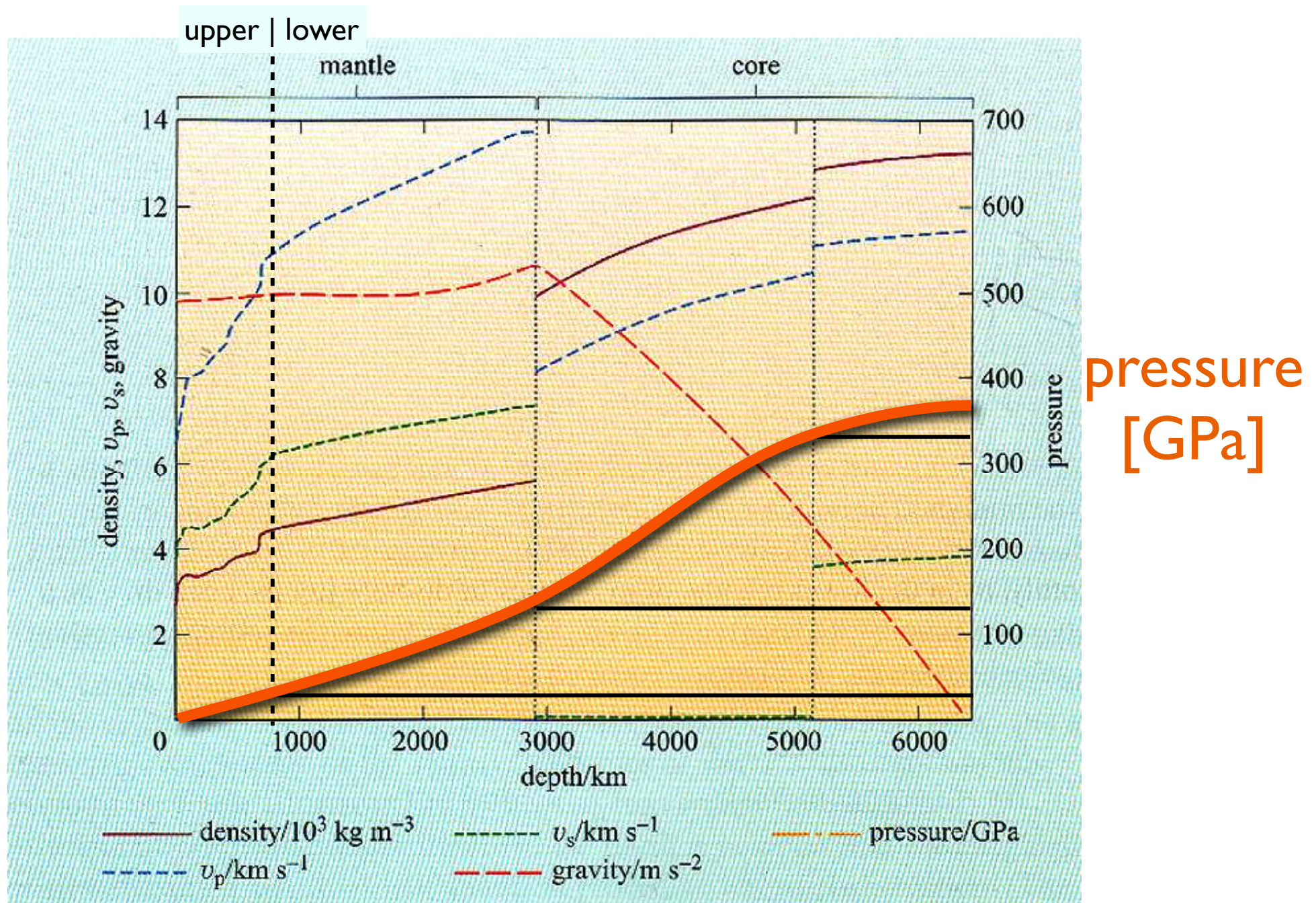


Tatort

Plattengrenze

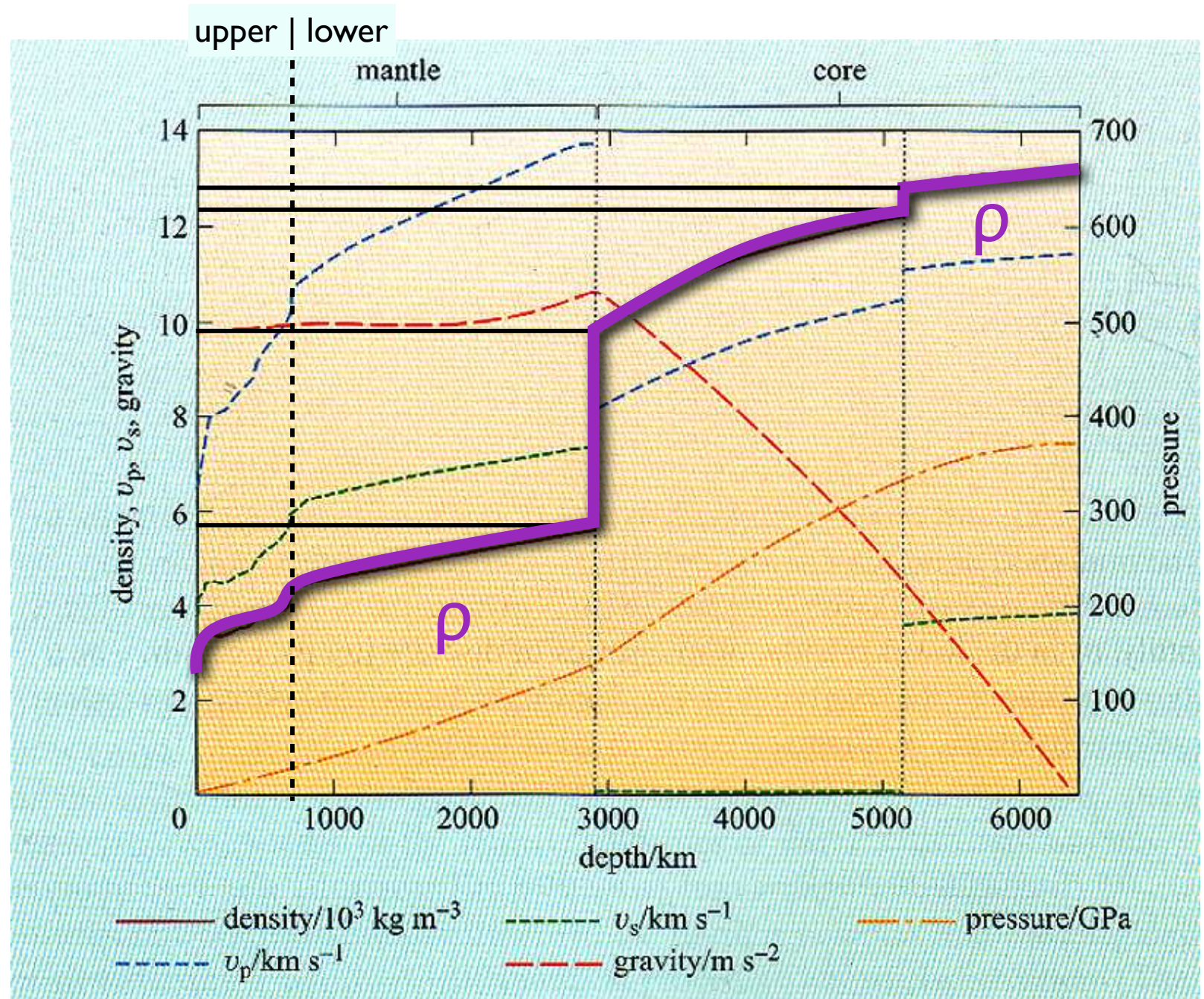
Fokus Erdbeben (4)

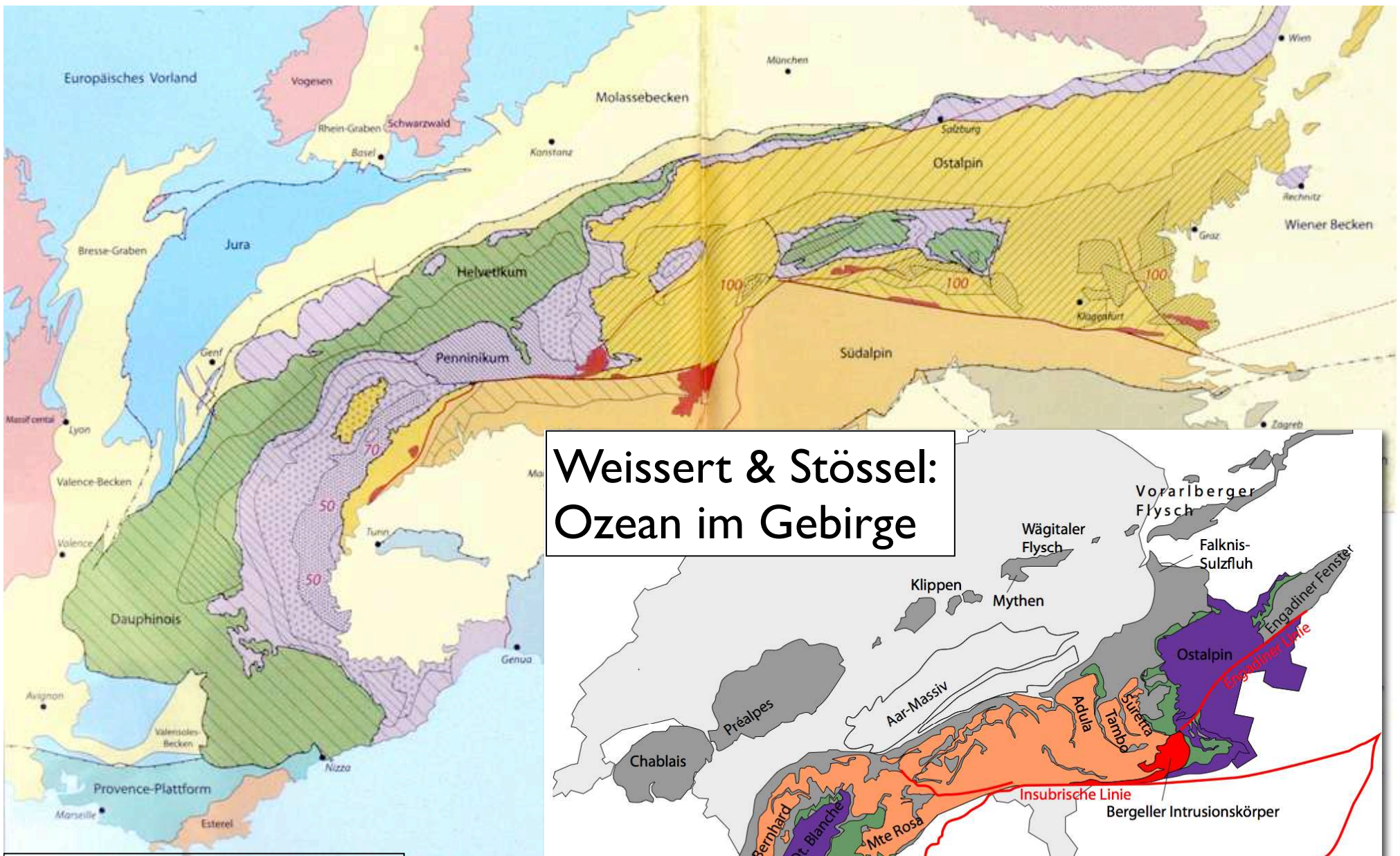
Preliminary reference earth model: p



Preliminary reference earth model

density
[10^3kgm^{-3}]





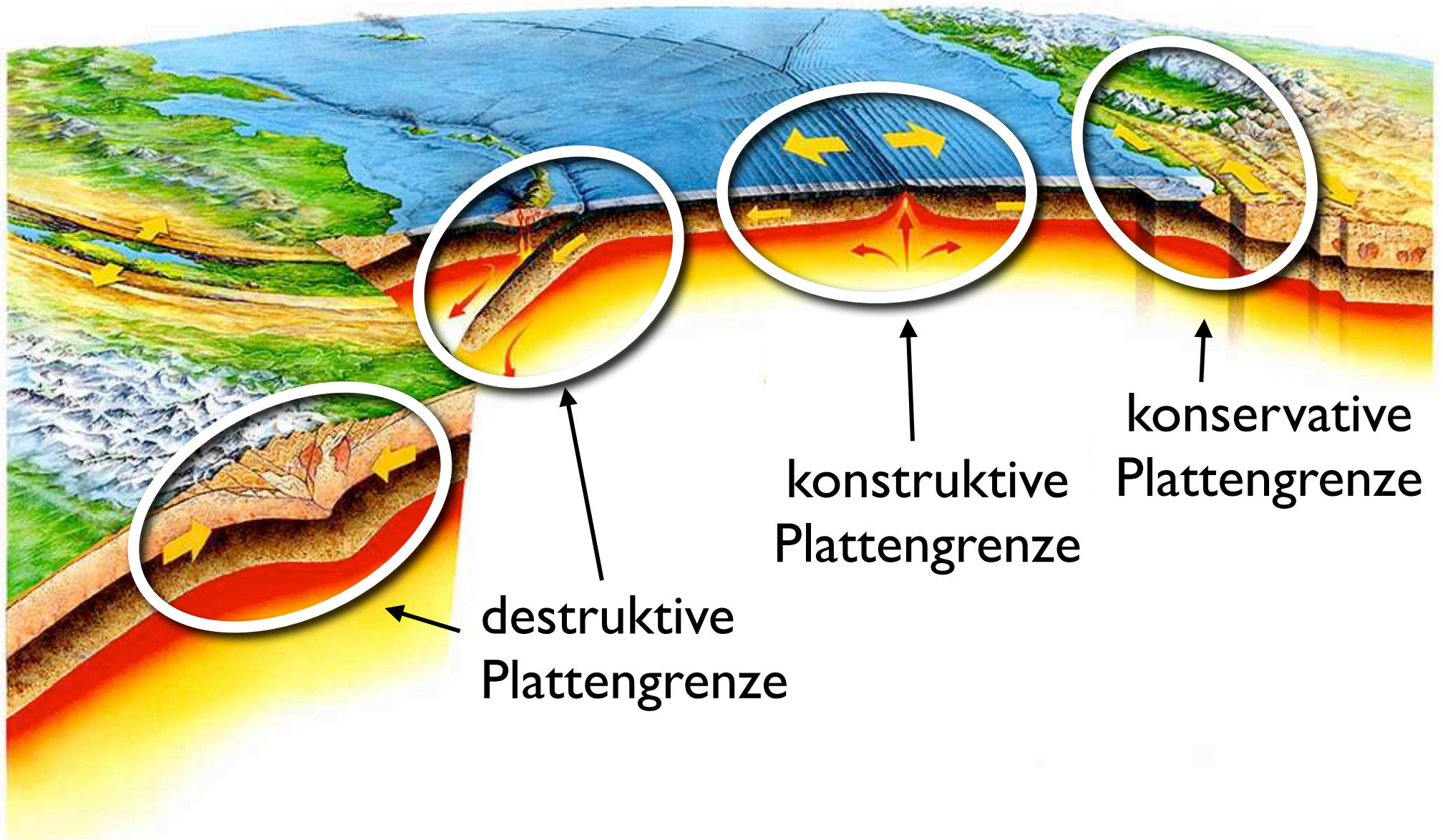
Weissert & Stössel: Ozean im Gebirge

Pfiffner: Geologie der Alpen



Erdbeben an Plattengrenzen

Der plattentektonische Zyklus



Rheologische Aufbau

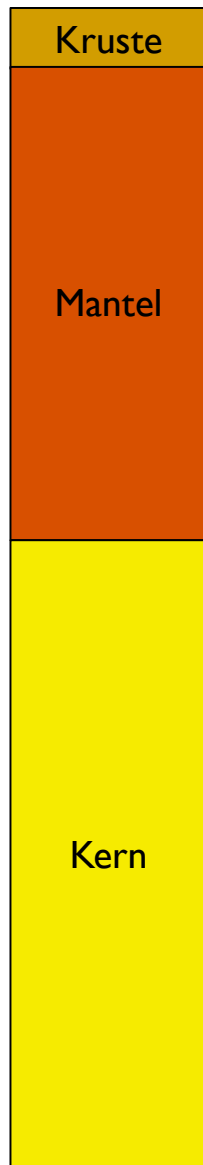
Plattengeschwindigkeiten:
bis zu 20 cm / Jahr



Aufbau der Erde

chemisch:

physikalisch:



Kruste

Mantel

Kern

Lithosphäre

Asthenosphäre

unterer Mantel

äusserer Kern

Innerer Kern

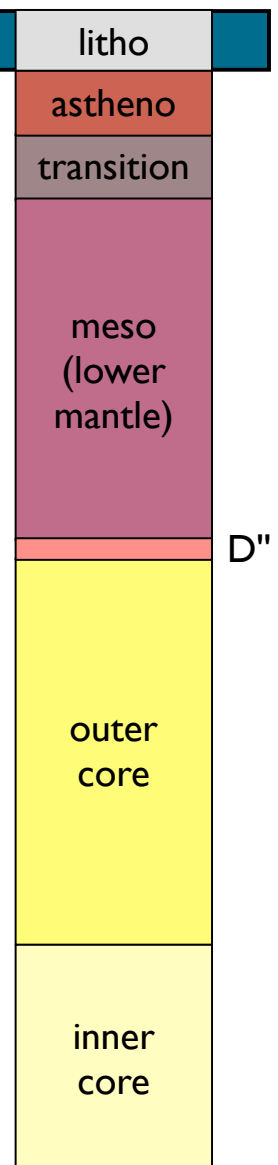
fest, stark

fest, schwach

fest, stark

flüssig

fest



litho

astheno

transition

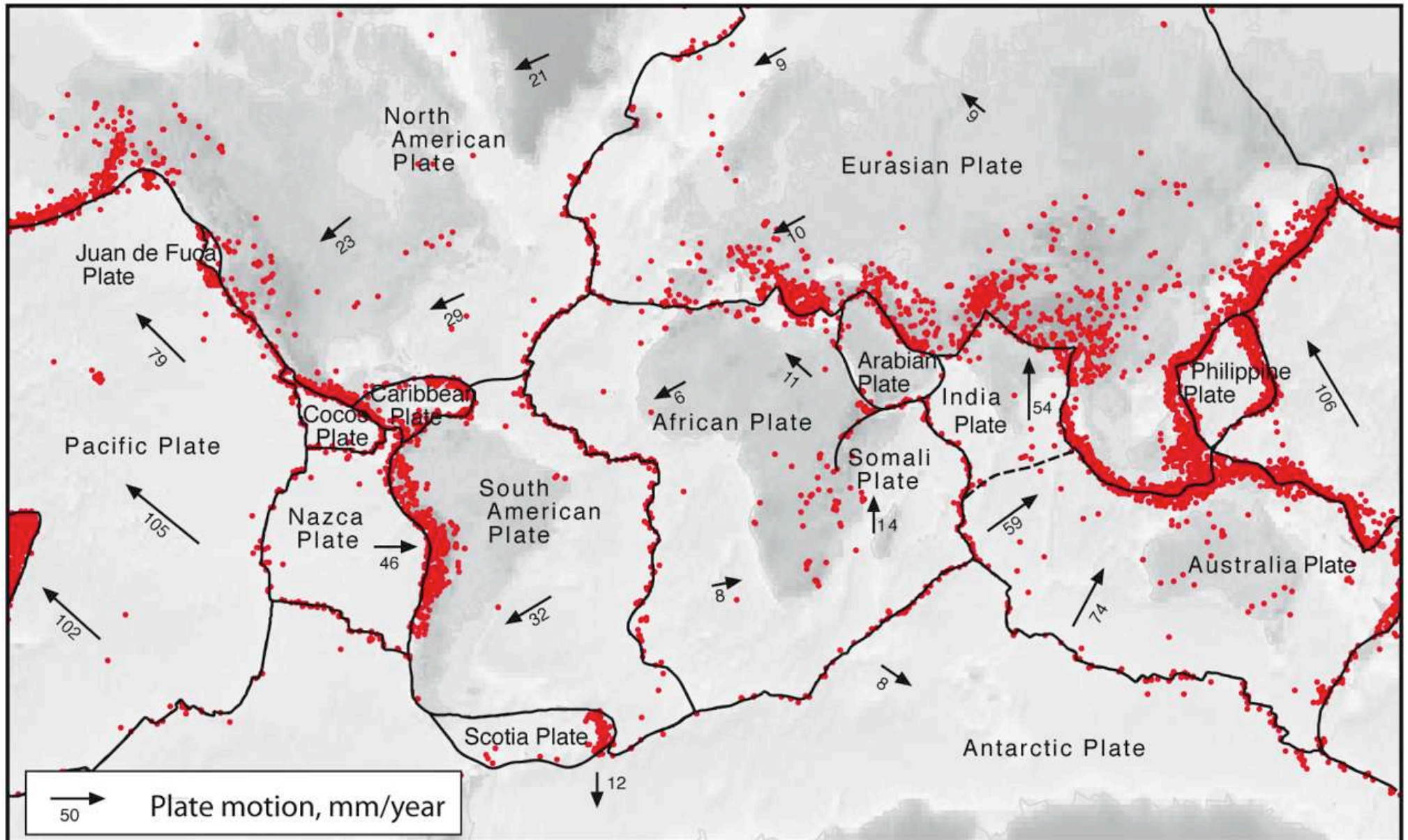
meso
(lower
mantle)

D''

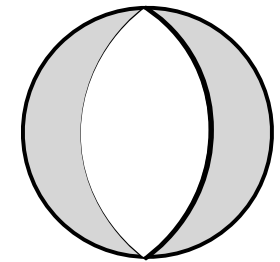
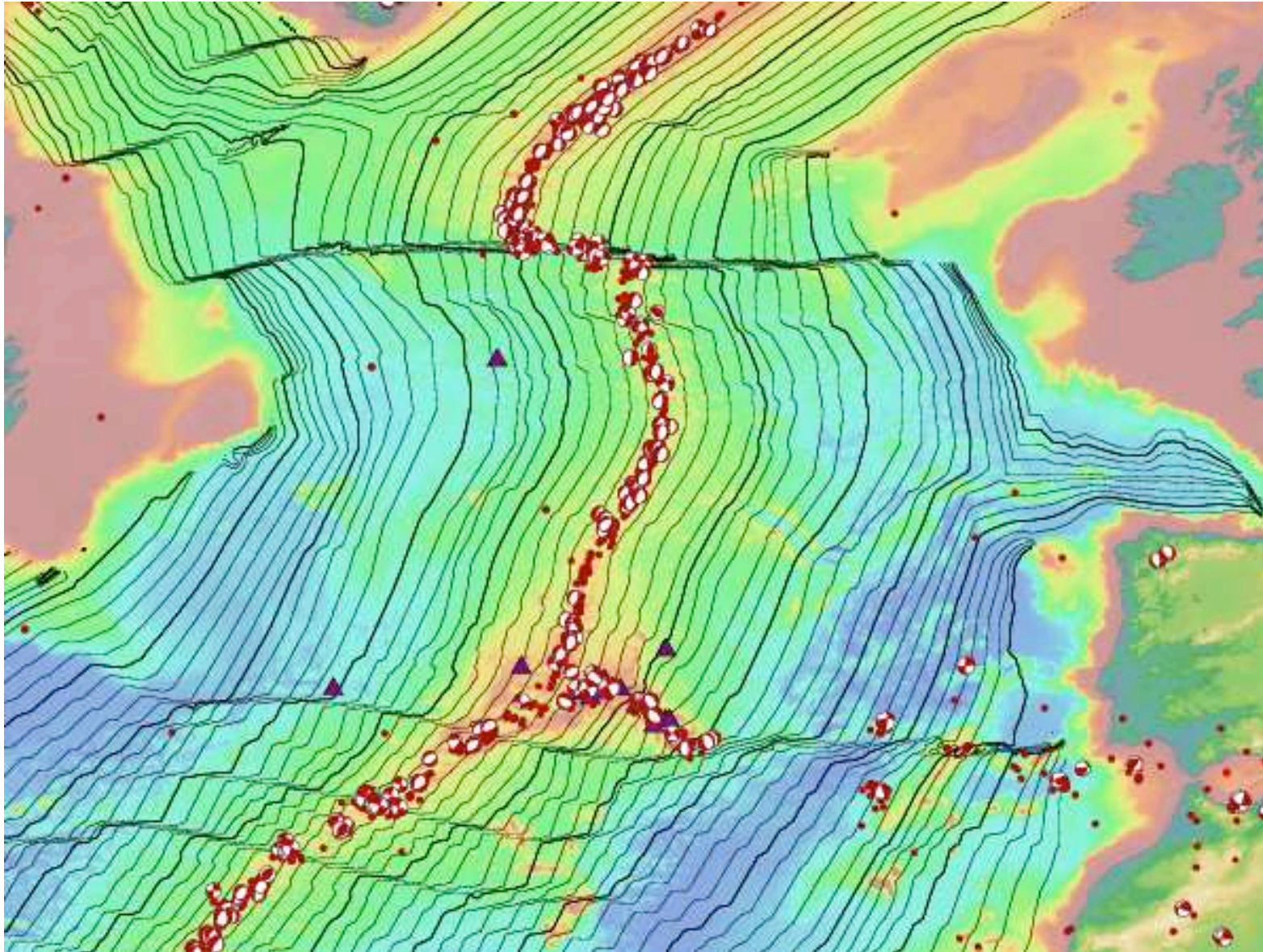
outer
core

inner
core

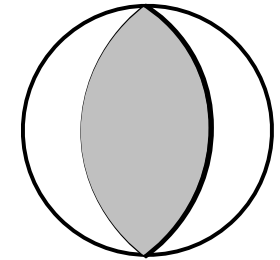
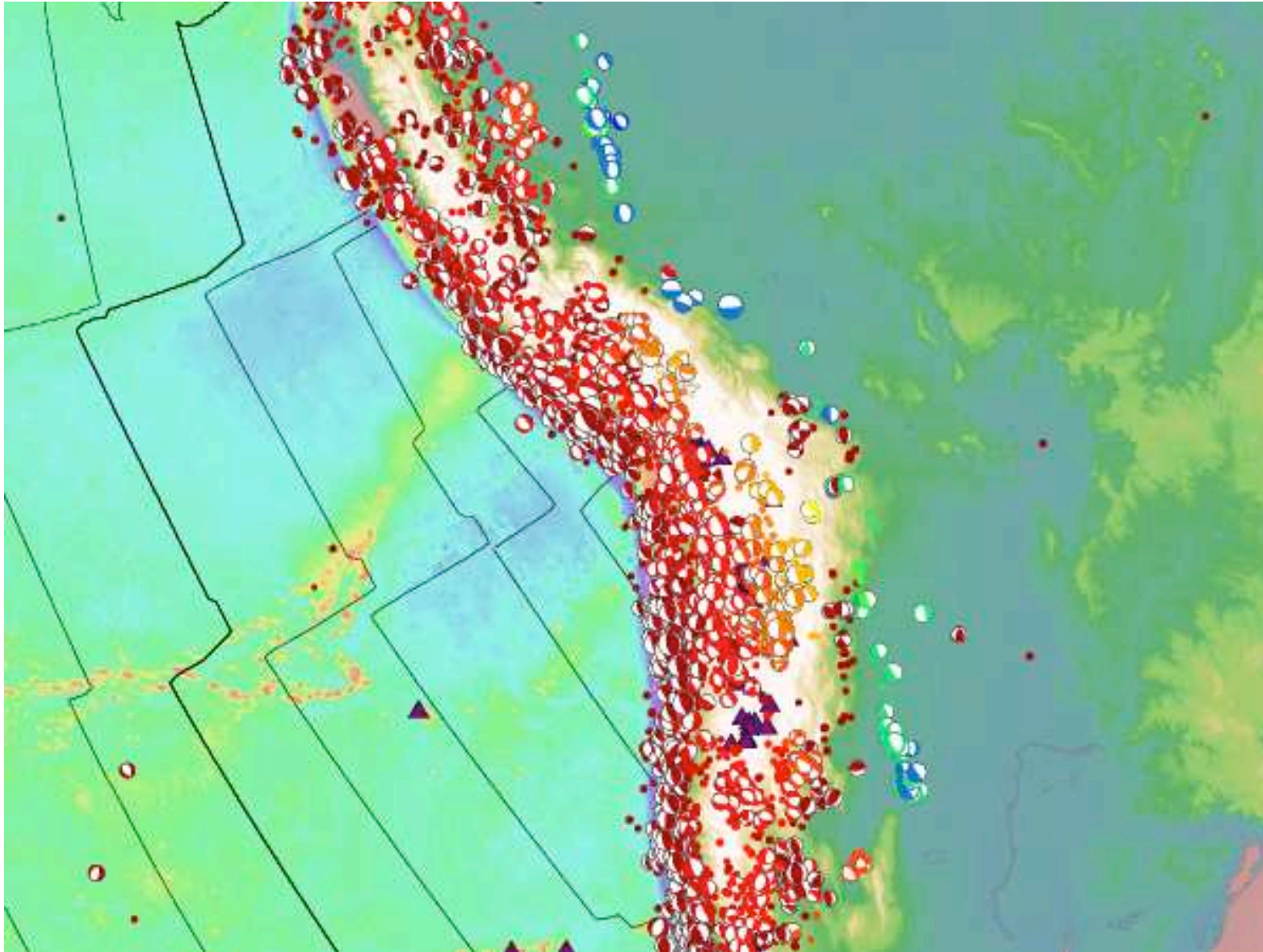
Plattenbewegung



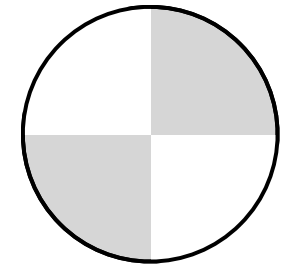
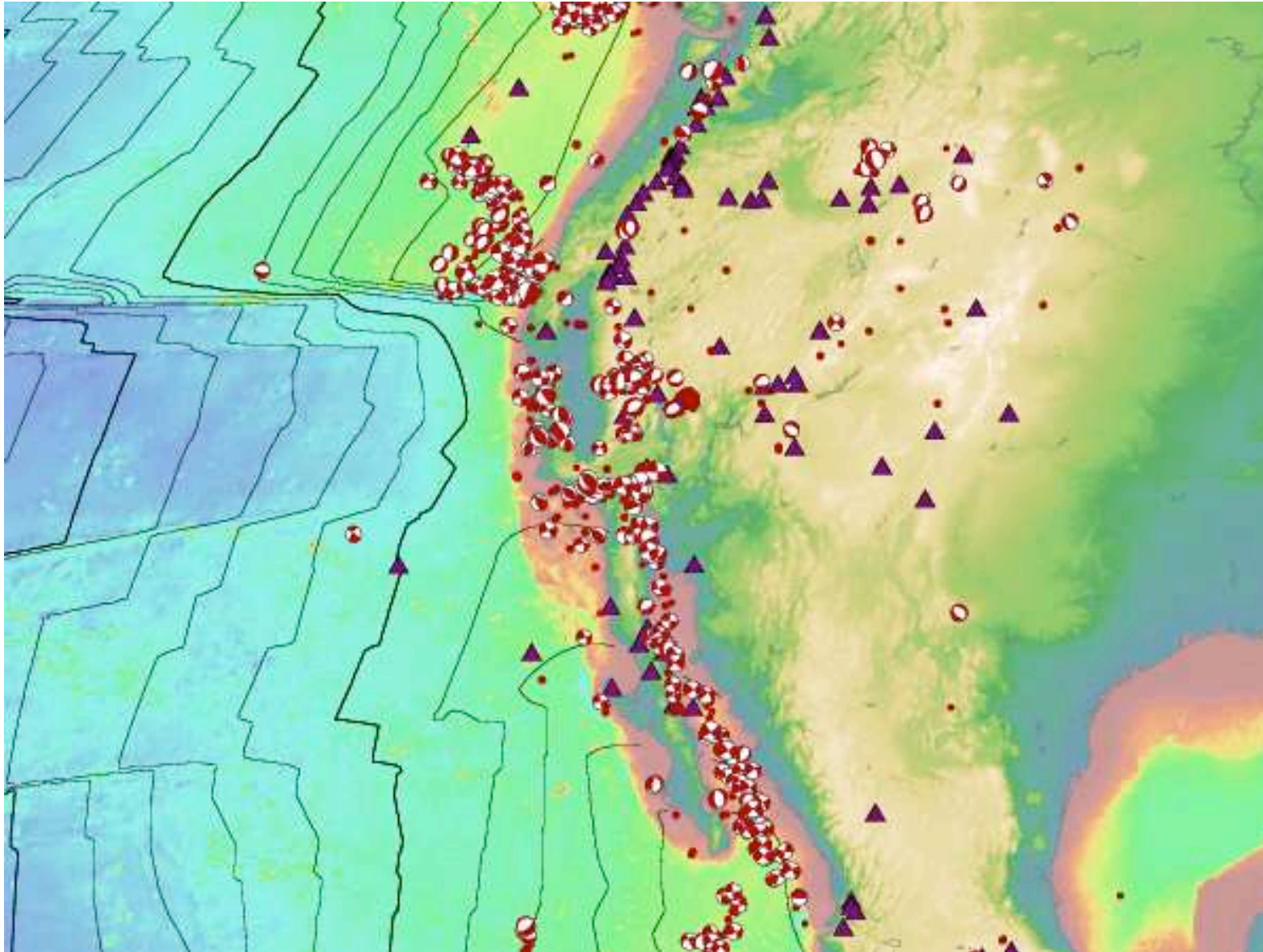
Erdbeben an Plattengrenzen



Erdbeben an Plattengrenzen

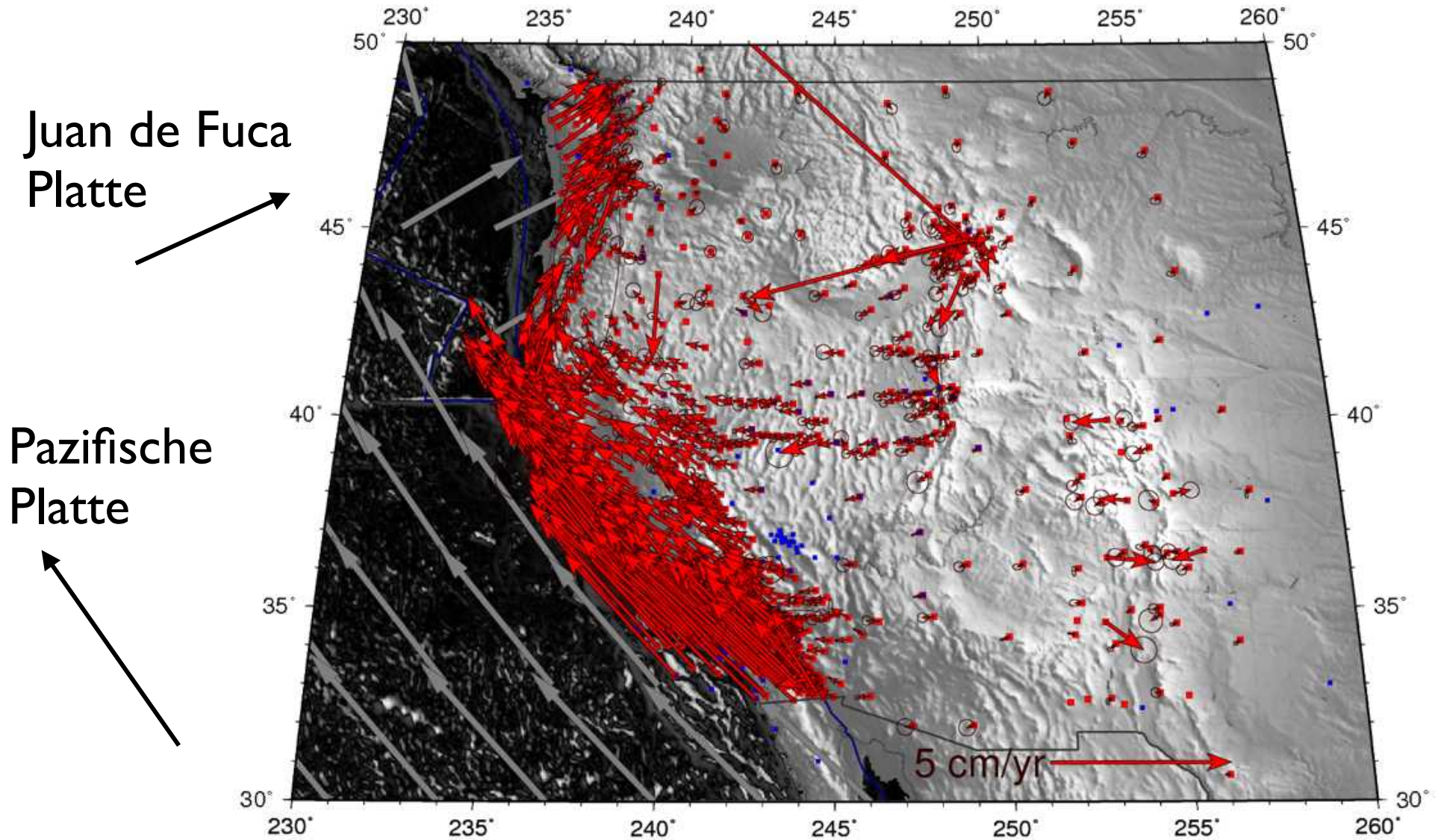


Erdbeben an Plattengrenzen



an Plattengrenzen: differentielle Bewegungen

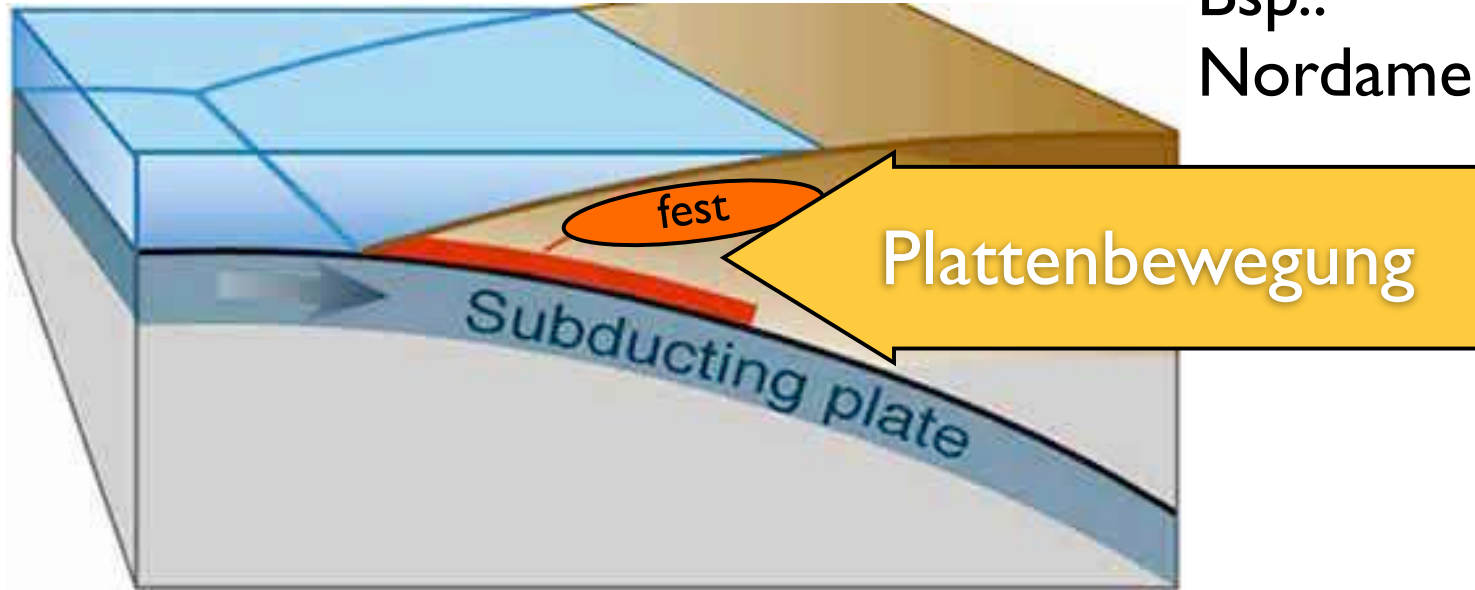
Nordamerikanische Platte



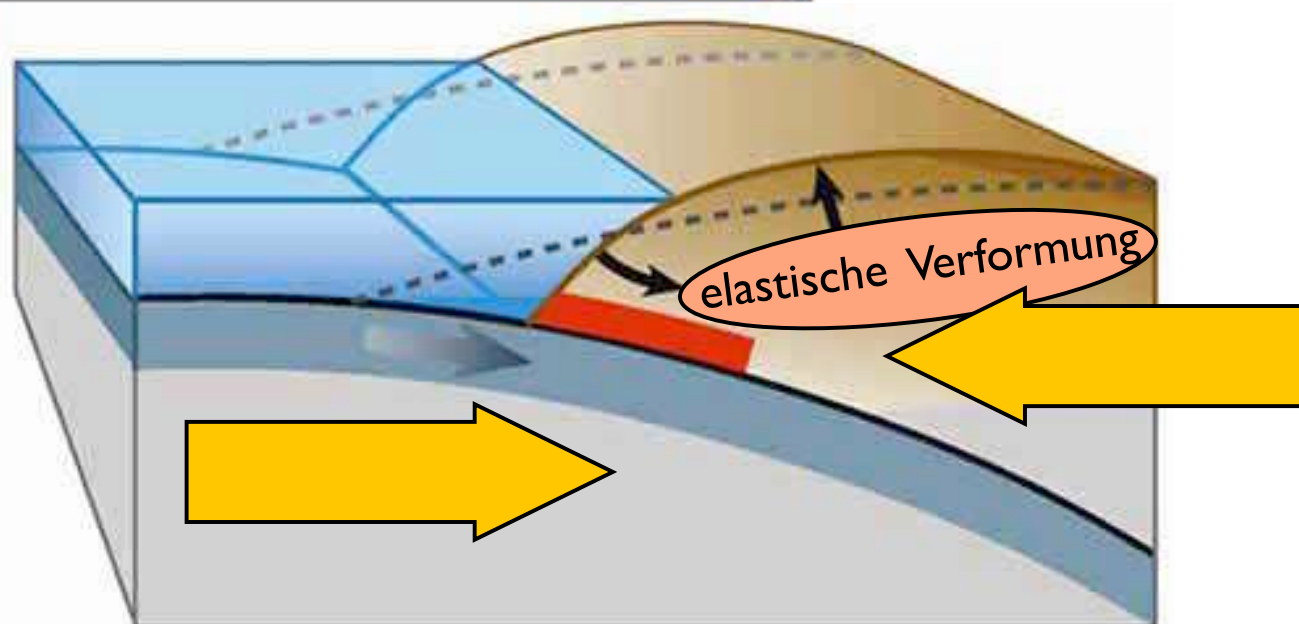
Anatomie eines Erdbebens

Elastische Spannung

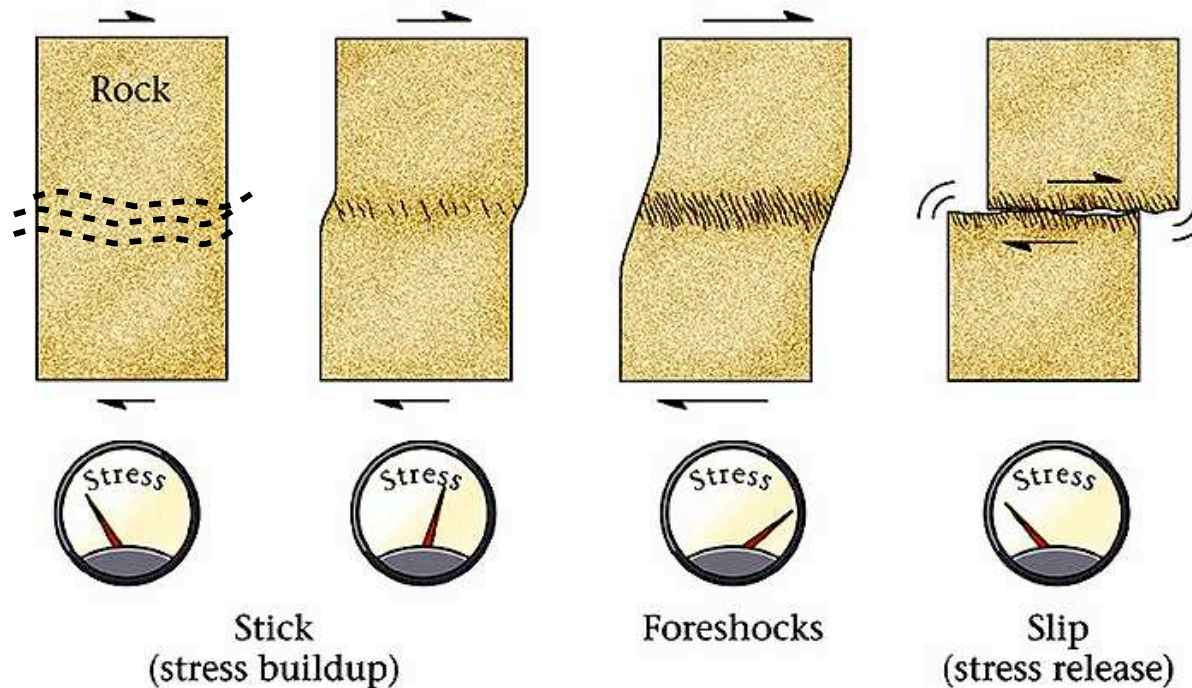
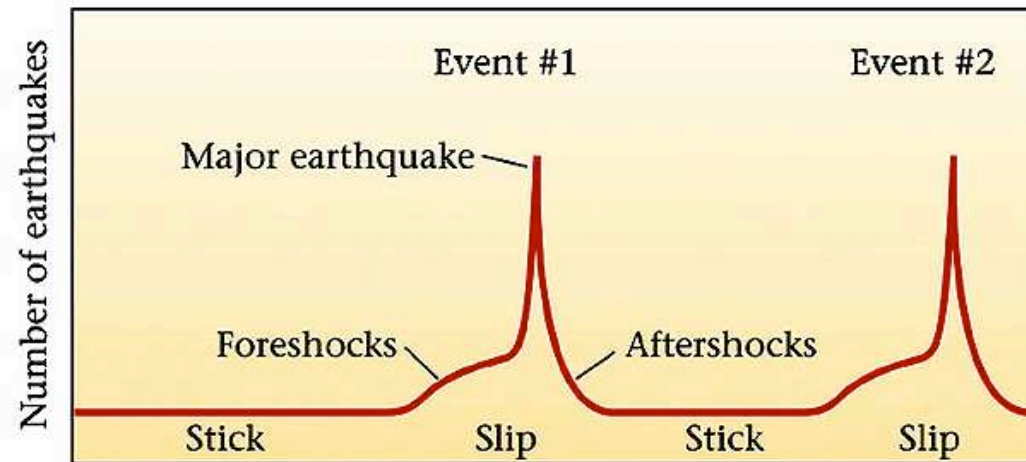
Bsp.:
Nordamerikanische Platte



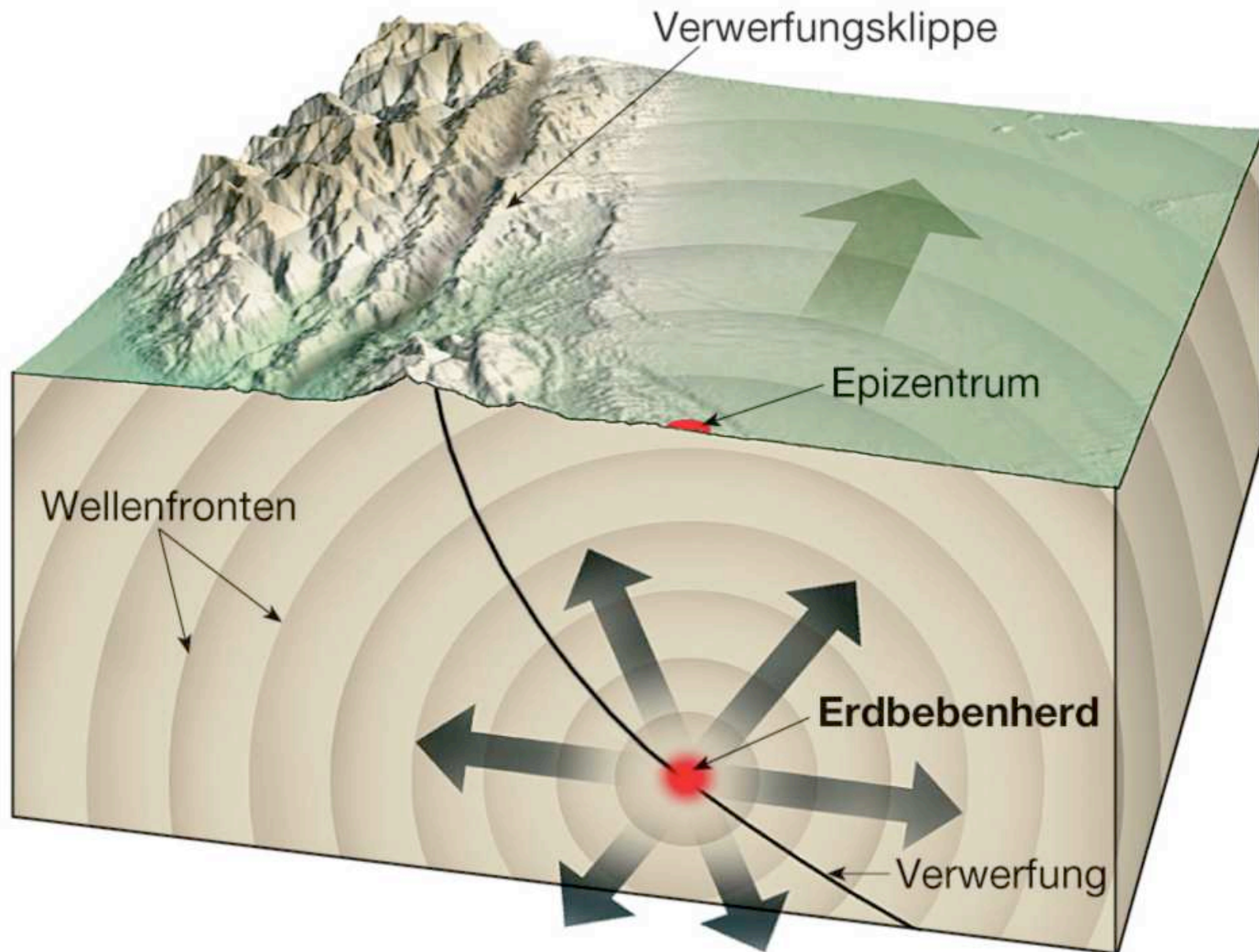
Bsp.:
Juan de Fuca
Platte



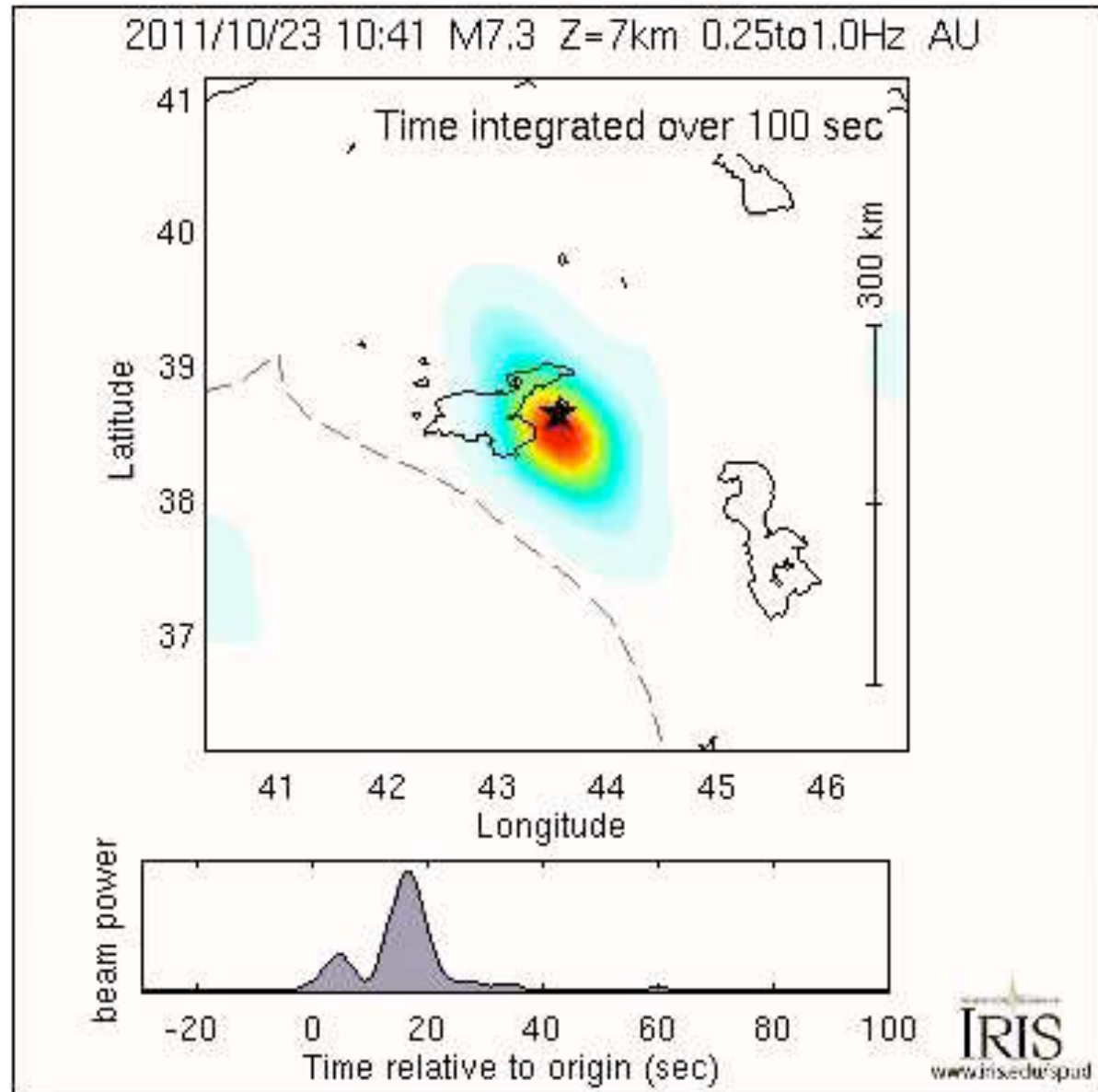
Erdbeben: Zeitlicher Ablauf



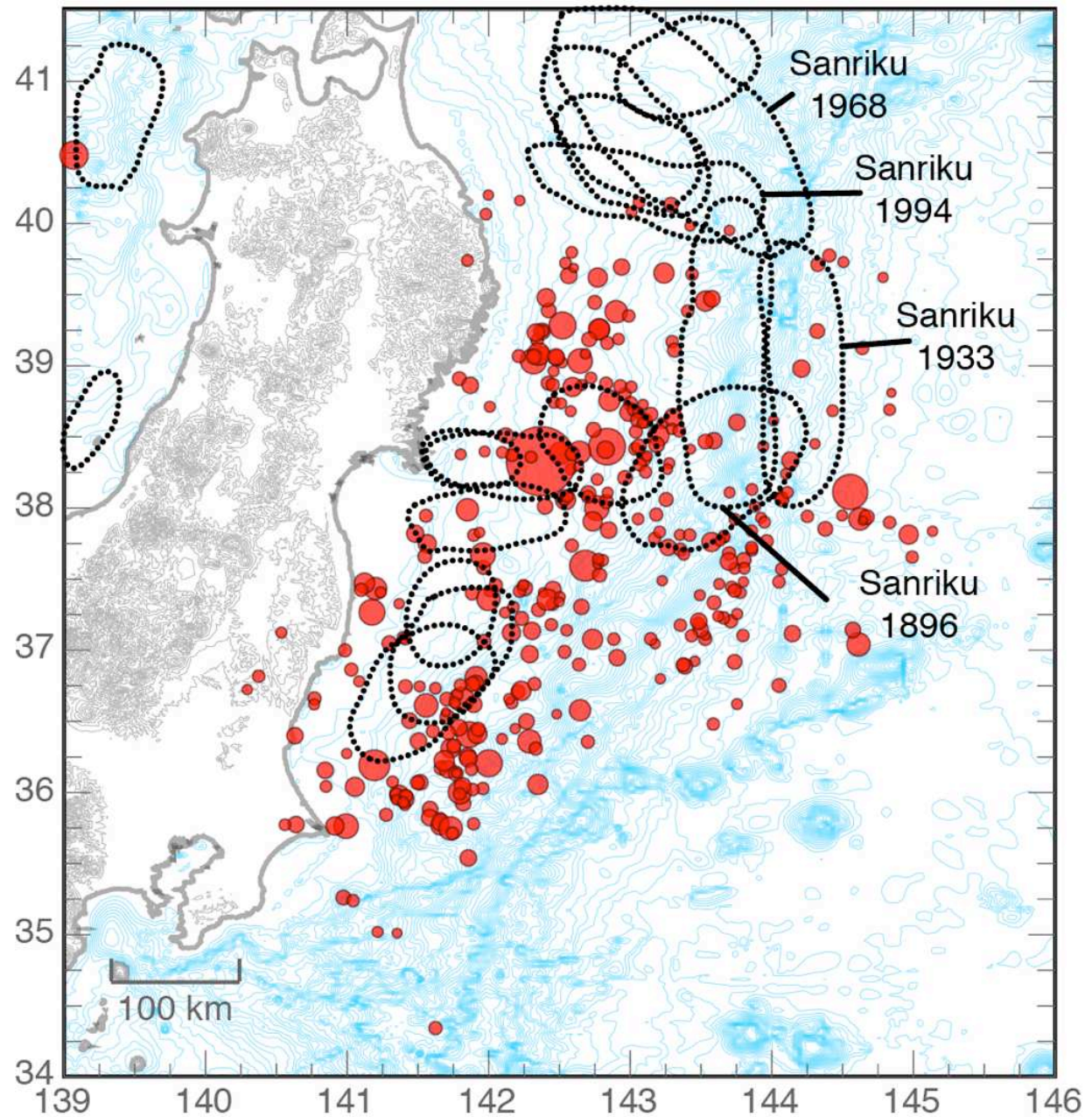
Erdbebenherd



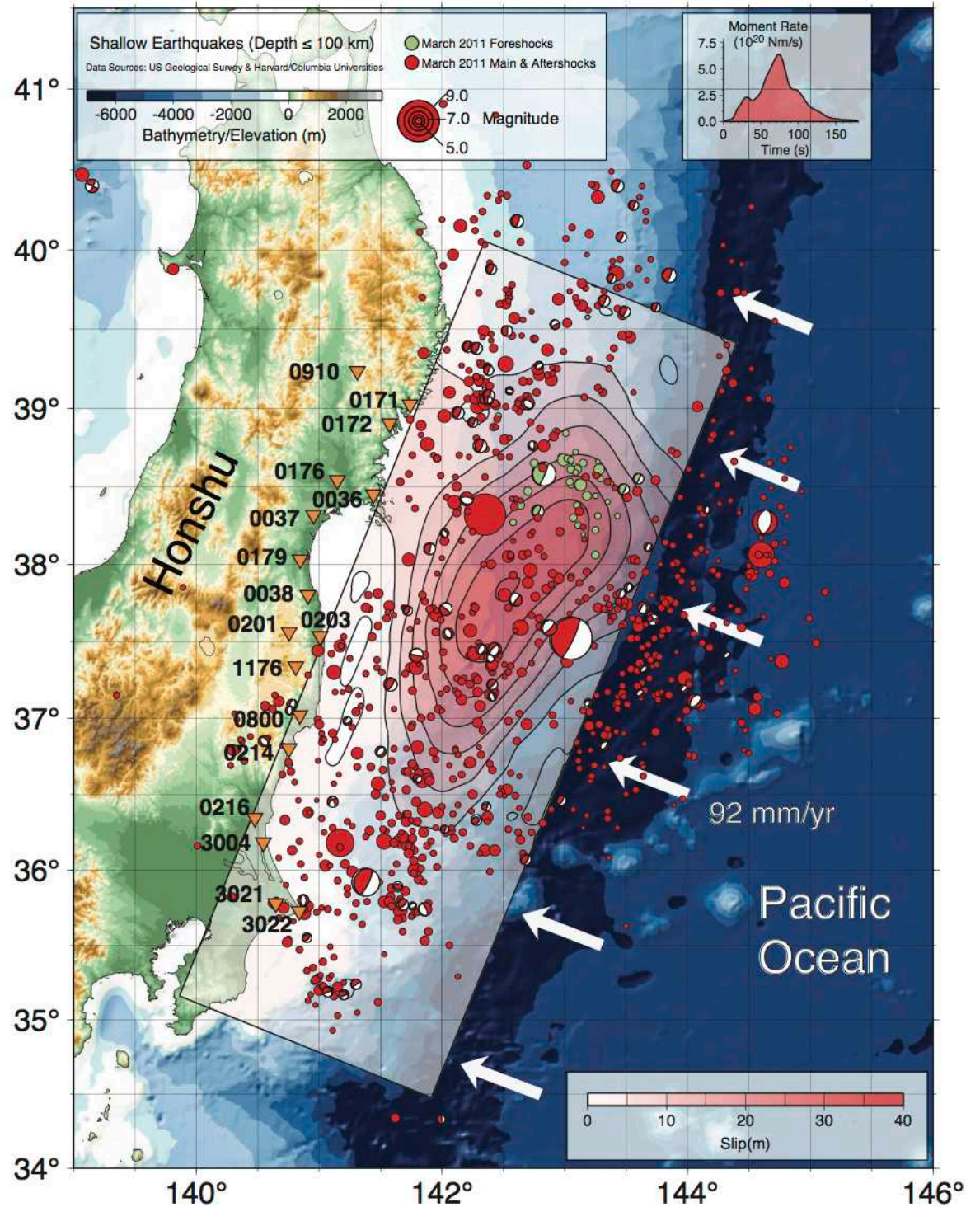
Herdfläche

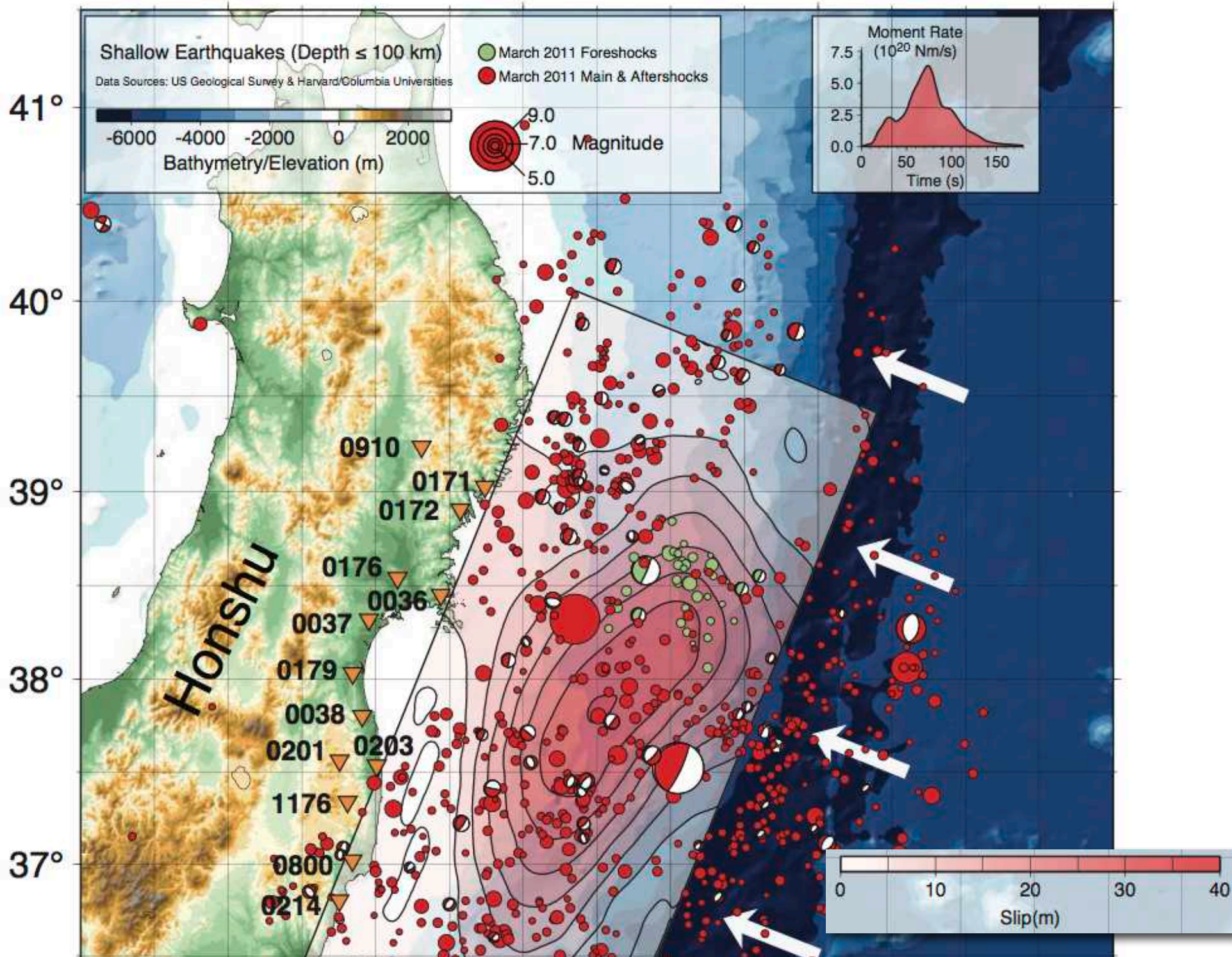


ein Erdbeben kommt selten allein

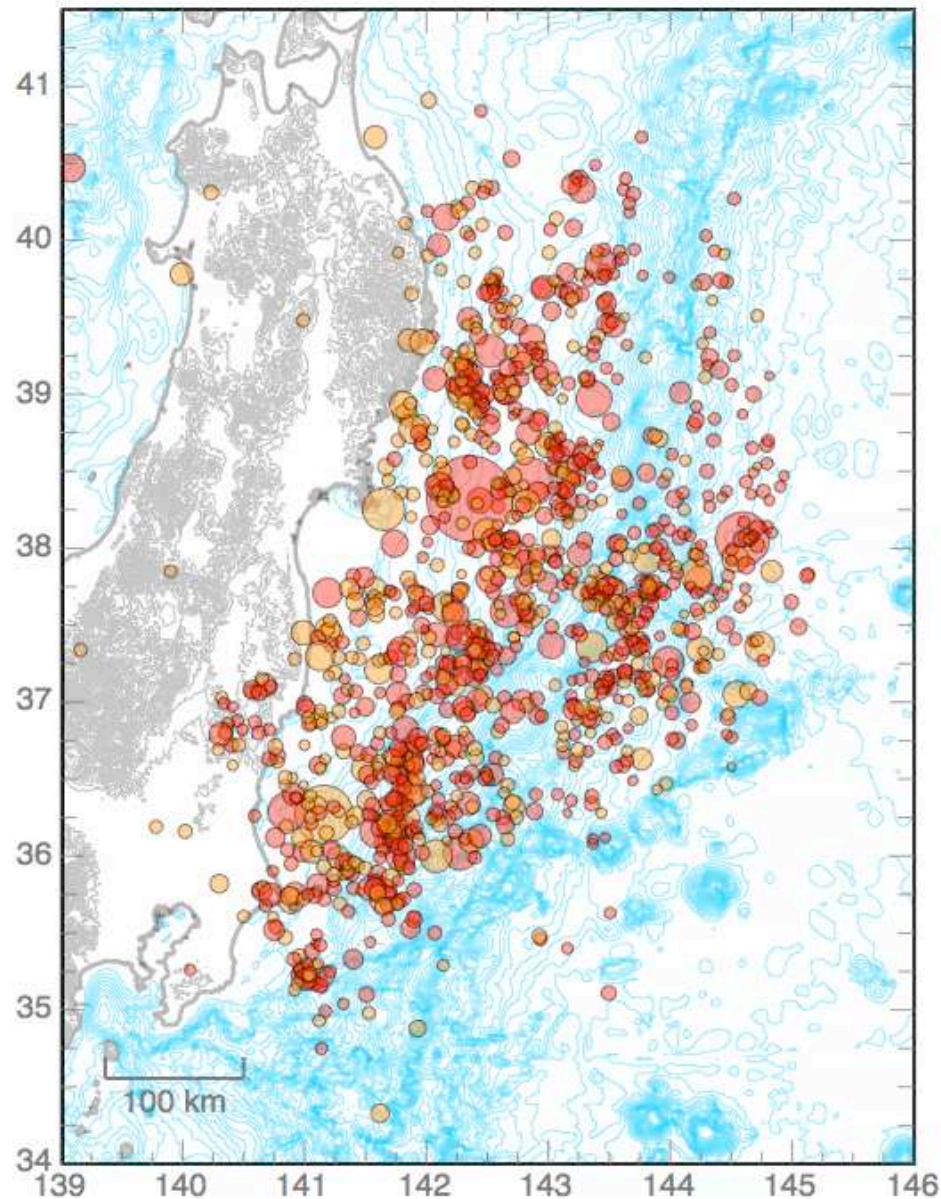
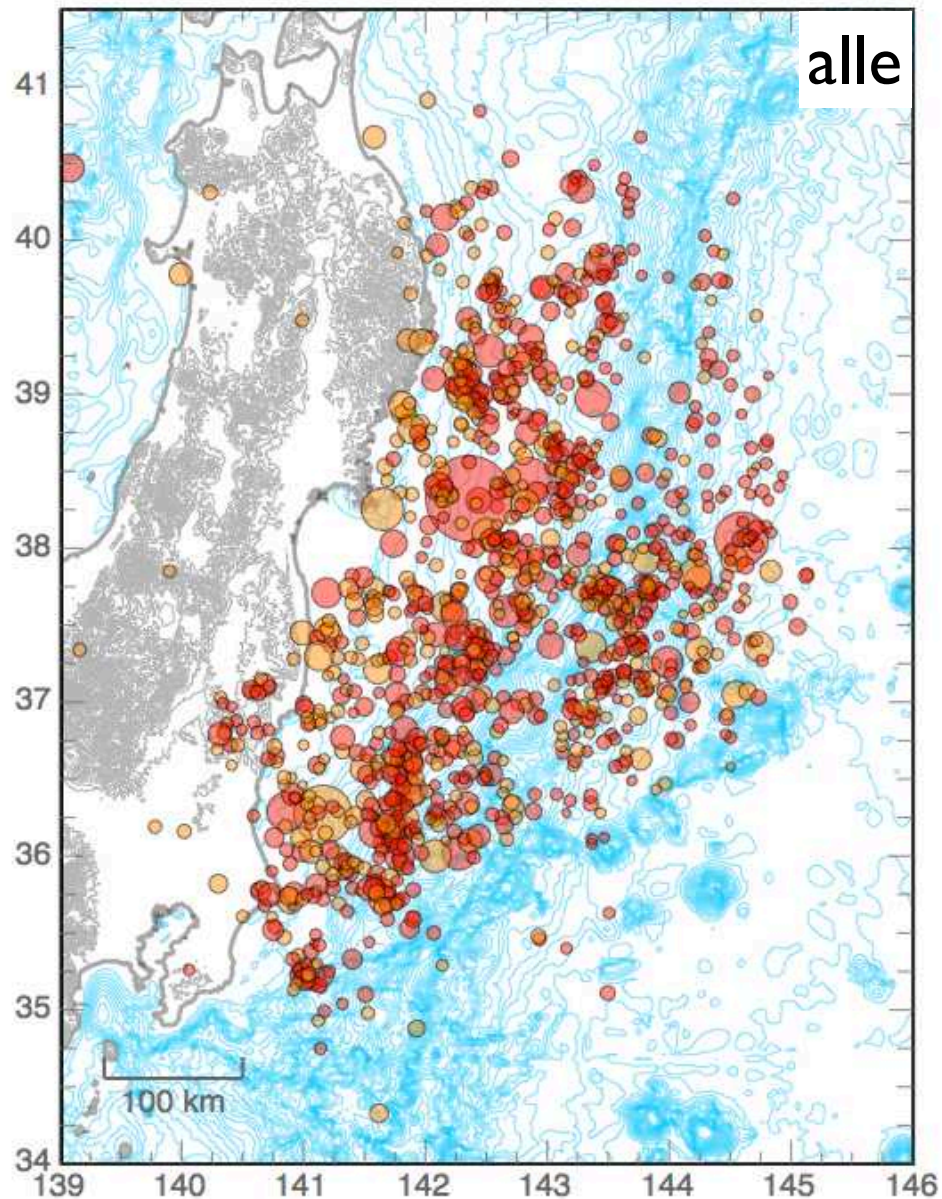


Vorläufer



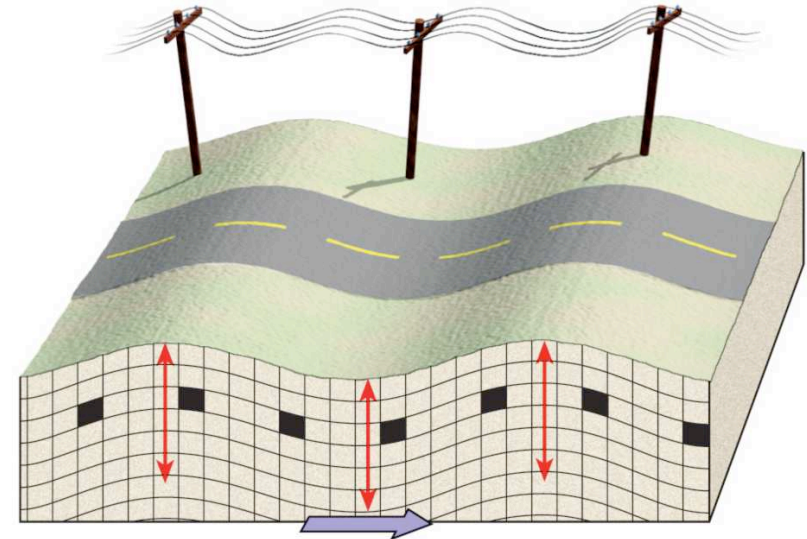
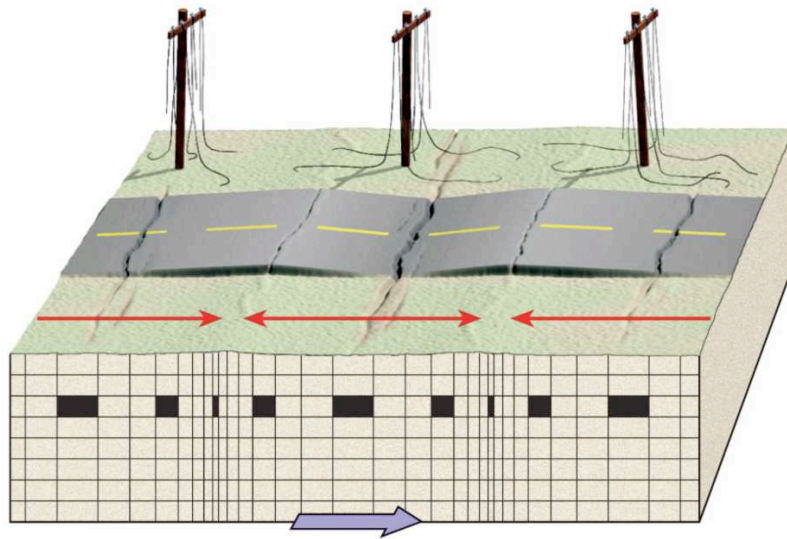


Nachbeben (aftershocks)



zerstörerische Erdbebenwellen

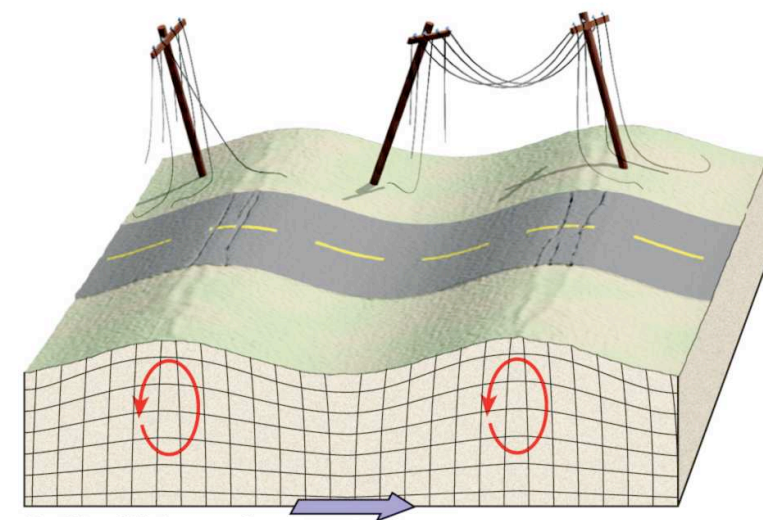
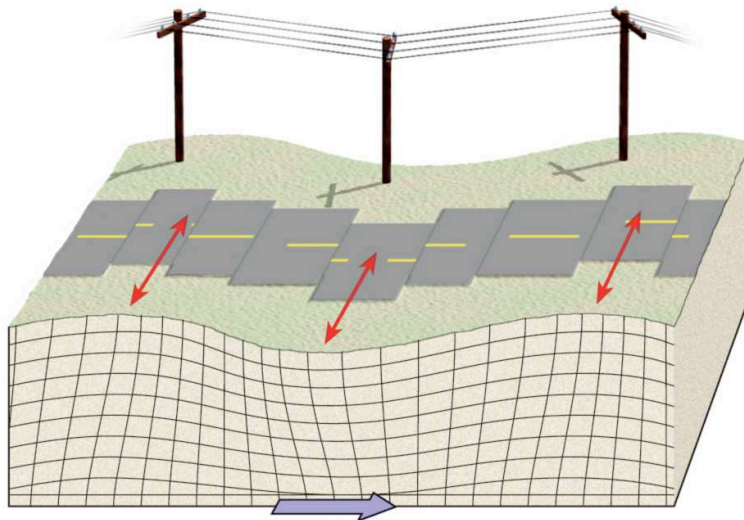
Seismische Wellen



Körperwellen

Kompressionswellen
P(primär) - Wellen

Scherwellen
S(ekundär) - Wellen

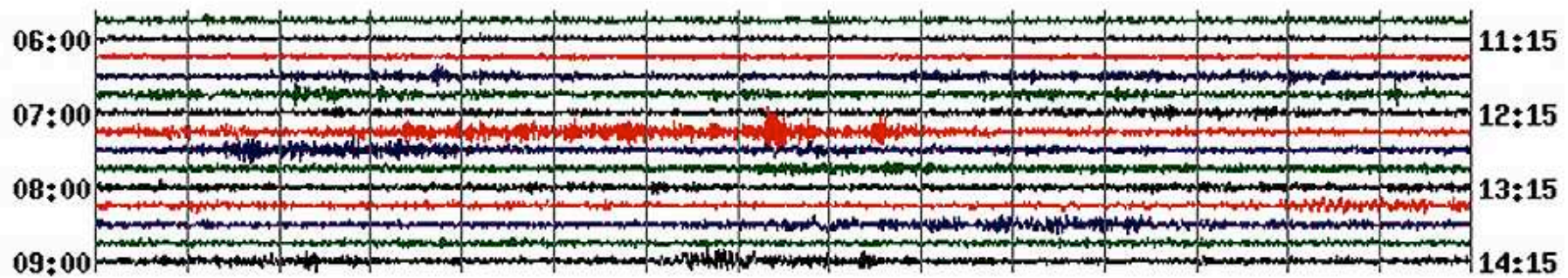
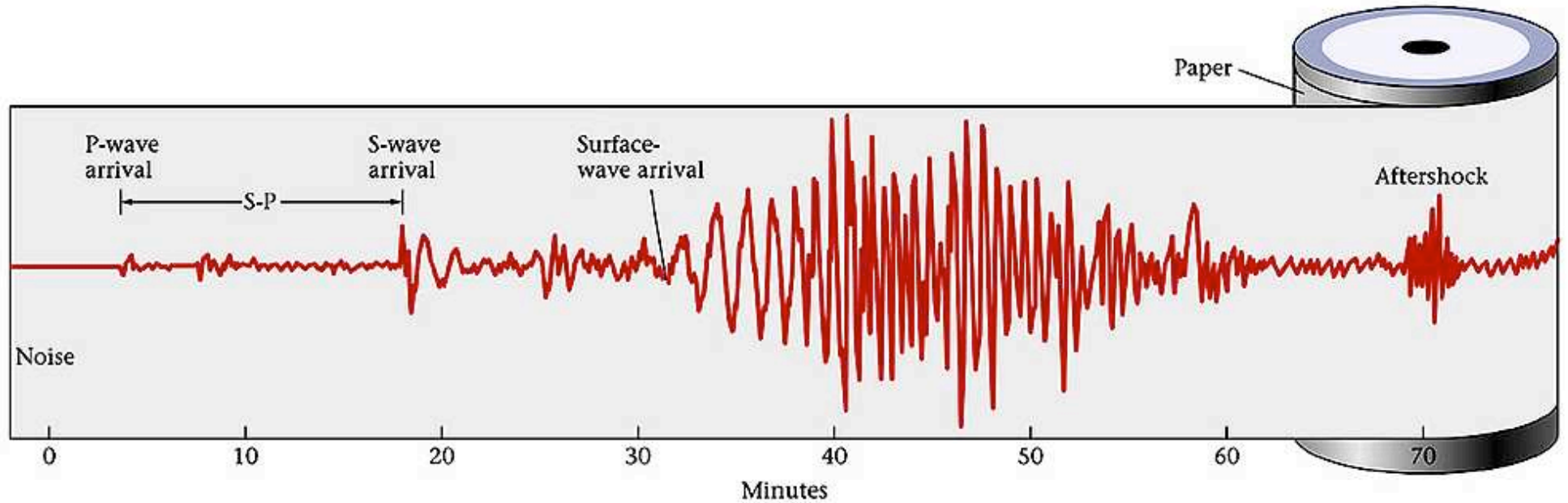


Oberflächenwellen

Love Wellen

Raleigh Wellen

Amplituden

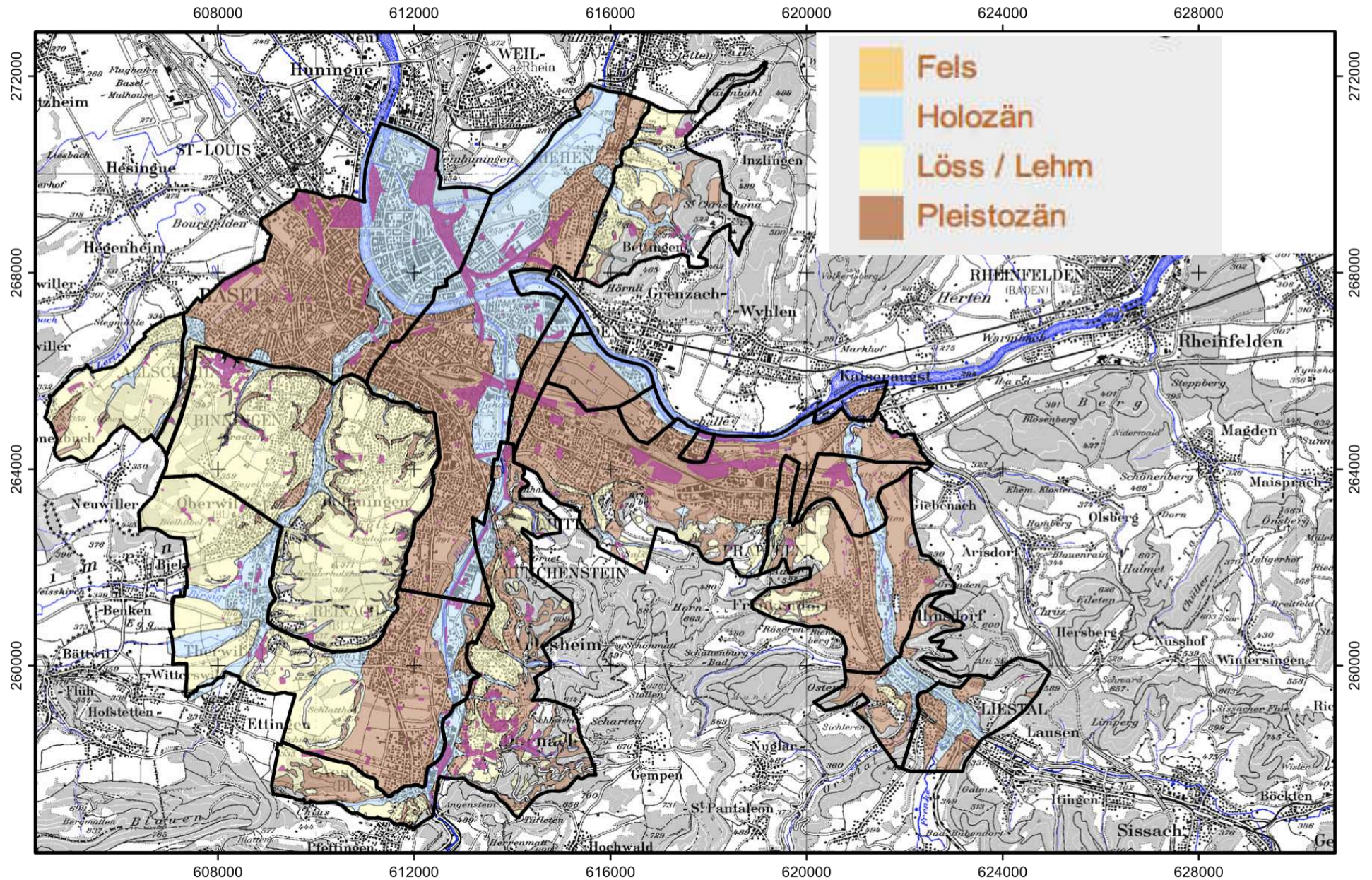


Resonanzschwingungen

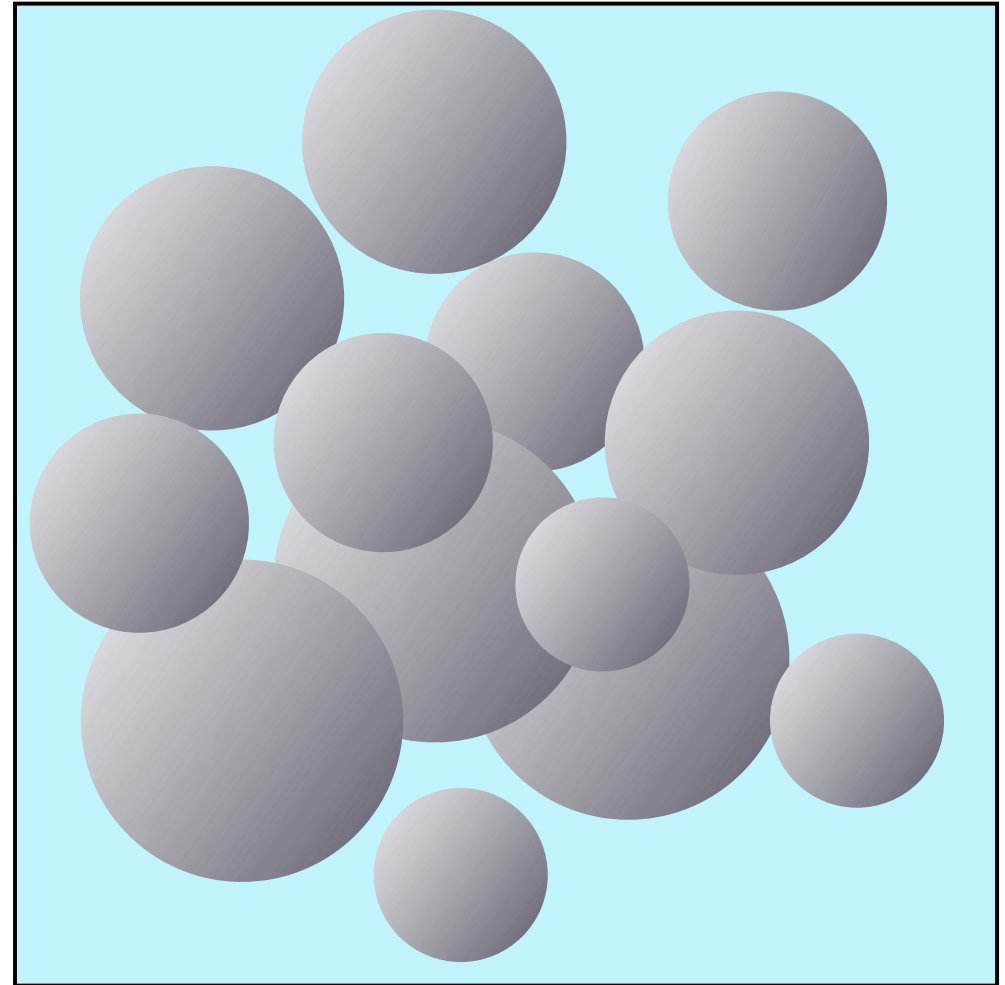
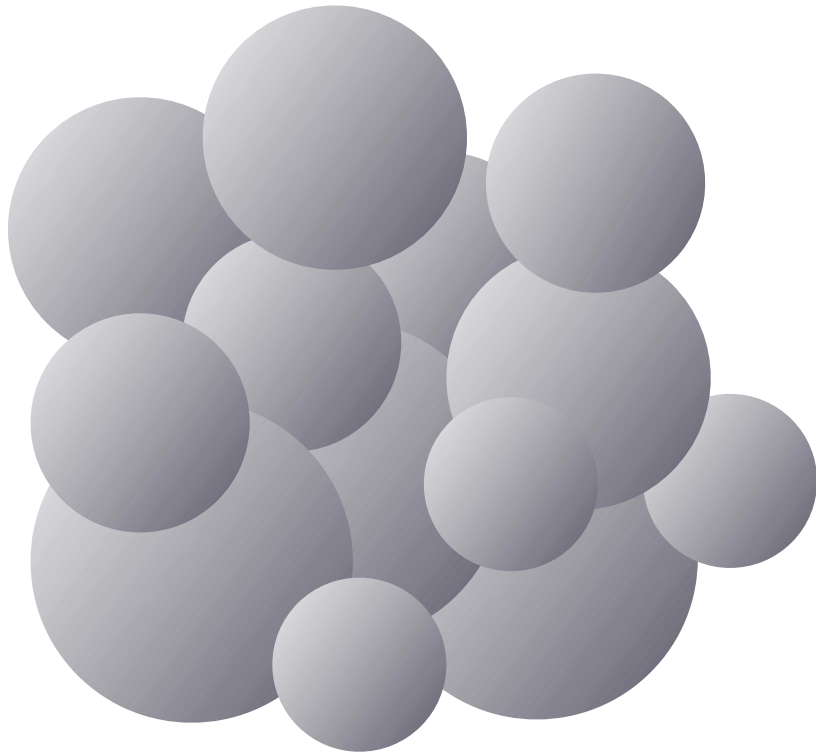
Modeling Resonance in Buildings
using uncooked Spaghetti noodles

Mikrozonierung (Zonen- und Subzonen)

Departement Umweltwissenschaften
Angewandte und Umweltgeologie



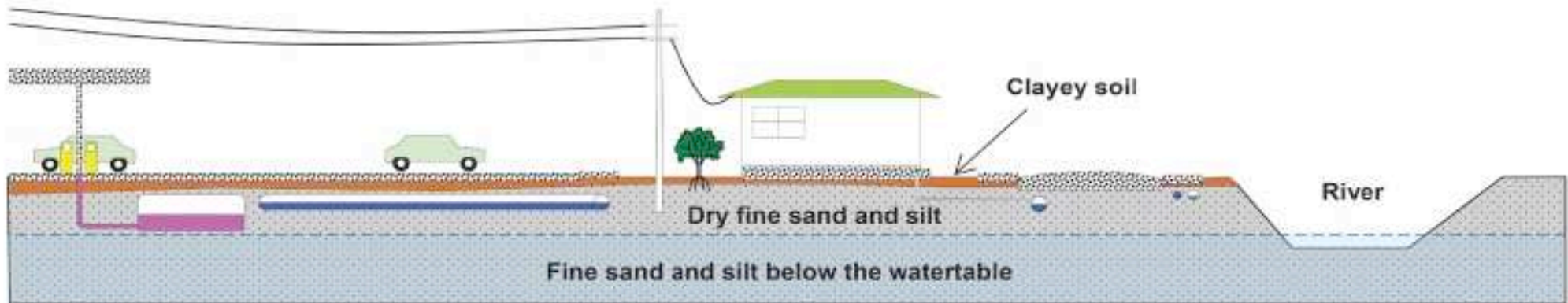
Porendruck



Bodenverflüssigung

Before the Earthquake

Areas of flat, low lying land with groundwater only a few metres below the surface, can support buildings and roads, buried pipes, cables and tanks under normal conditions.



During and after the Earthquake

During the earthquake fine sand, silt and water moves up under pressure through cracks and other weak areas to erupt onto the ground surface. Near rivers the pressure is relieved to the side as the ground moves sideways into the river channels.

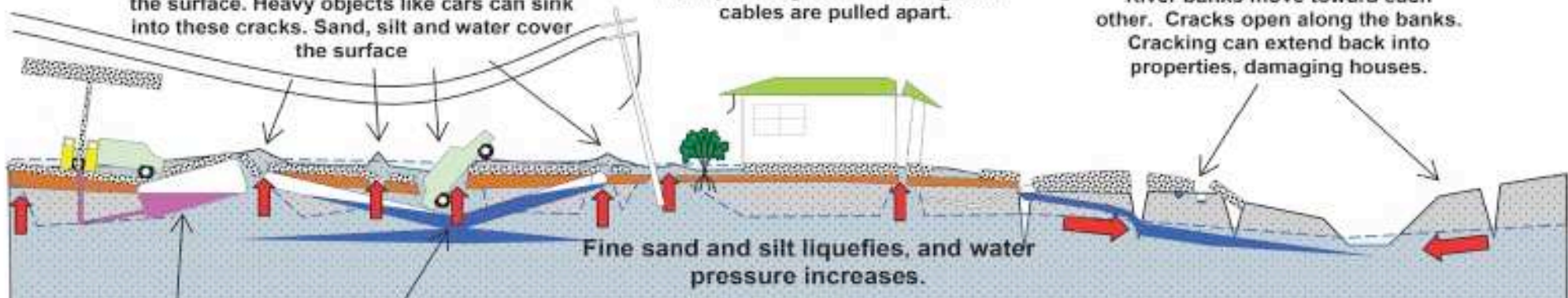
Sand Boils (Sand Volcanoes)

Sand, silt and water erupts upward under pressure through cracks and flows out onto the surface. Heavy objects like cars can sink into these cracks. Sand, silt and water cover the surface

Power poles are pulled over by their wires as they can't be supported in the liquefied ground. Underground cables are pulled apart.

Lateral Spreading

River banks move toward each other. Cracks open along the banks. Cracking can extend back into properties, damaging houses.



Tanks, pipes and manholes float up in the liquefied ground and break through the surface. Pipes break, water and sewage leaks into the ground.

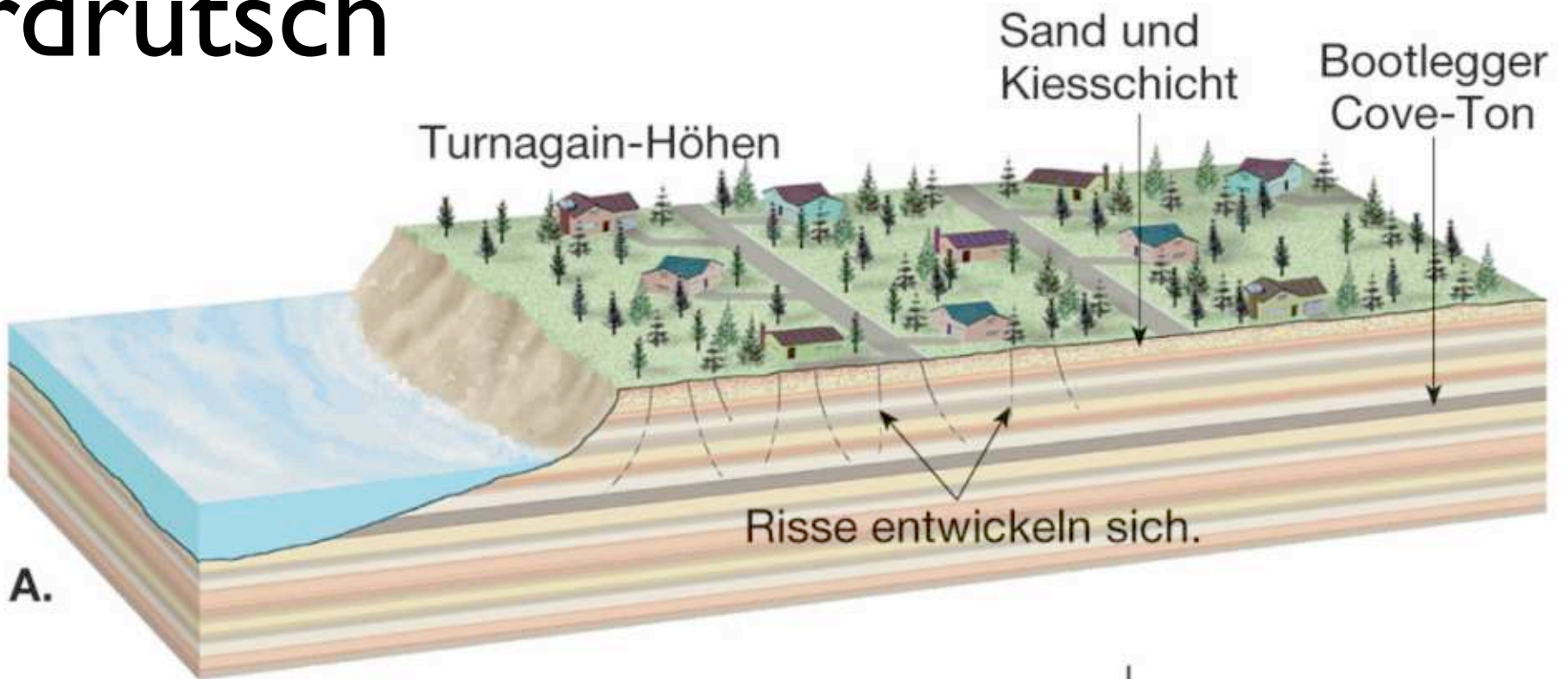
Bodenverflüssigung



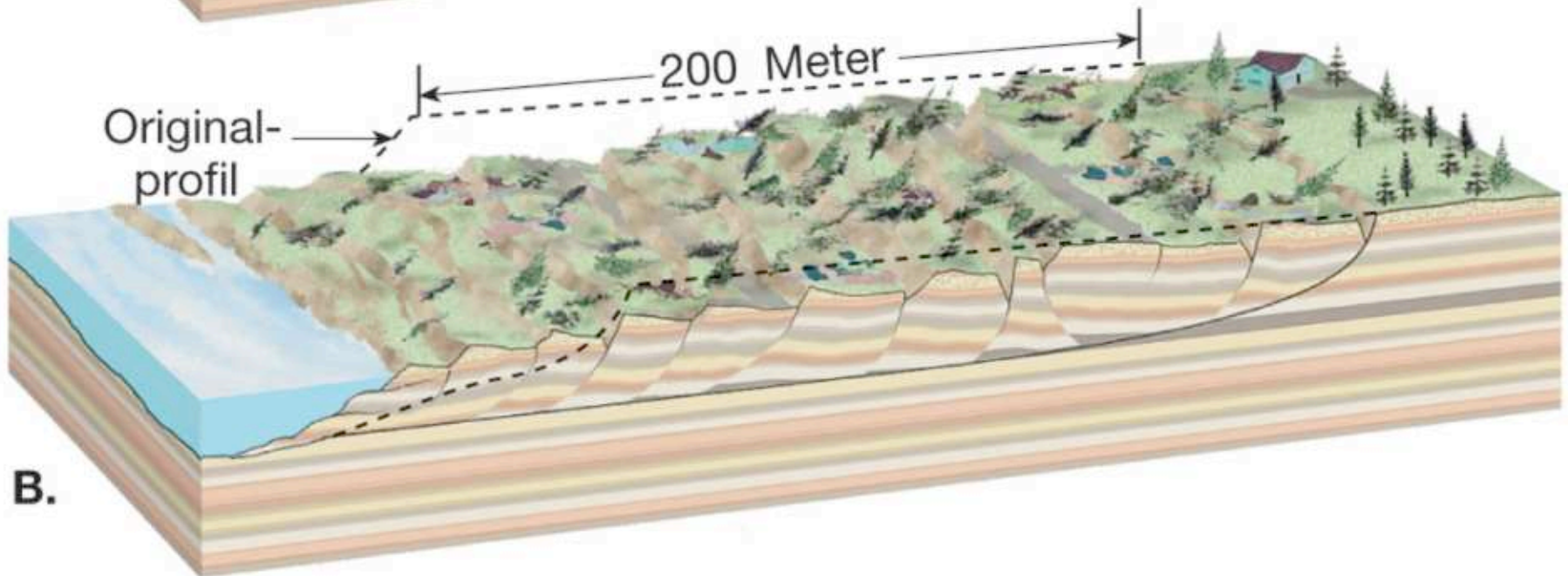
Bodenverflüssigung



Erdrutsch



A.



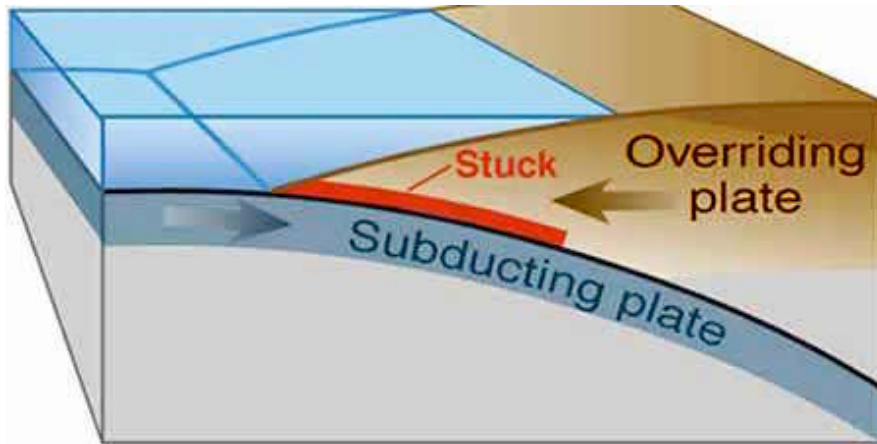
B.

Erdrutsch

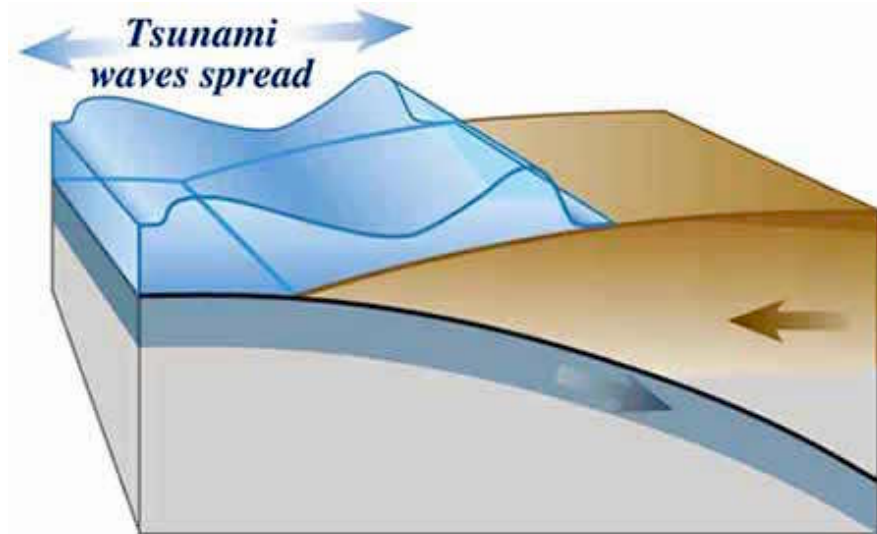
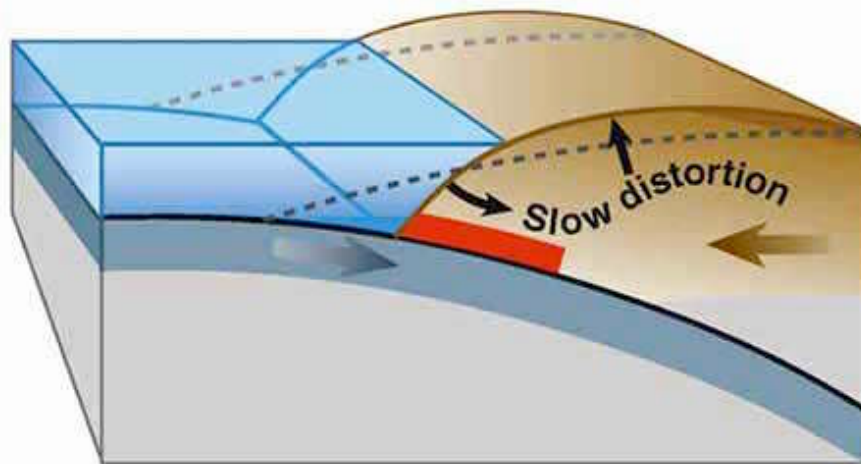
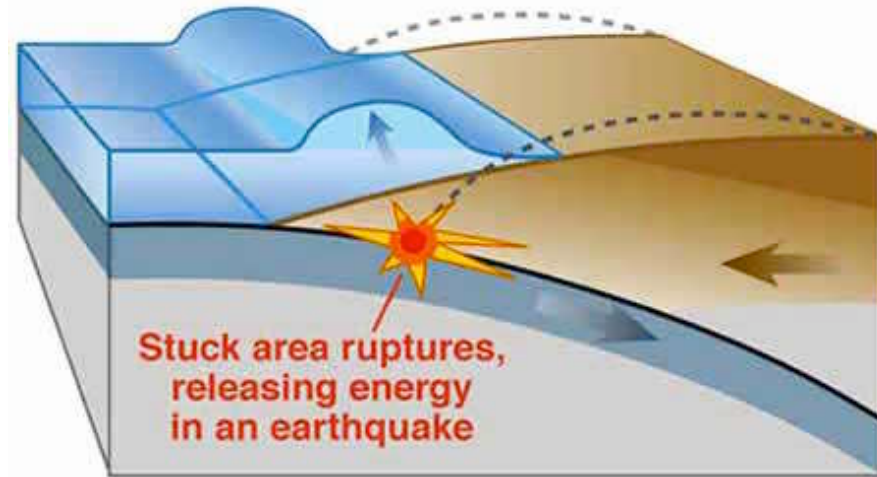


Tsunami

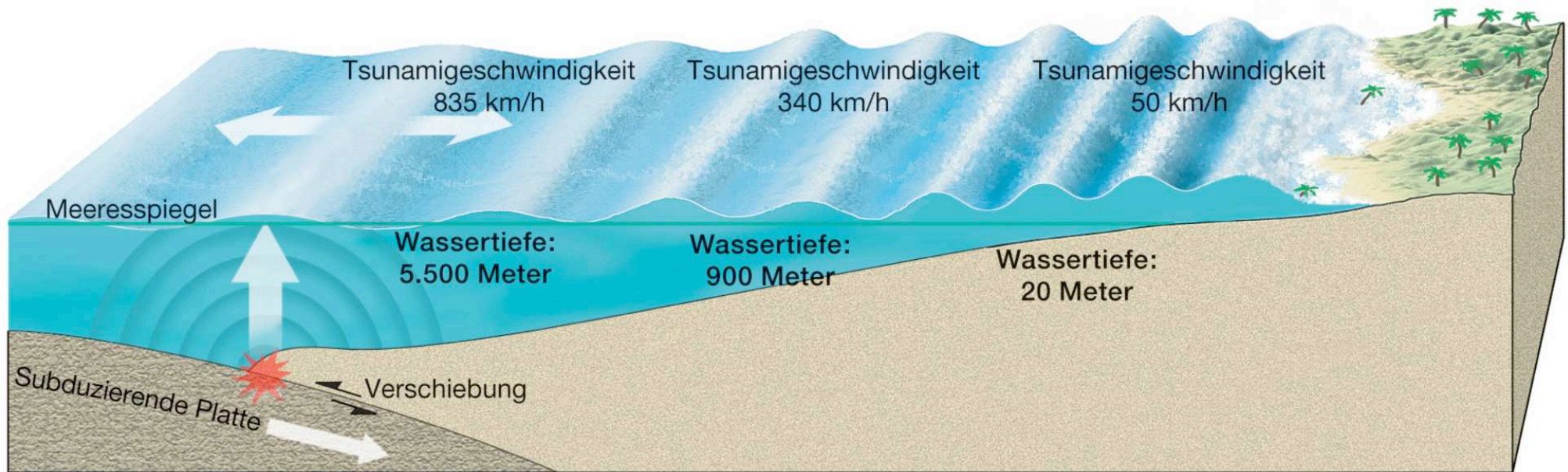
Tsunami



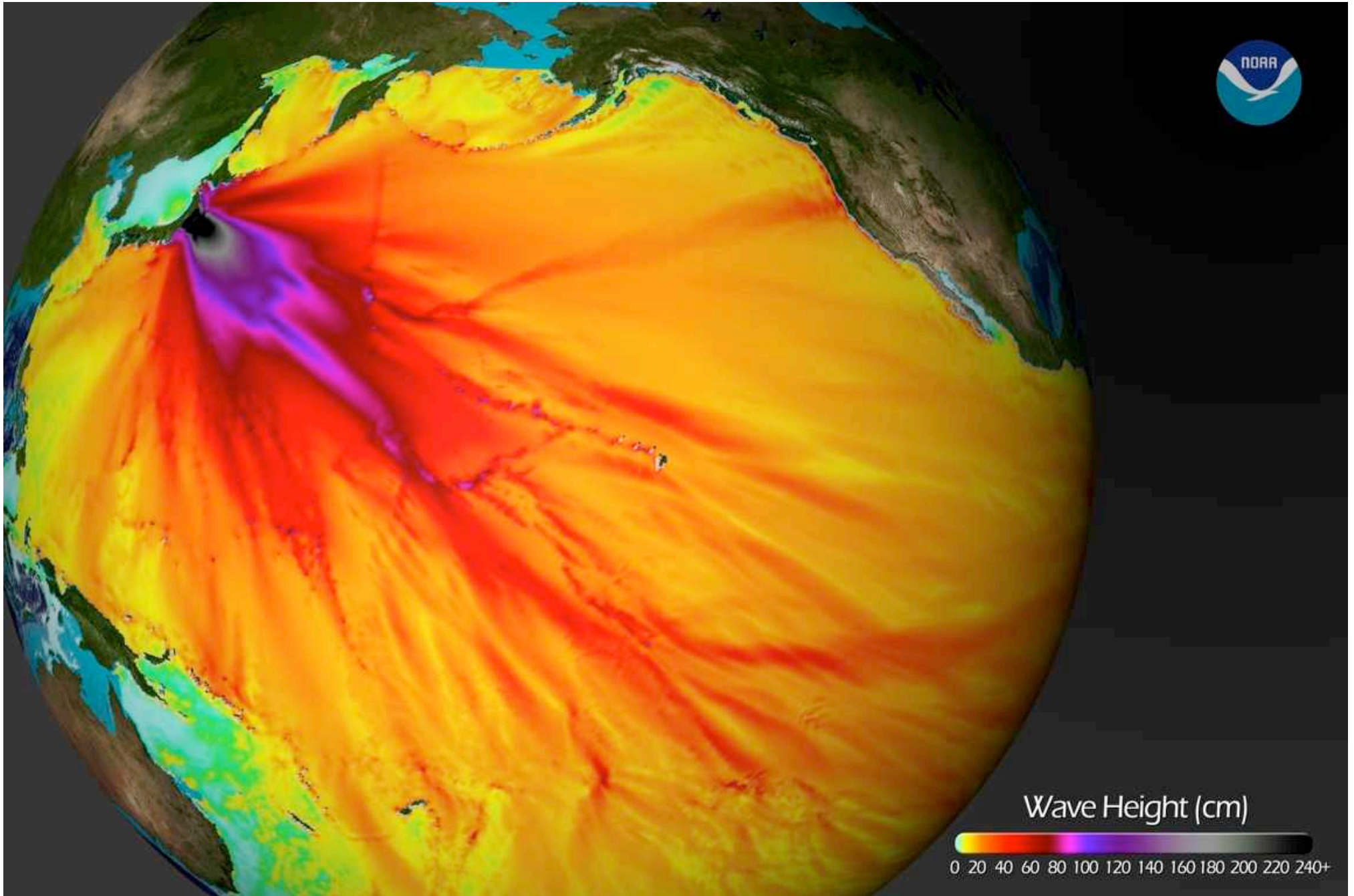
Earthquake starts tsunami



Tsunami



Tsunamiwelle

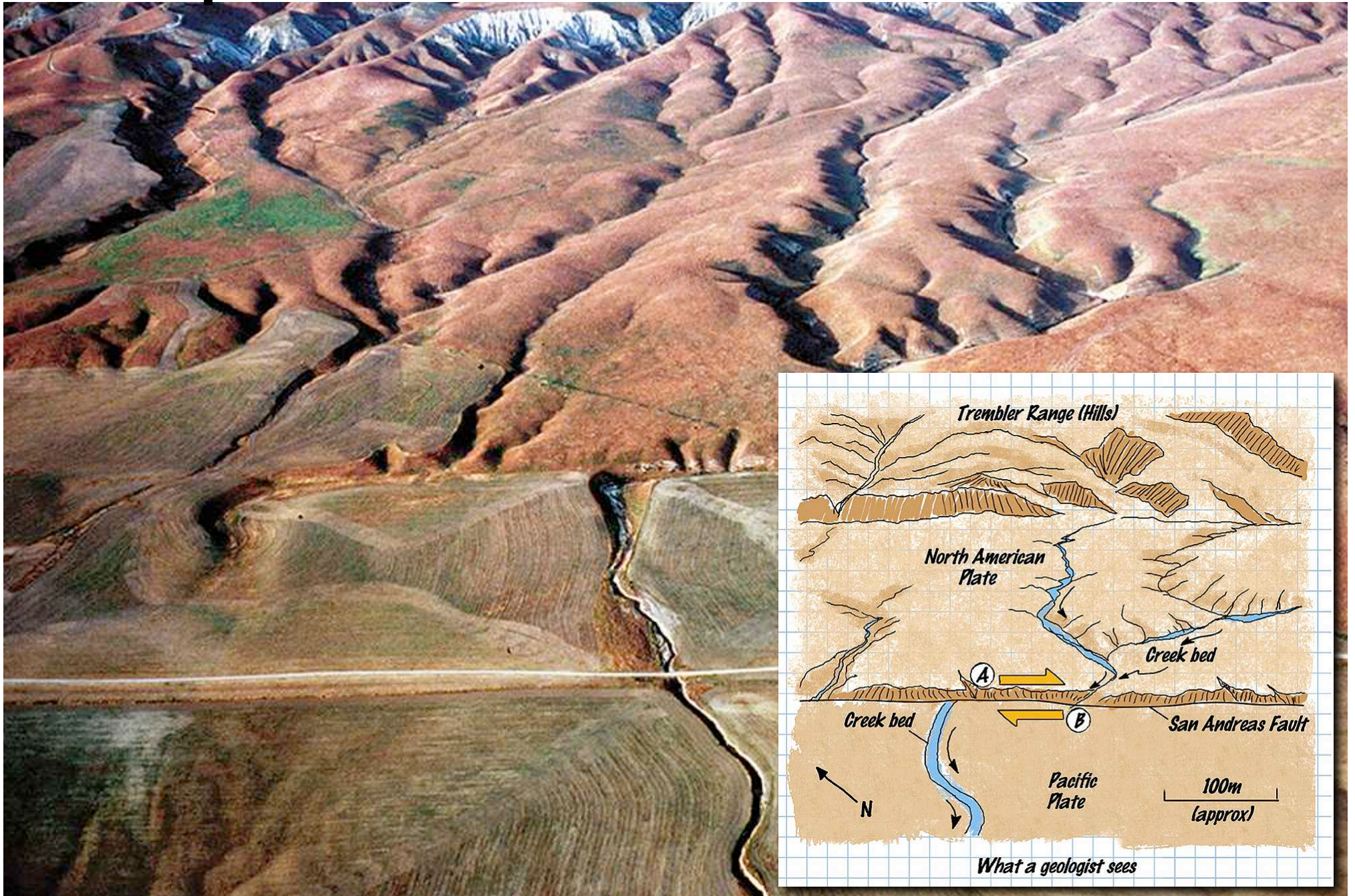


Spuren von Erdbeben

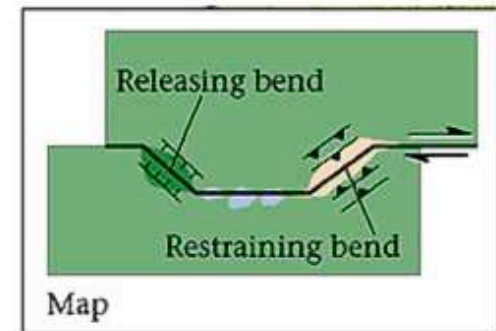
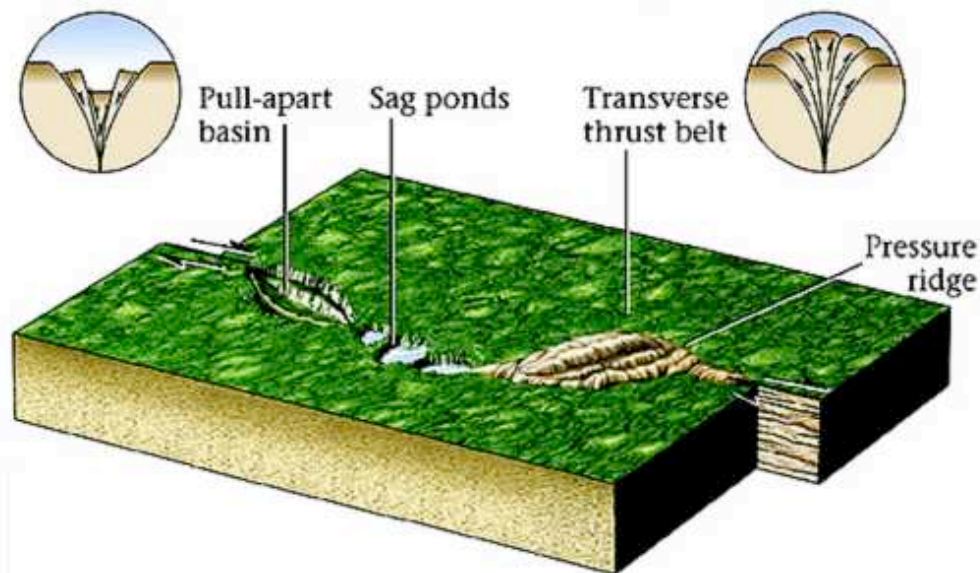
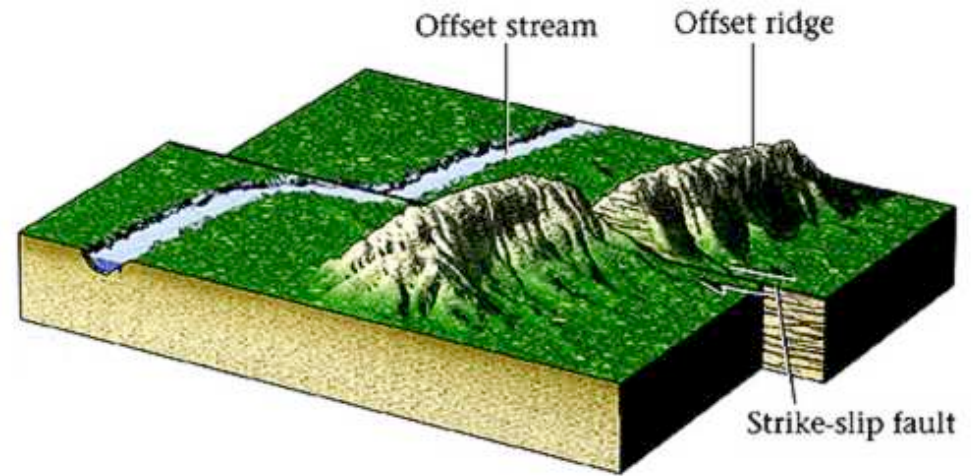
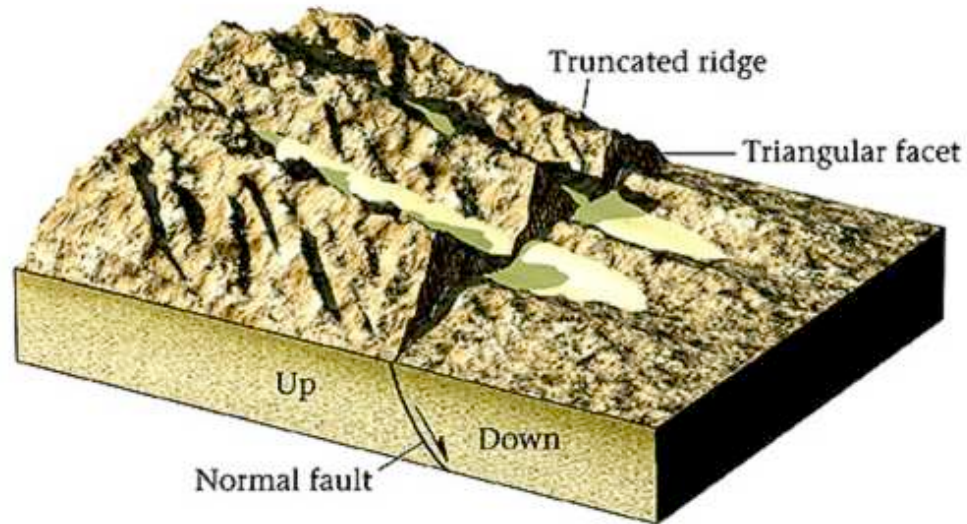
Beispiel: Hector Mine, 1999



Beispiel: San Andreas Fault

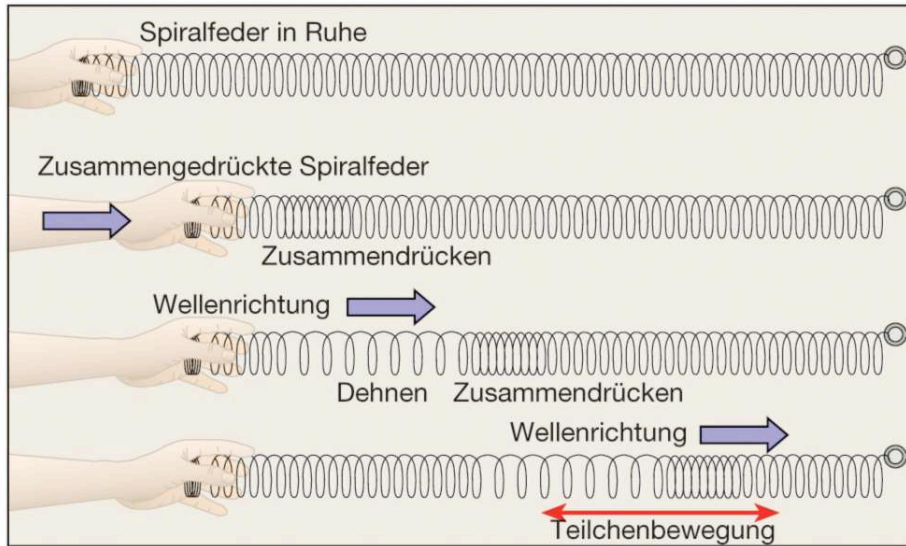


Topographische Ausprägung

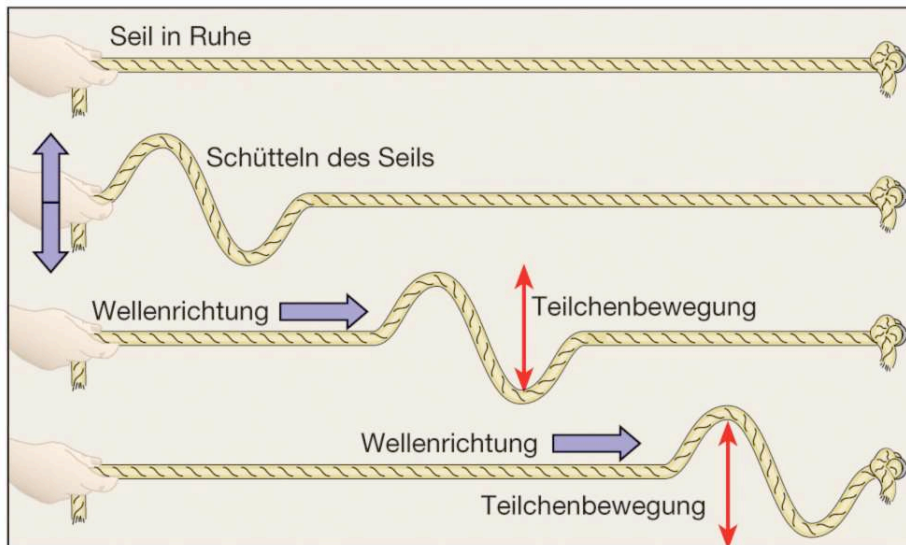


Aufzeichnung seismischer Wellen

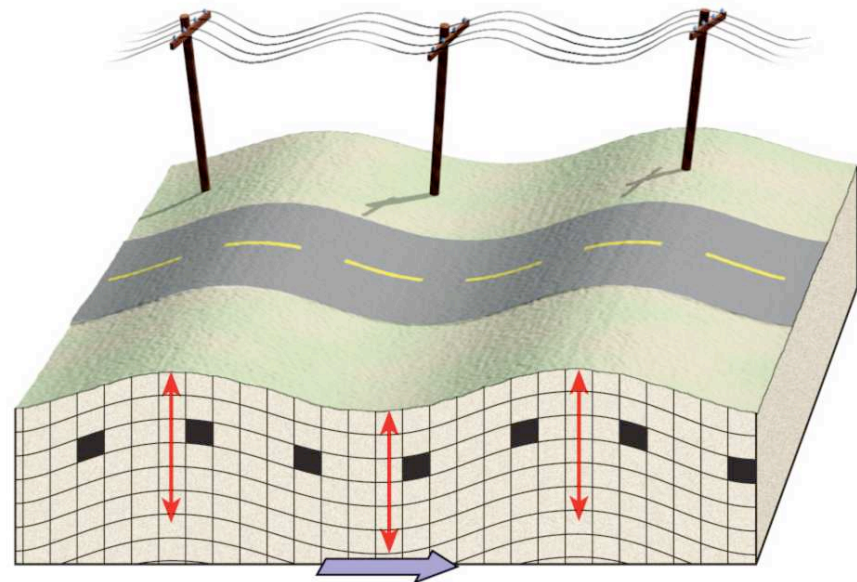
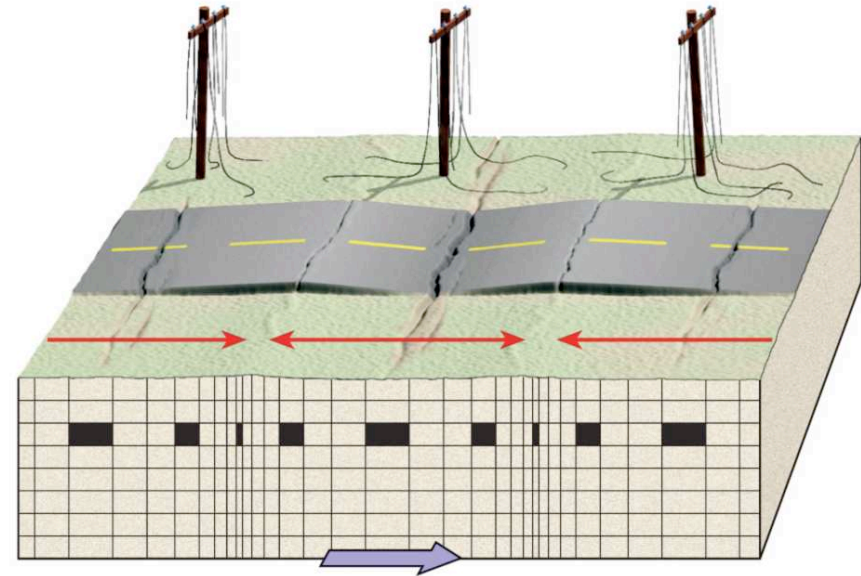
P- und S-Wellen



A. P-Welle



B. S-Welle



Erdbeben



Author: Kåre Kullerud, University of Tromsø

Übersetzt ins Deutsche durch Horst Gerlach



© USGS

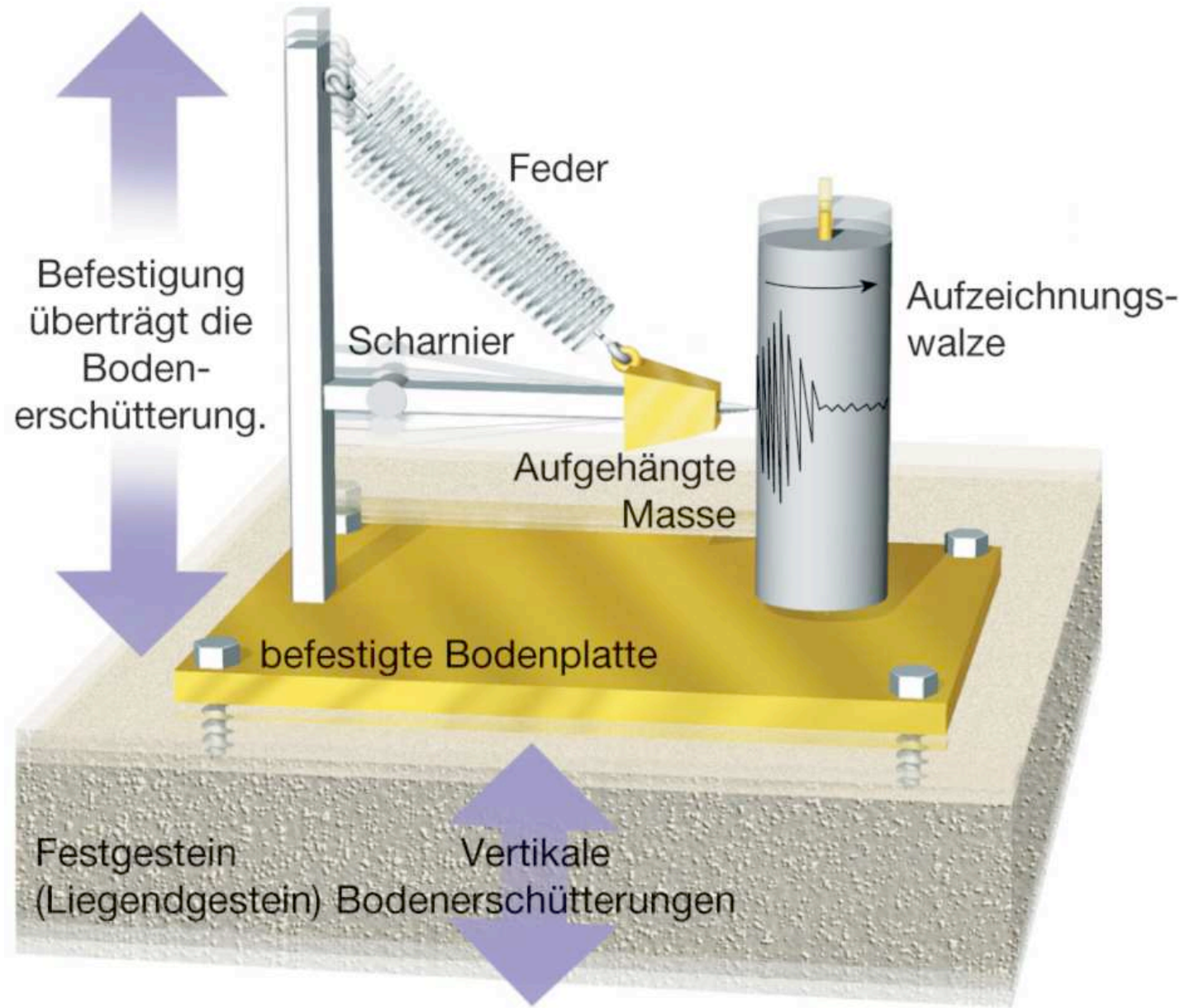


© USGS

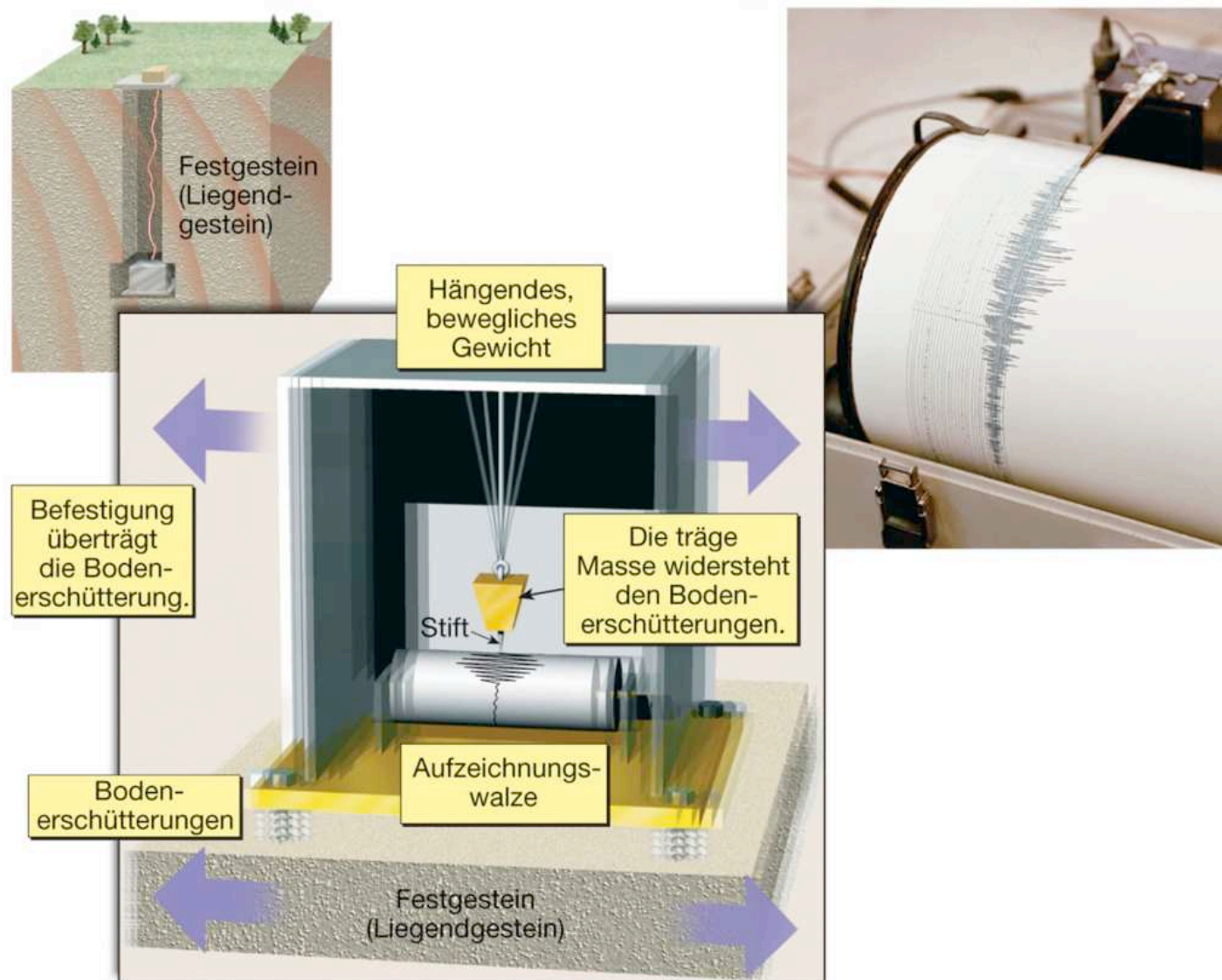
[Zum Modul](#)

http://ansatte.uit.no/kku000/webgeology/webgeology_files/deutsch/earthquakes_deutsch.html

Seismograph (vertikal)



Seismograph (horizontal)

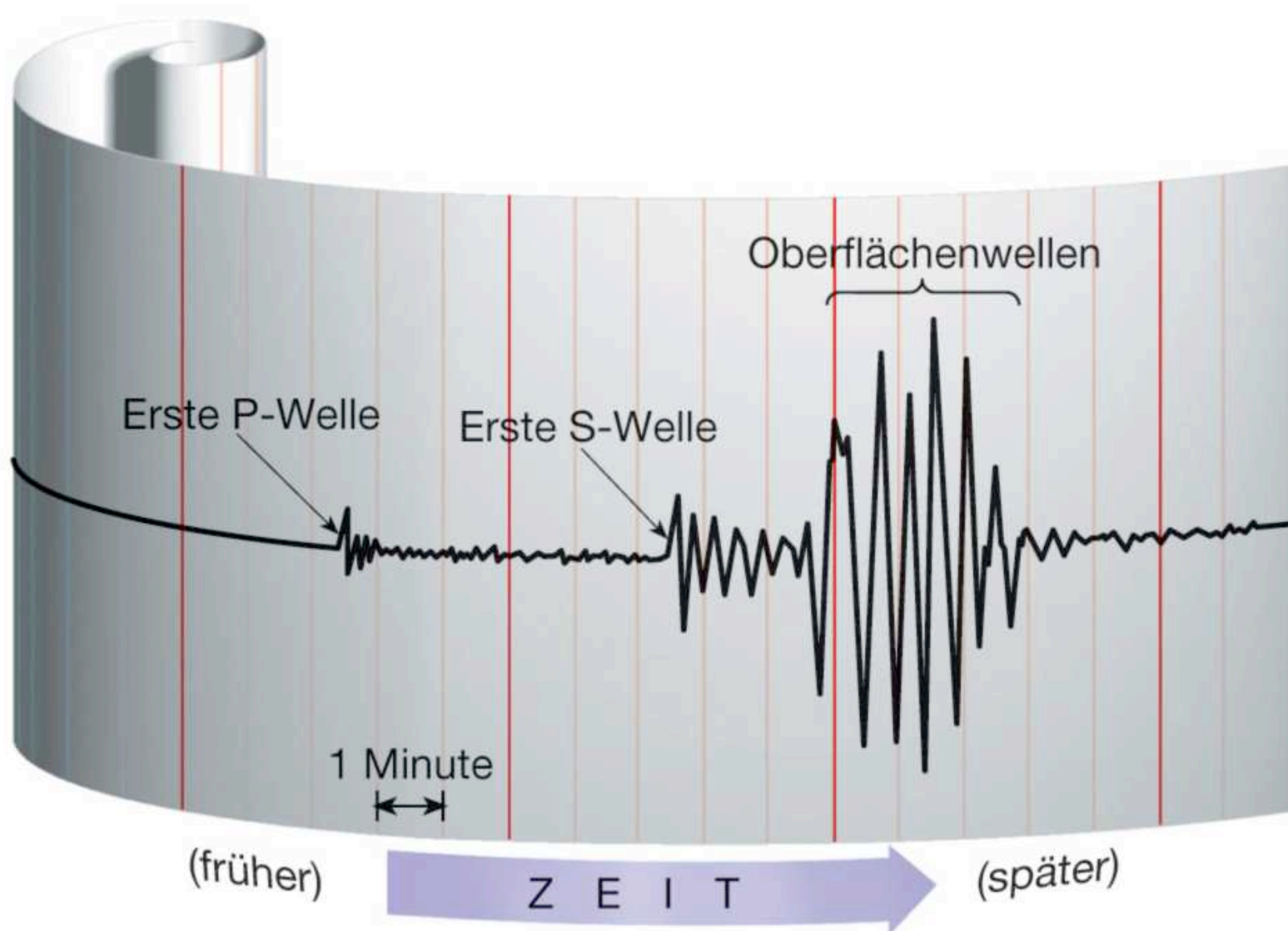


Seismography: Tohoku Erdbeben

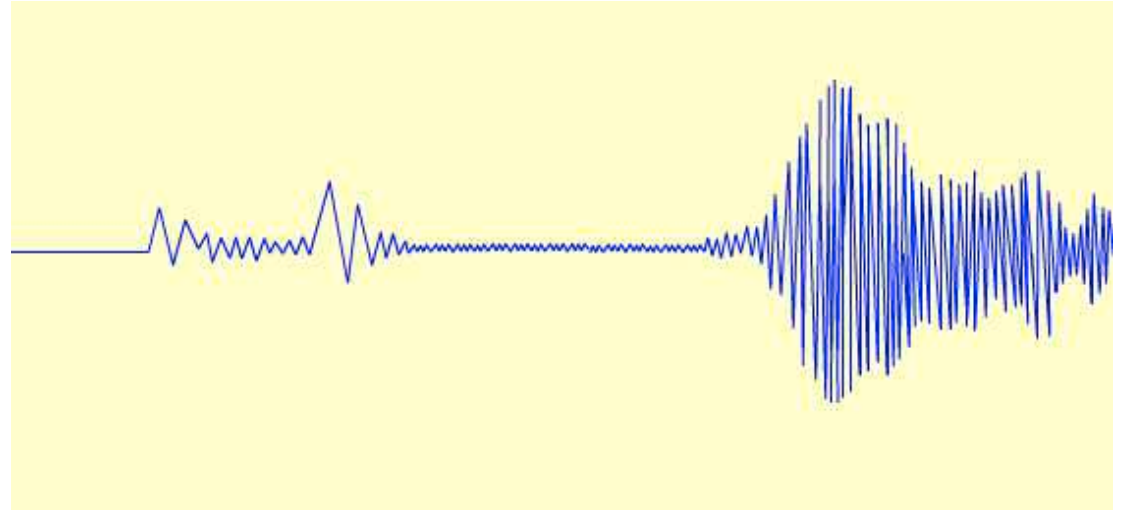


Seismische Wellen rund um den Globus

Eintreffende Wellen

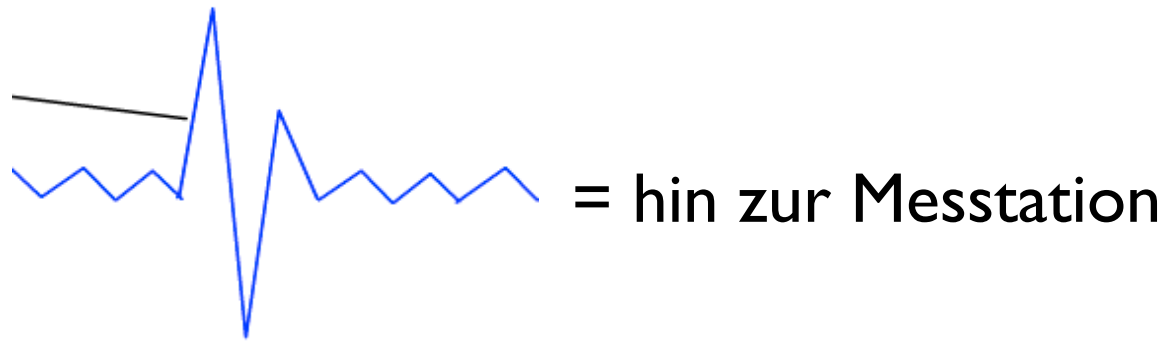


Erstausschlag



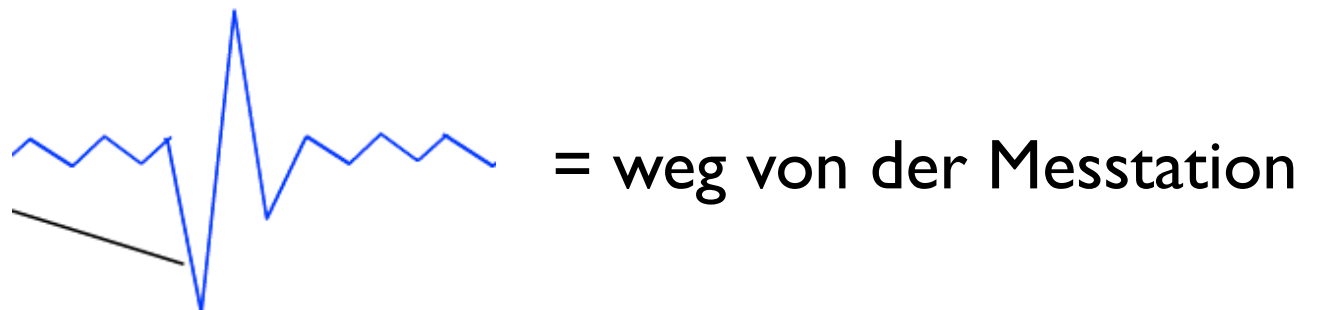
weg vom Epizentrum

Abschiebung



Überschiebung

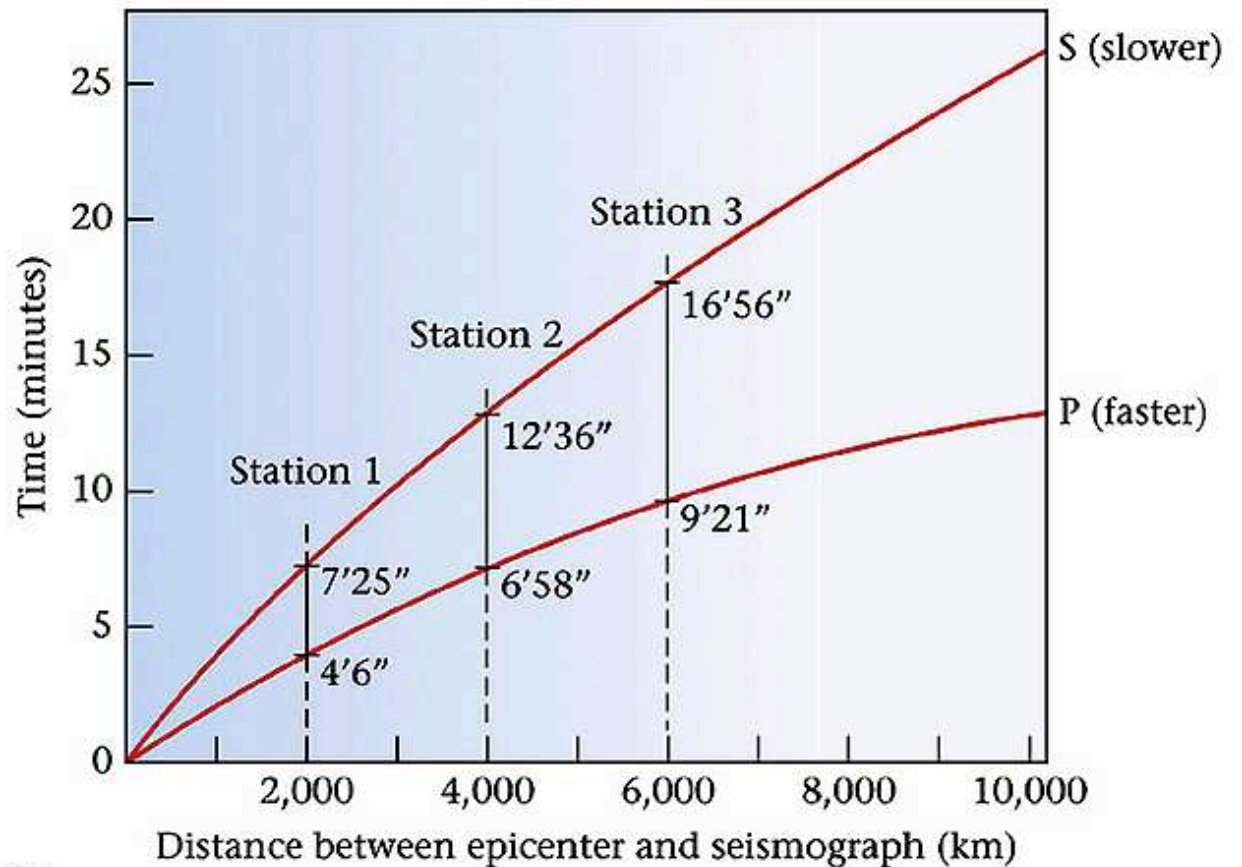
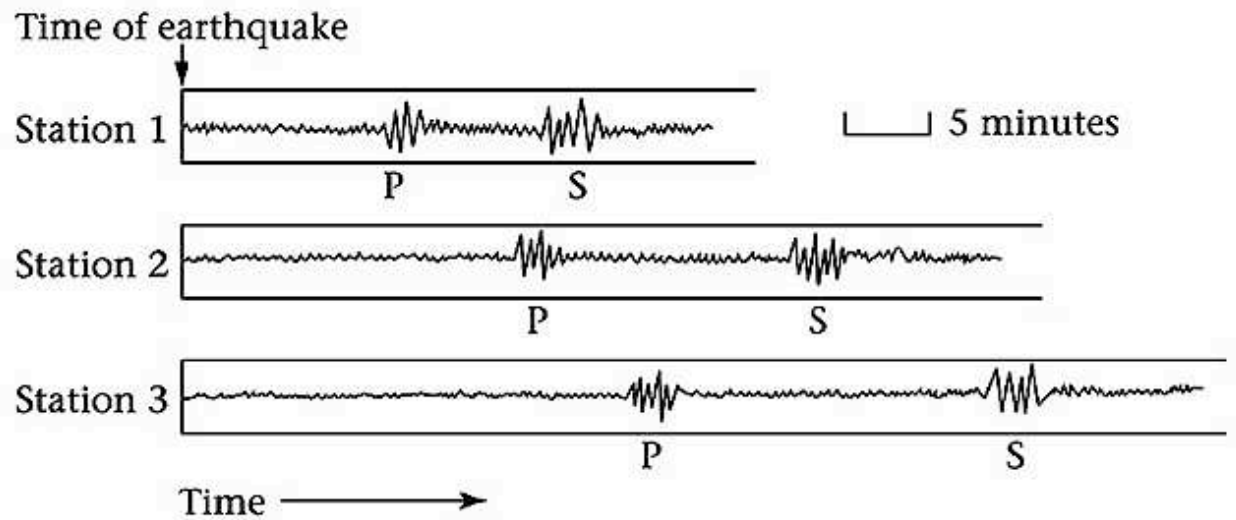
hin zum Epizentrum



Laufzeit

Zeitlicher
Abstand P - S

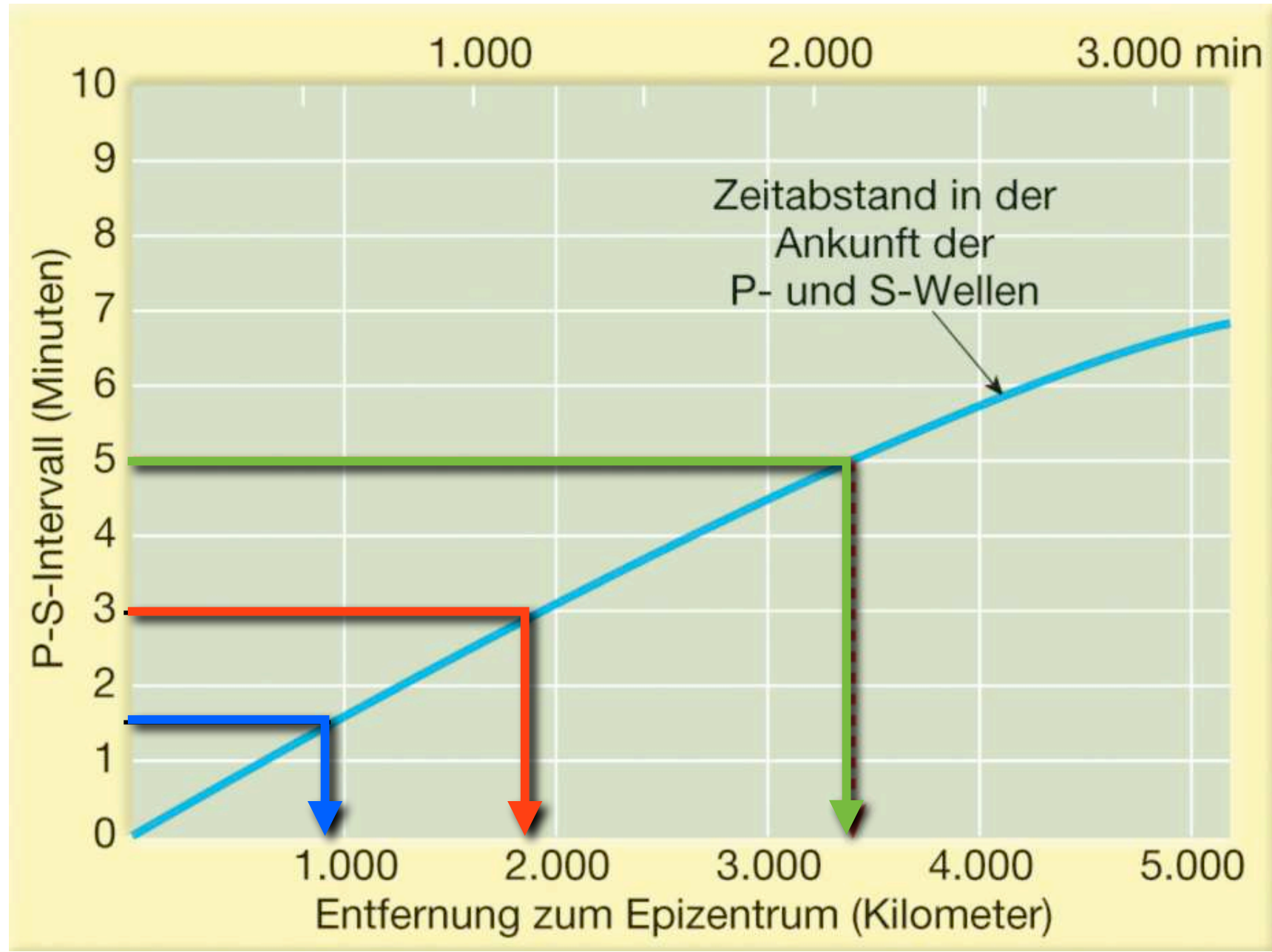
örtliche Distanz
Erdbeben -Messtation



wo ist das Epizentrum ?

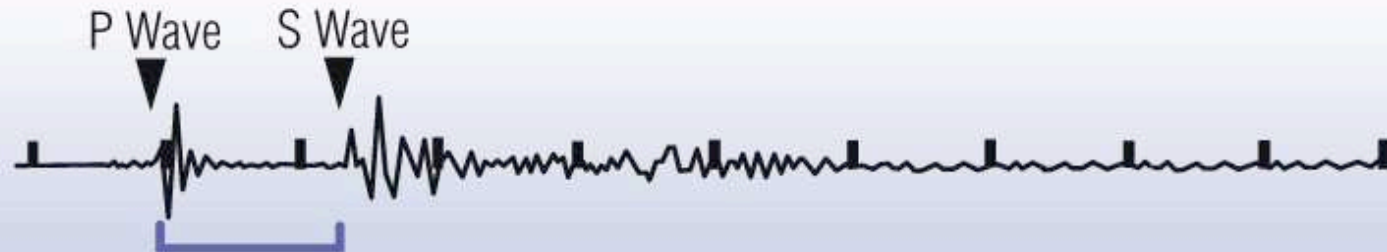


Laufzeitunterschied



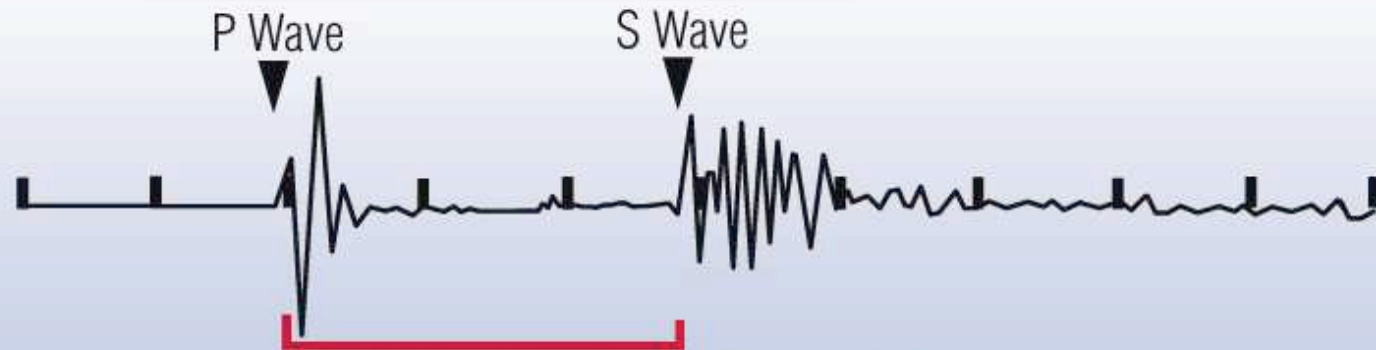
wo ist das Epizentrum ?

Record from
Tepich,
Mexico
(TEIG)



1.5 Minuten = 900 km

Record from
Isla Socorro,
Mexico
(SOCO)



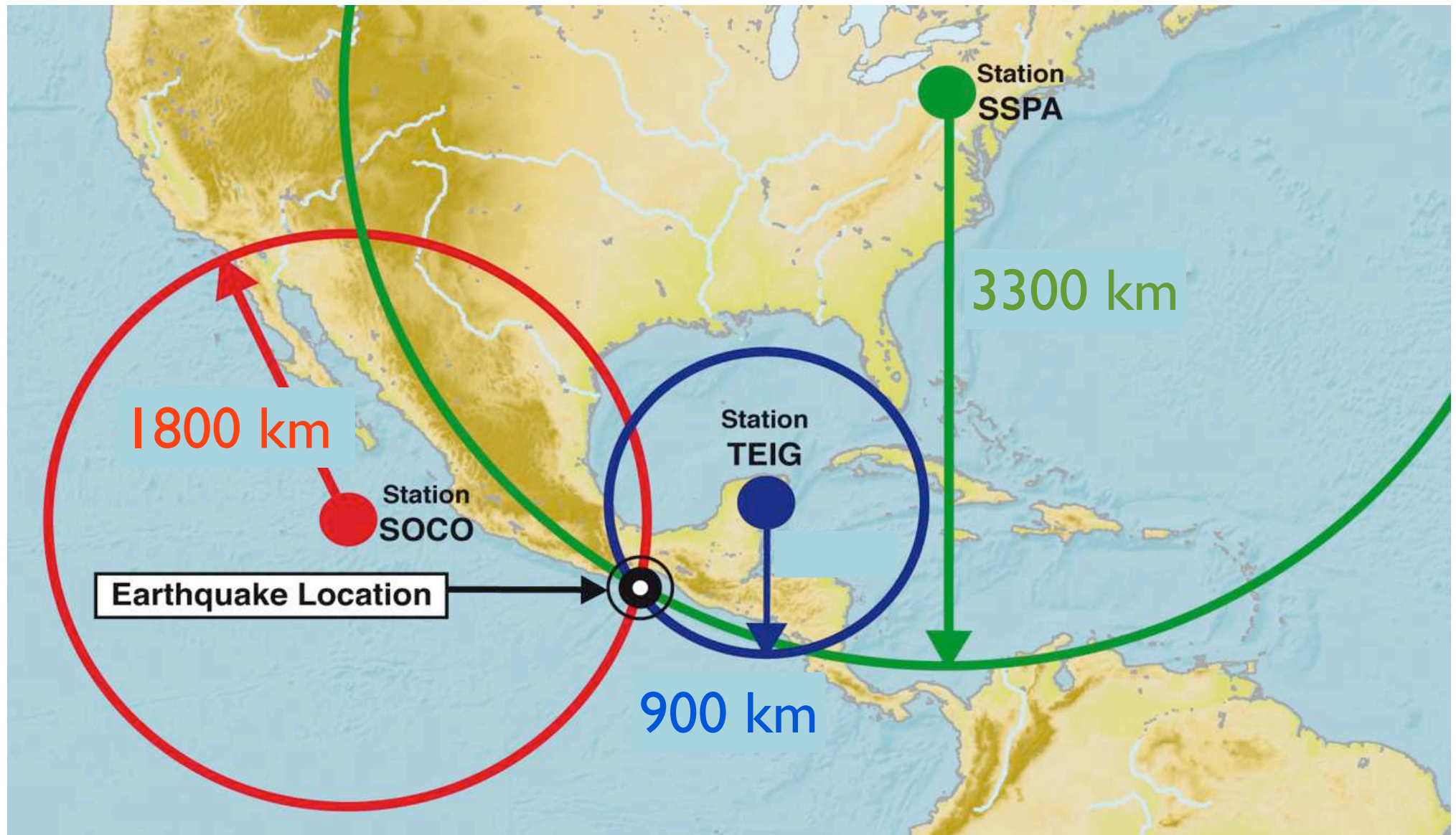
3 Minuten = 1800 km

Record from
Standing Stone,
Pennsylvania
(SSPA)



5 Minuten = 3300 km

wo ist das Epizentrum ?



Beispiel

