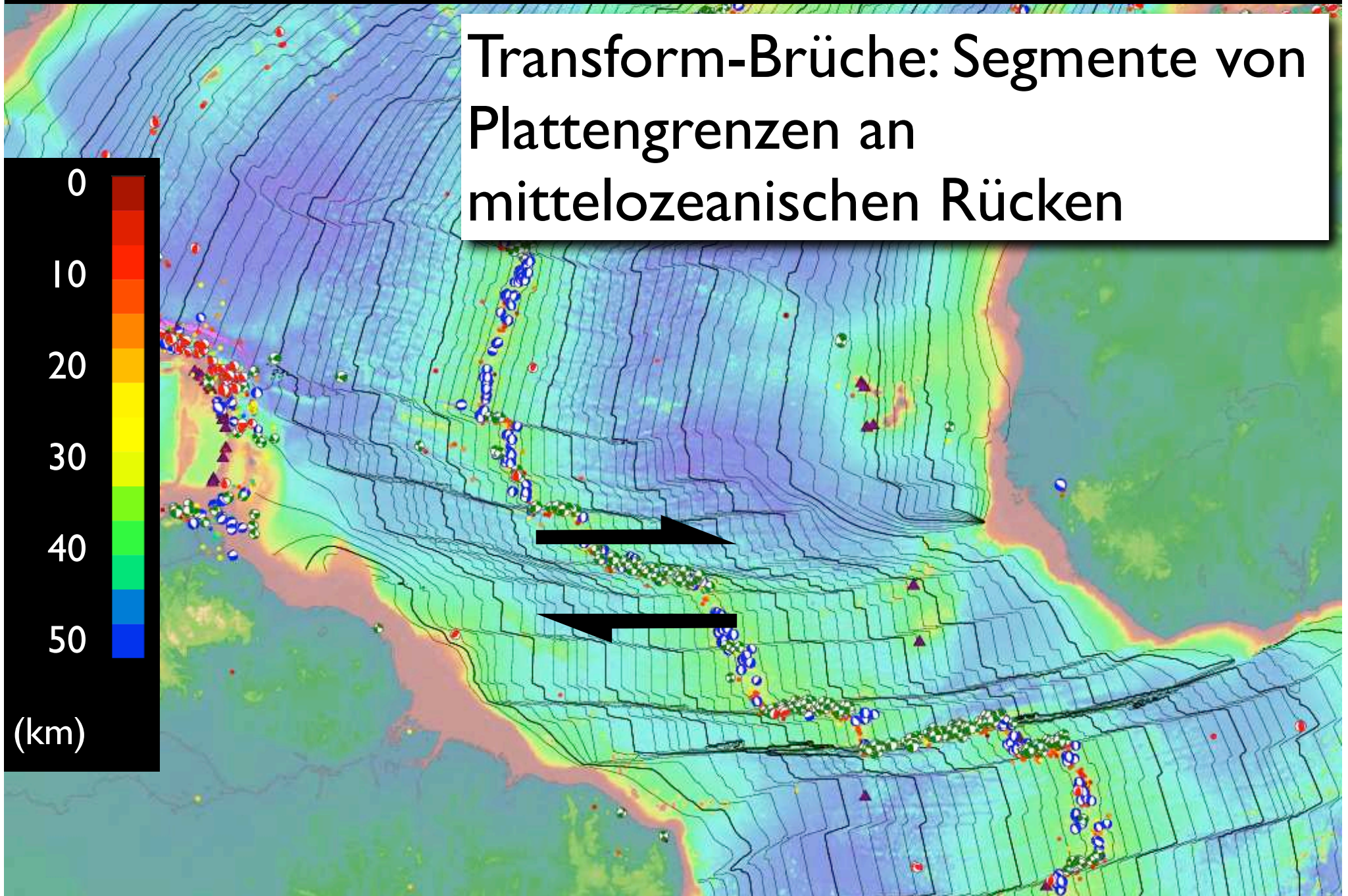
Tatort Plattengrenze

Renée Heilbronner

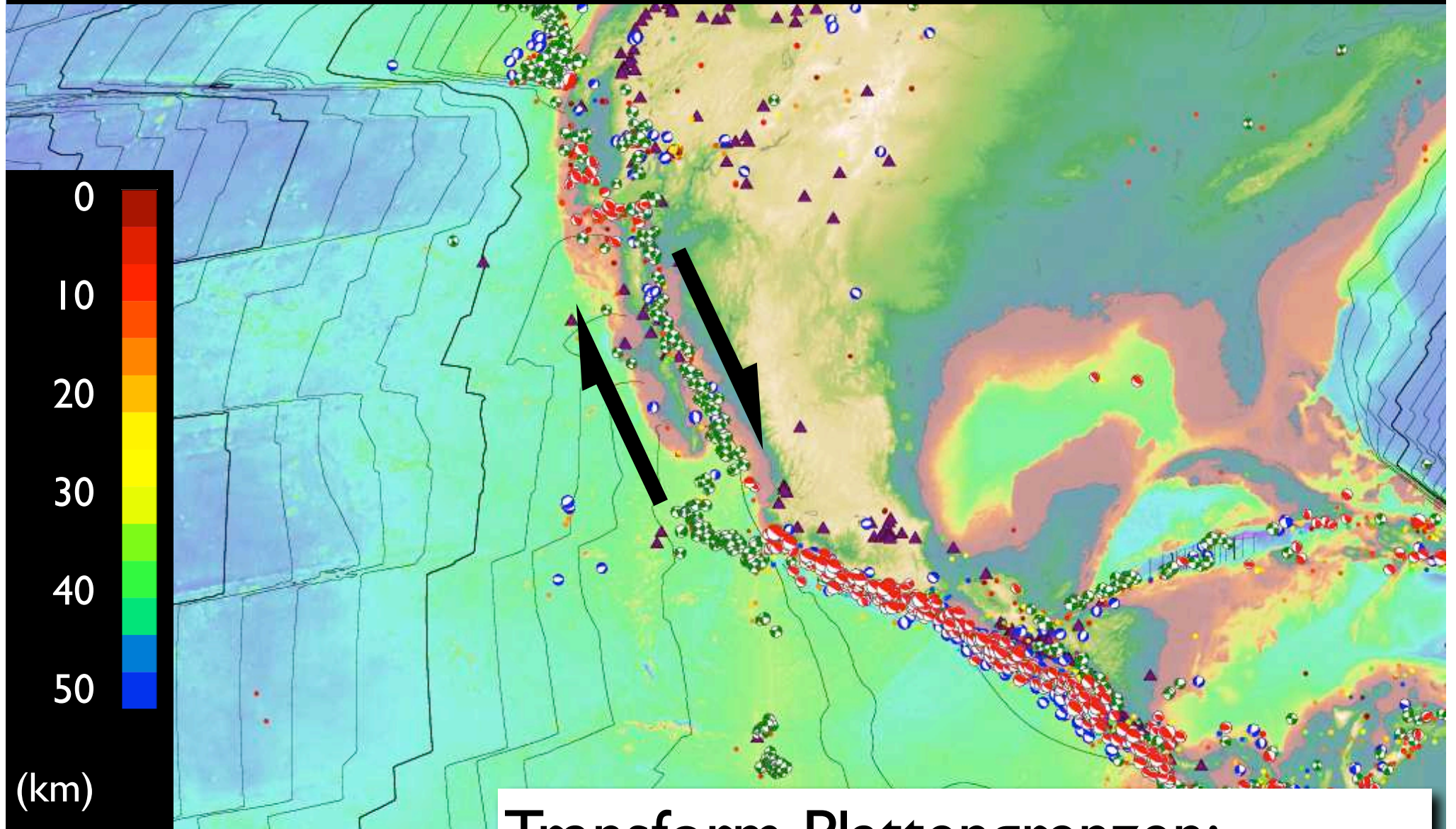
5. Nov. 12. Nov. 19. Nov. 26. Nov.

konservative Plattengrenze

Transform-Brüche: Segmente von Plattengrenzen an mittelozeanischen Rücken



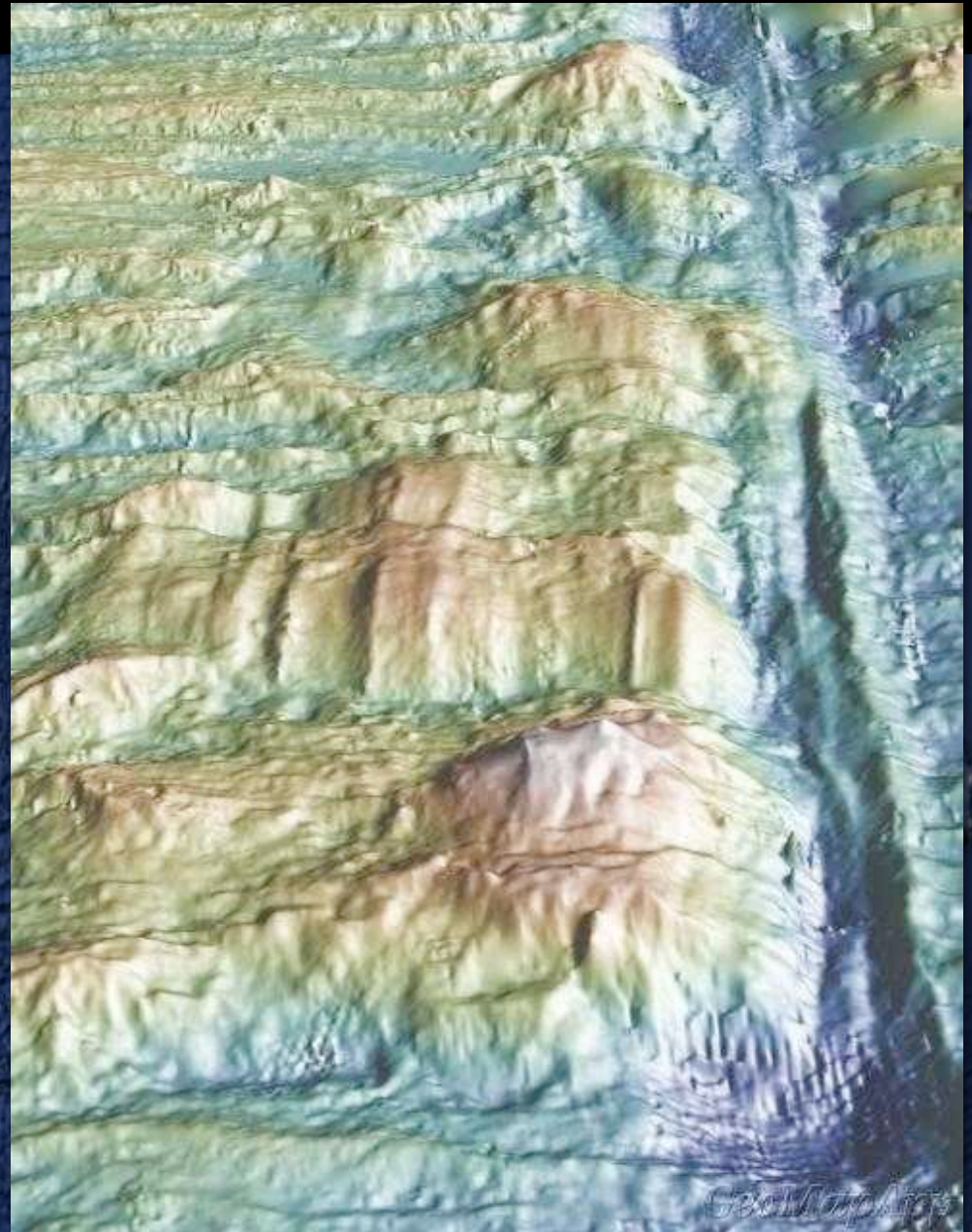
konservative Plattengrenze



Transform Plattengrenzen:
Beispiel Kalifornien

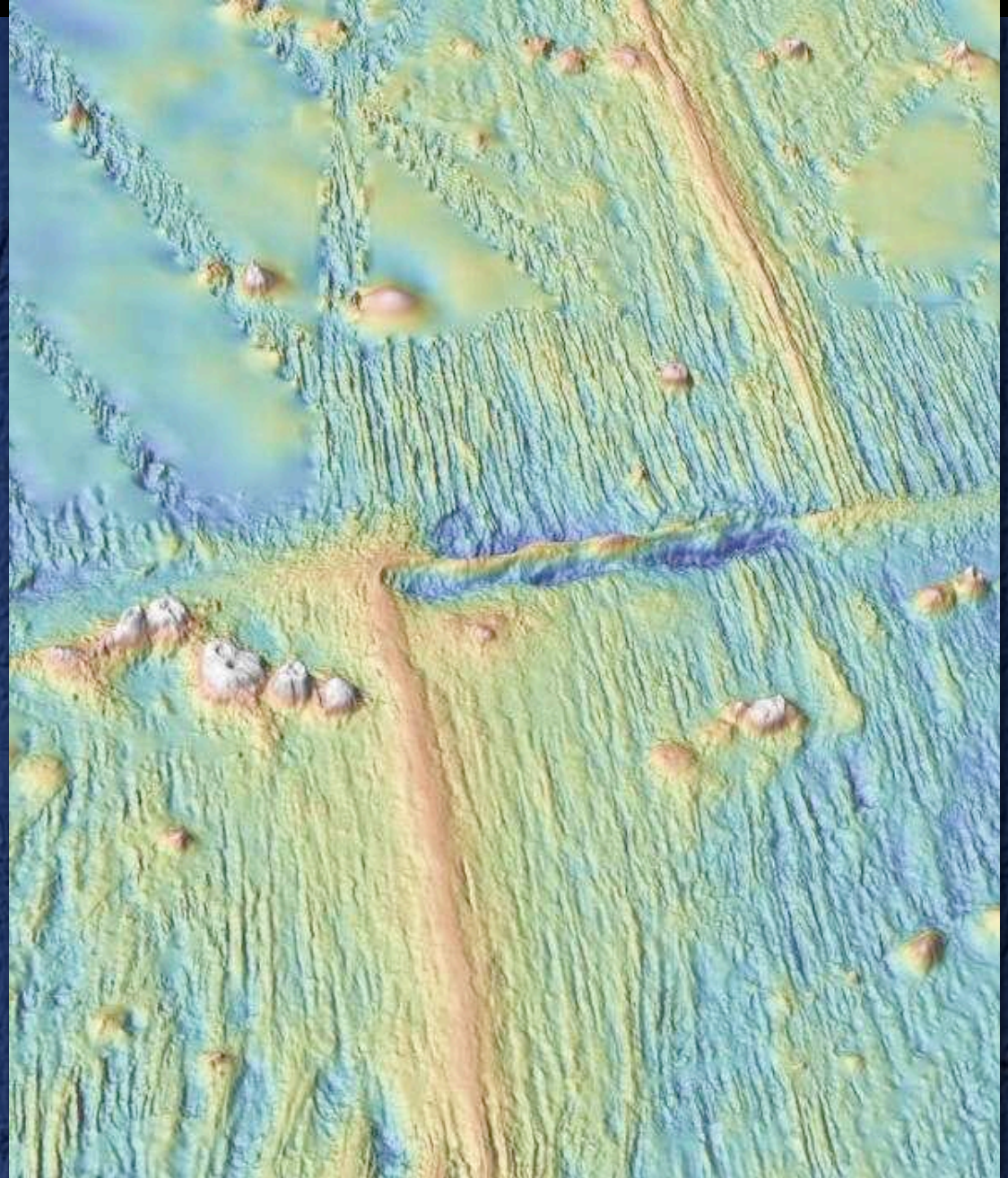
Transformbruch

Kane Fracture
Zone (MAR)



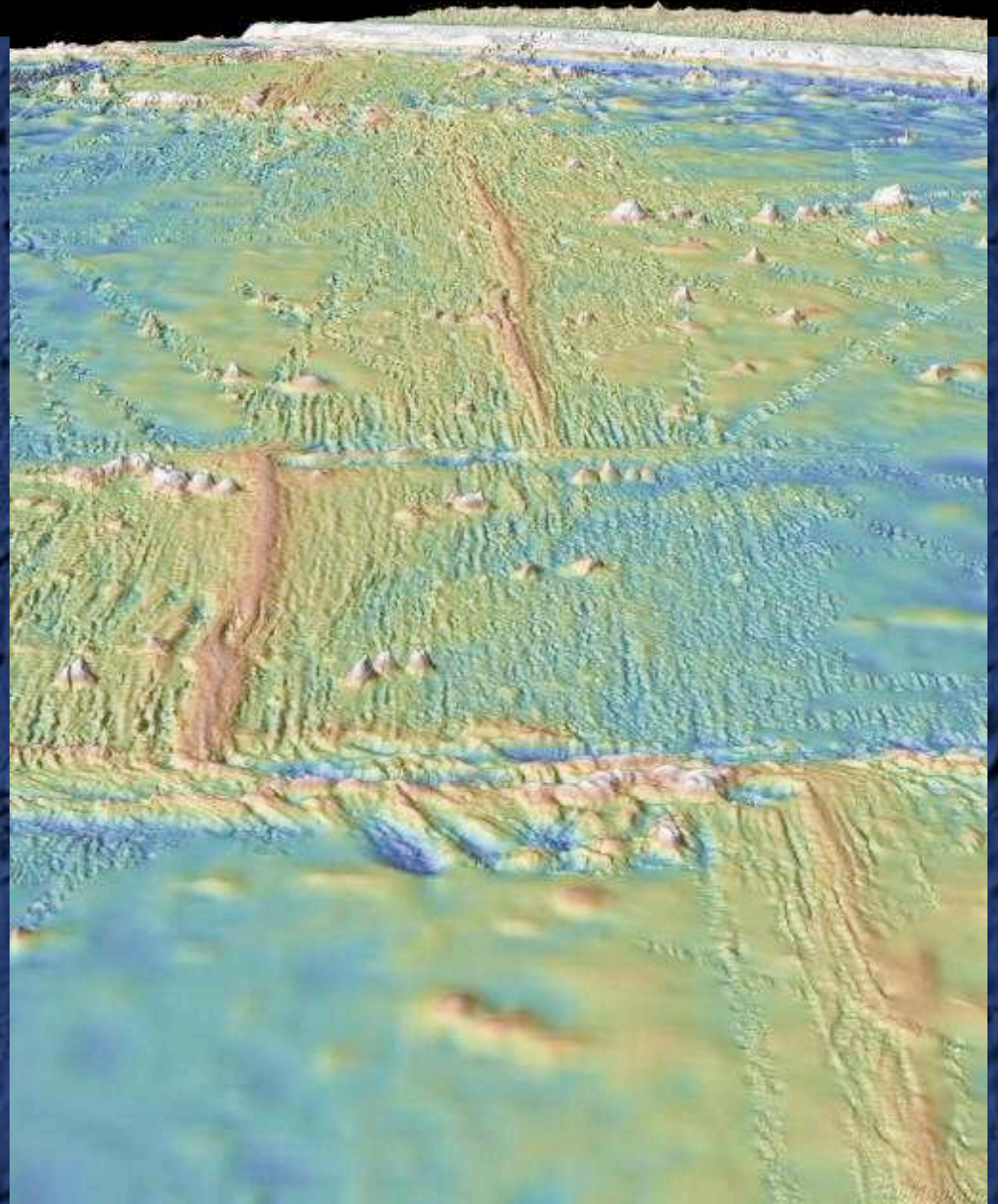
Transformbruch

East Pacific Rise

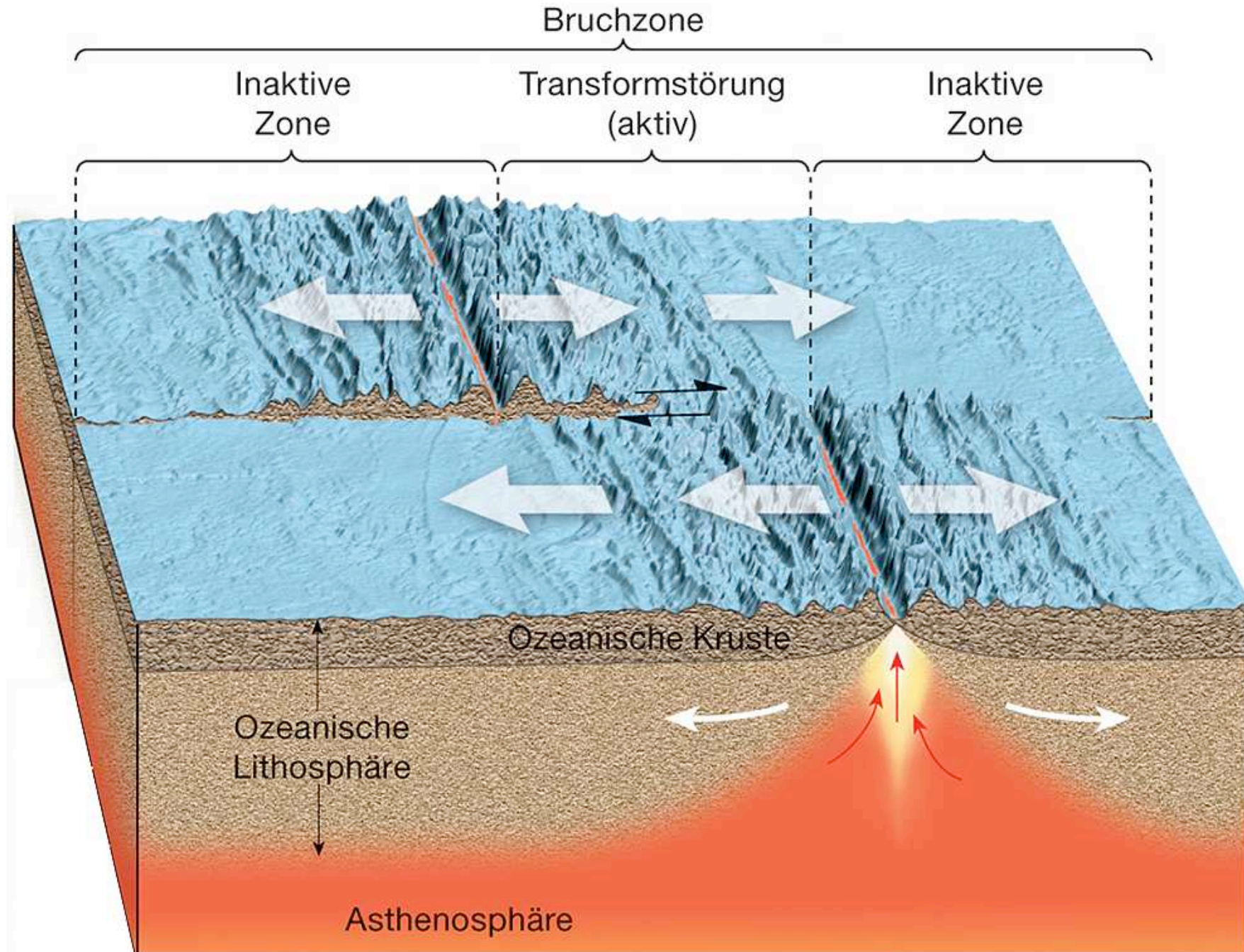


Transformbruch

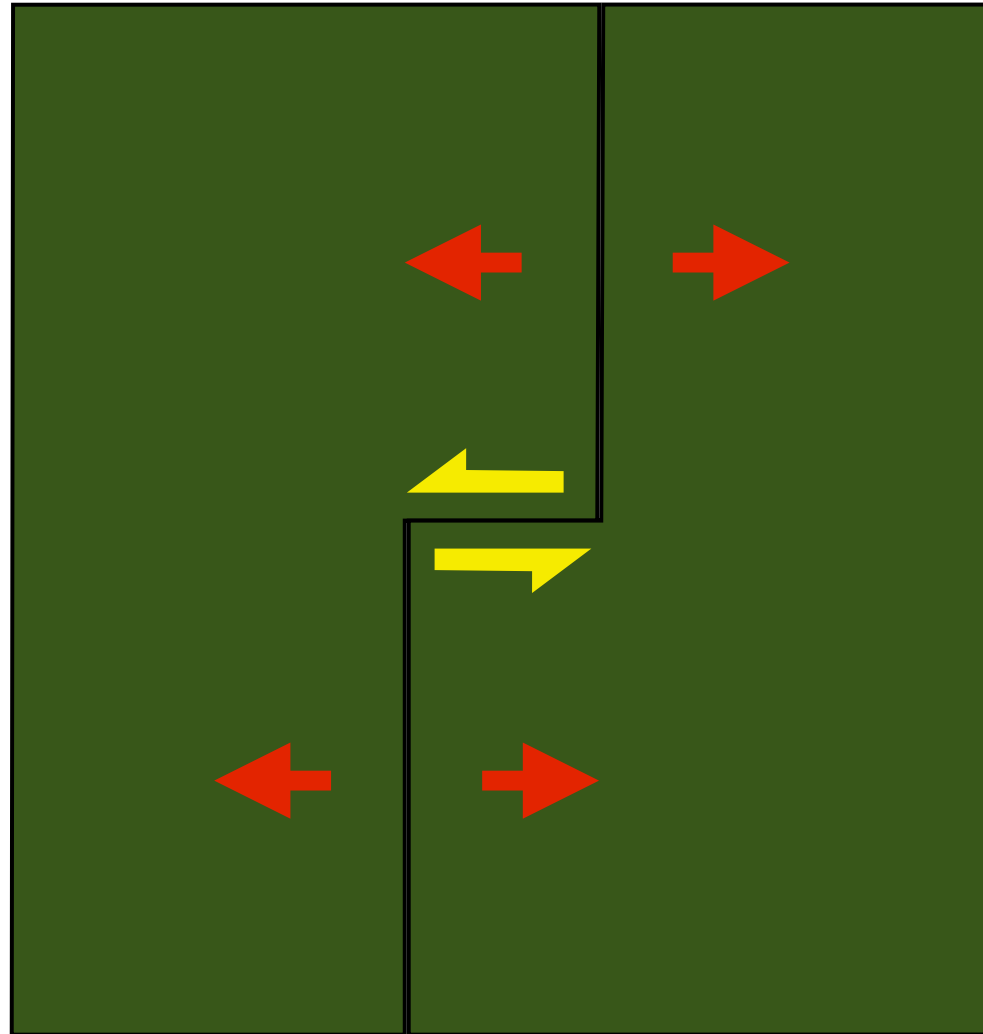
East Pacific Rise



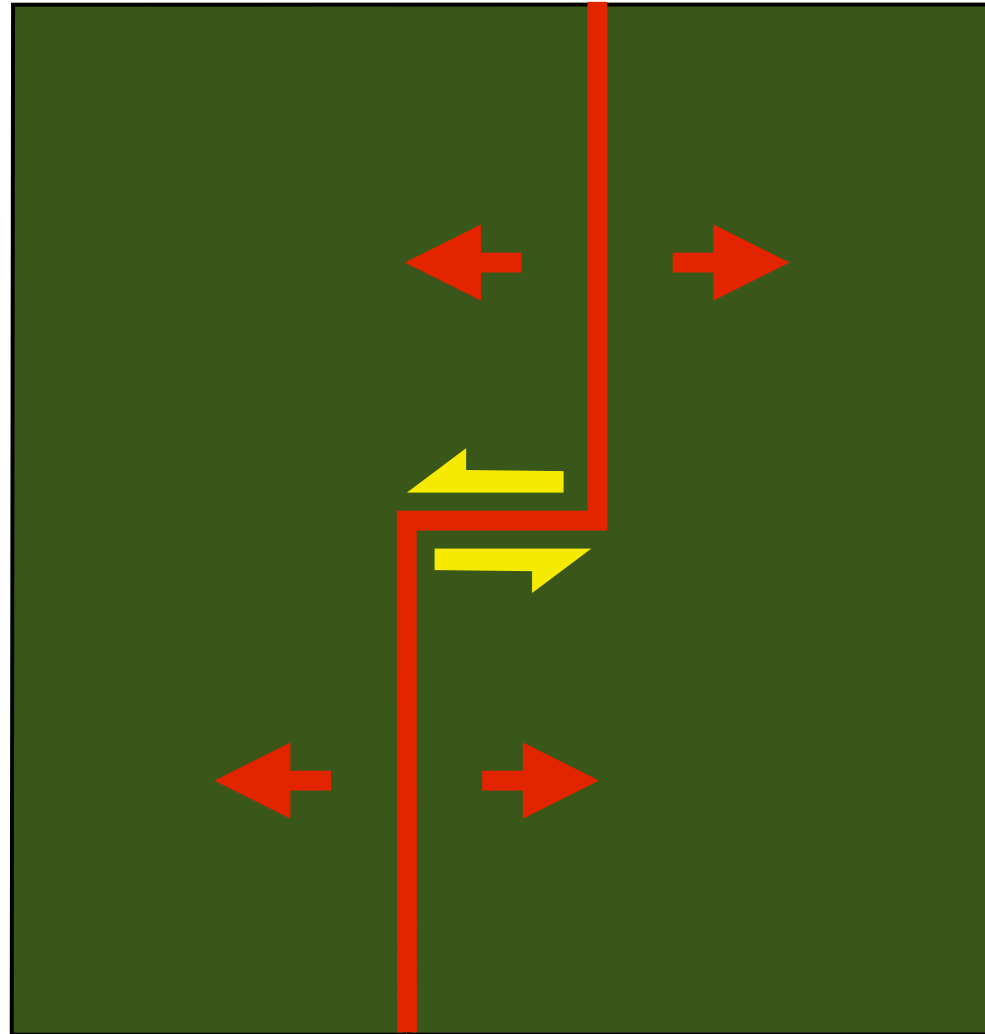
Transformstörungen



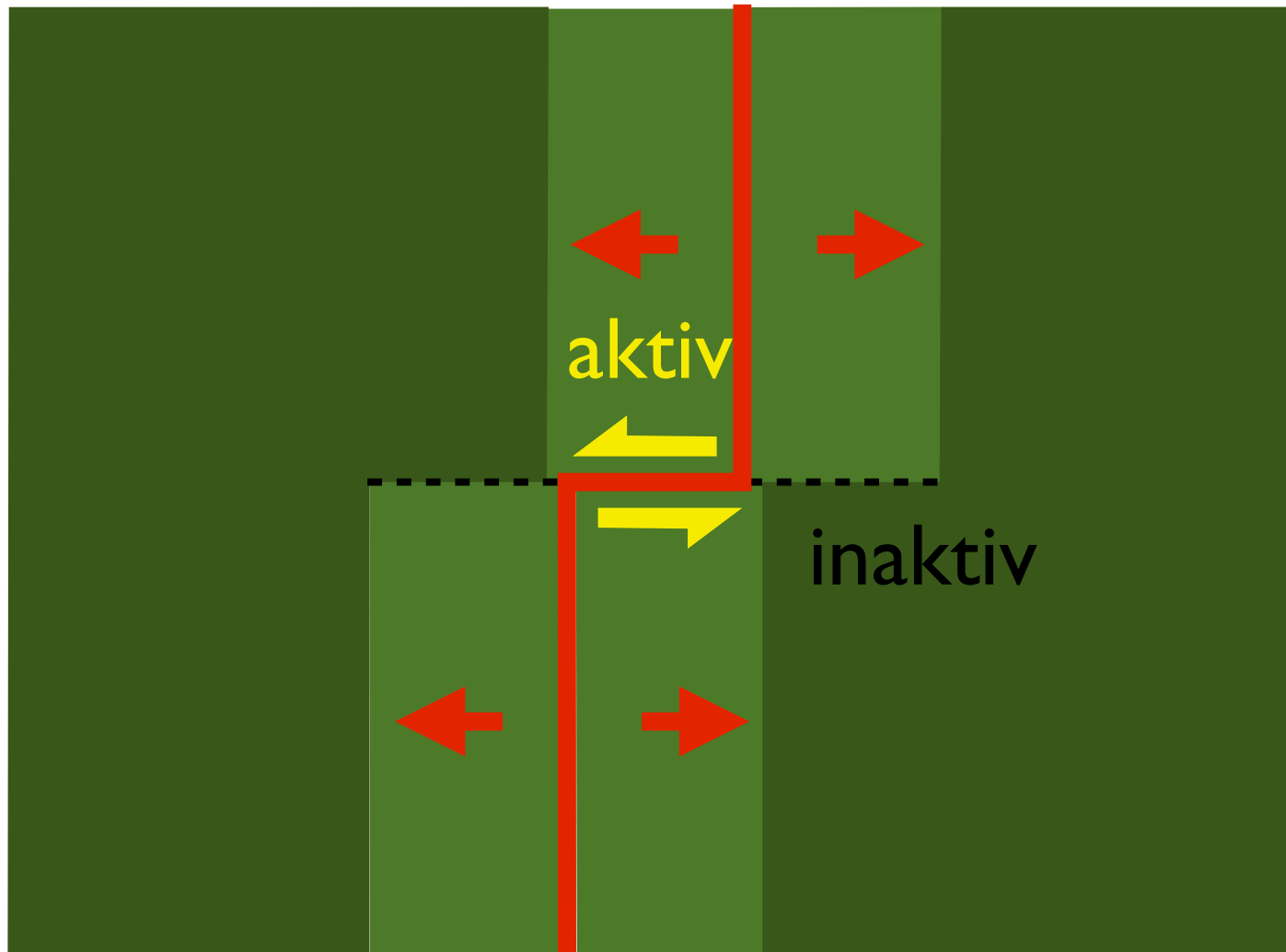
Bewegung an Transformstörungen



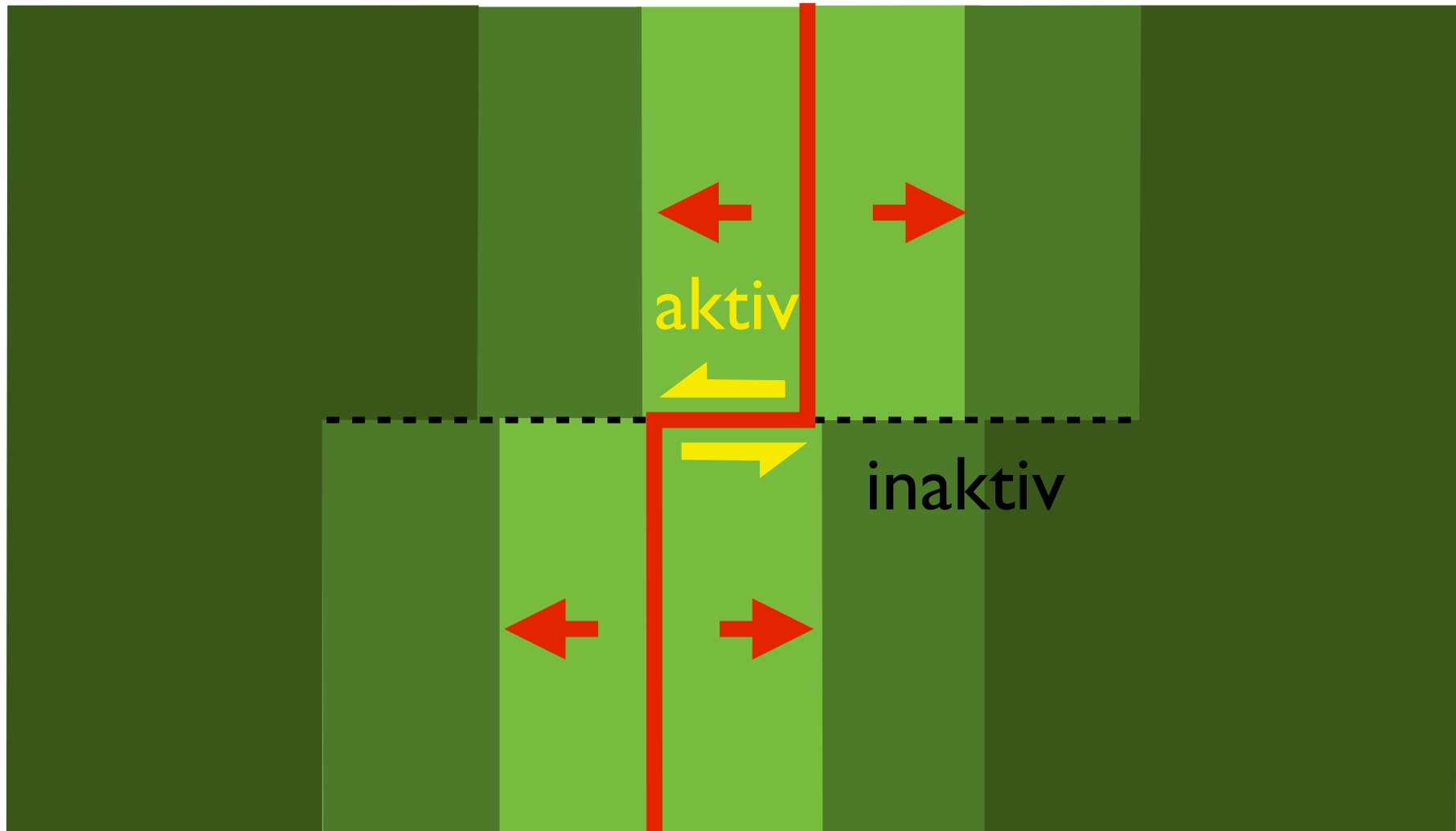
Bewegung an Transformstörungen



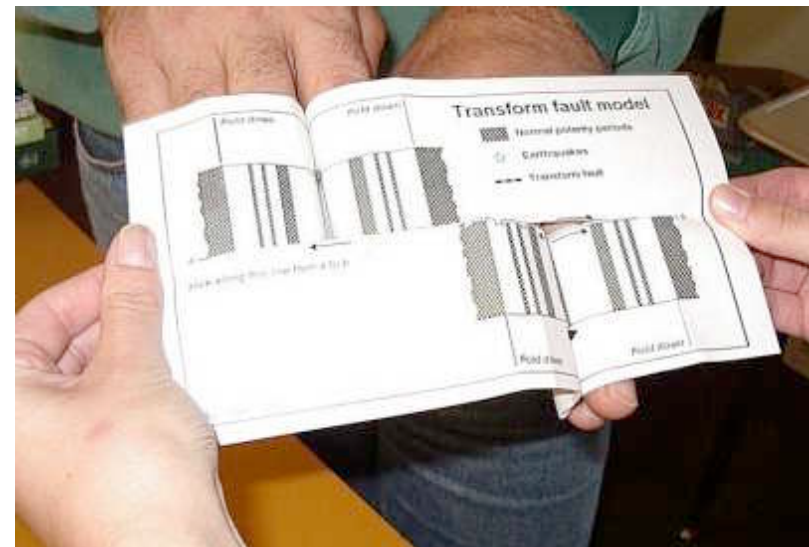
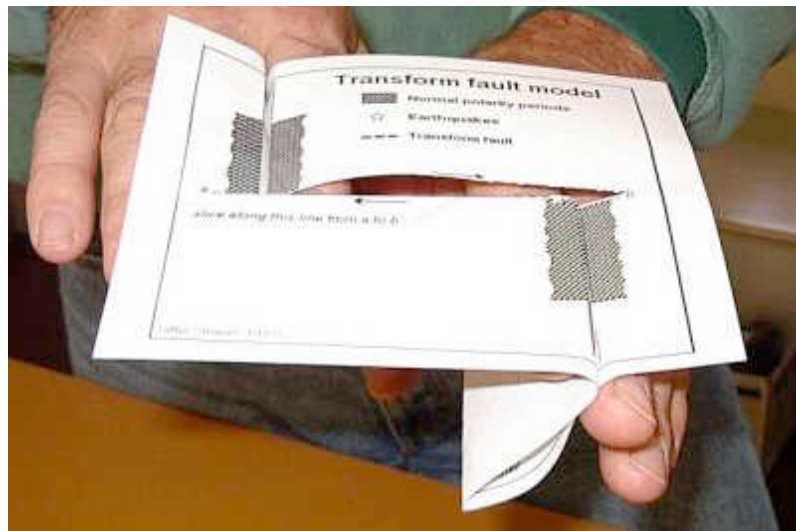
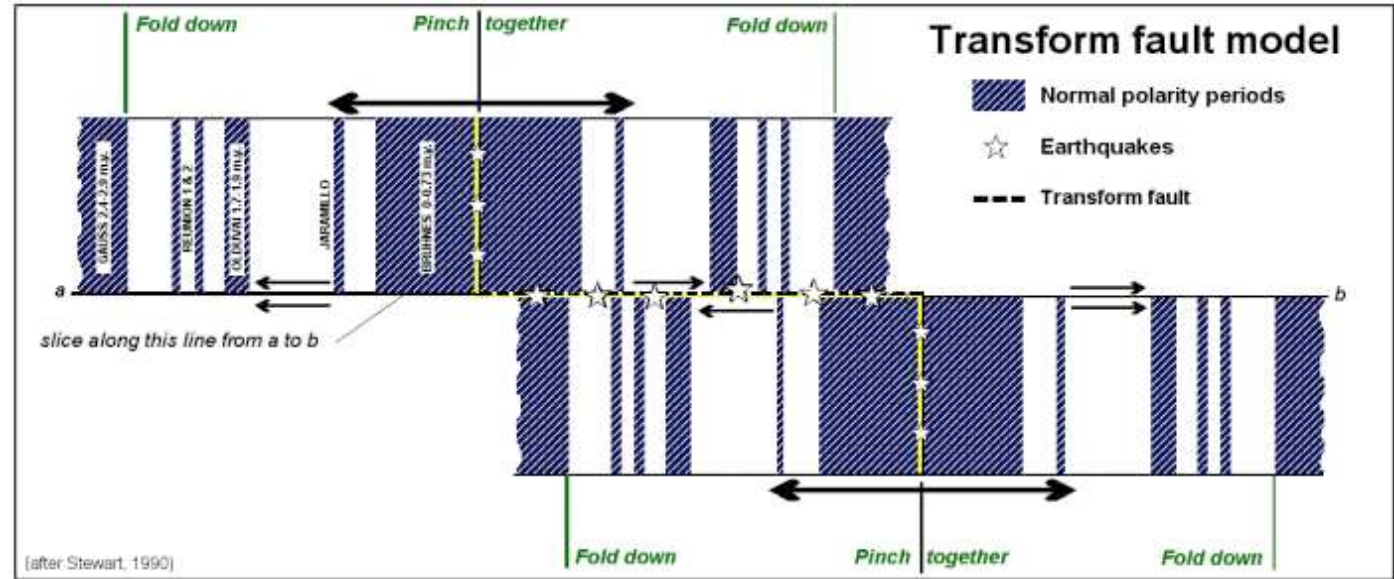
Bewegung an Transformstörungen



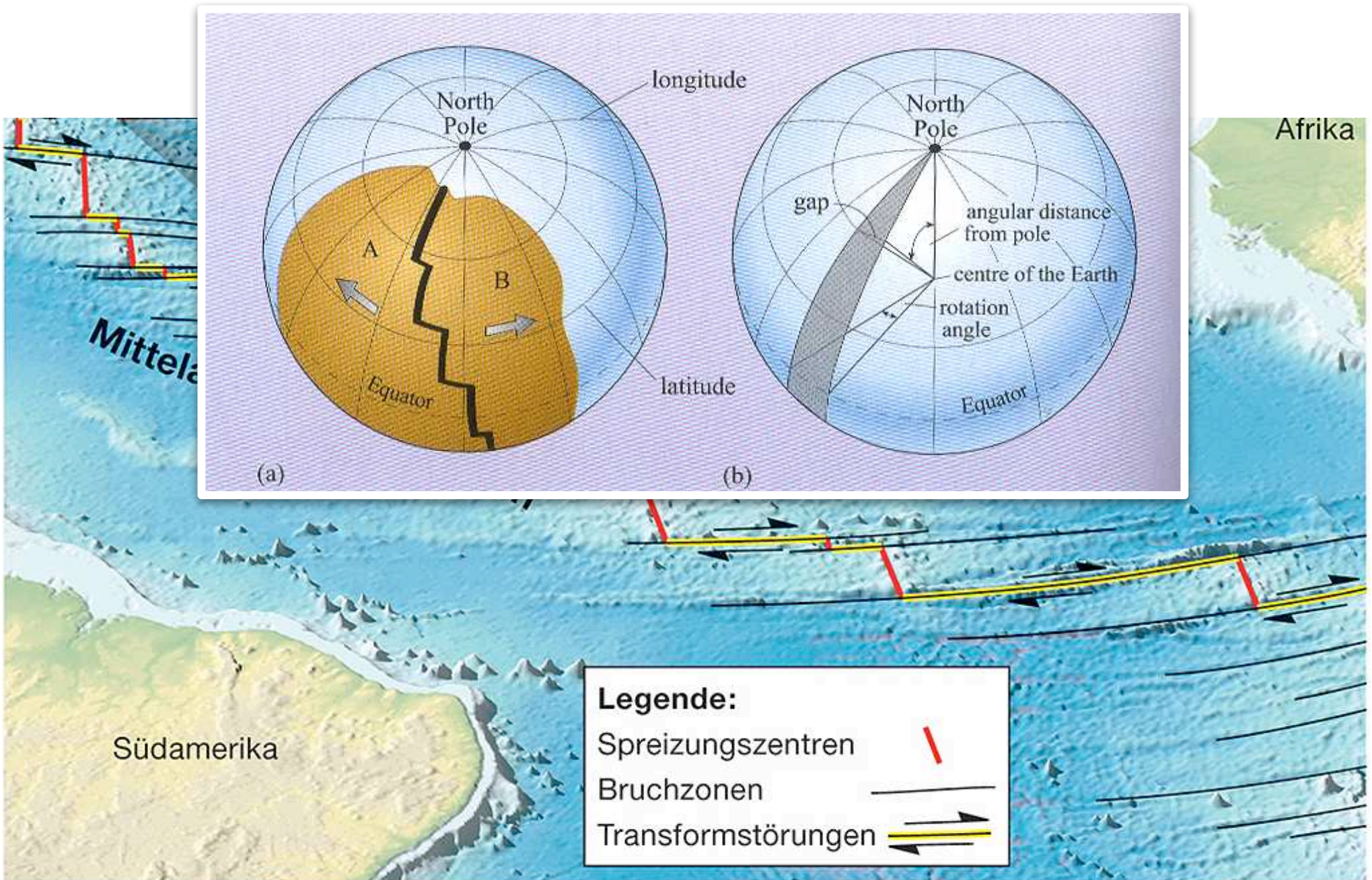
Bewegung an Transformstörungen



Transform fault boundaries



Transformstörungen



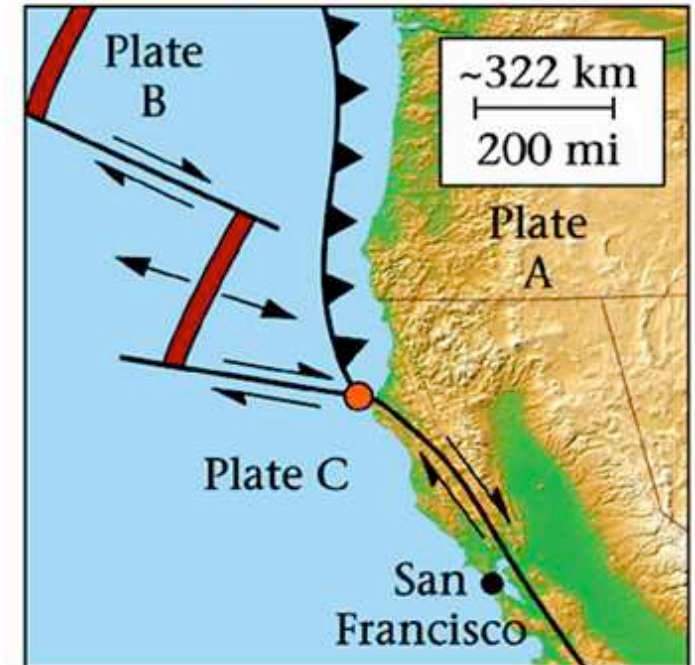
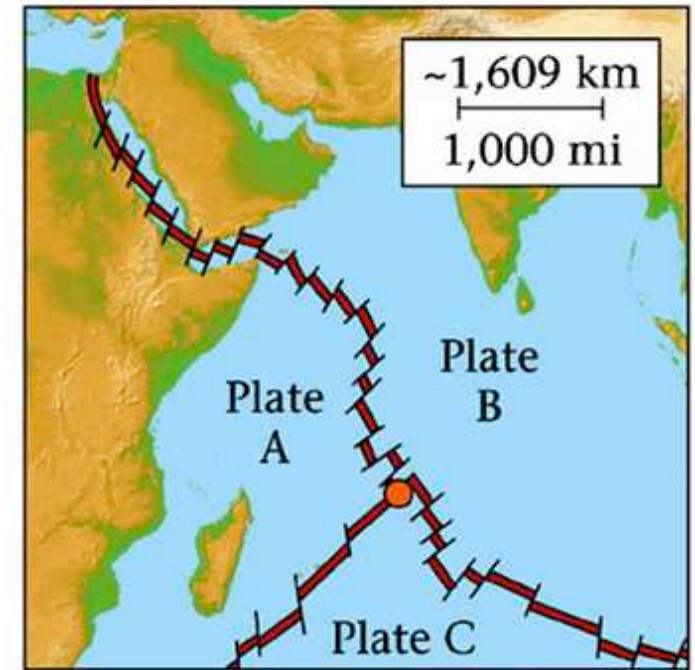
Beispiel: San Andreas Fault



Point Reyes

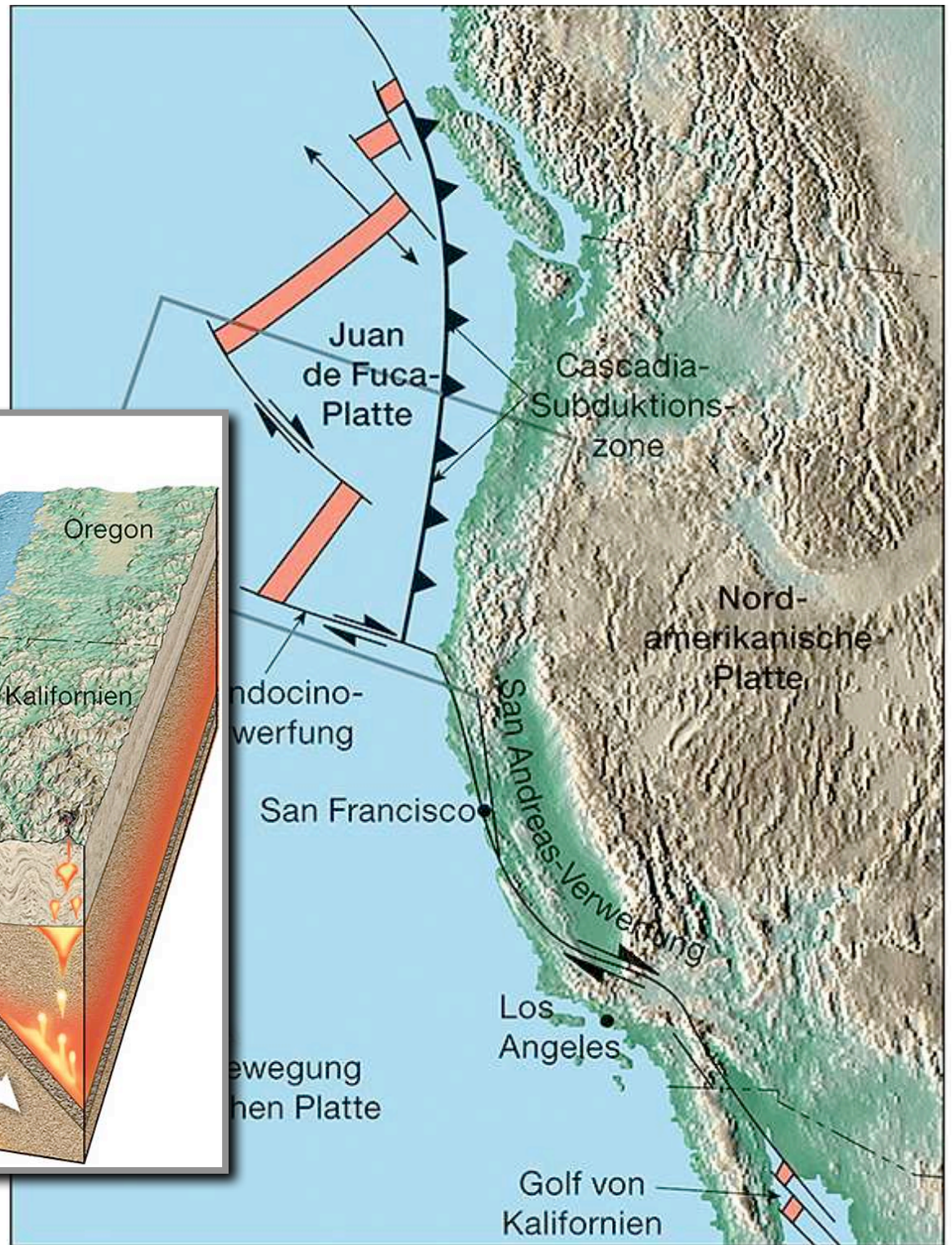
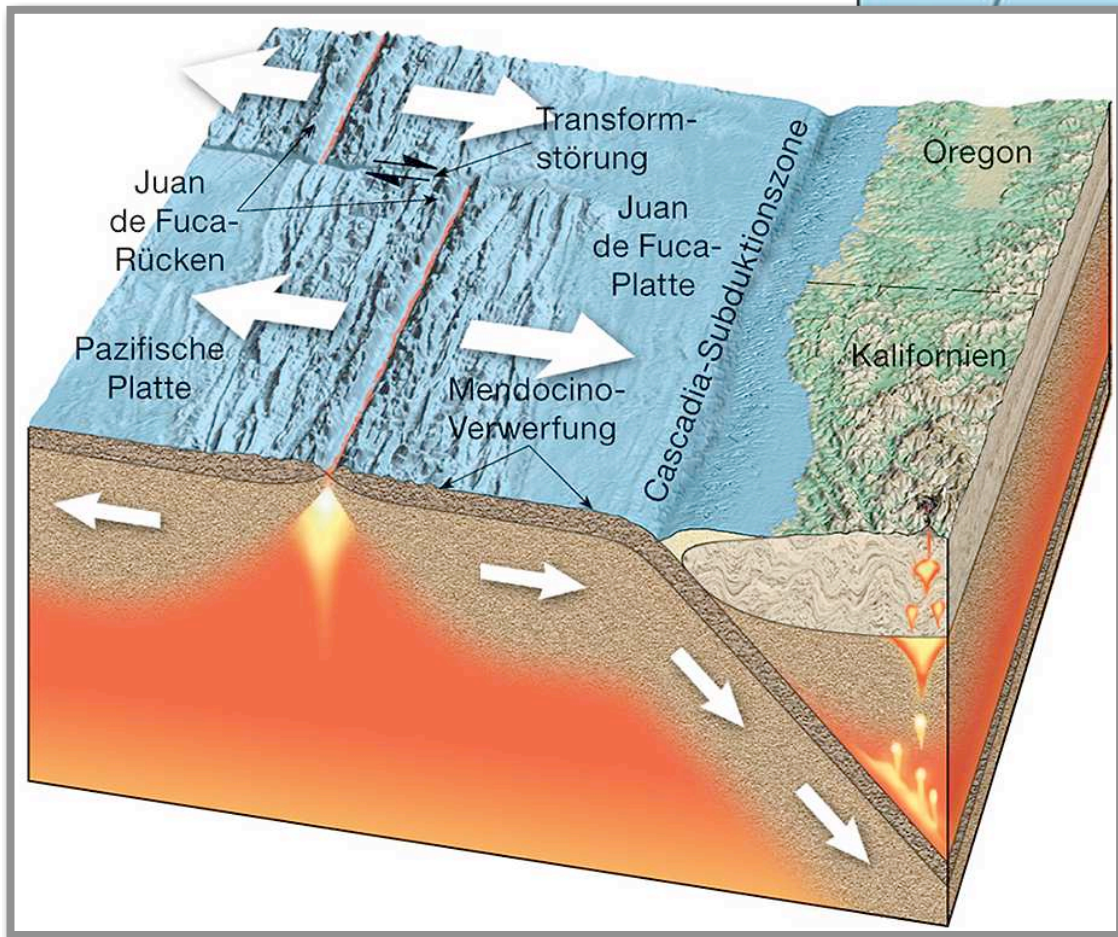
San Francisco

Transform - Plattengrenzen

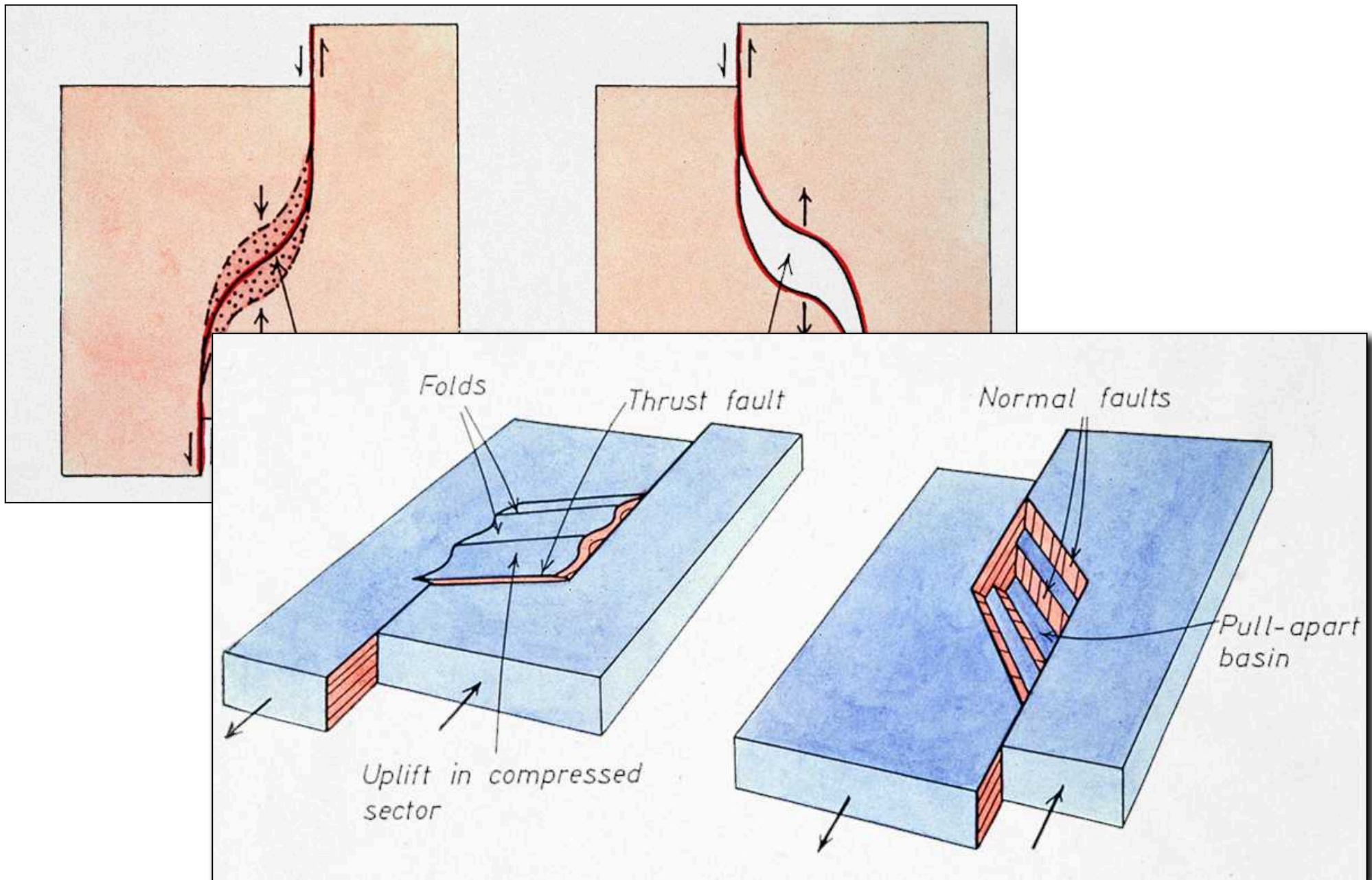


Beispiel: Rotes Meer, Indischer Ozean





Transpression - Transtension



San Andreas Fault, California



San Andreas Fault, California



San Andreas Fault, California



3x überhöht

Zusammenfassung

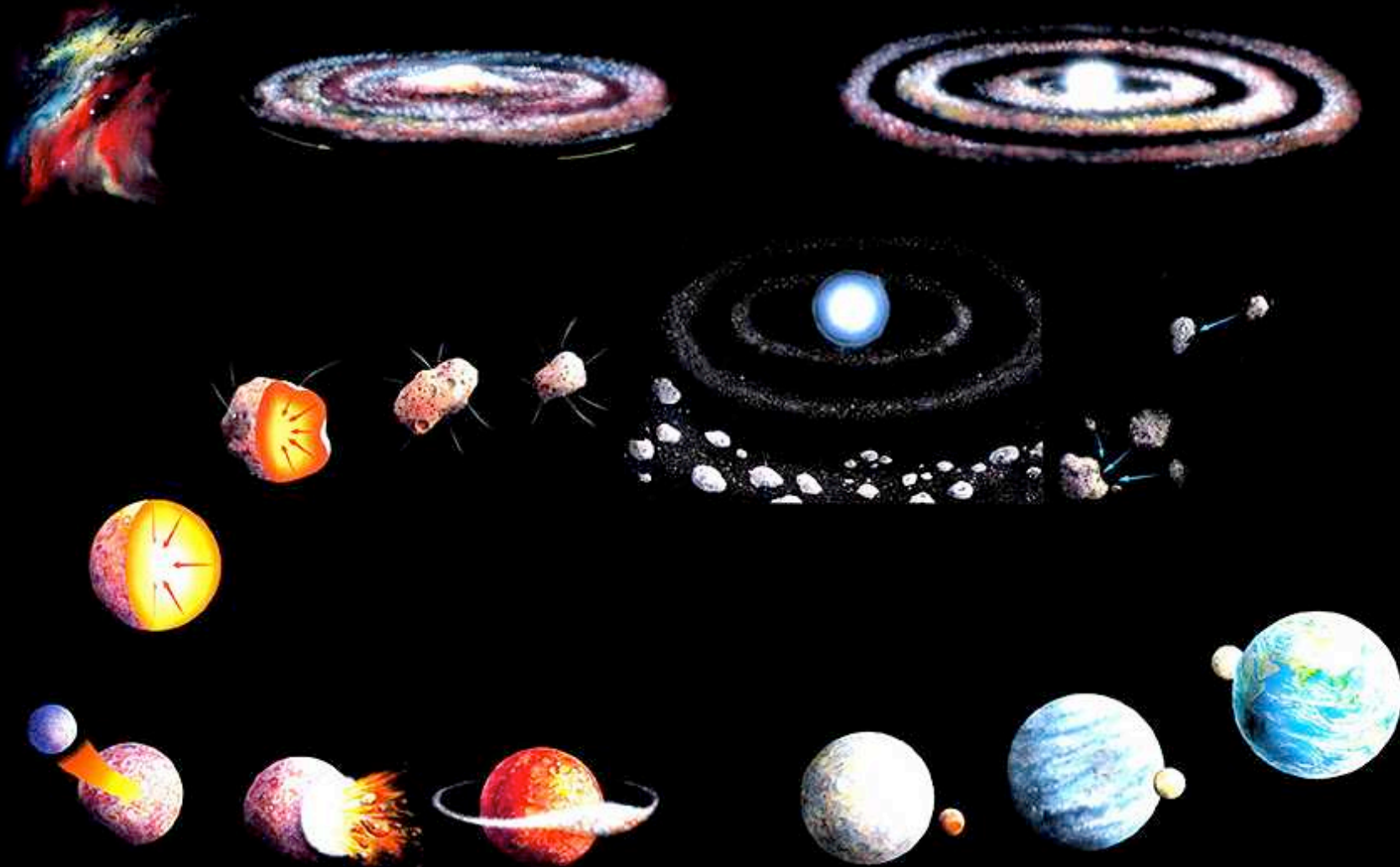
Schalenbau der Erde

Plattenetektonik

Platten - Hotspots

Plattengrenzen !

vom big bang (13.6 Ga) bis heute



vom Hadaikum (4.5 Ga) bis heute

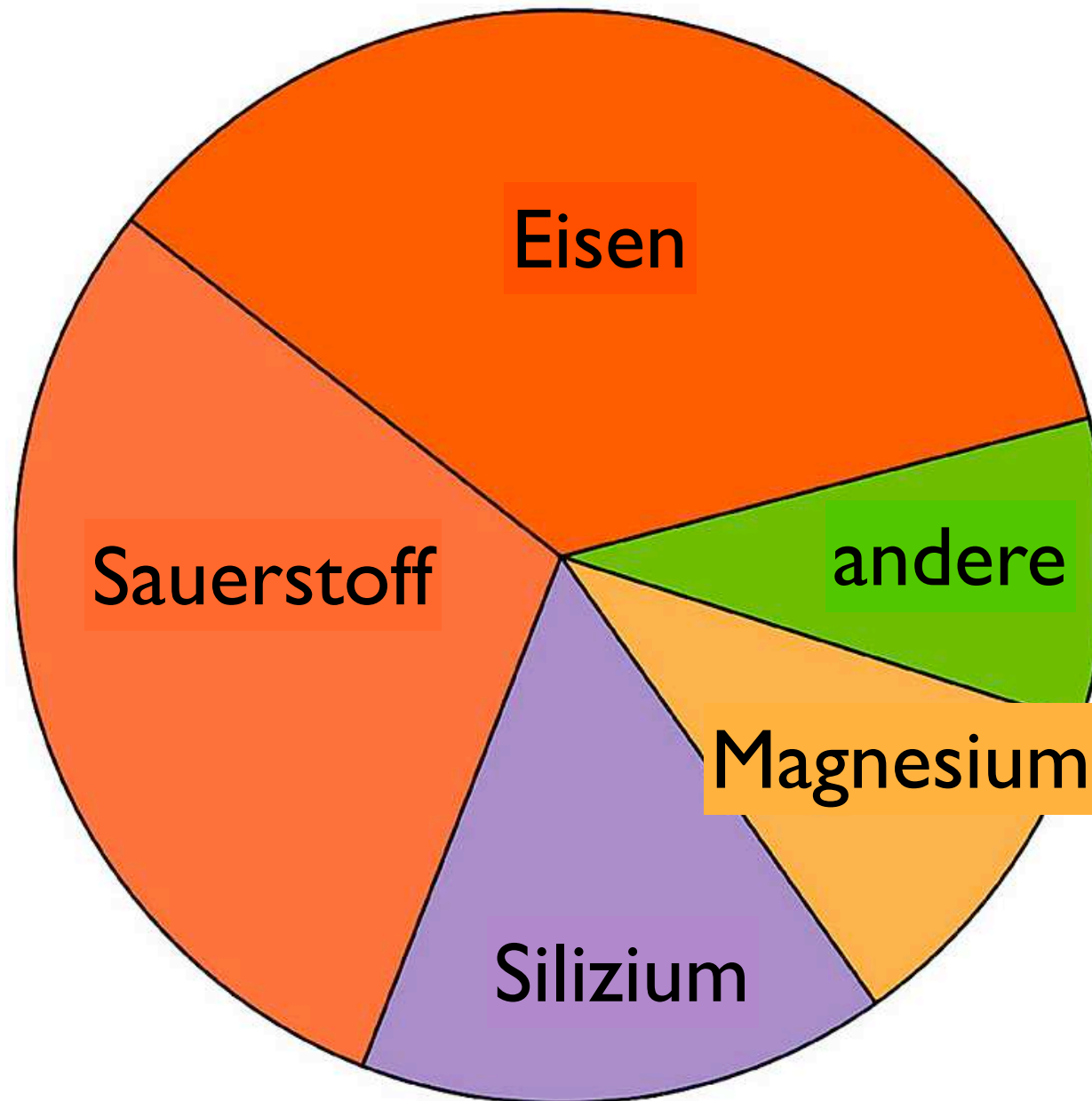
Hadaikum bis Archaikum:
Kontinente werden gebildet

Kontinente ≤ 4.5 Ga
werden nicht mehr neugebildet und nicht subduziert

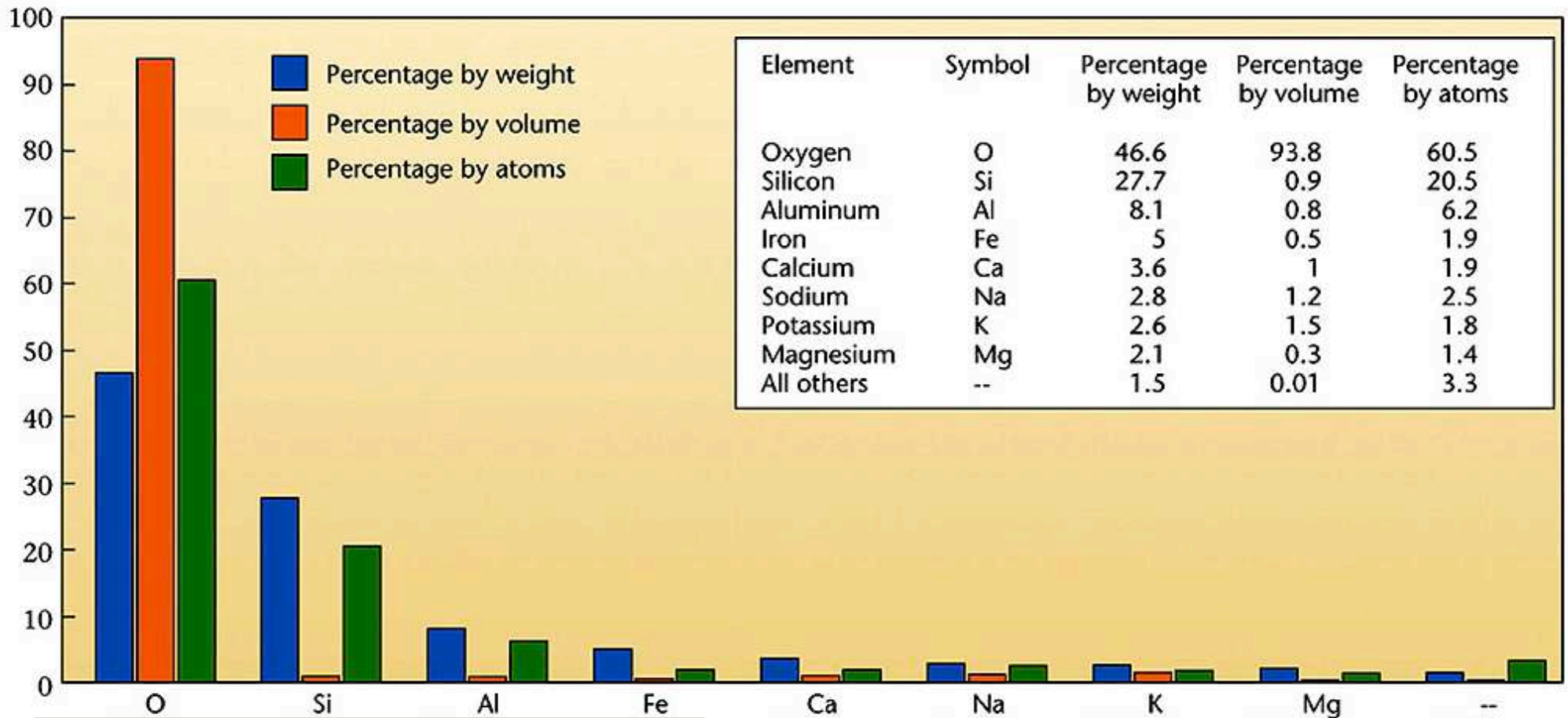
Ozeane ≤ 200 Ma
werden laufend neu gebildet und wieder rezykliert



Zusammensetzung der Erde (Gesamt)



Zusammensetzung der Erdkruste



Sauerstoff Aluminium

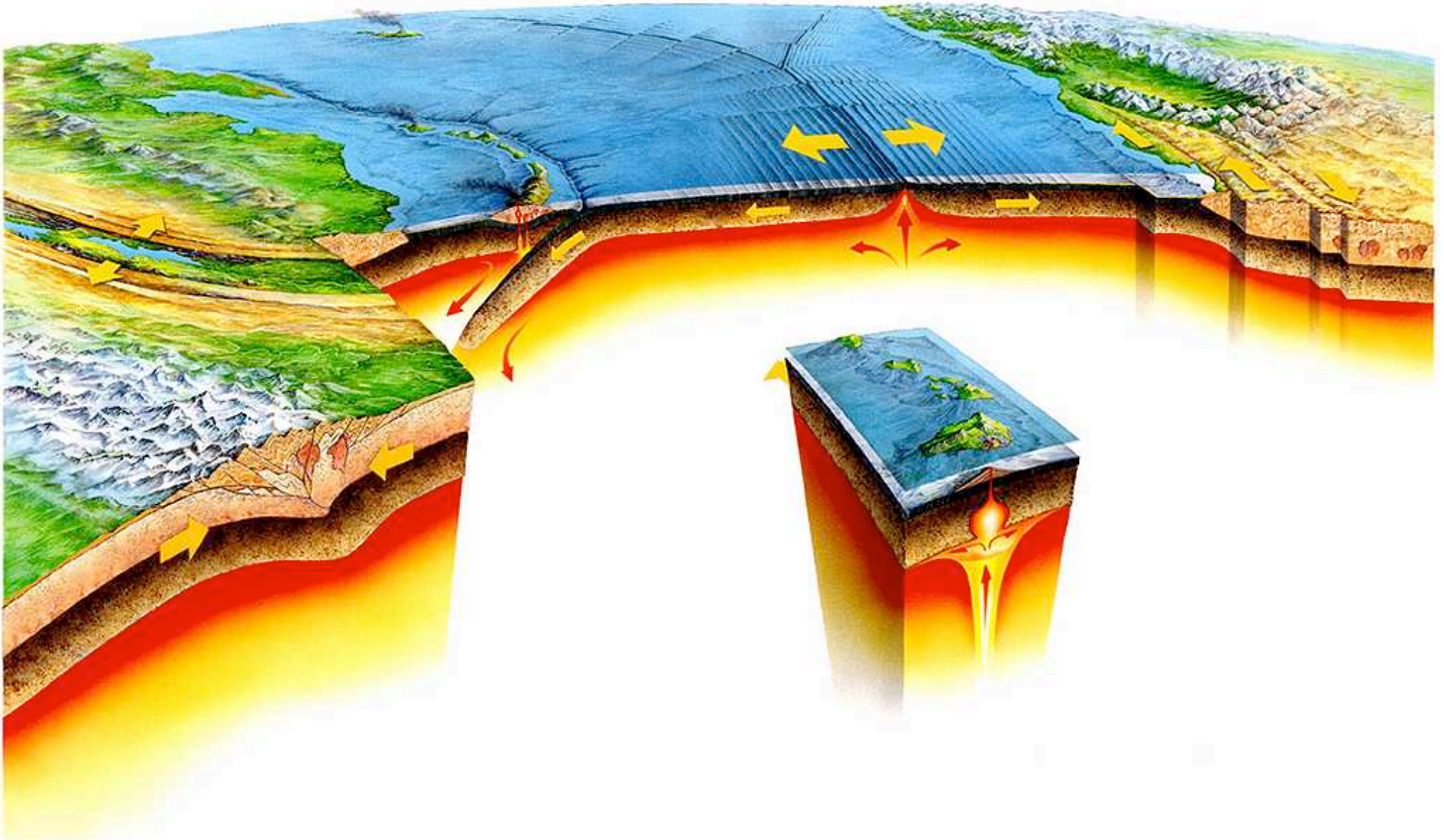
Silizium

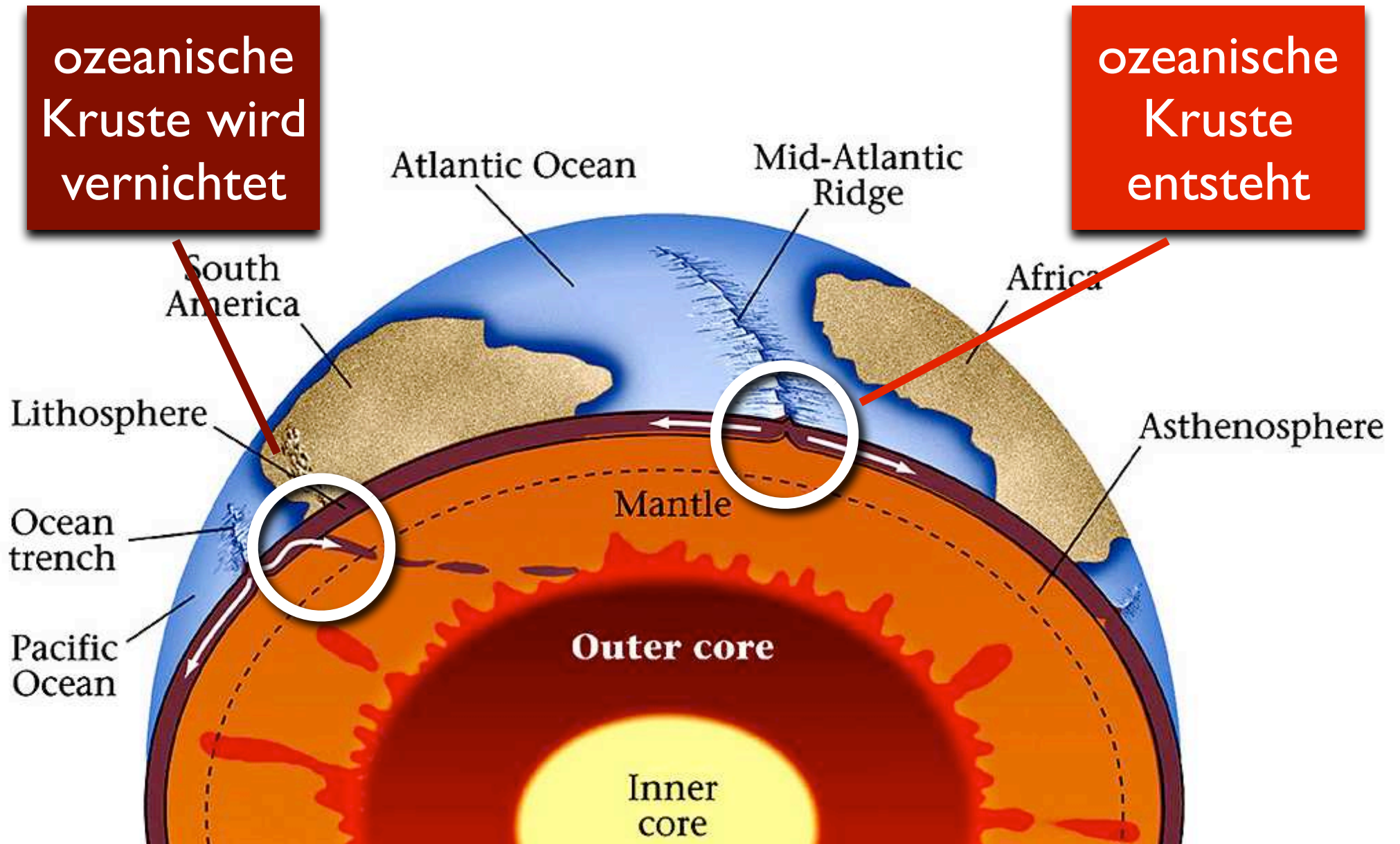
Eisen

Magnesium

andere

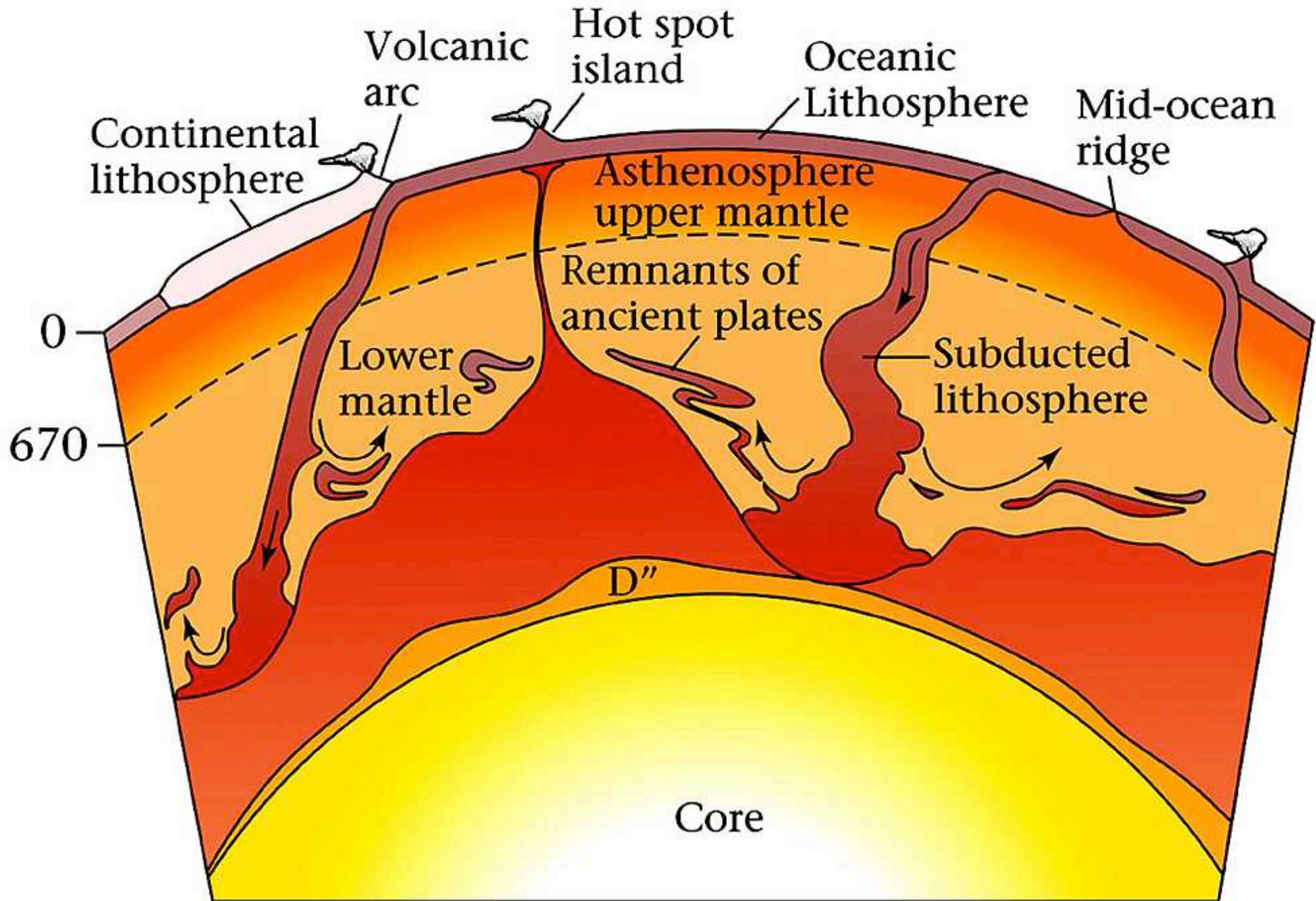
Der plattentektonische Zyklus



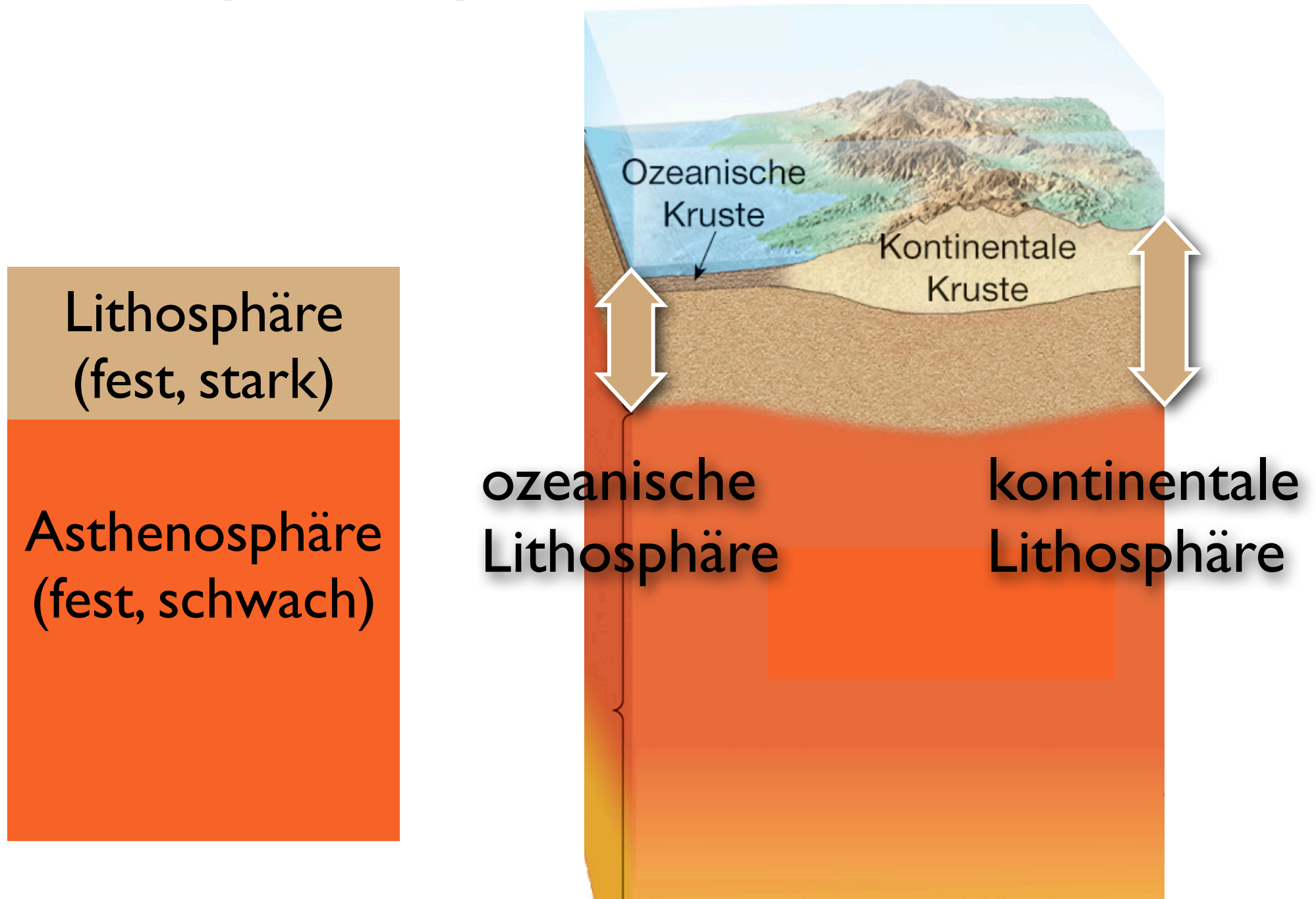


ozeanische Kruste: dynamisches Gleichgewicht
kontinental Kruste: stabil

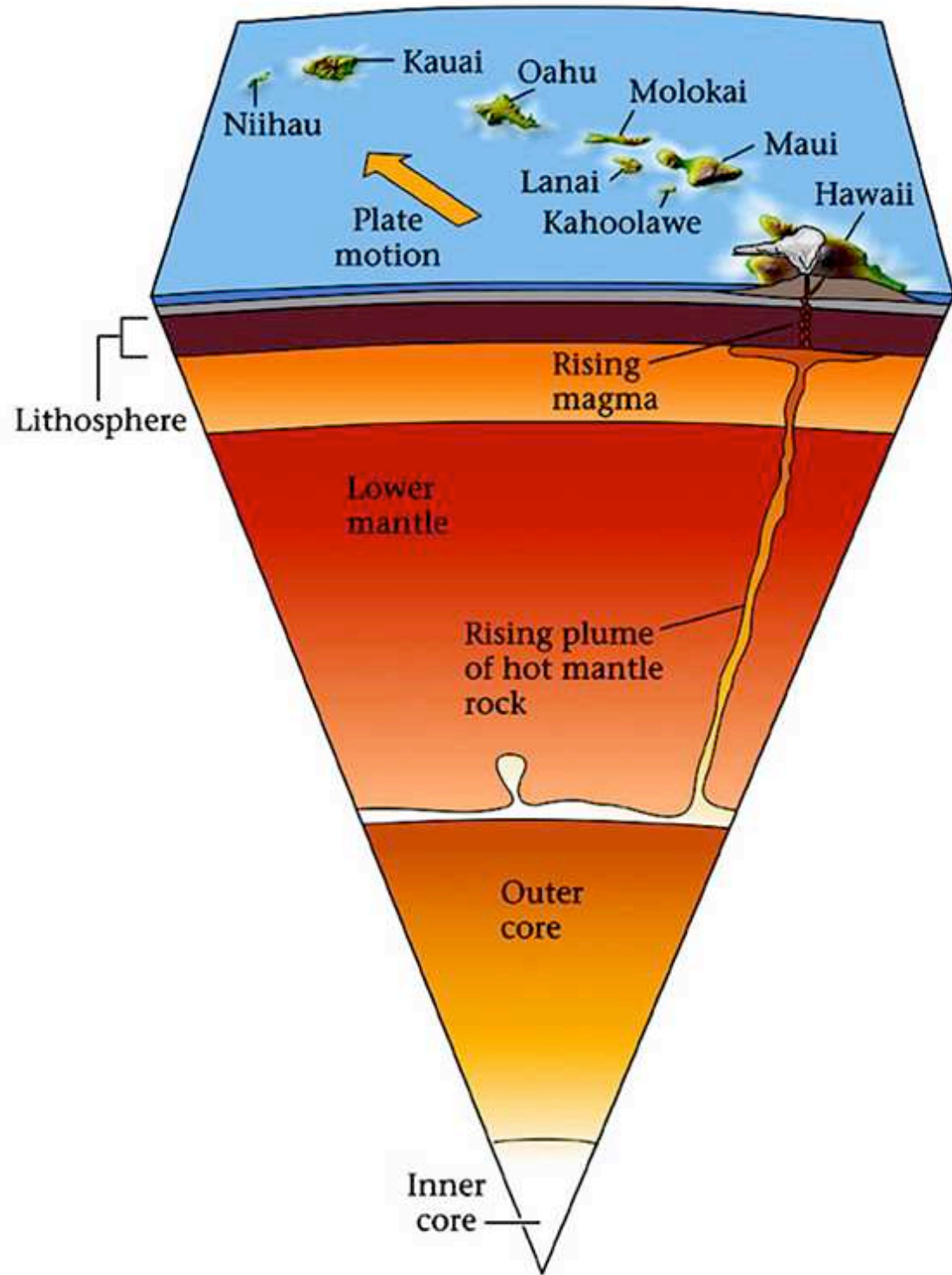
Mantelkonvektion



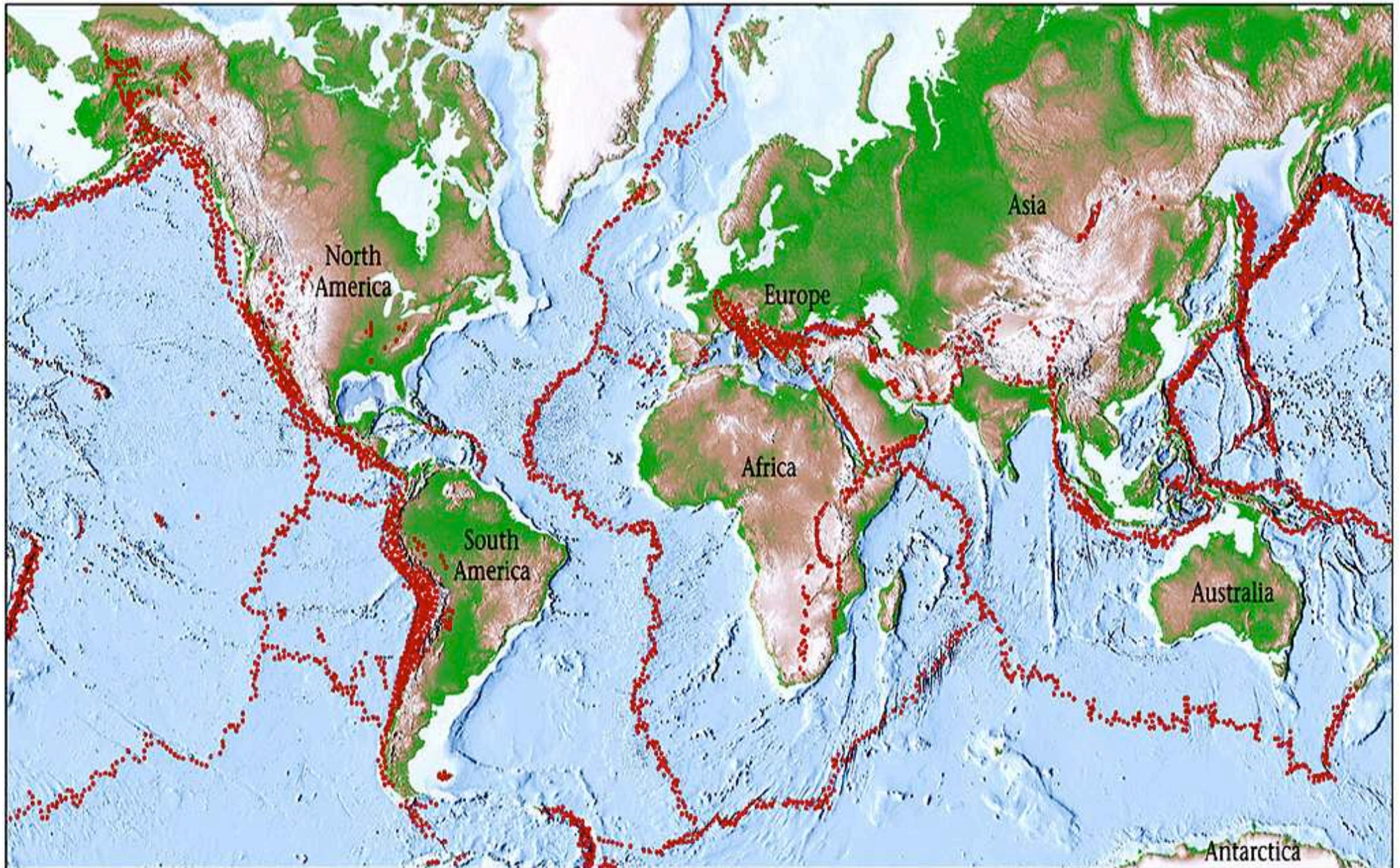
Lithosphärenplatten



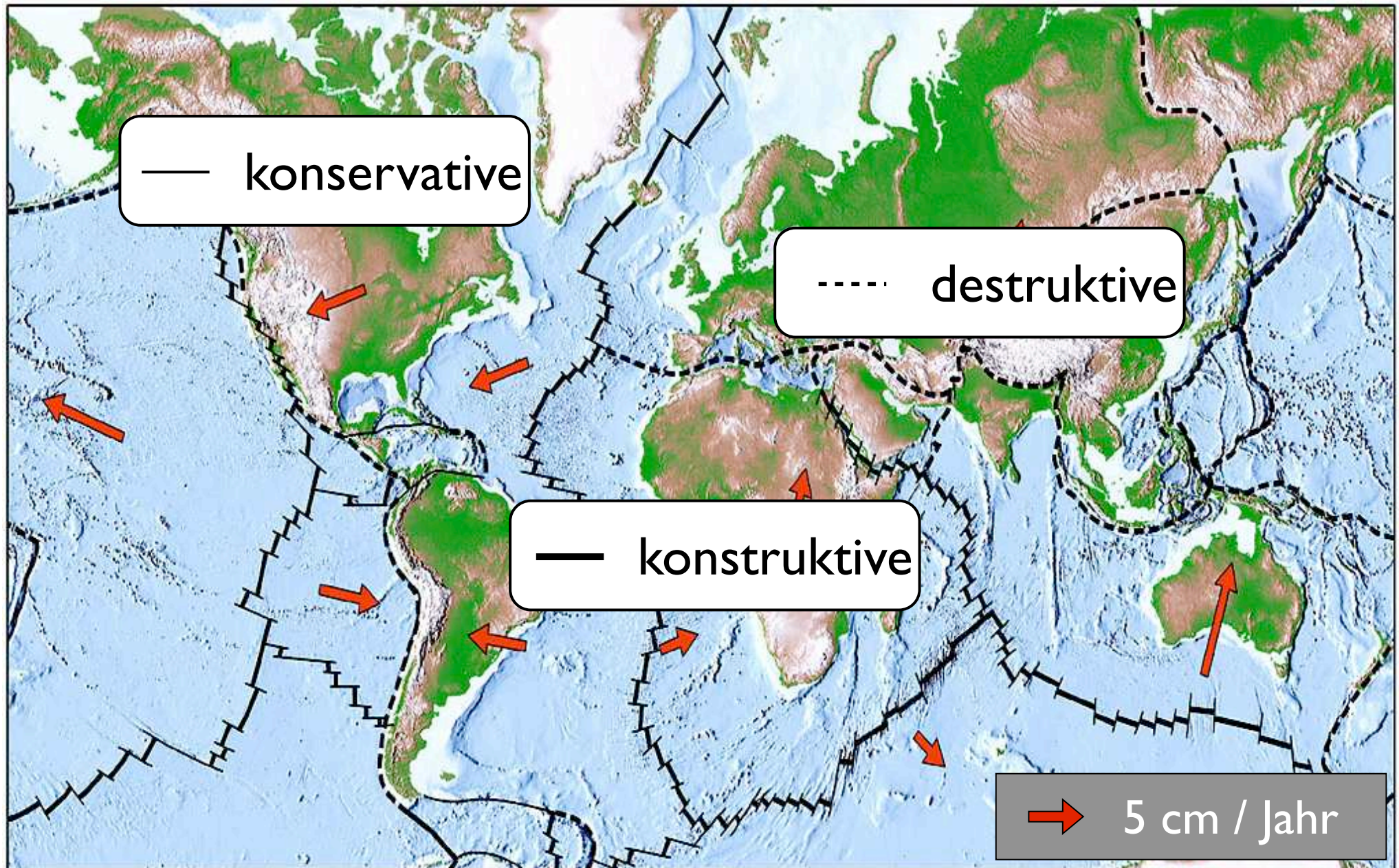
Hot Spot



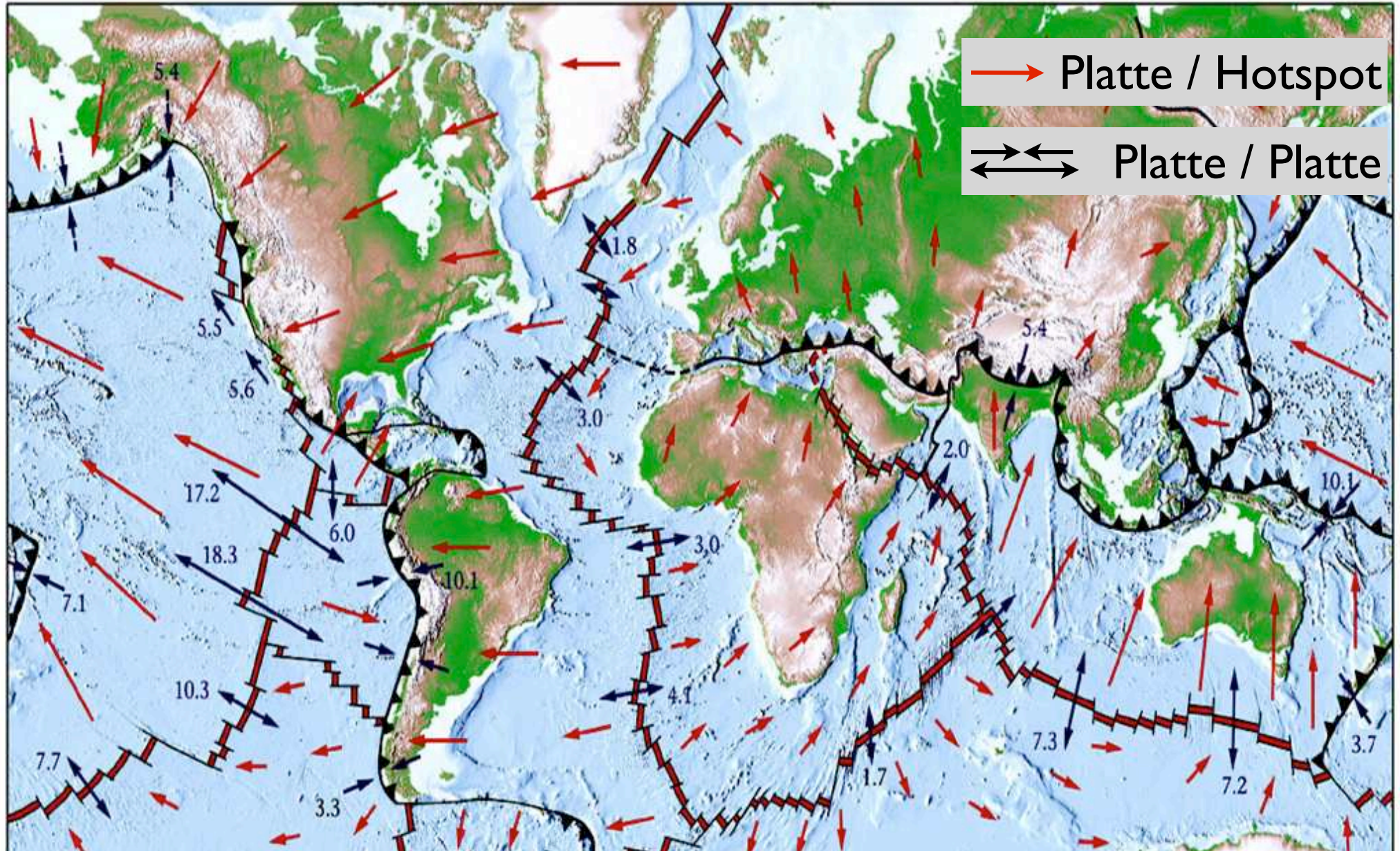
Seismische Aktivität



3 Typen von Plattengrenzen



Plattengeschwindigkeiten

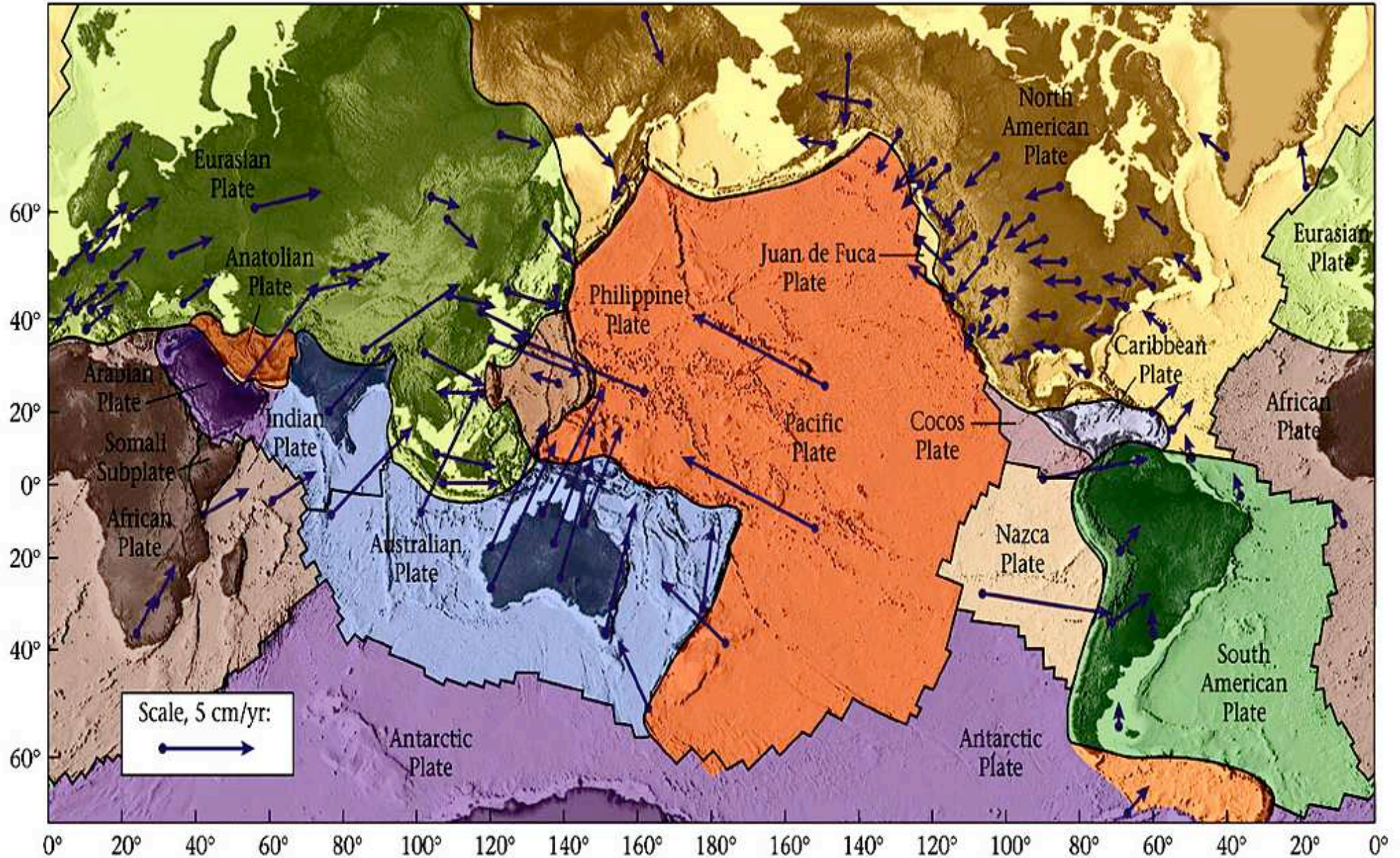


→ Platte / Hotspot

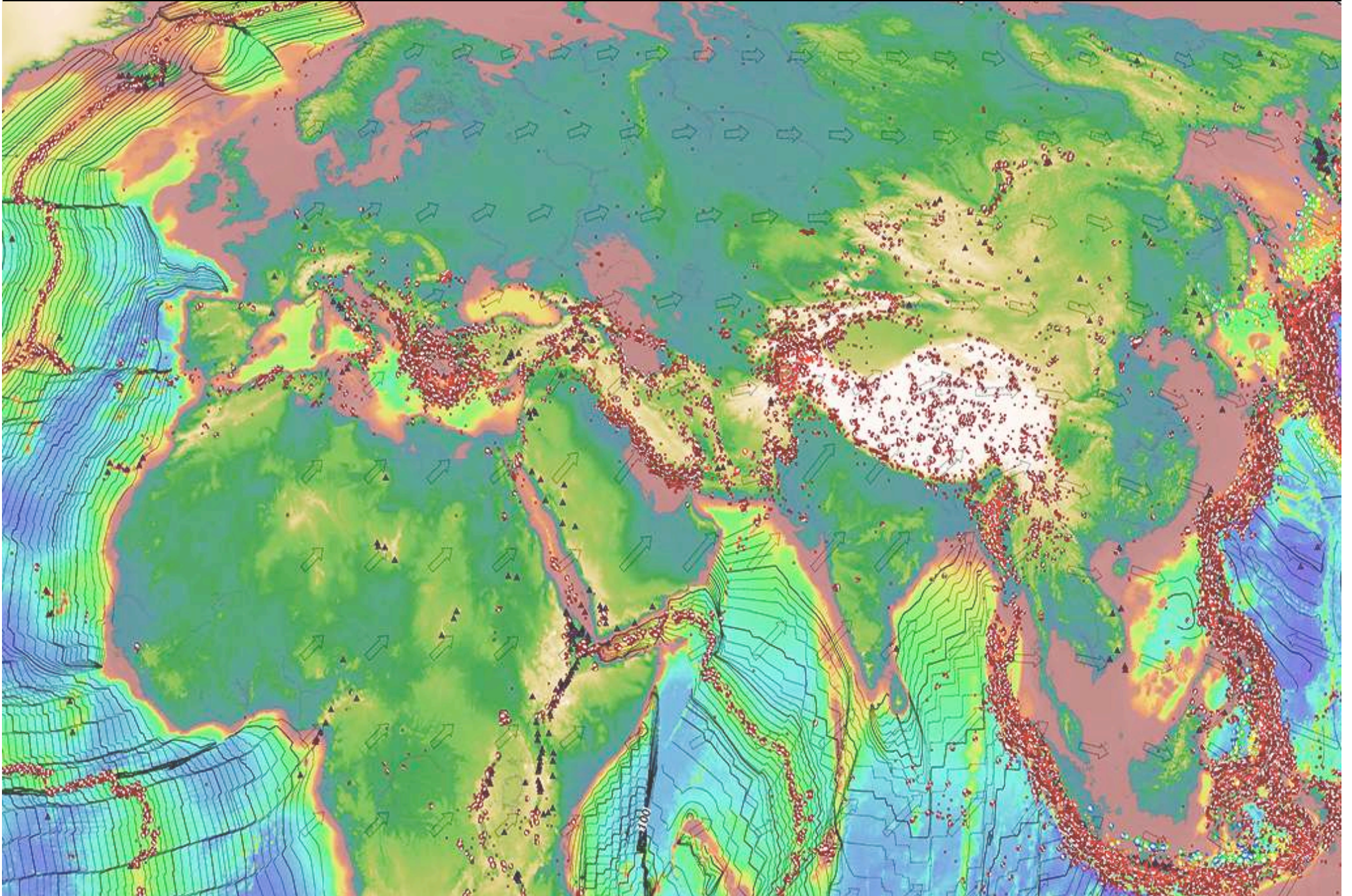
↔ Platte / Platte

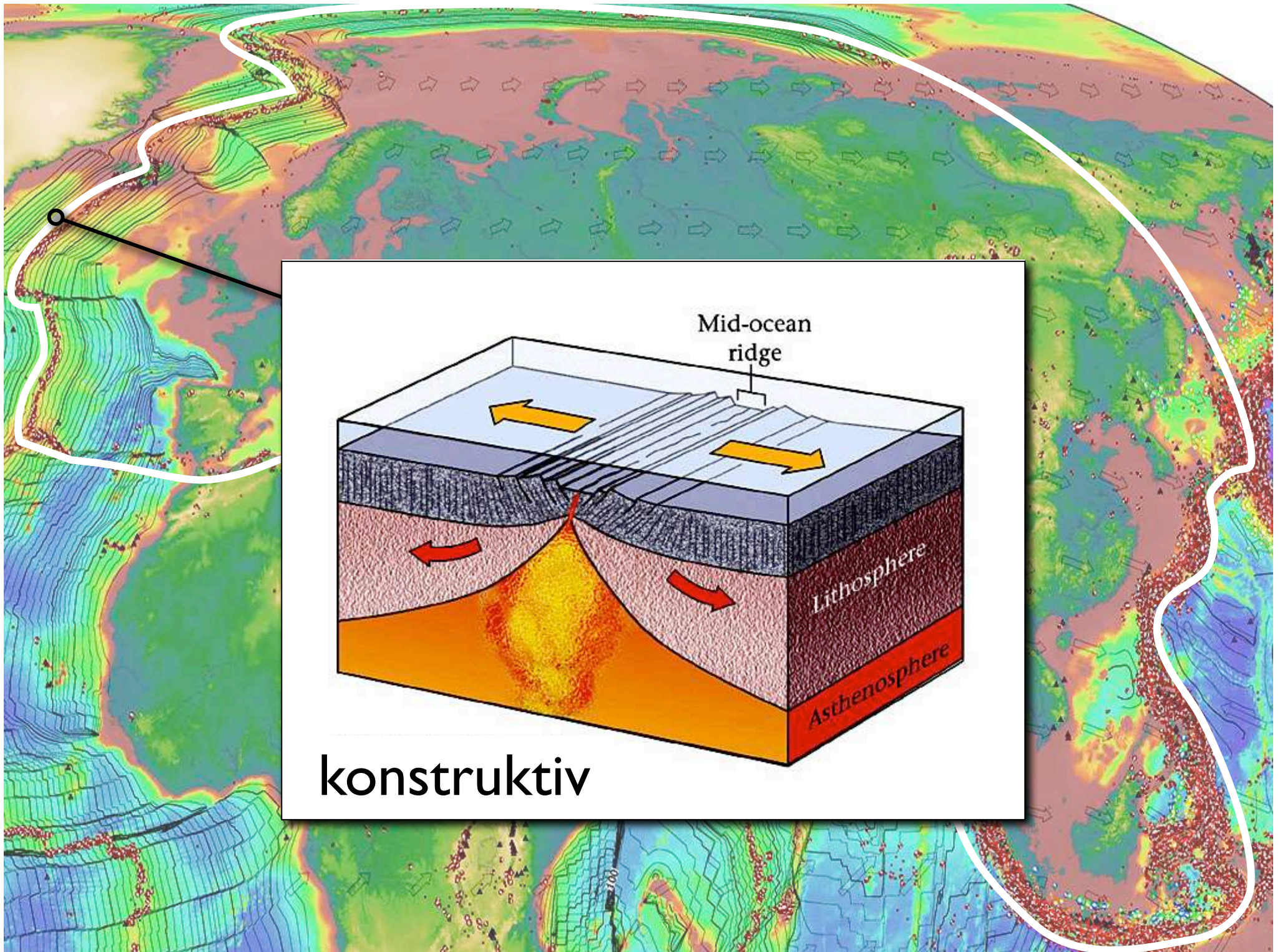
▲▲▲ destruktive ——— konstruktive ——— Transform

Absolute Plattengeschwindigkeit GPS



Zusammenfassung



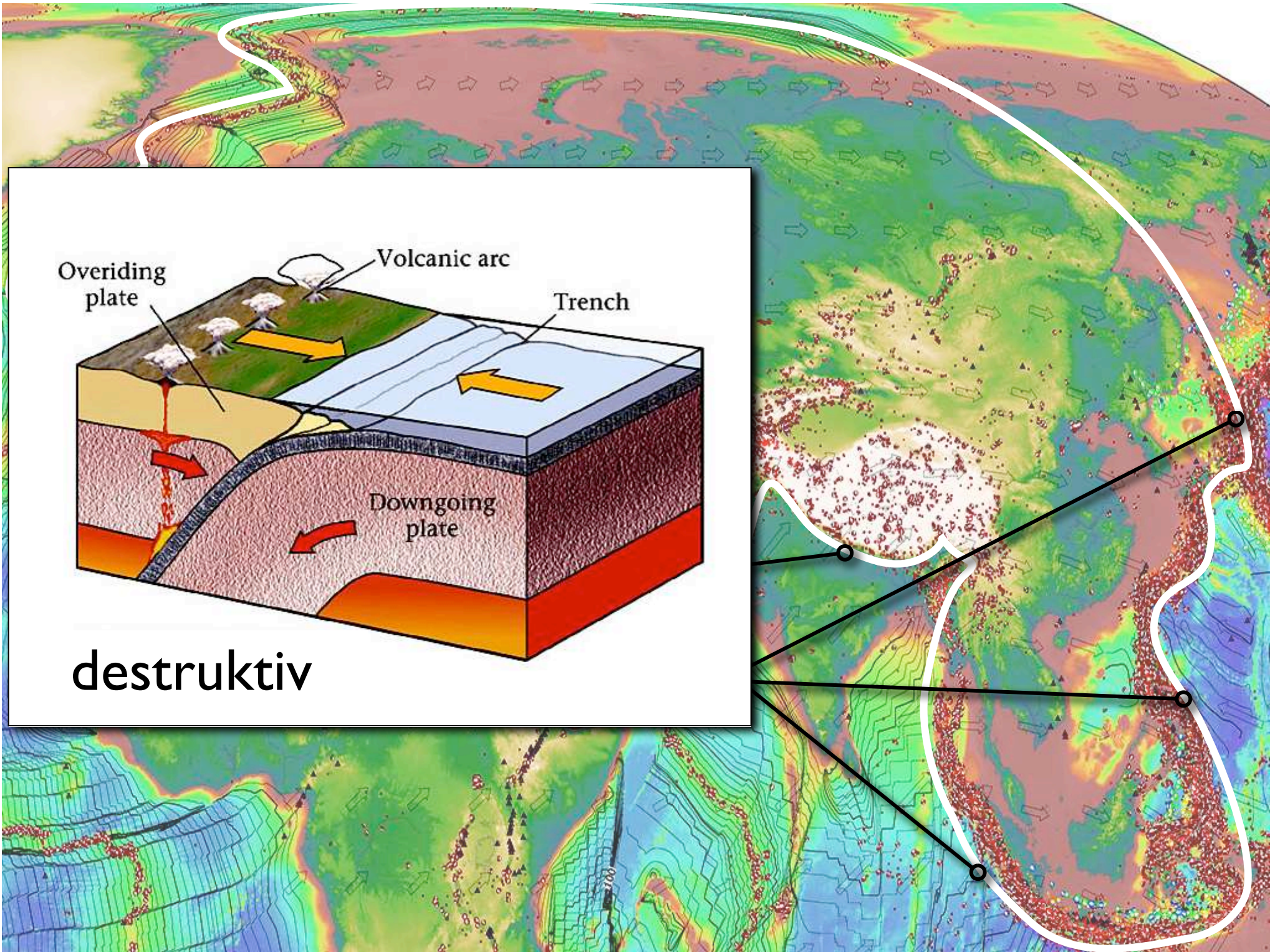


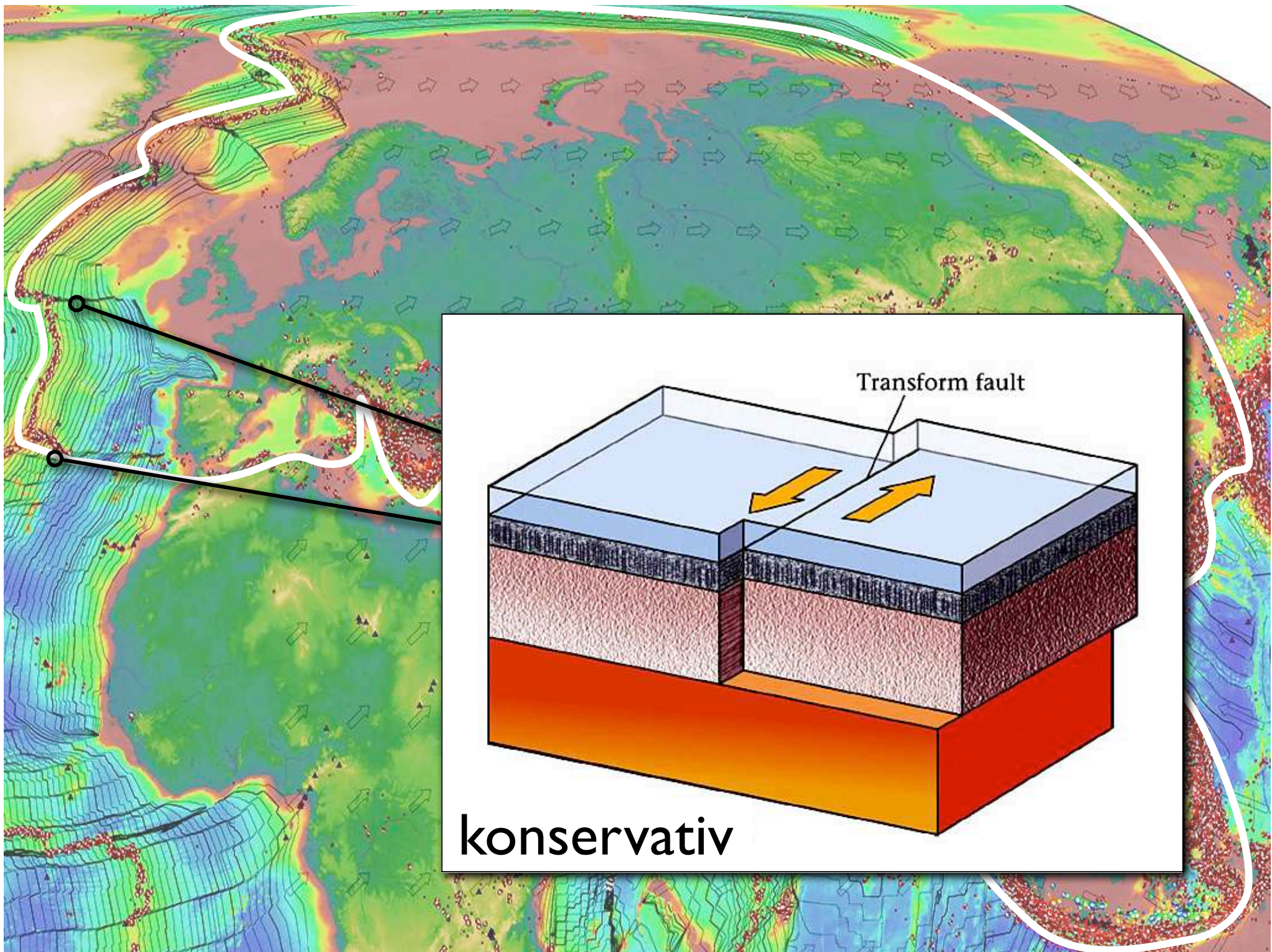
Mid-ocean
ridge

Lithosphere

Asthenosphere

konstruktiv

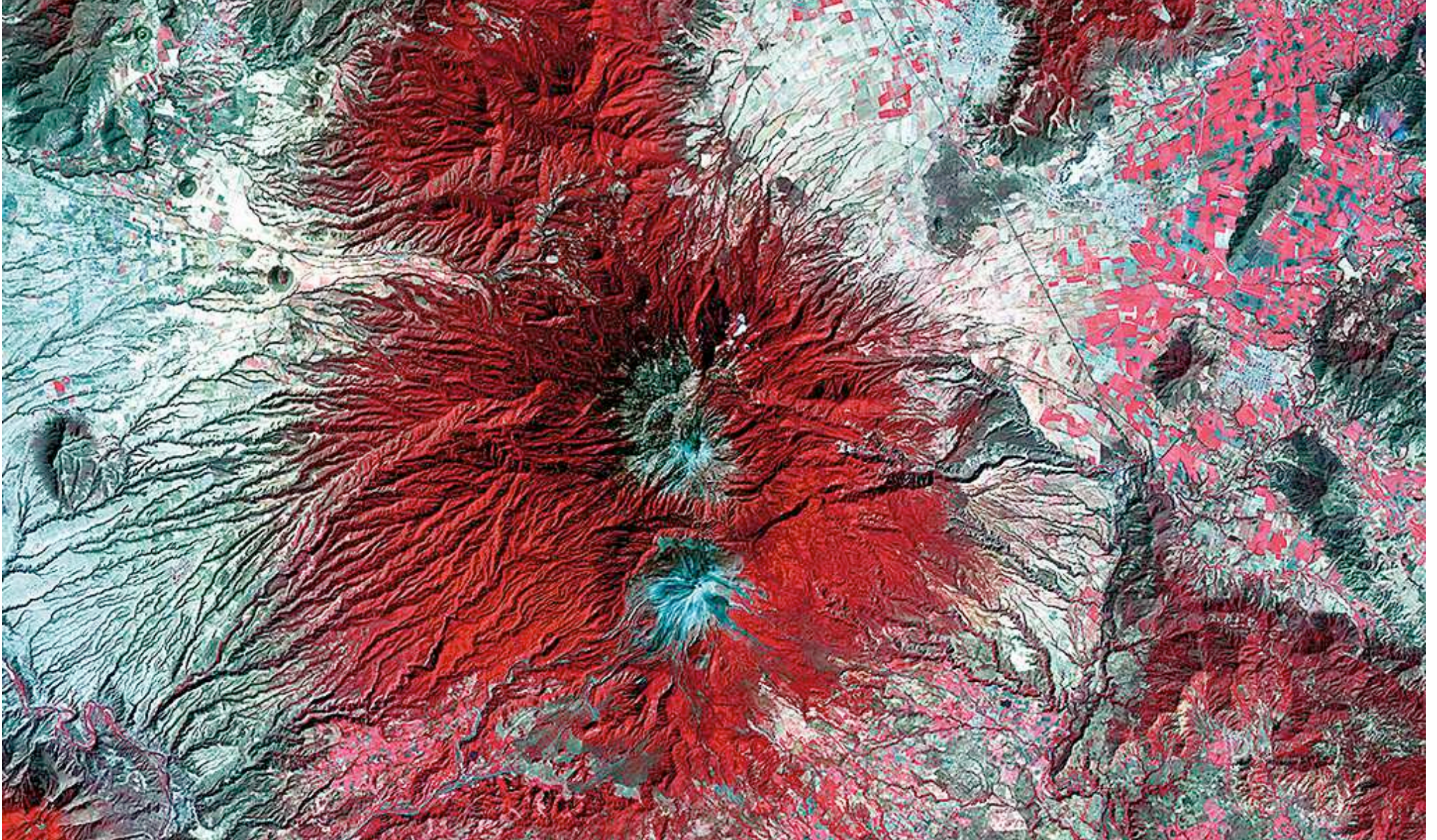




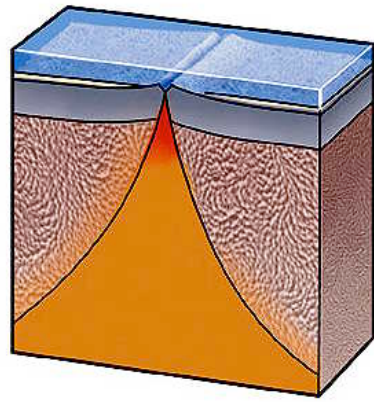
Transform fault

konservativ

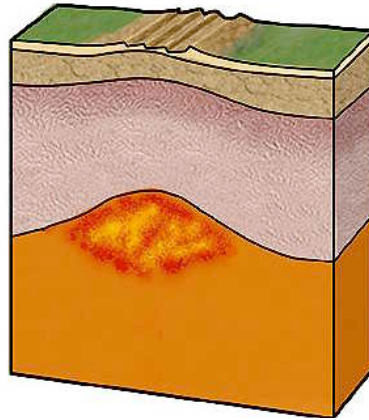
Prozesse an Plattengrenzen: I - Vulkanismus



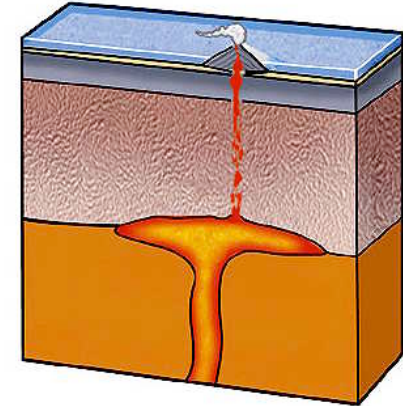
Vulkanismus im plattentektonischen Zusammenhang



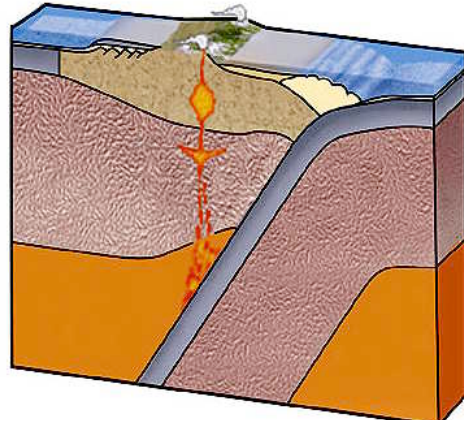
konstruktive



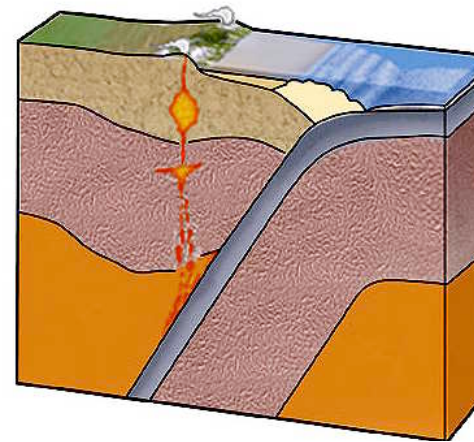
konstruktive



Hot Spot



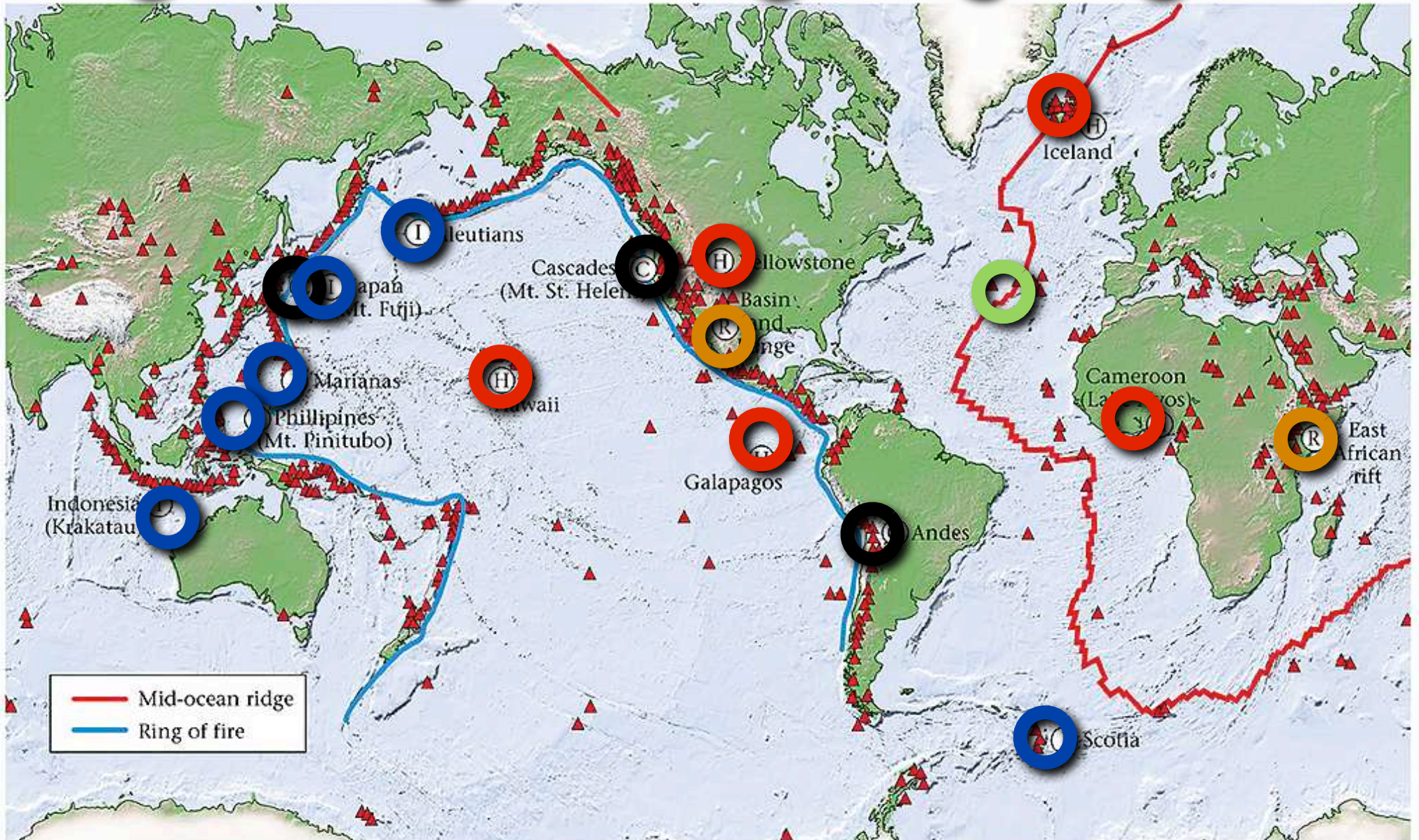
destruktive



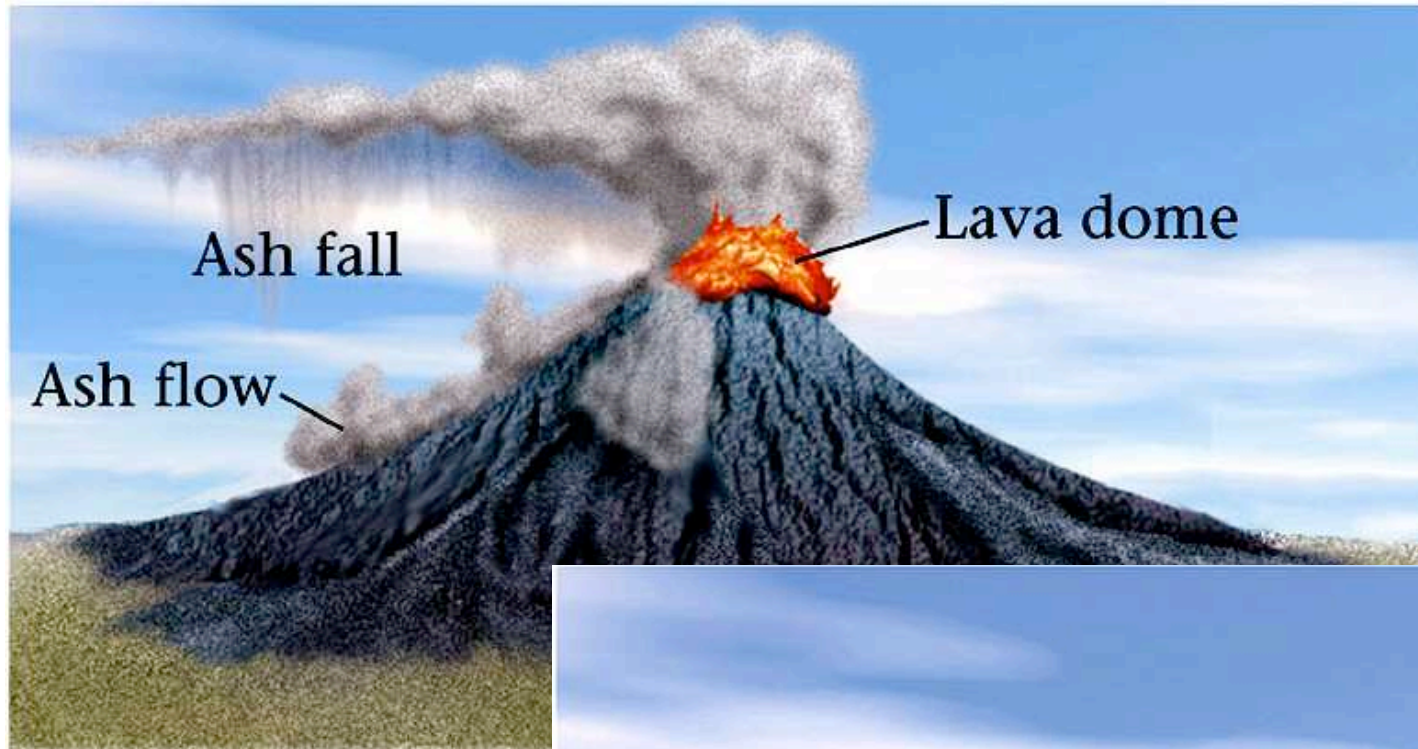
destruktive

Vulkanismus an Plattengrenzen

- I** Island arc
- C** Continental arc
- R** Rift
- H** Hot spot
- M** Mid-ocean ridge



Vulkanismus: 2 Typen

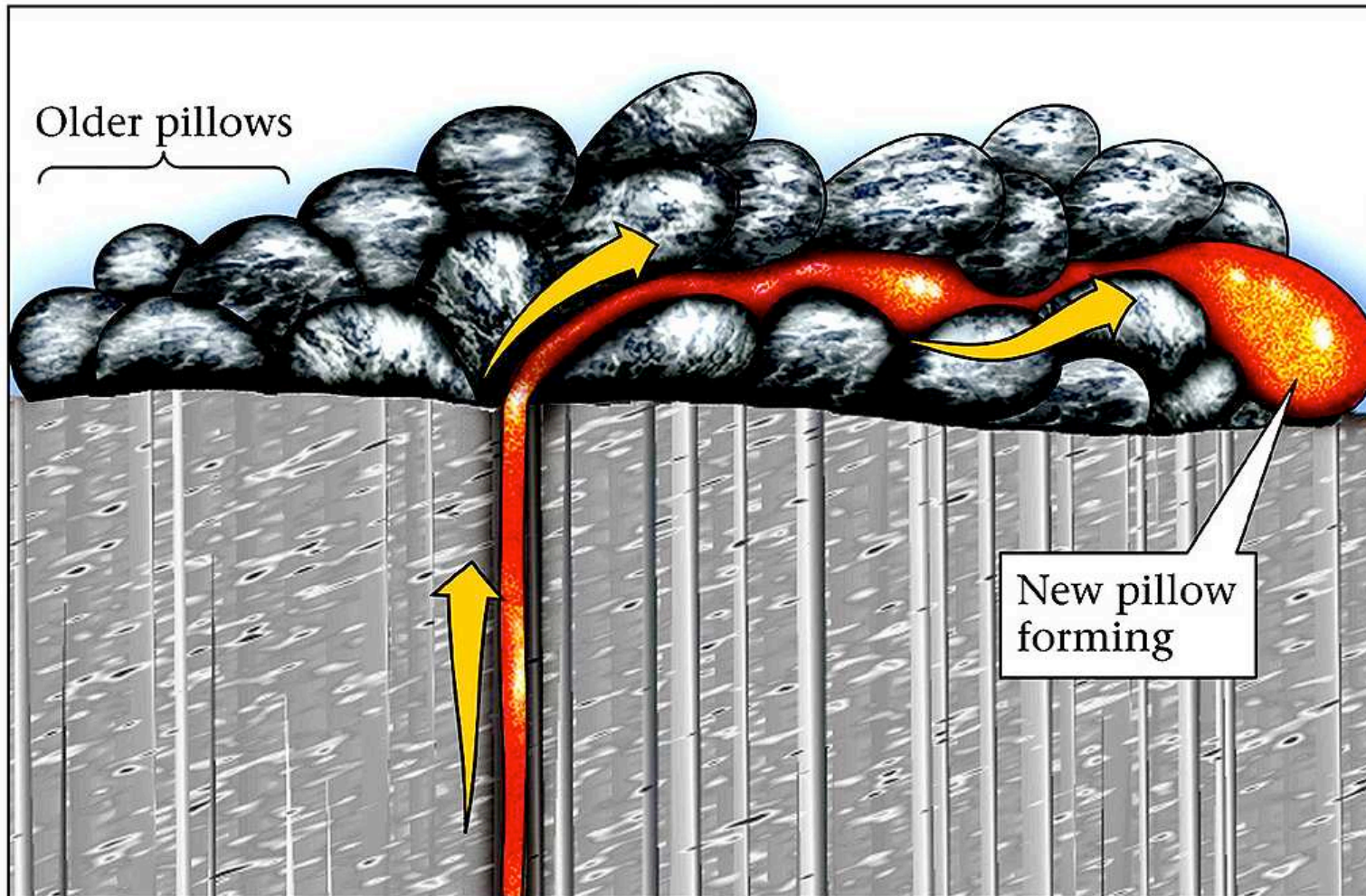


hochviskös
(zäh)
Si reich
explosiv

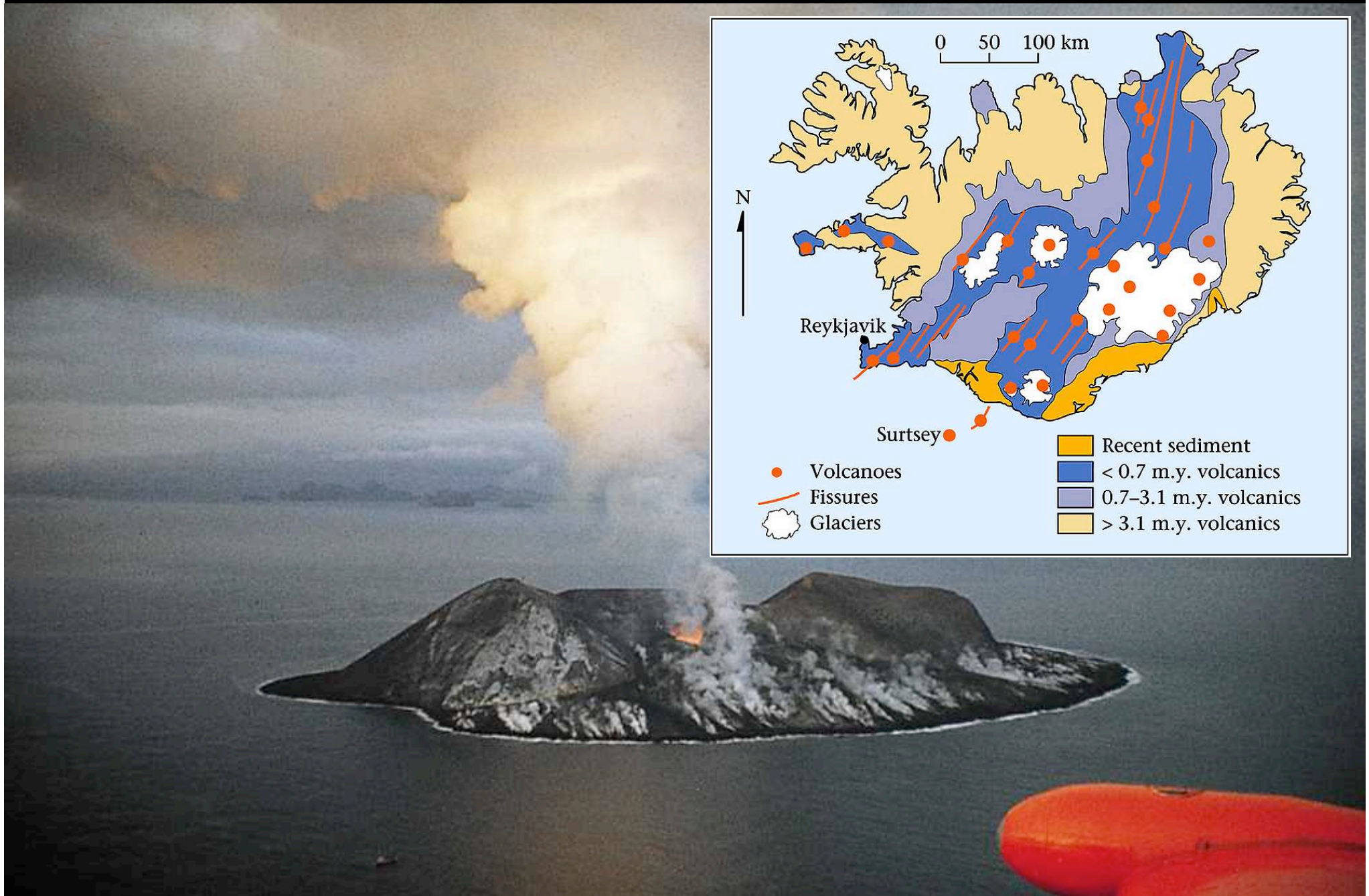
niederviskös
(flüssig)
mafisch



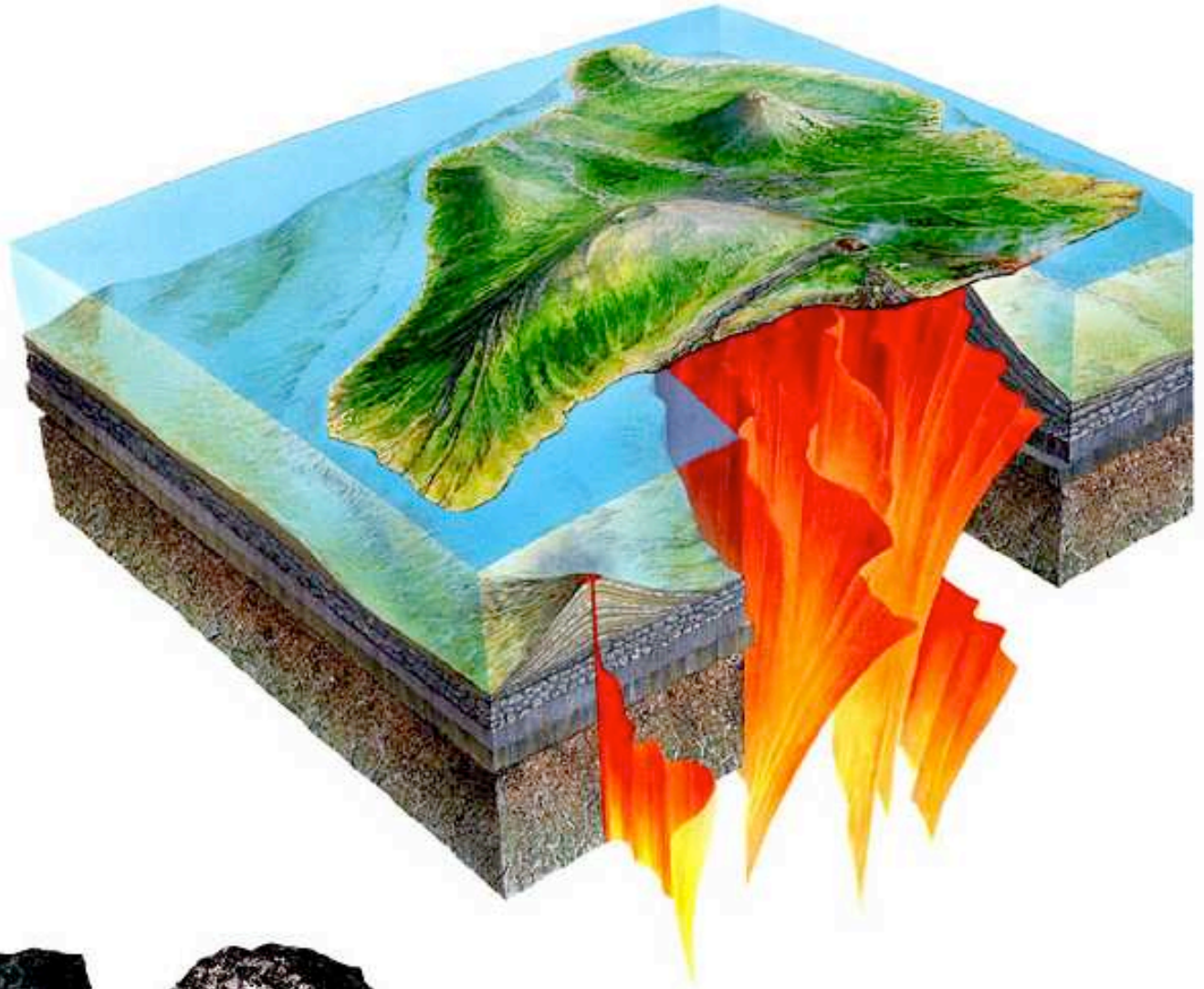
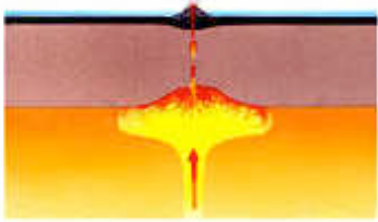
.. an konstruktiven Plattenrändern



Beispiel: Surtsey, Island

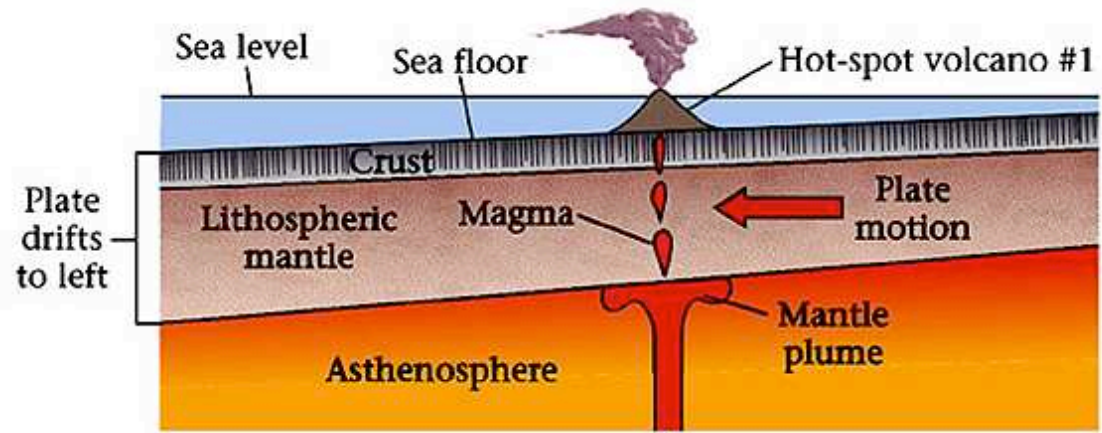


... an Hotspots

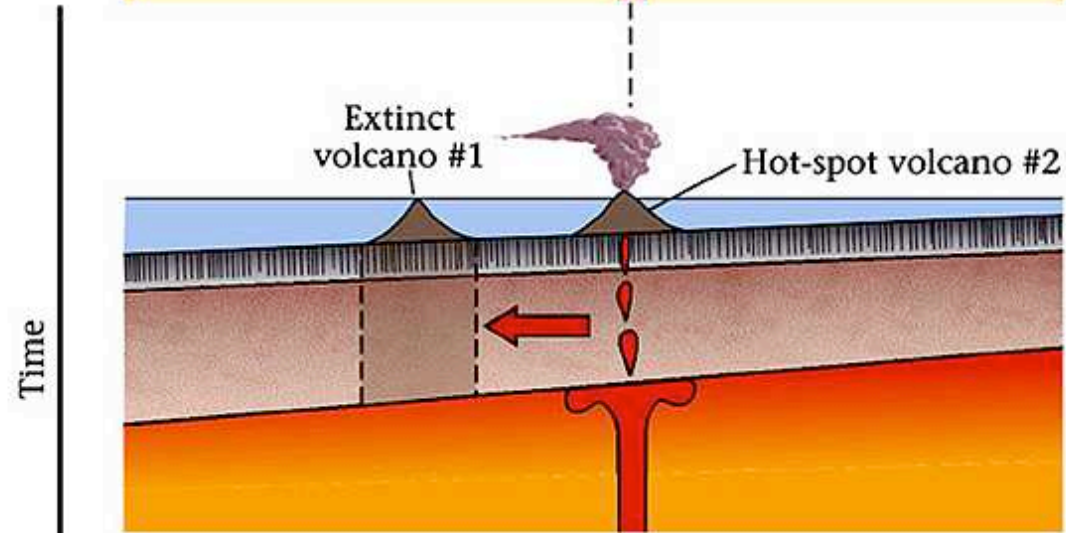


Hot spot

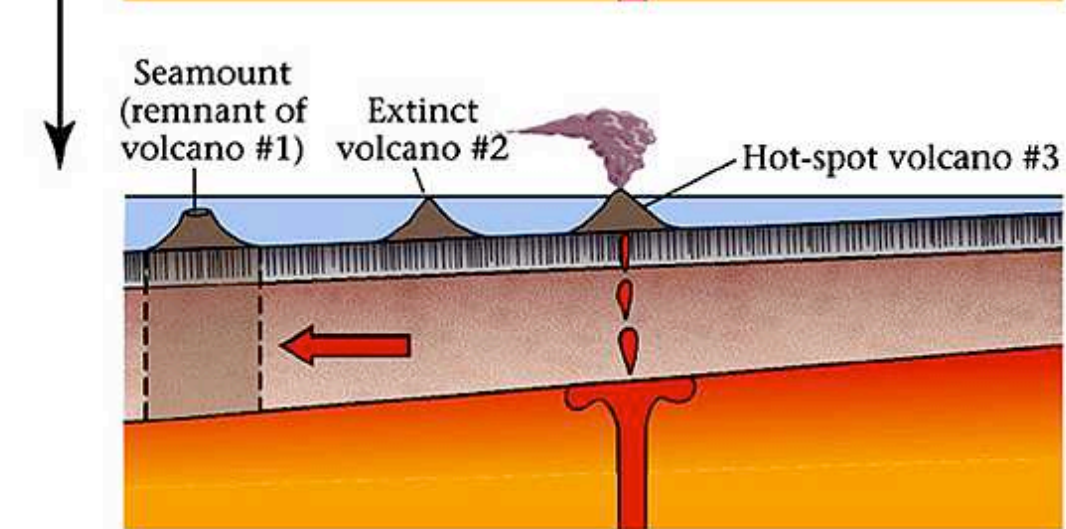
Zeit 1



Zeit 2



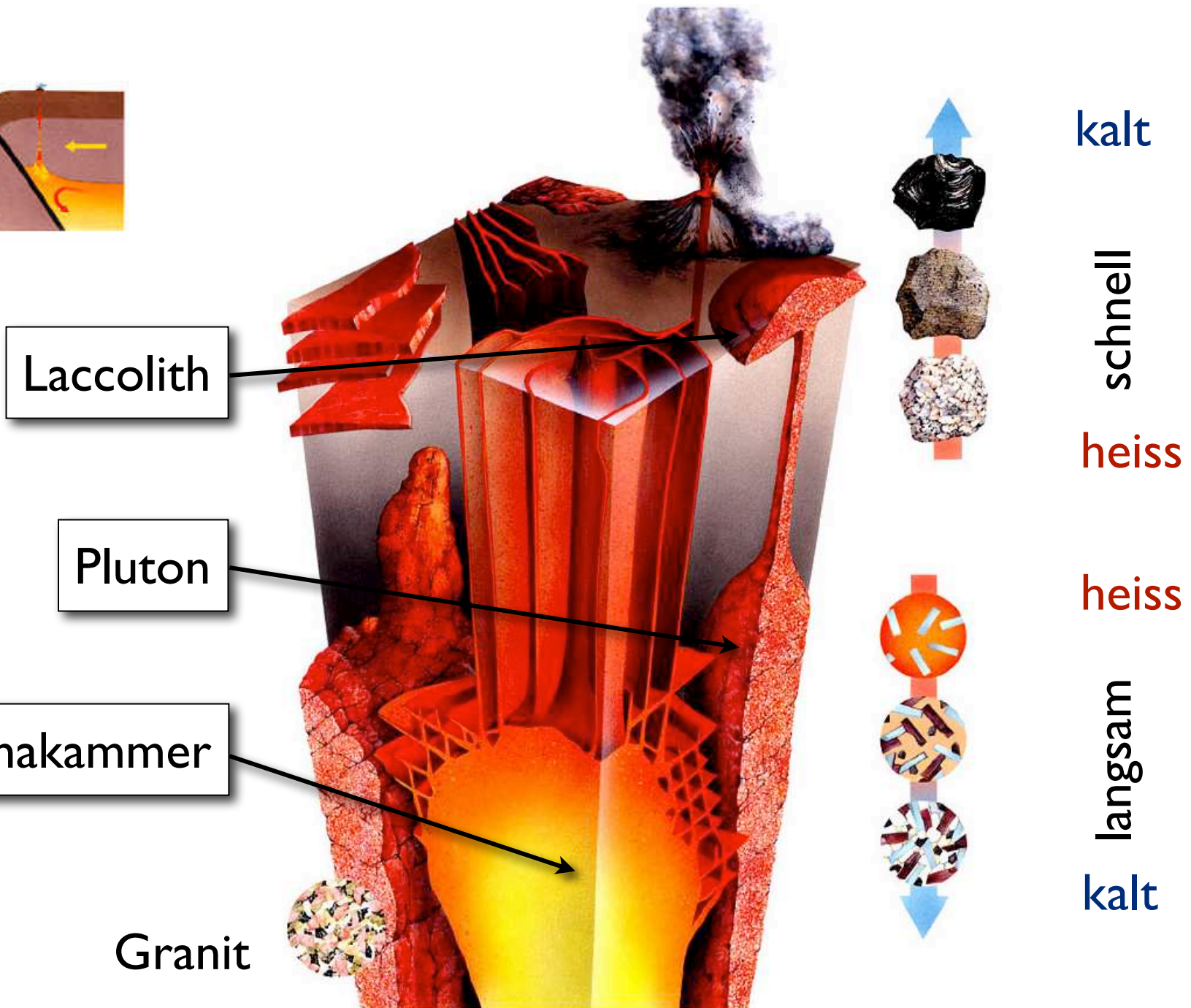
Zeit 3



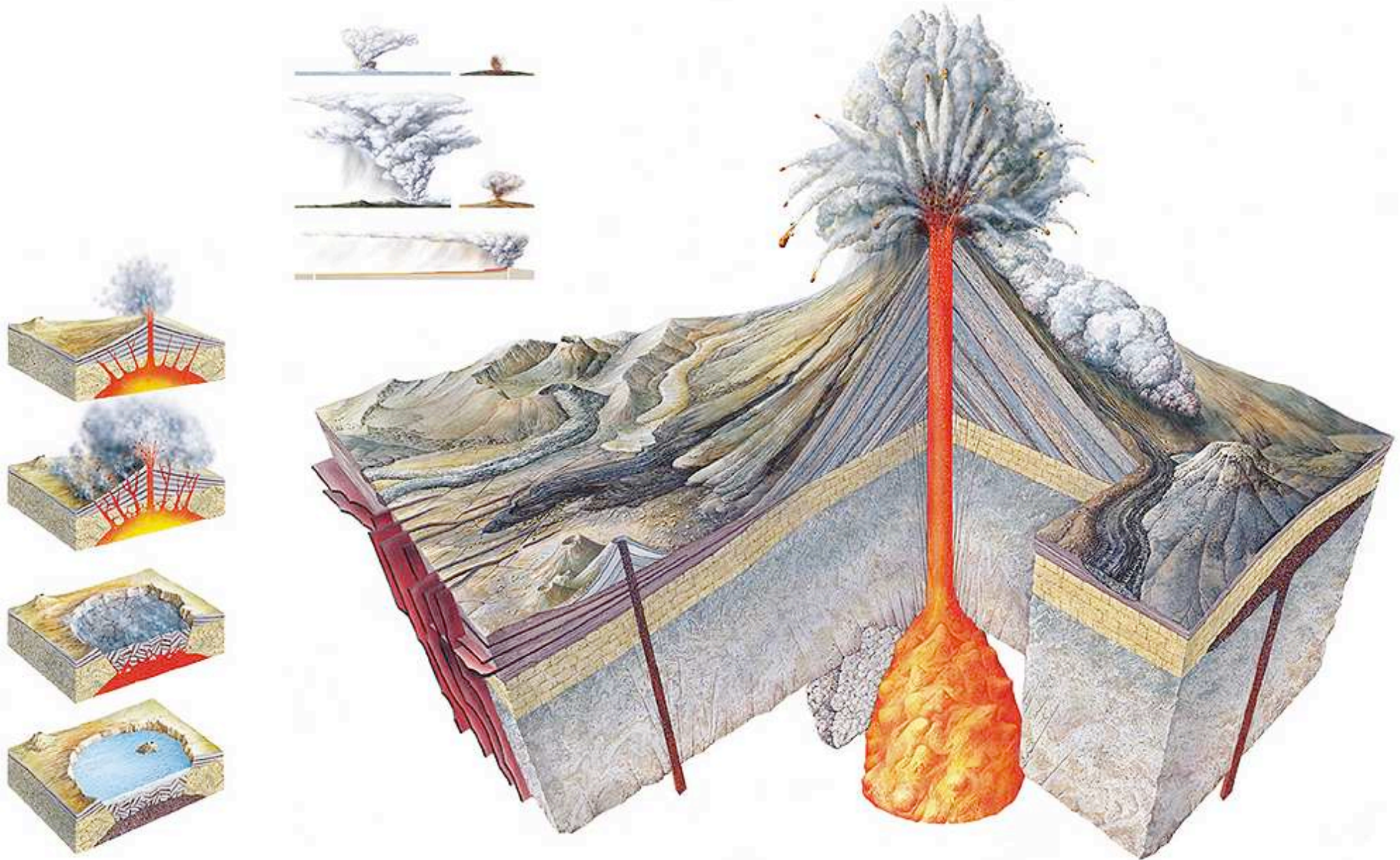
Beispiel: Hawaii



... an destruktiven Plattenrändern



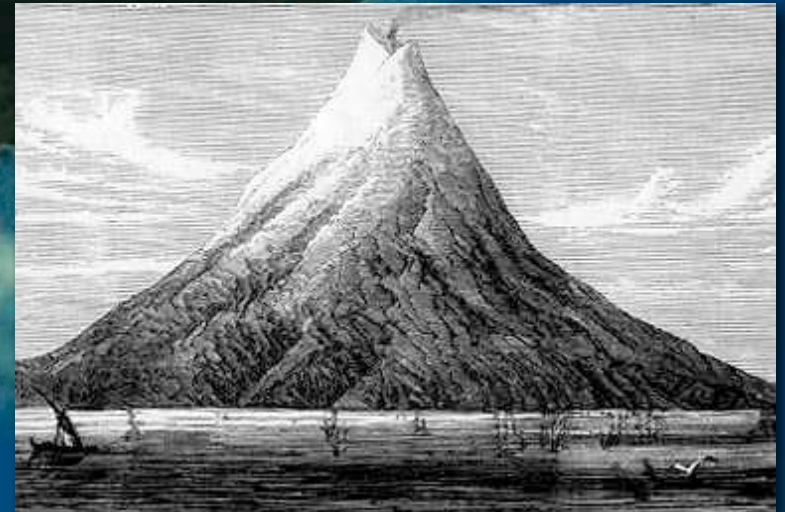
Vulkan - Ausbruch



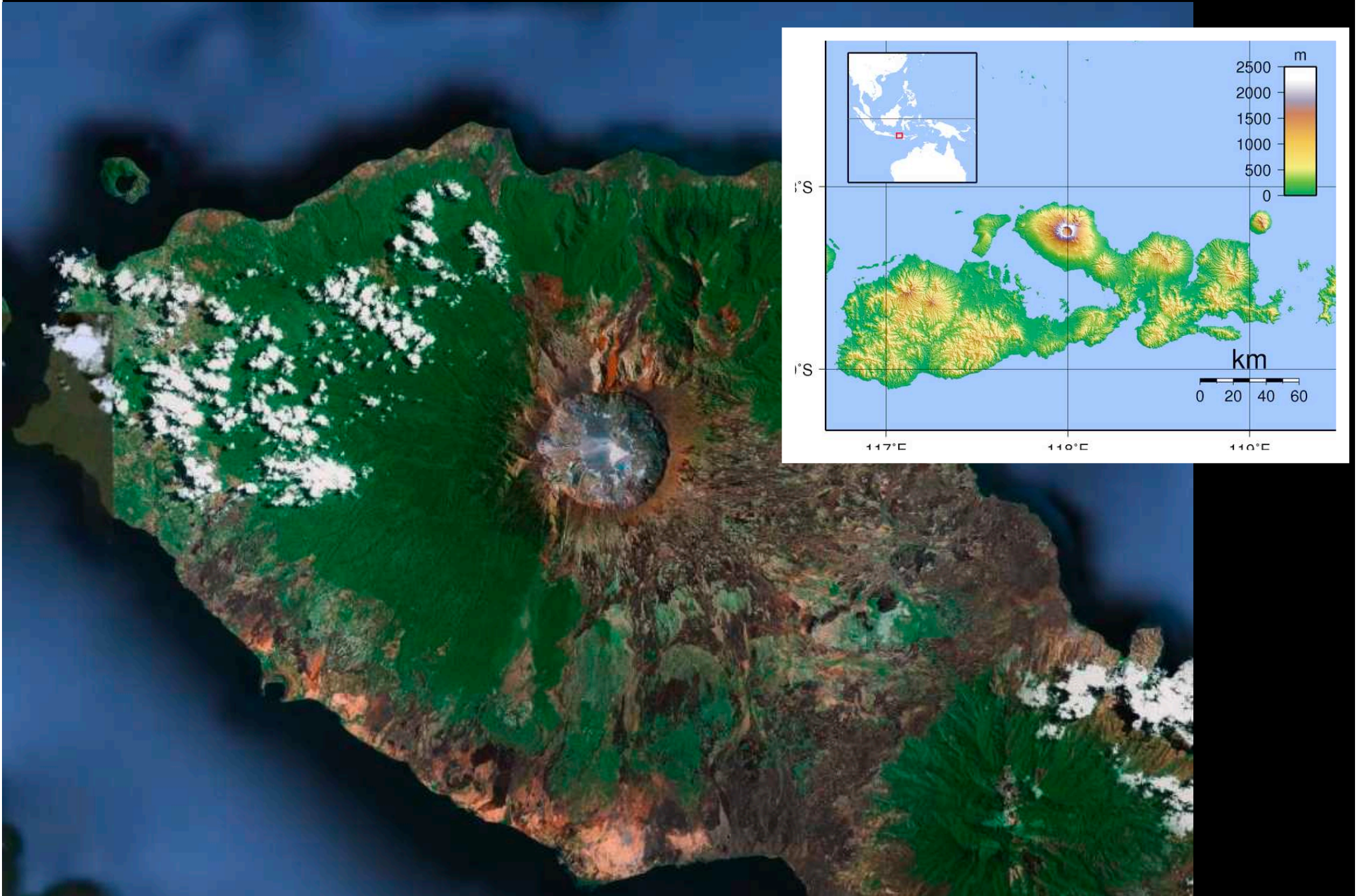
Beispiel: Mount St Helens, USA (1980)



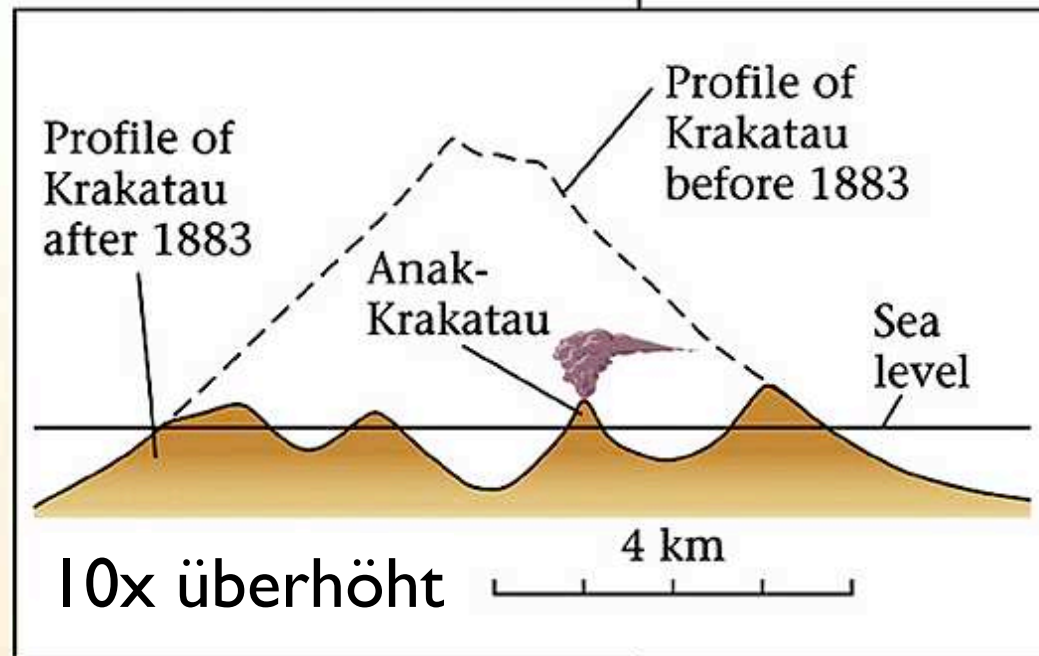
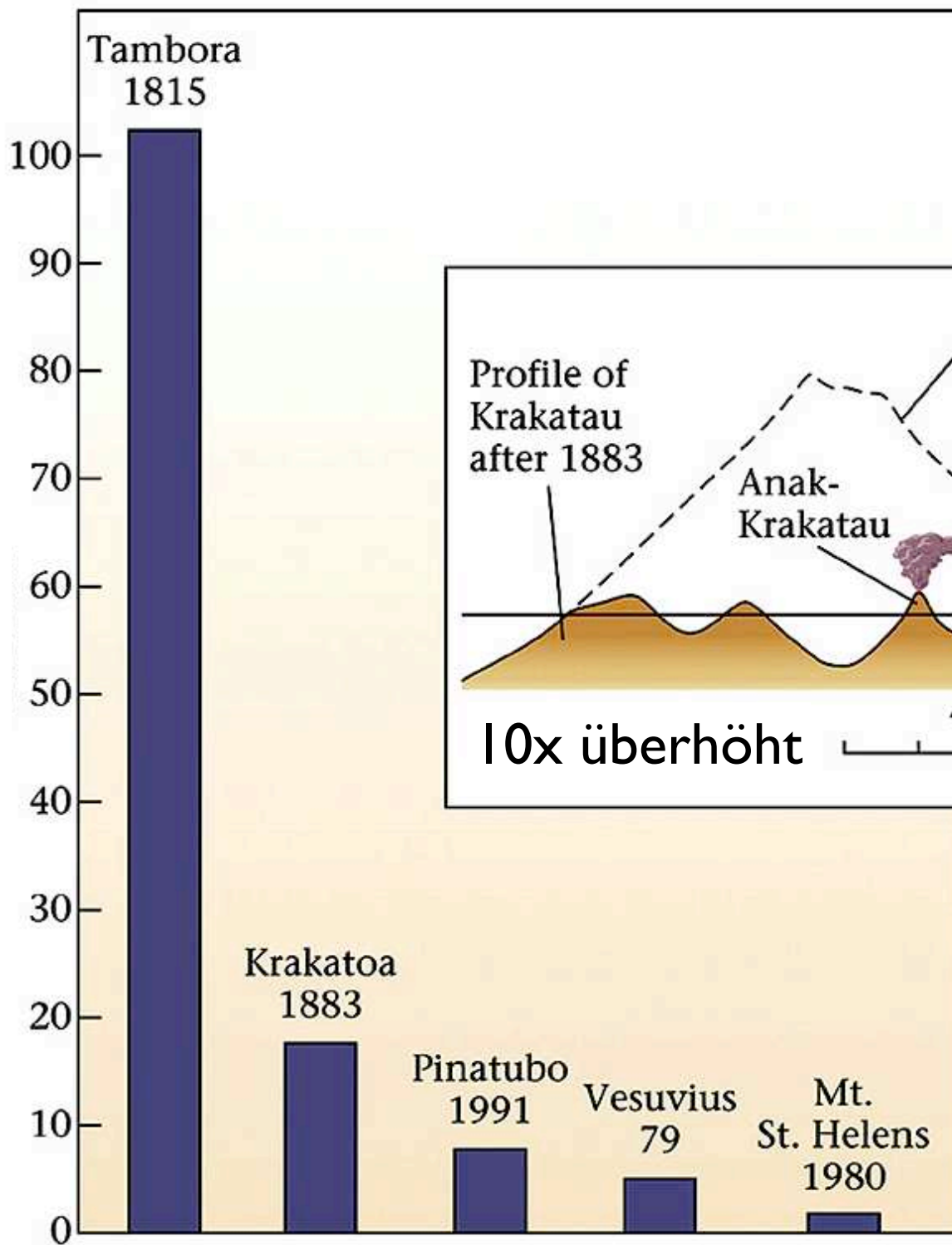
Beispiel: Krakatau, Indonesia (1883)



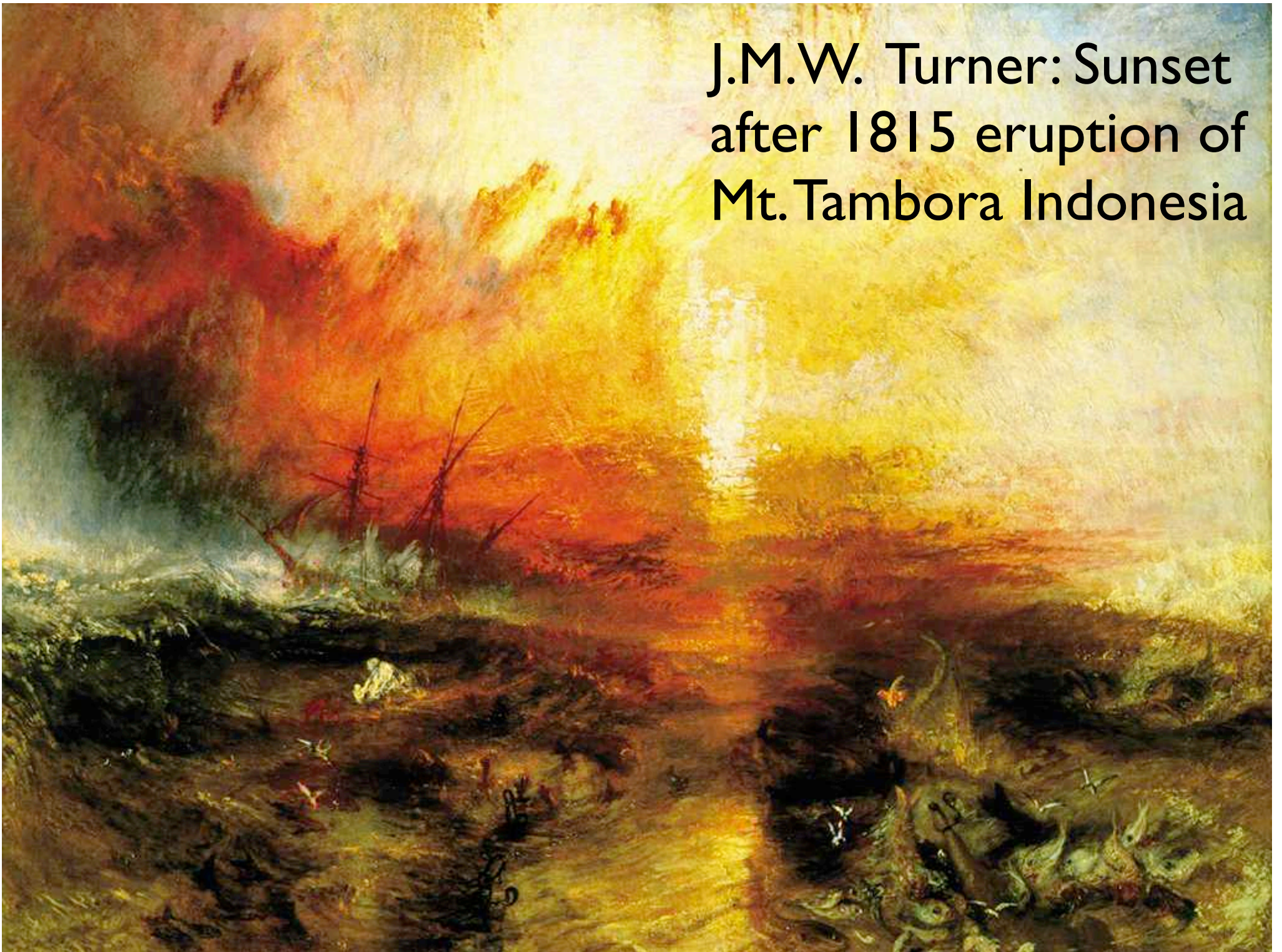
Beispiel: Tambora, Indonesia (1815)



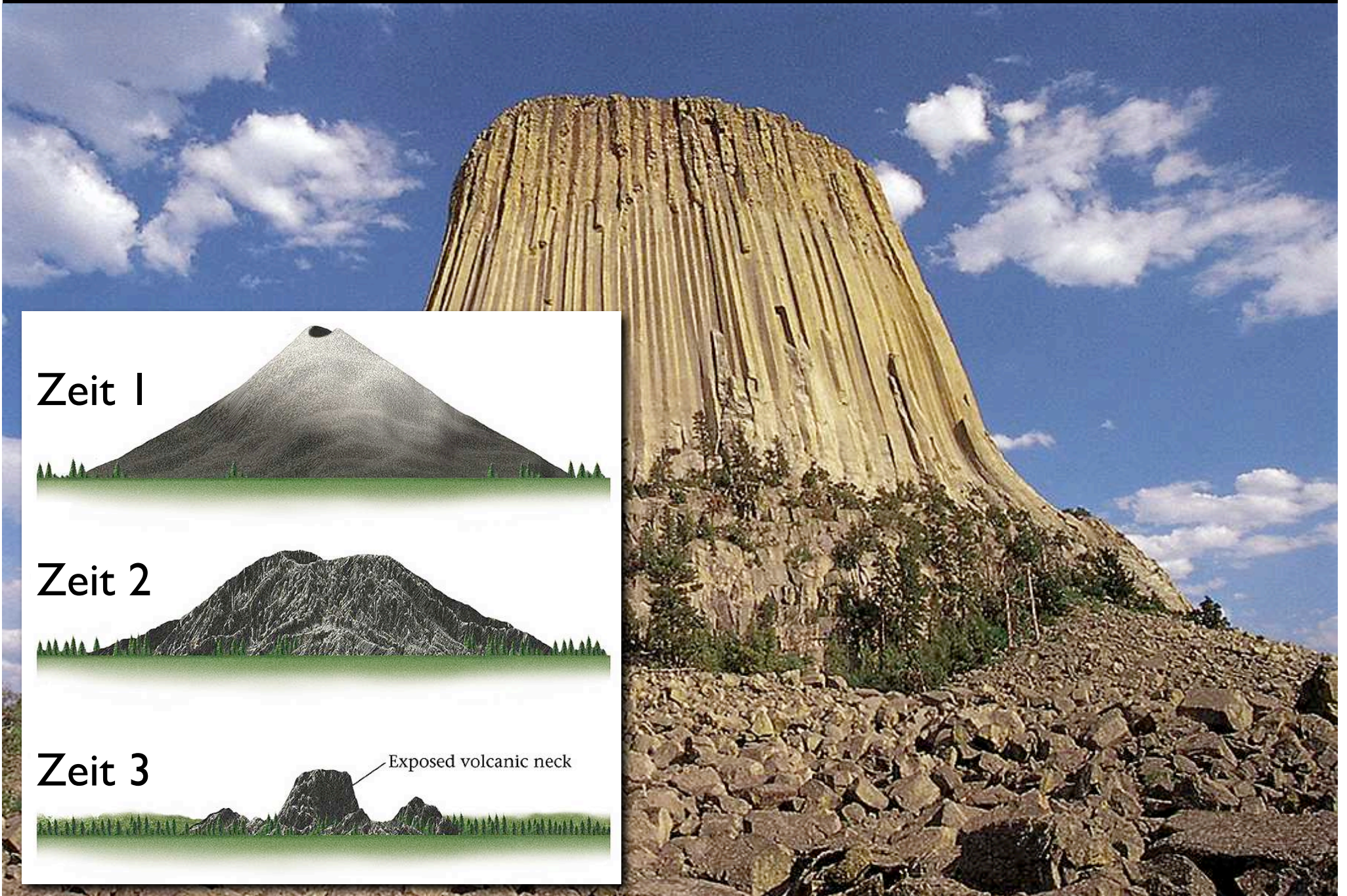
Ausgeworfene Menge (km³)



J.M.W. Turner: Sunset
after 1815 eruption of
Mt. Tambora Indonesia



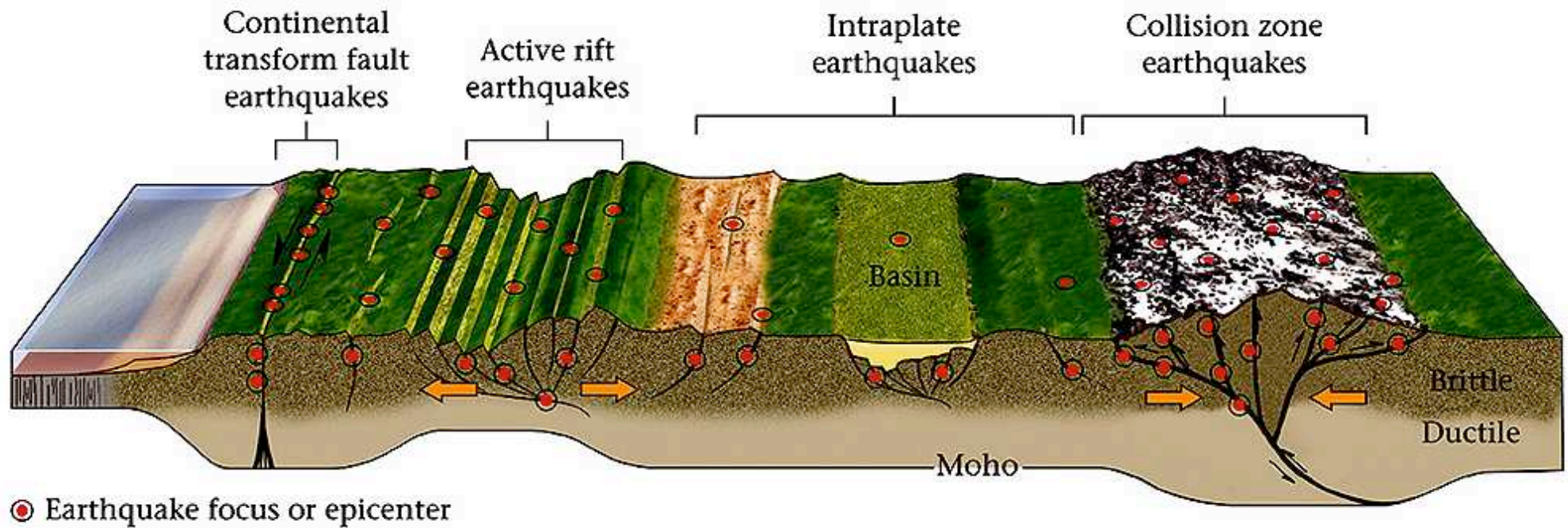
Erosion eines Vulkans



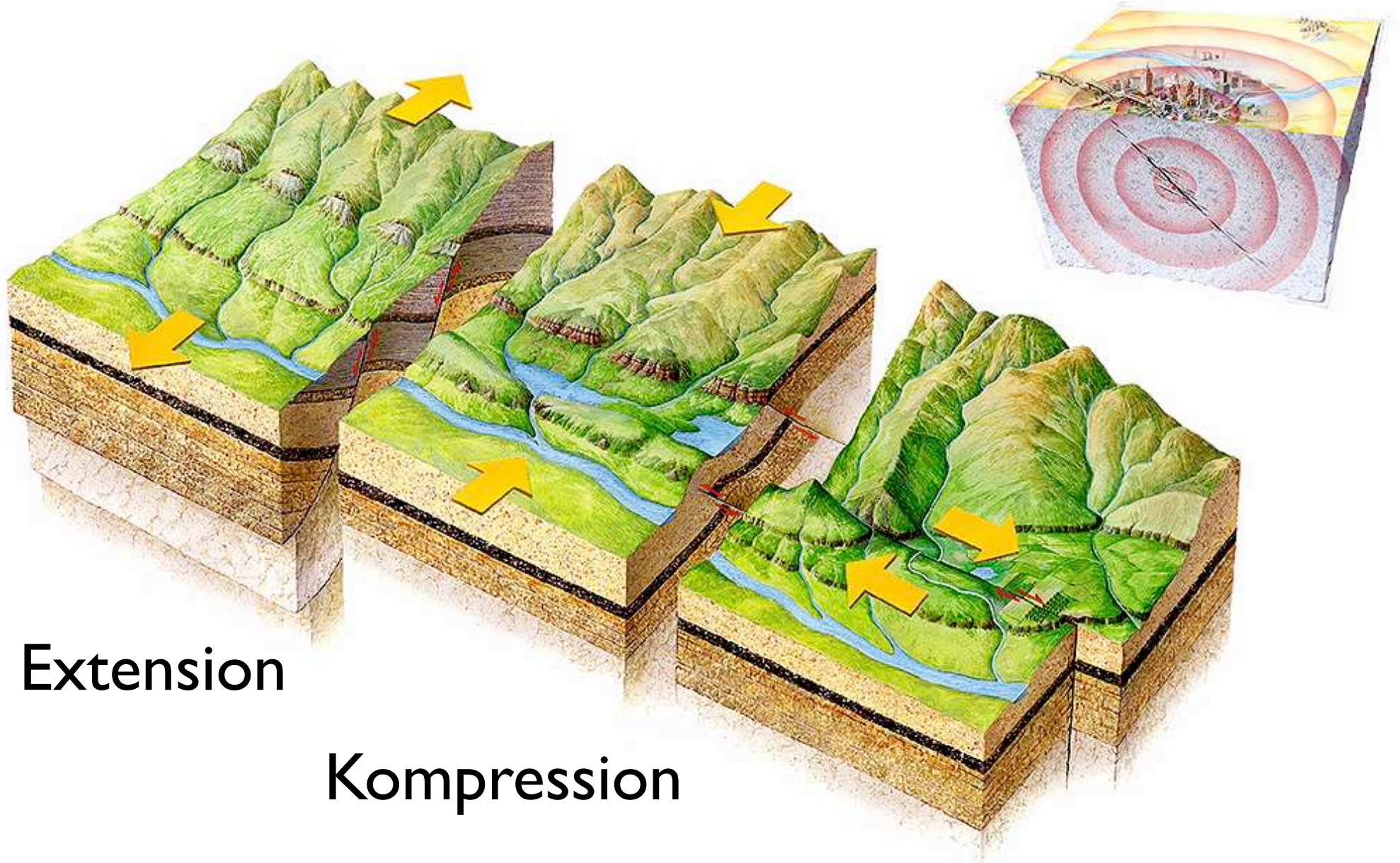
Prozesse an Plattengrenzen: 2 - Erdbeben



Typen von Erdbeben



Bewegungssinn

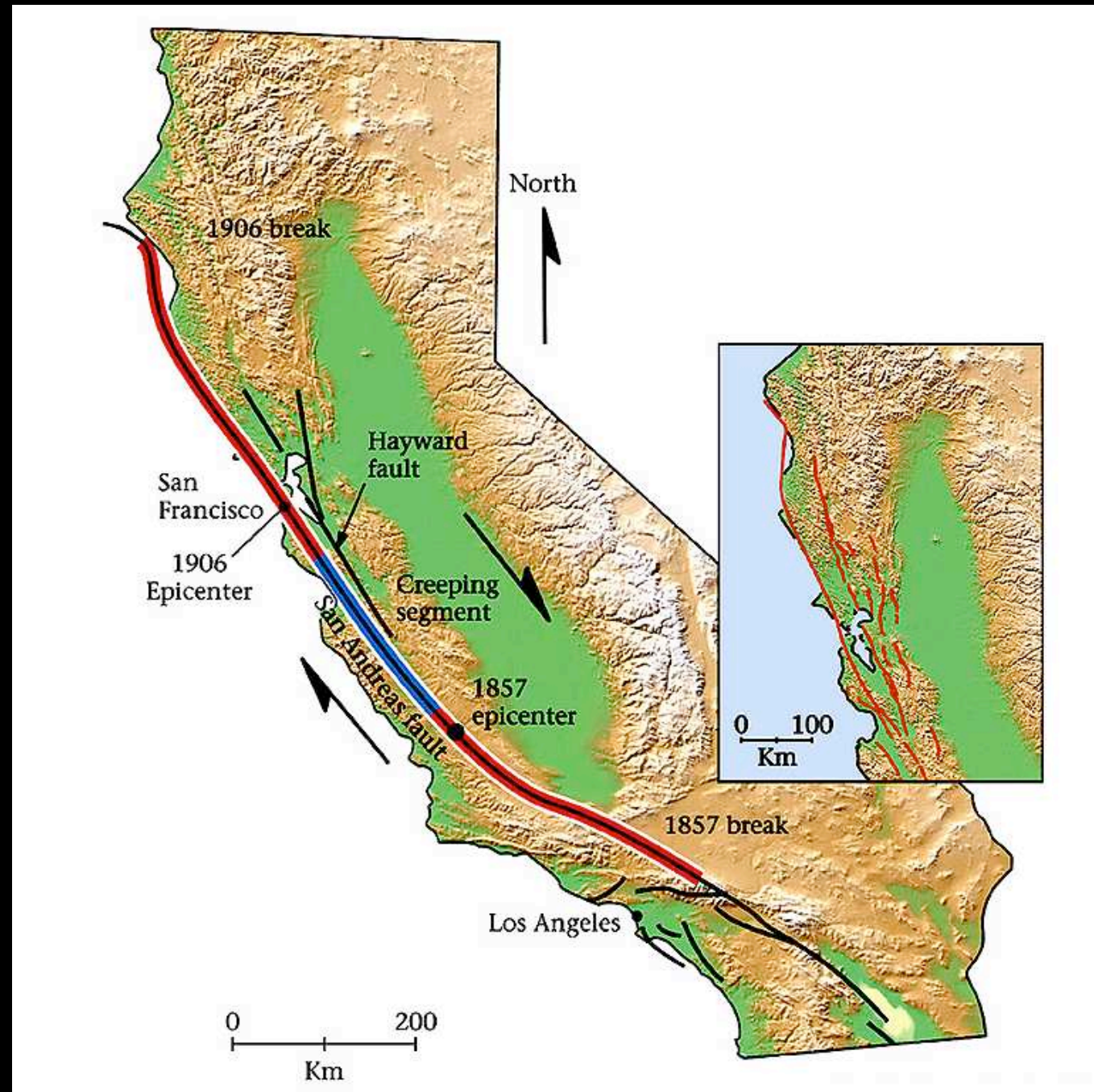


Extension

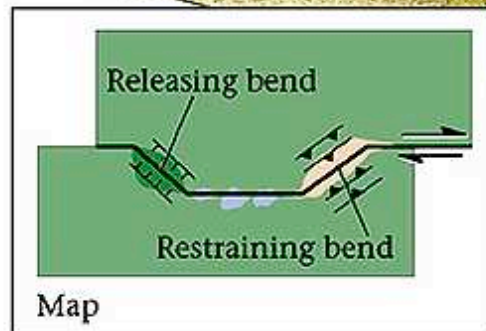
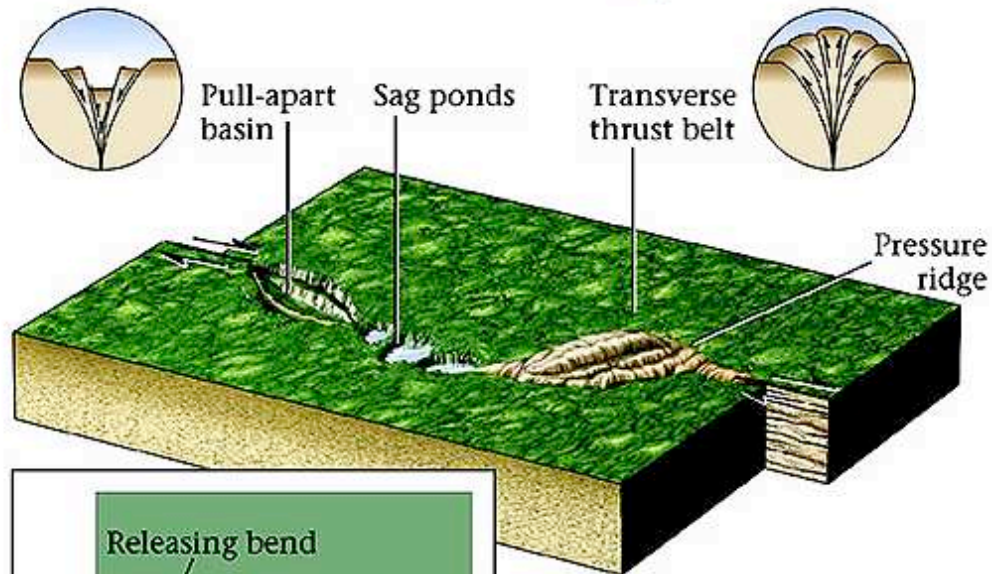
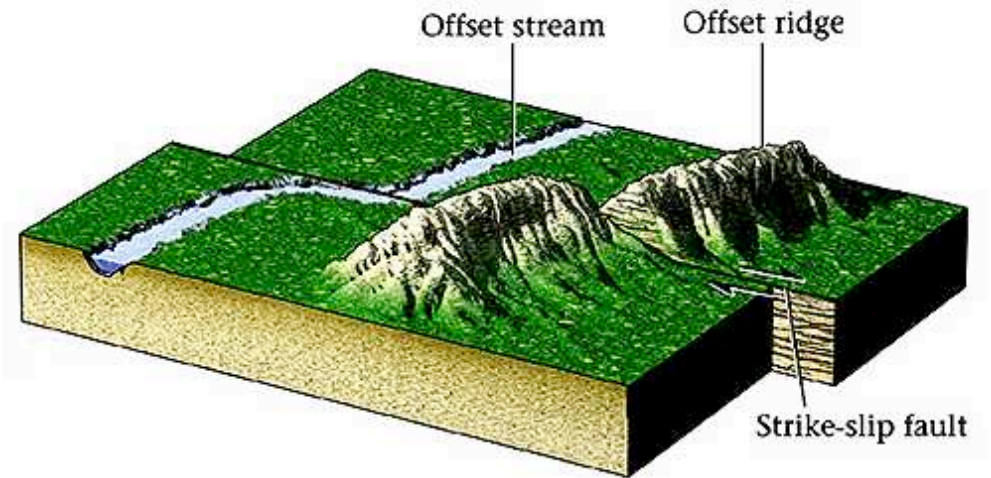
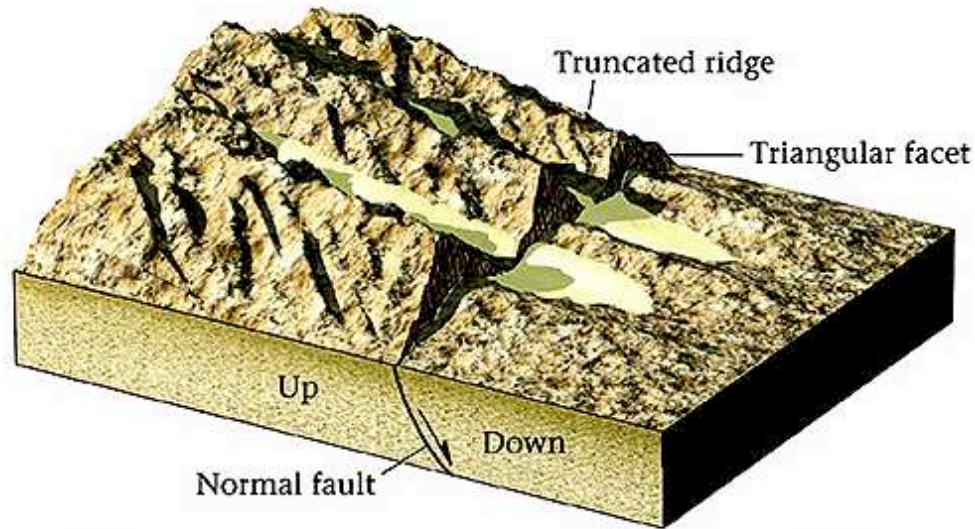
Kompression

Blattverschiebung

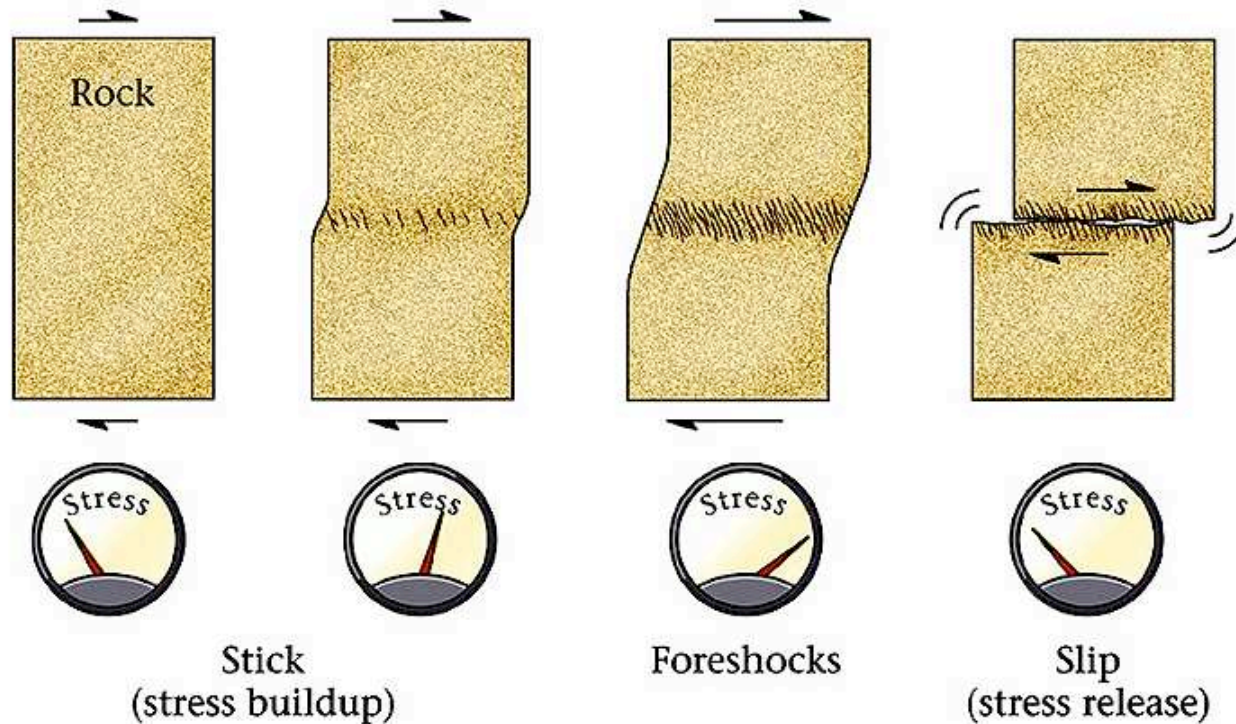
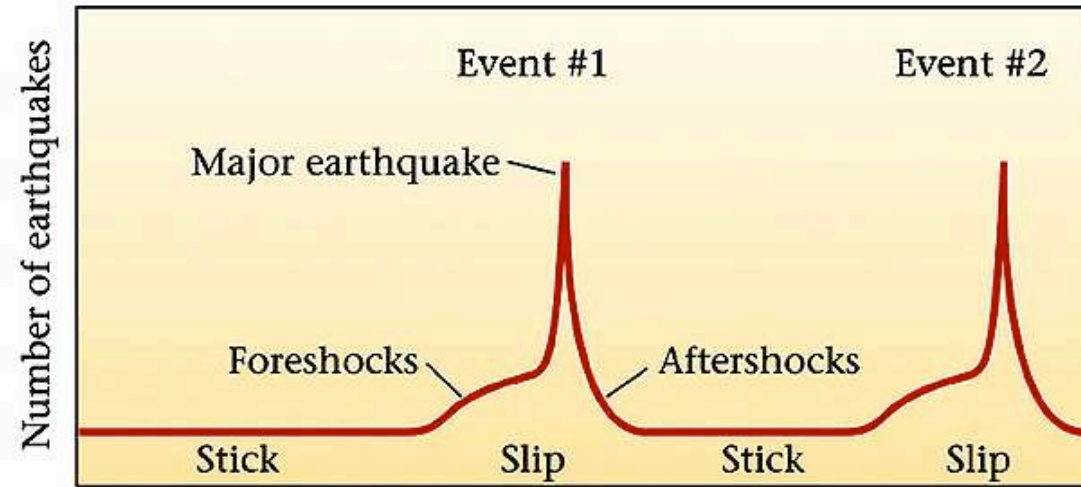
Beispiel: San Andreas Fault



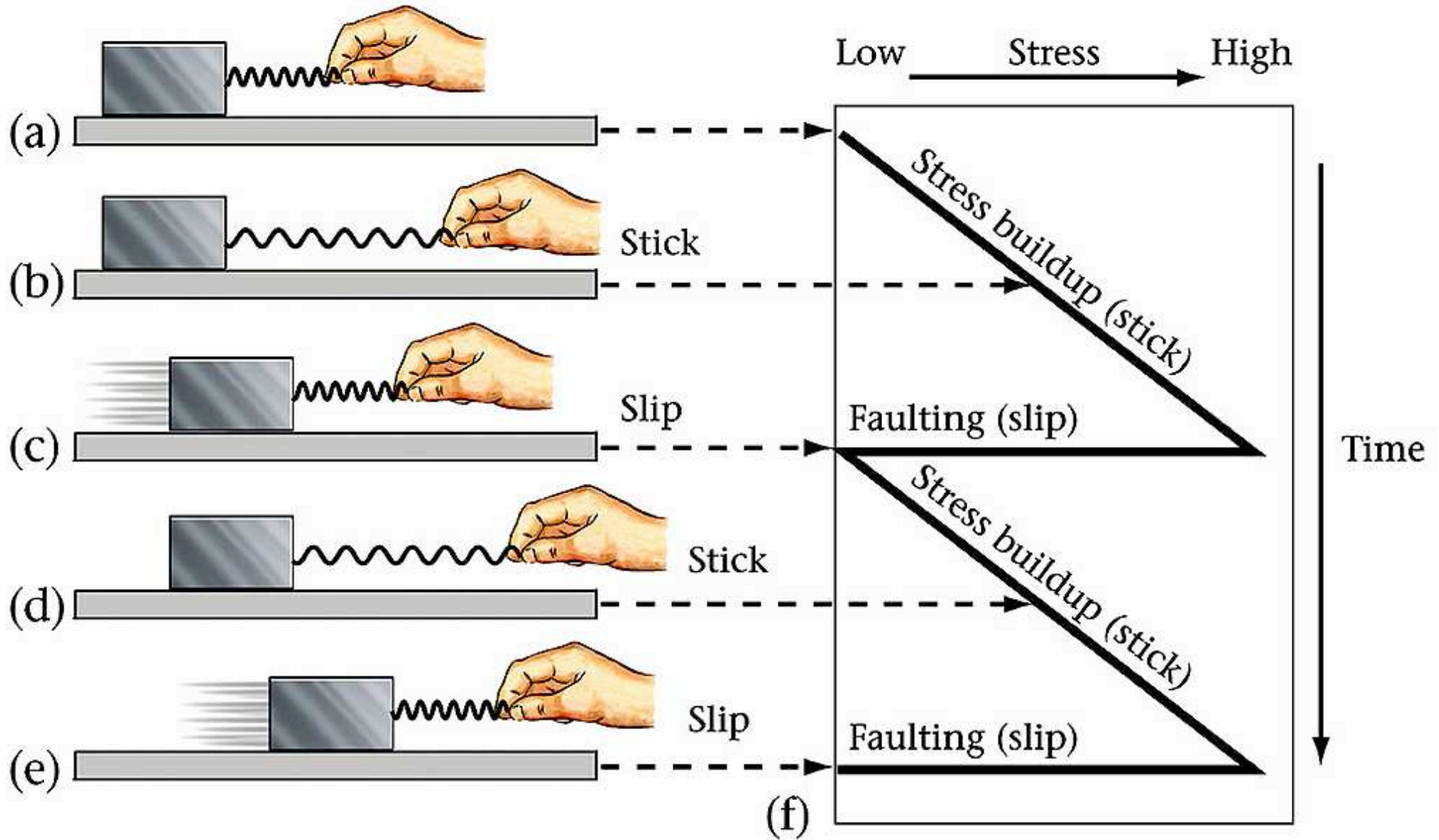
Topographische Ausprägung



Erdbeben: Zeitlicher Ablauf



Stick - Slip - Modell

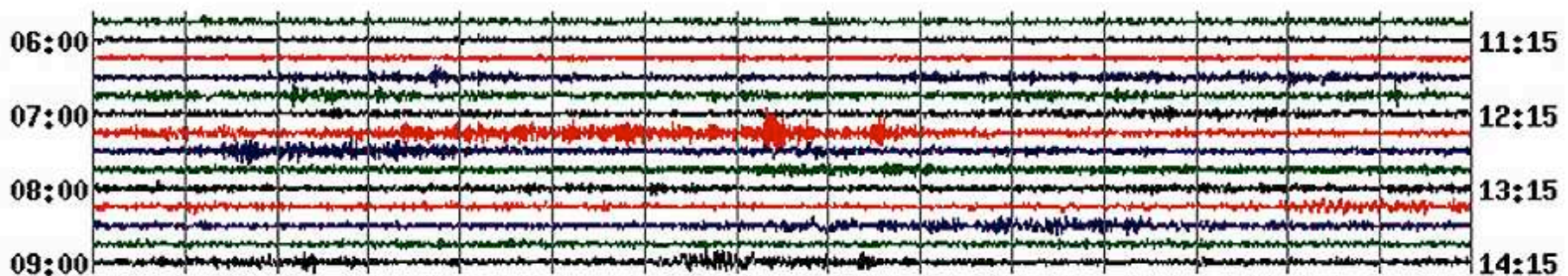
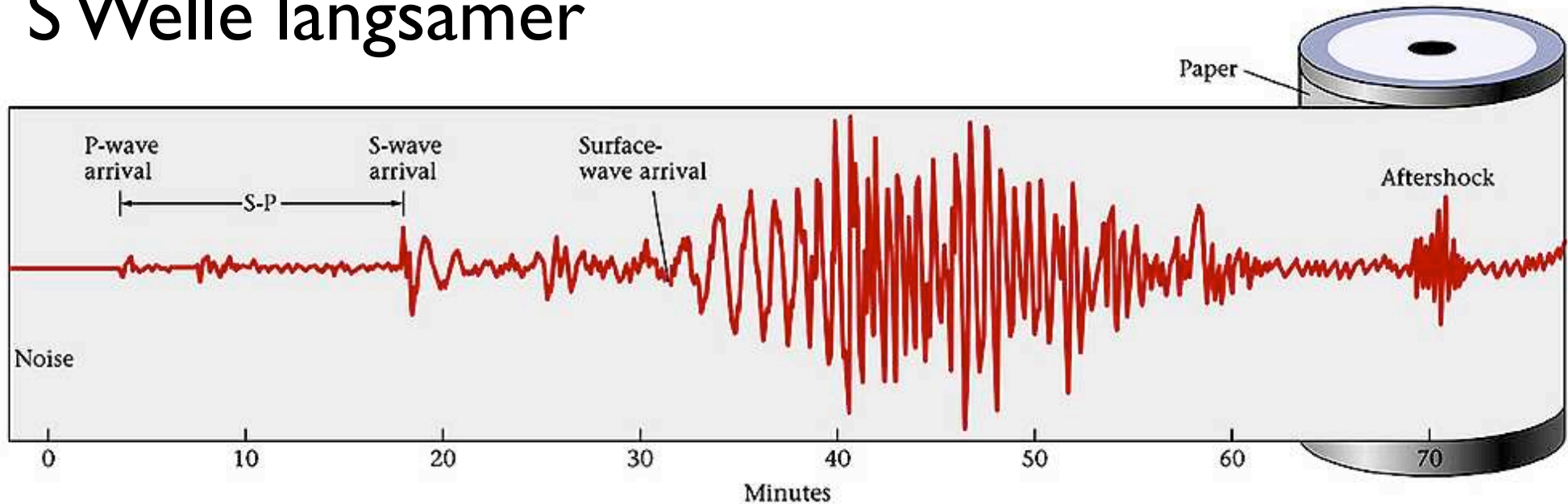


Erdbebenwellen

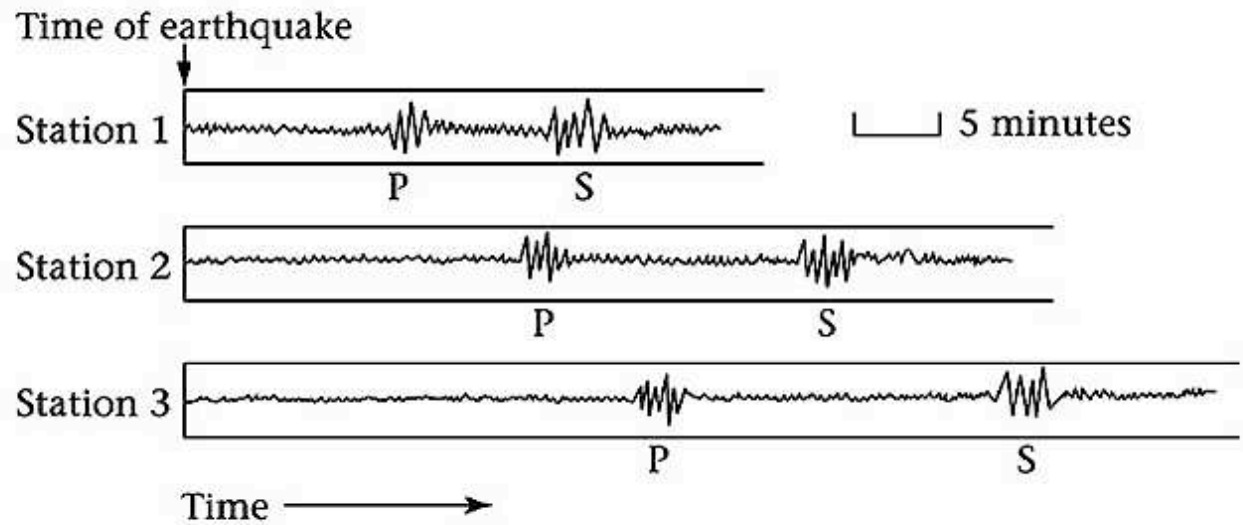
Typischer Wert: $v = 6 \text{ km s}^{-1}$

P Welle schneller

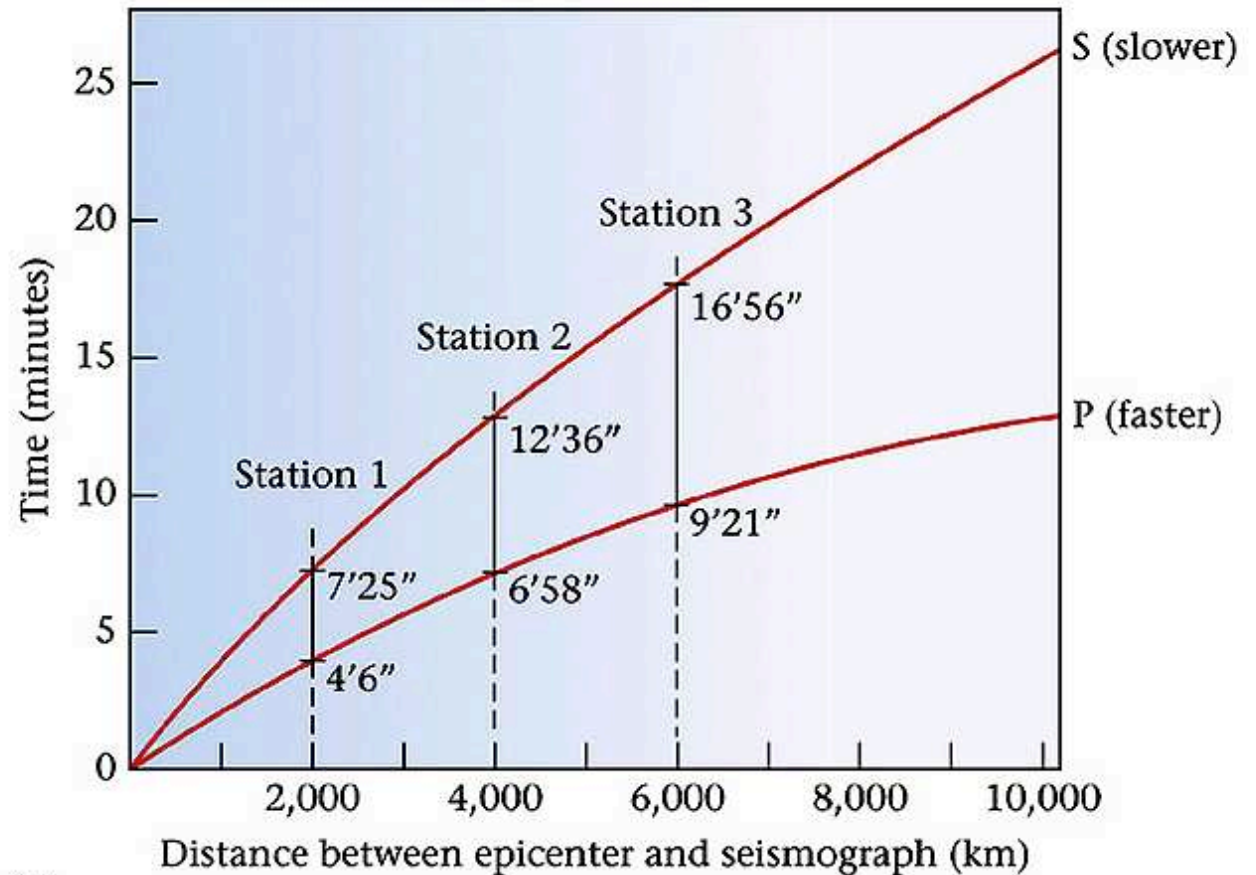
S Welle langsamer



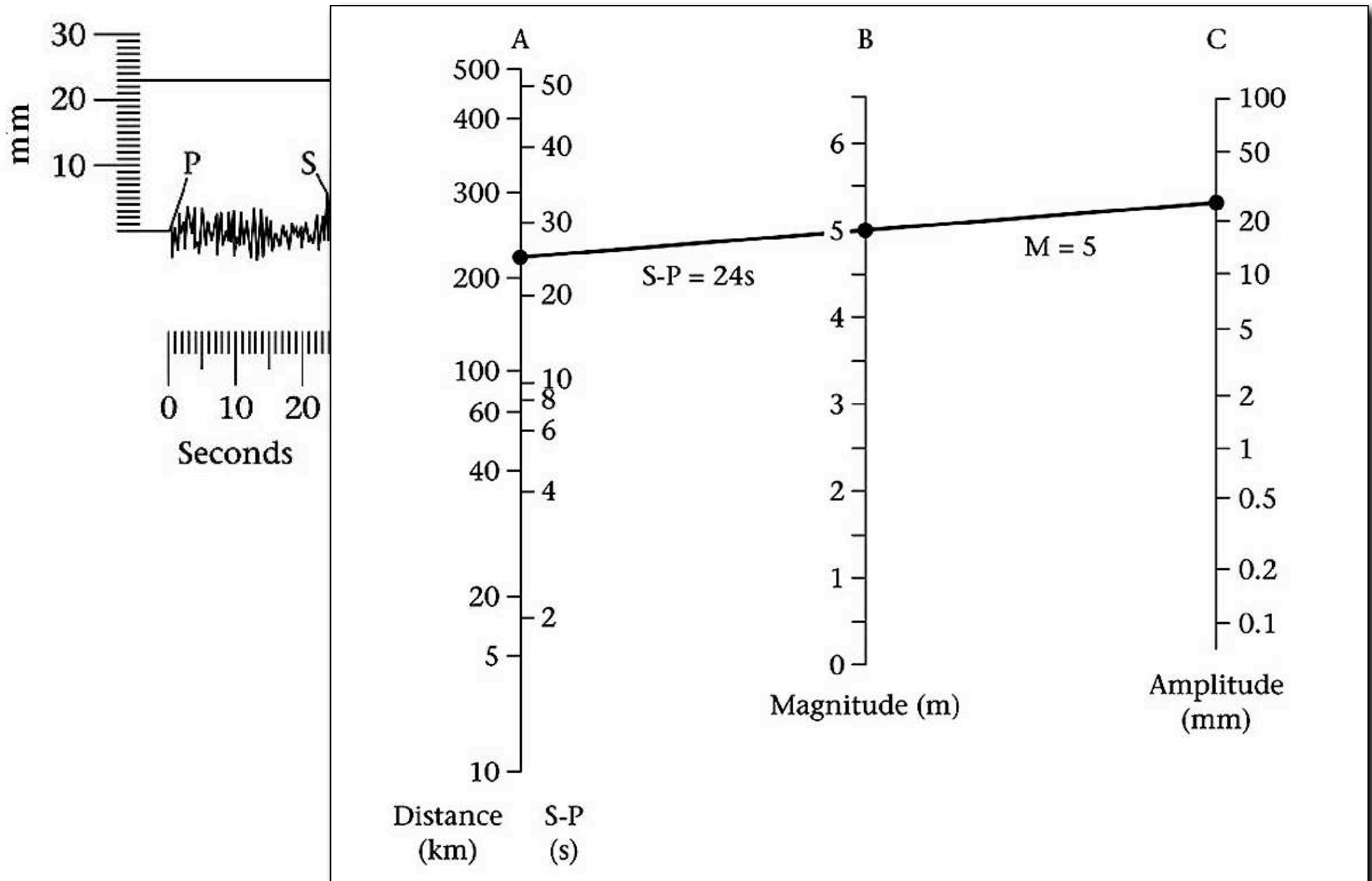
Zeitlicher Abstand P - S



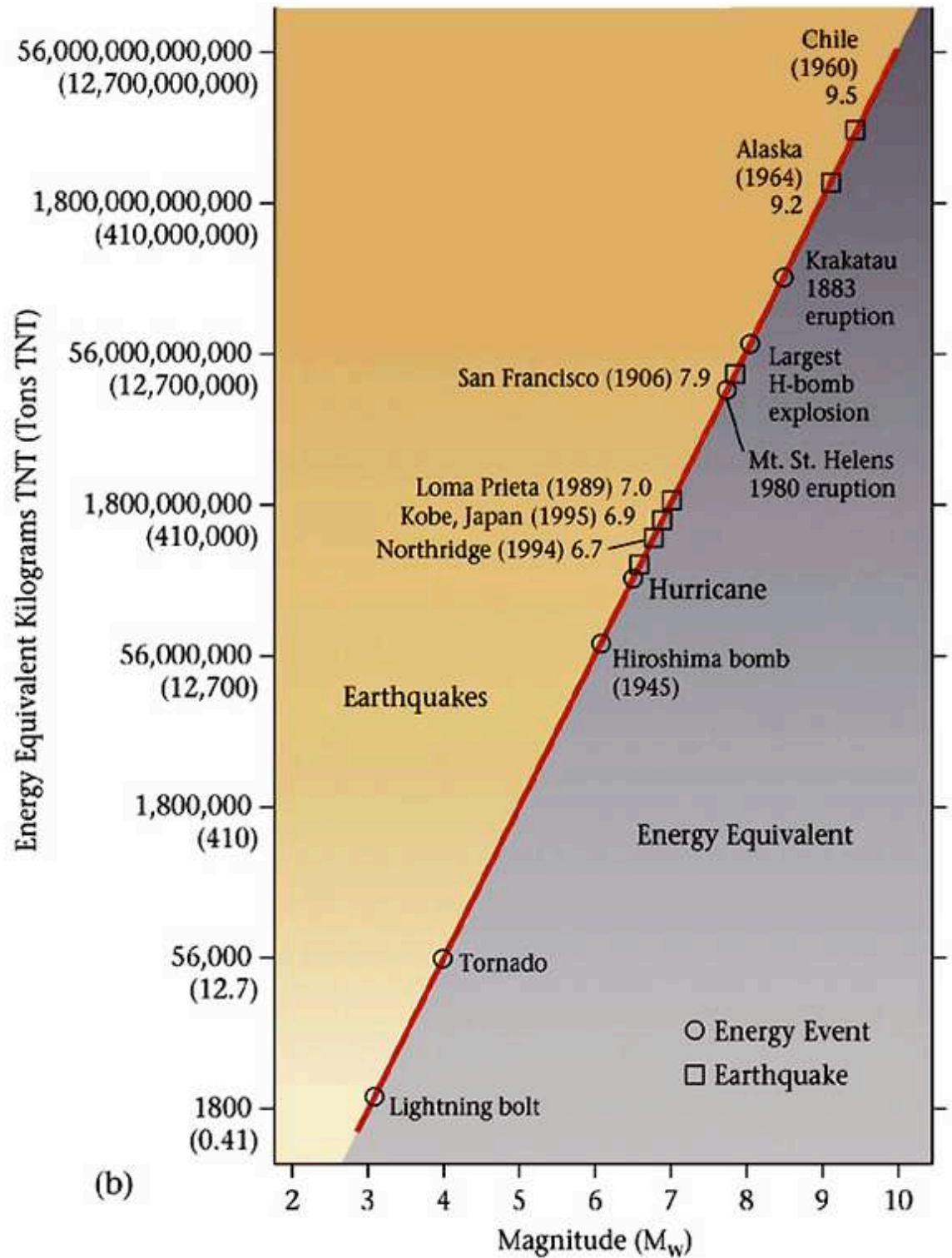
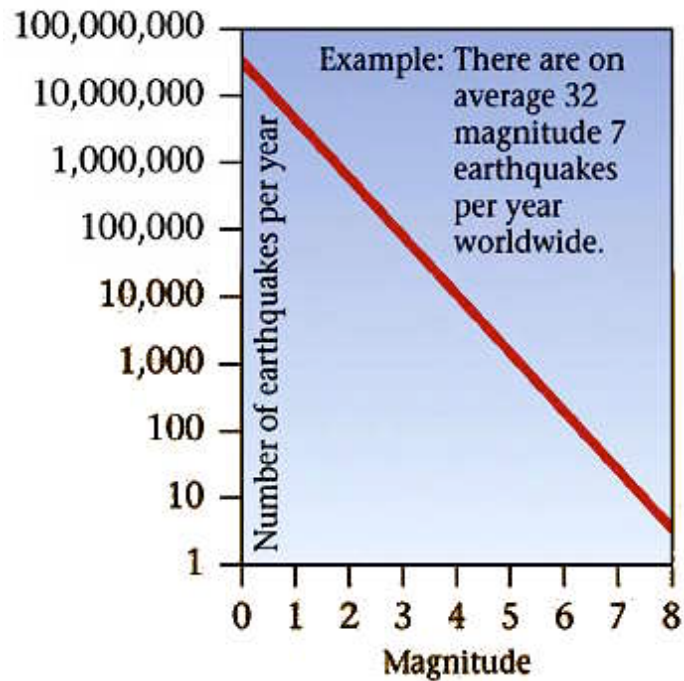
örtliche Distanz Erdbeben - Messtation



Magnitude

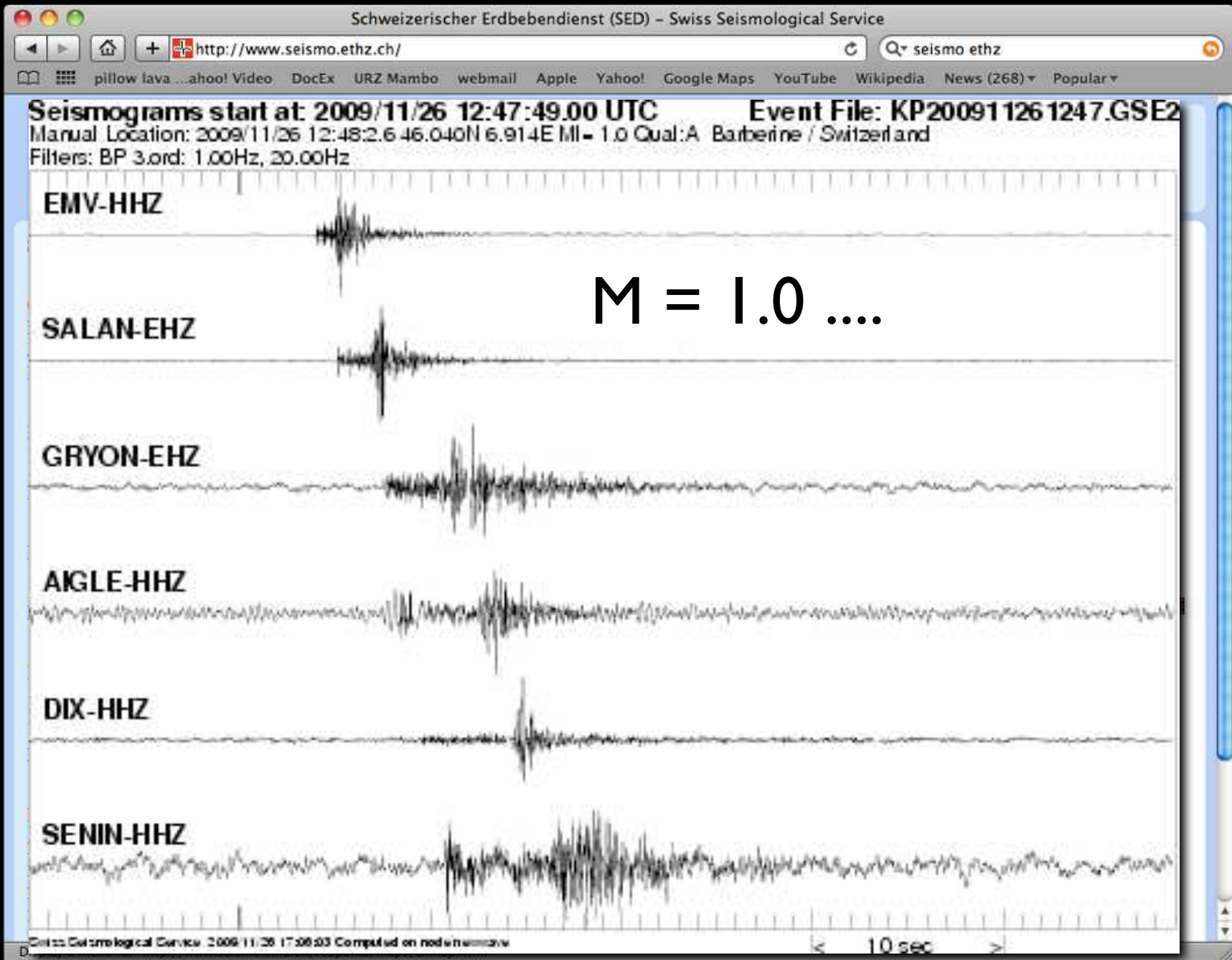


Erdbebenrisiko



(b)

<http://www.seismo.ethz.ch/e.com>



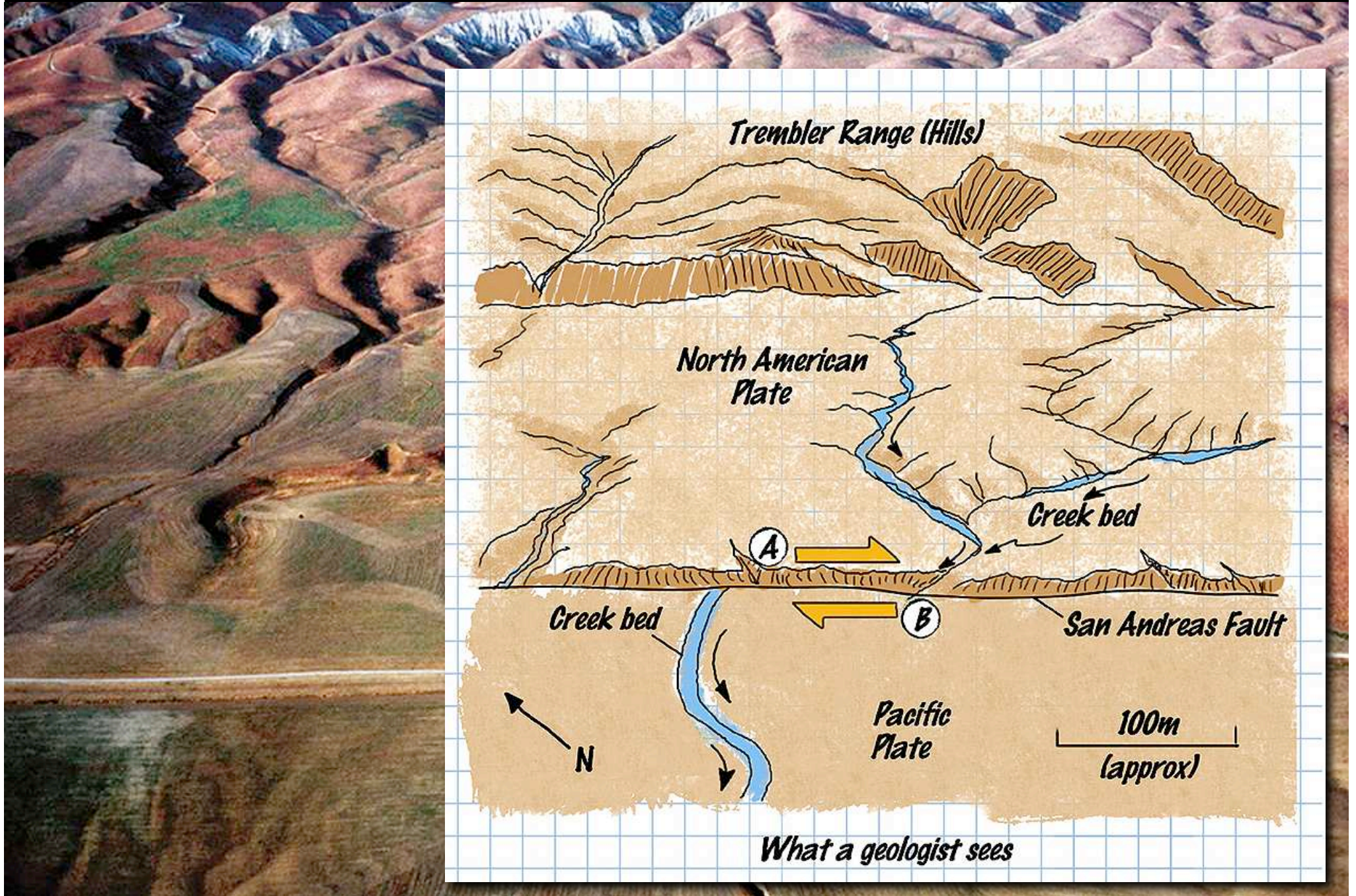
Beispiel: San Francisco, 1906



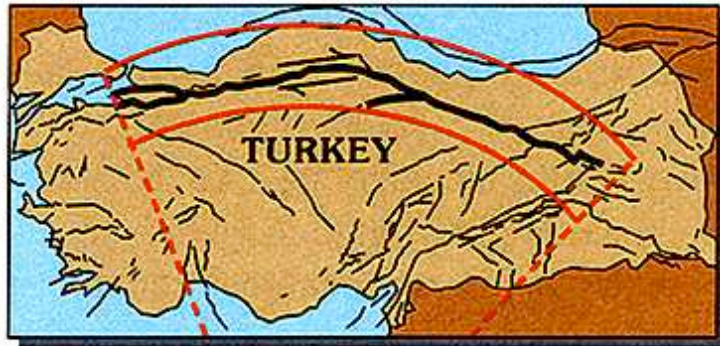
Beispiel: Hector Mine, 1999



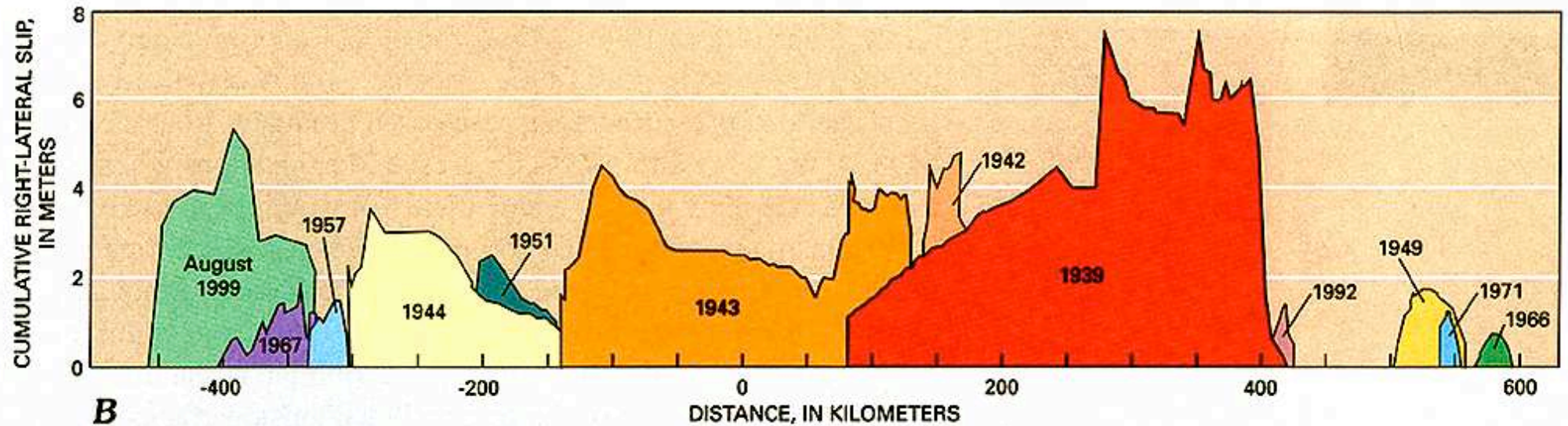
Beispiel: San Andreas Fault



Beispiel: Nordanatolischer Bruch



A

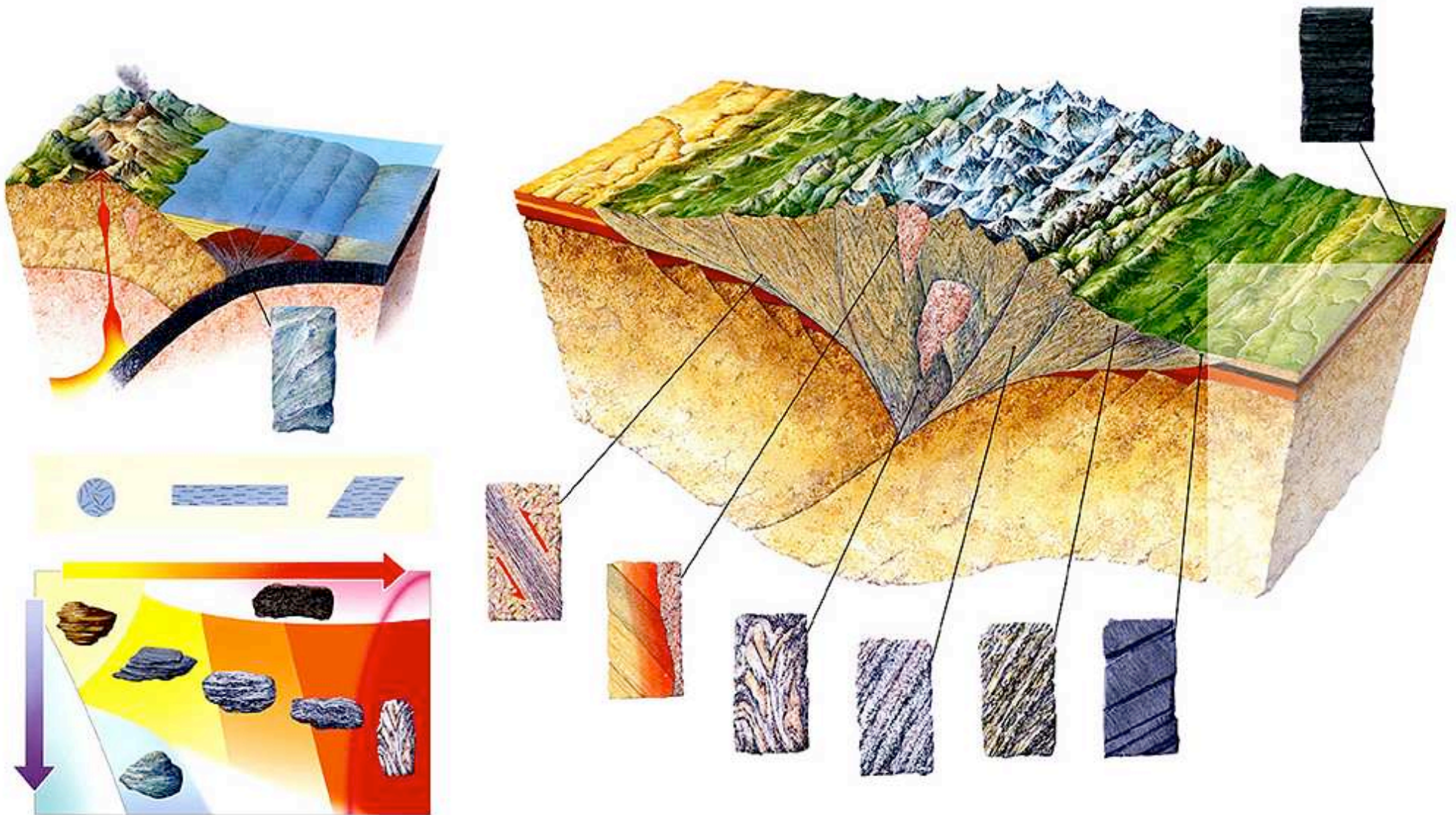


B

Prozesse an Plattengrenzen: 3 - Metamorphose

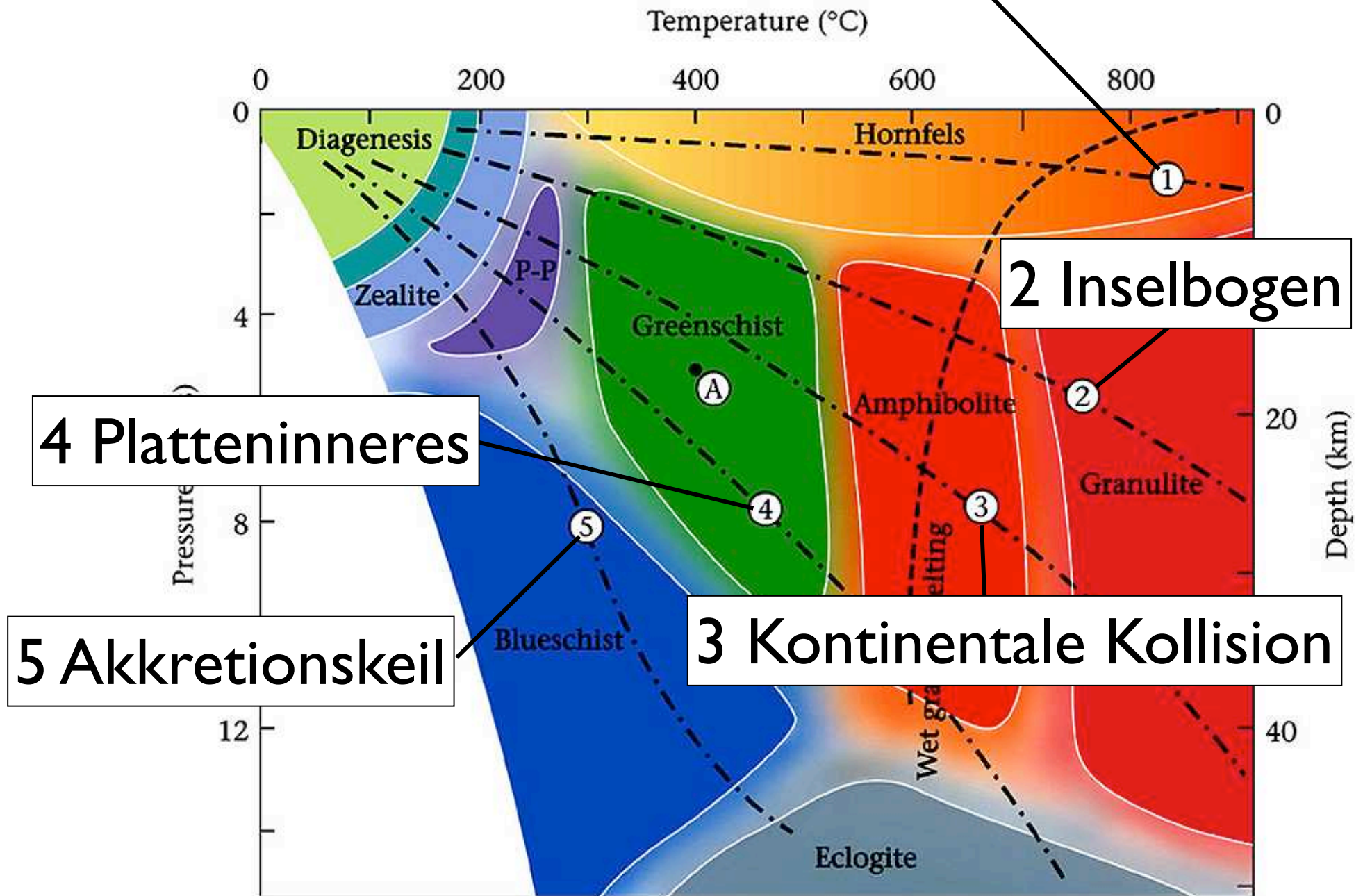


Metamorphose im plattentektonischen Zusammenhang

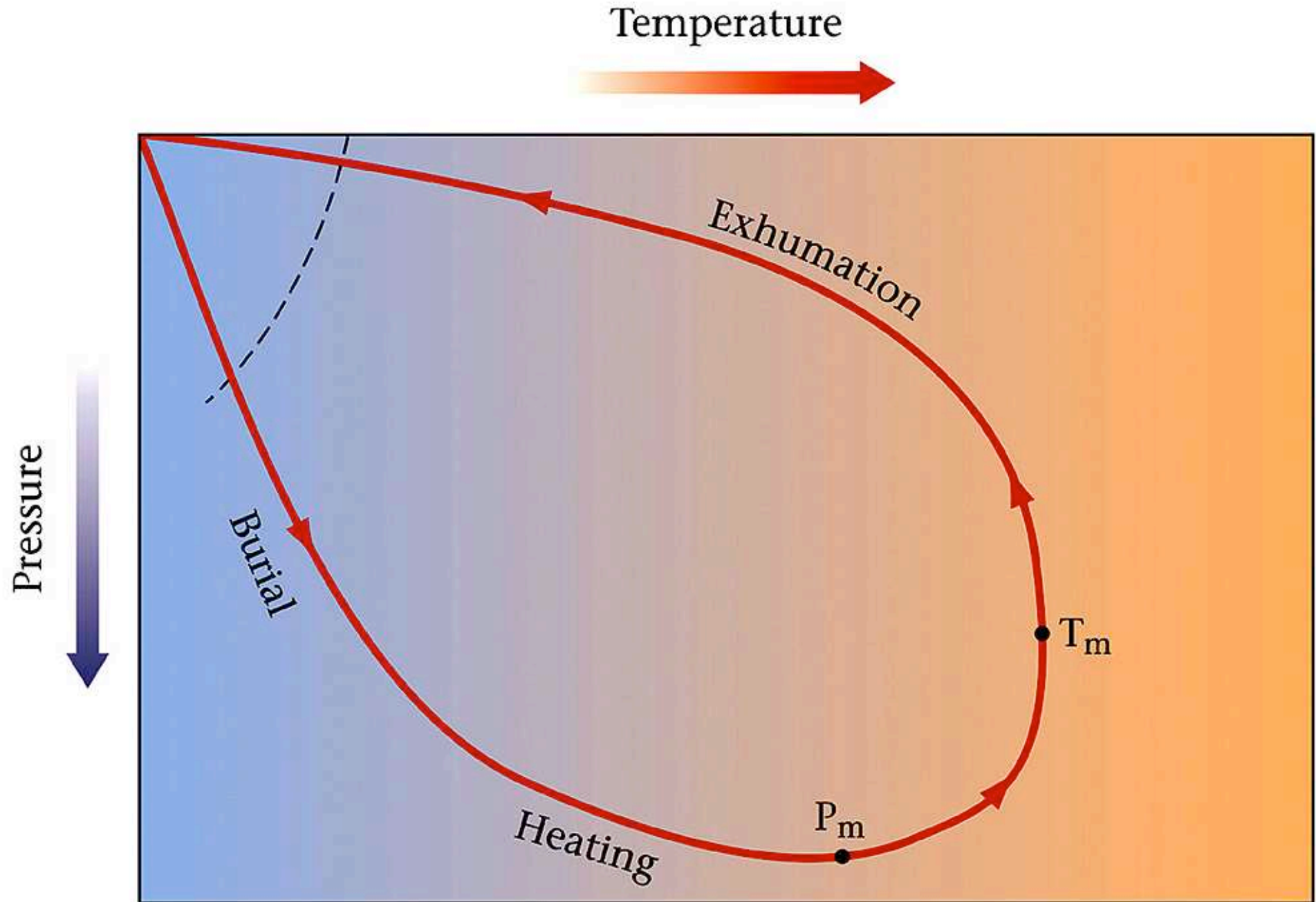


Metamorphose

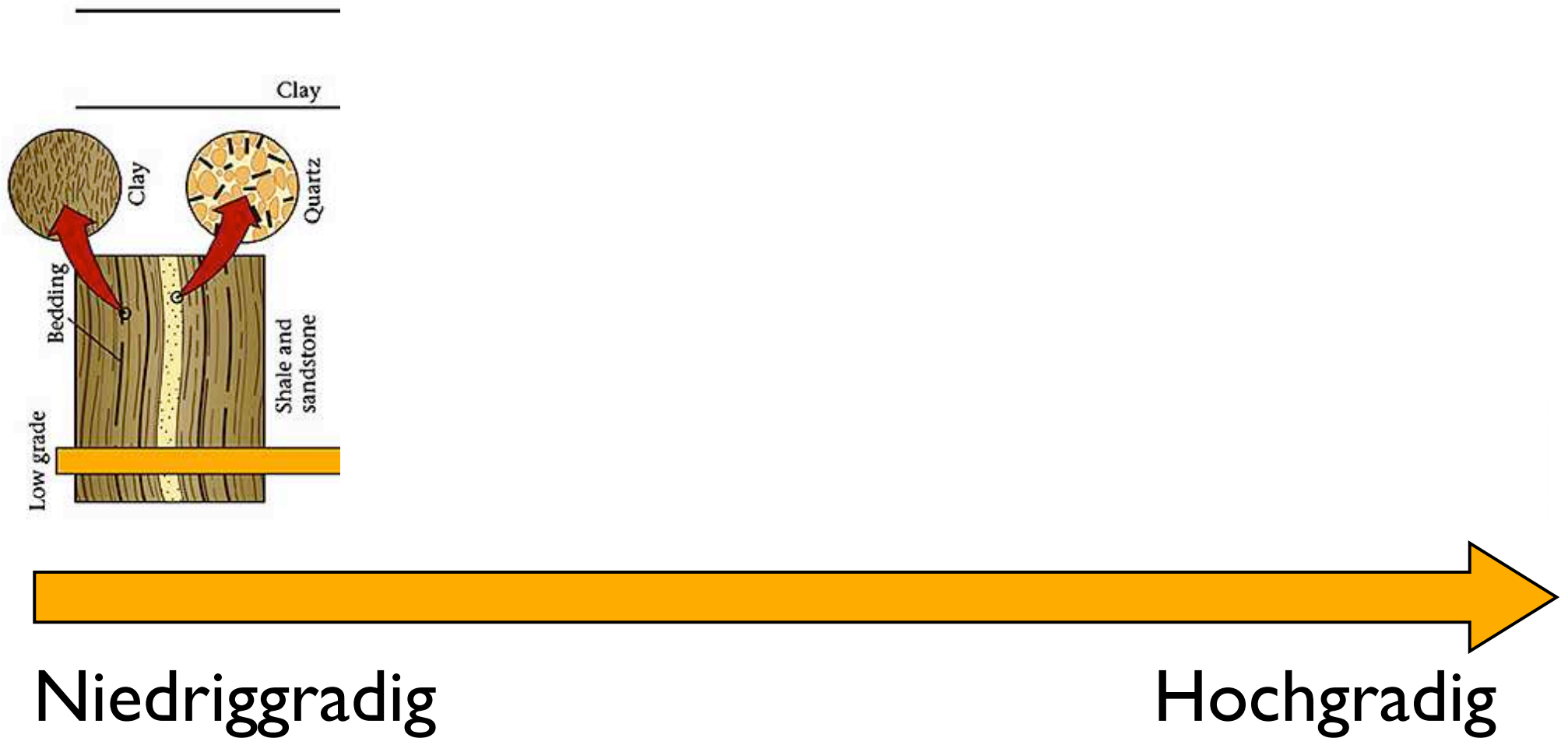
Kontaktmetamorphose



P - T - t - Loop



Fortschreitende Metamorphose



Prozesse an Plattengrenzen: 4 - Deformation



Duktile Deformation



Penninikum, Laghetti, Ticino



Scherzzone in Granit



Scherzone in Granit

Lavertezzo, TI



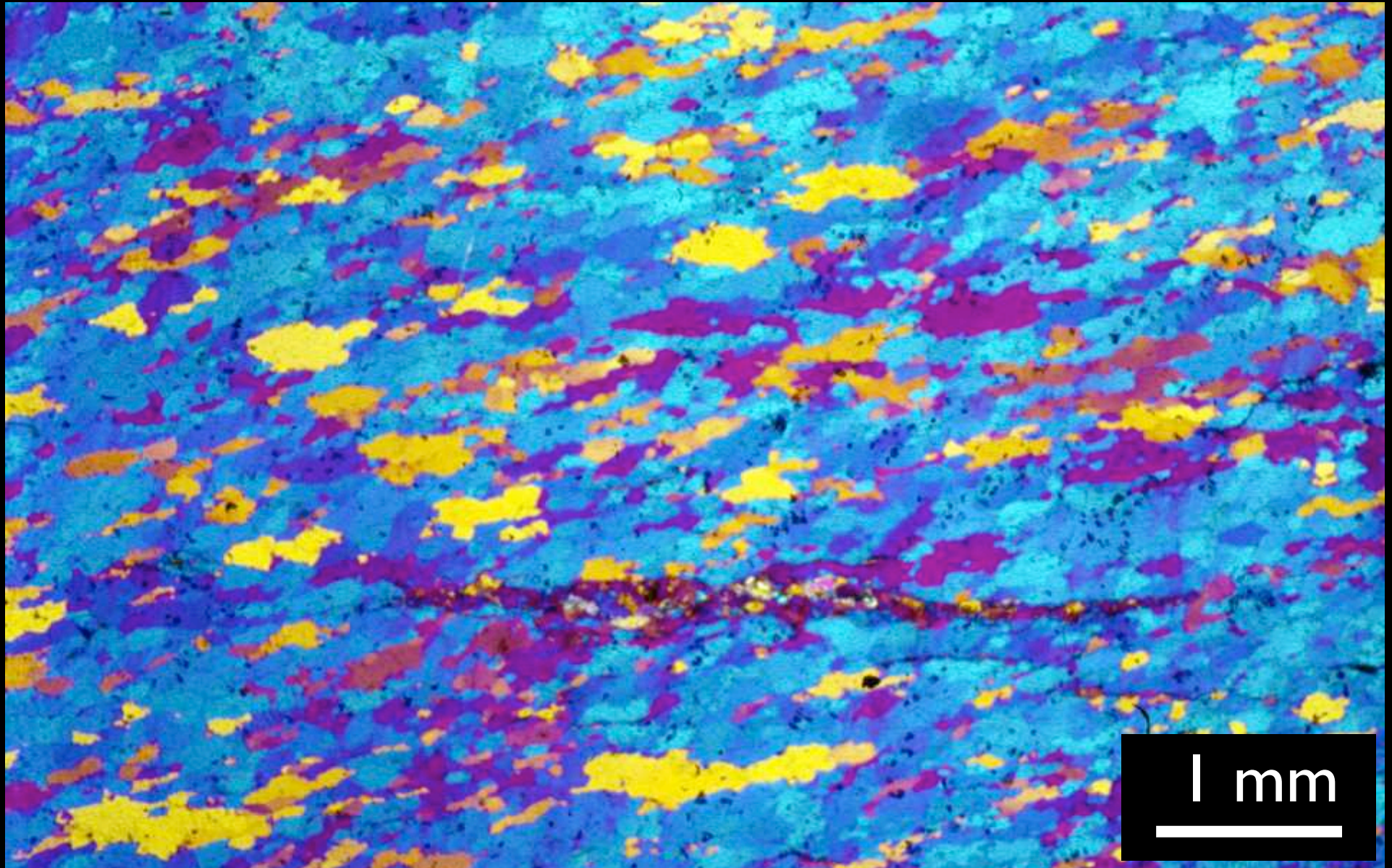


Isoklinalfalten





Duktile Deformation



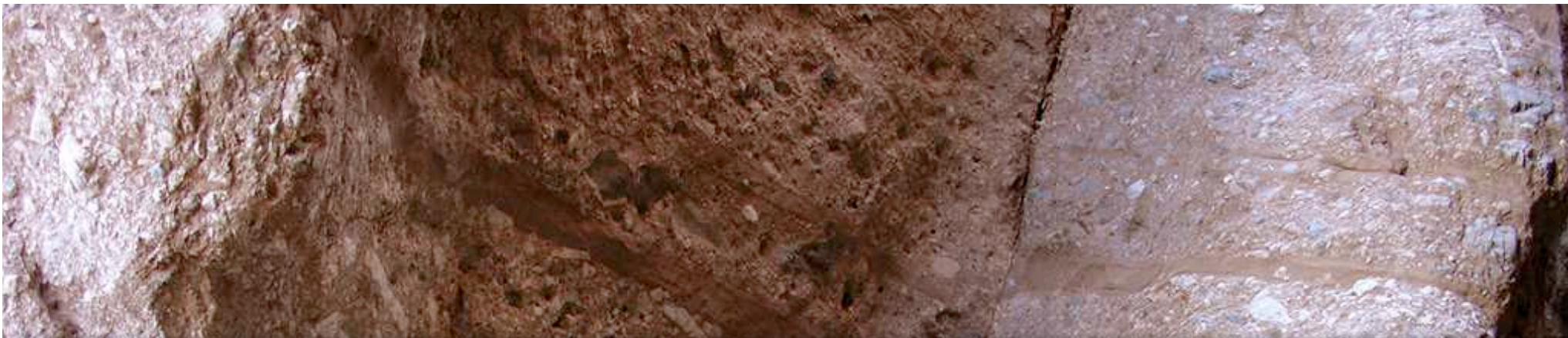
im Dünnschliff

Spröddeformation





Detachment Fault, Western Chemihuevi Mountains





Bruchfläche

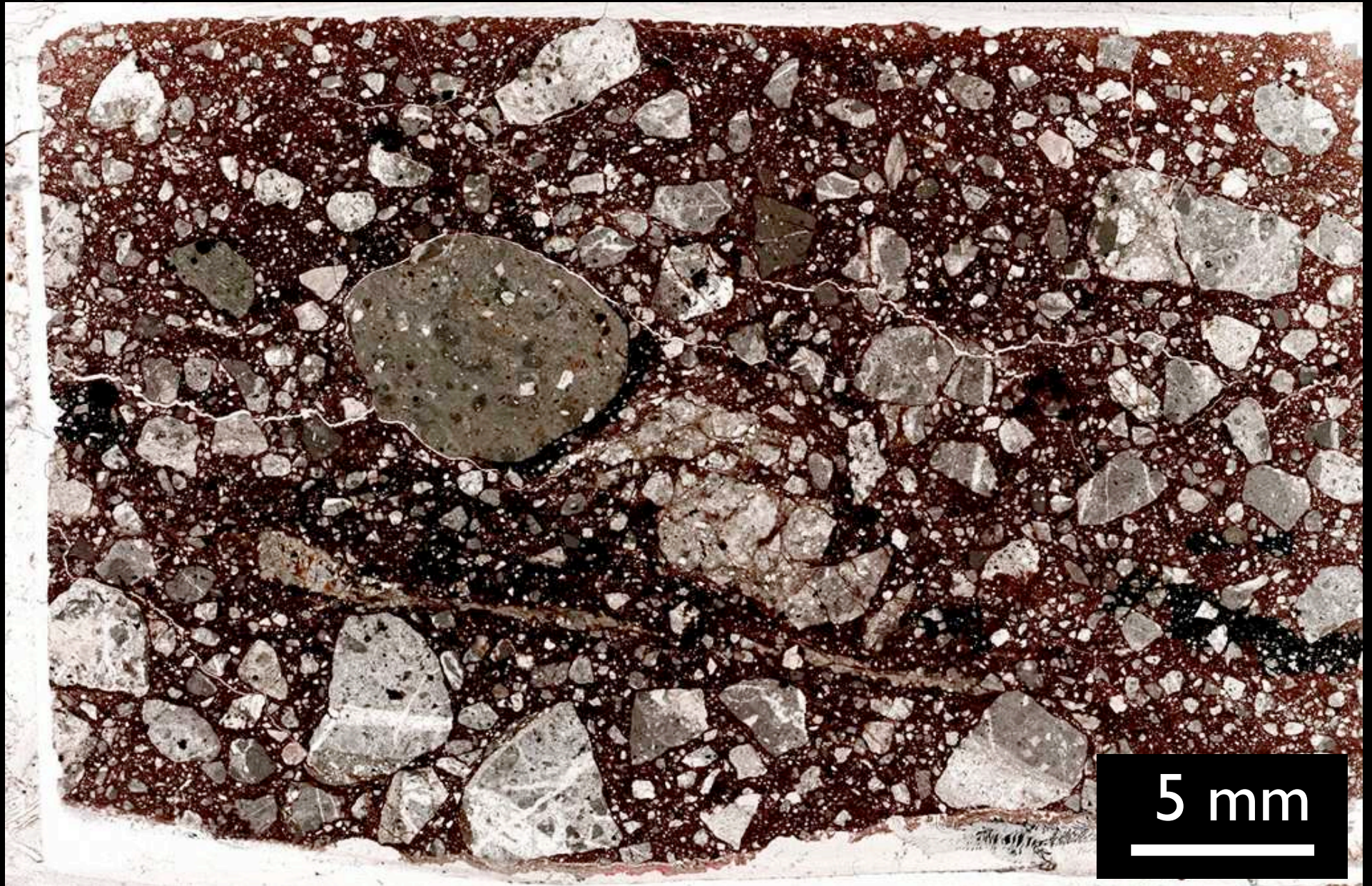


Bruchfläche



Kataklasit

Spöde Deformation



im Dünnschliff



Mojave Desert



the end