volks—
hochschule
beider basel

Tatort Plattengrenze 2017 - Themen

1 *2. November*
Was ist Plattentektonik ?
Was sind Platten ?
Plattenrundgang

2 *9. November*
Entstehung der Erde
Kontinentaldrift
Vorläufer der Plattentektonik

3 *16. November* *
Geomagnetik, Seismologie
Formulierung der Plattentektonik
Platten und Plattengrenzen

4 *23. November*
Alles über Erdbeben ...
Erste Tatortbesichtigung
Irak-Iran Erdbeben 2017

5 *30. November*
Alles über Vulkane ...
Historische Ausbrüche
... wo welcher Vulkanismus

6 *7. Dezember*
Deformation an Plattengrenzen
Spezielle Tatorte
Zusammenfassung

* *im Bernoullianum Hörsaal 223*

Vulkanausbrüche on-line

Volcano Discovery

aktuell

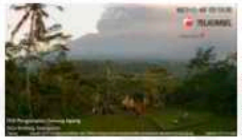
https://www.volcanodiscovery.com/erupting_volcanoes.html

Which volcanoes are erupting now?

Agung volcano news & activity updates:

Gunung Agung volcano (Bali, Indonesia): eruption has begun

Sunday Nov 26, 2017 08:30 AM | BY: T



Ash plume from Agung volcano yesterday morning (image: PVMBG)

After several weeks of apparent calm, the awaited eruption of the volcano has begun early on Saturday morning (25 Nov 2017): Moderate explosive ash emissions have been creating a plume that has been rising 1.5-4 km above the summit crater of the volcano and drifting mainly to the south.

So far, the eruption is only moderate in scale and has not caused significant damage, and Indonesia's civil protection urges the population to remain calm and not panic. While Denpsar's airport remains operational, several (mainly Australian) airlines have already cancelled flights in and out of Denpasar.

According to observers and some webcam images, incandescence can be seen at the crater at night, and according to the volcanologists from PVMBG, the erupted ash is dark to black, likely from fresh magma. These observation suggest that by now the new magma ha indeed arrived at the surface.

Chances are that the eruption intensifies in the coming days, but just how much and how long it will last, and how dangerous it might become, is impossible to say at the moment.

Earlier on Tuesday, some small explosions had already occurred that generated white steam plumes with some ash that rose a few hundred meters, probably as a result of phreatic activity as the magma inside the conduit continued to approach the surface.

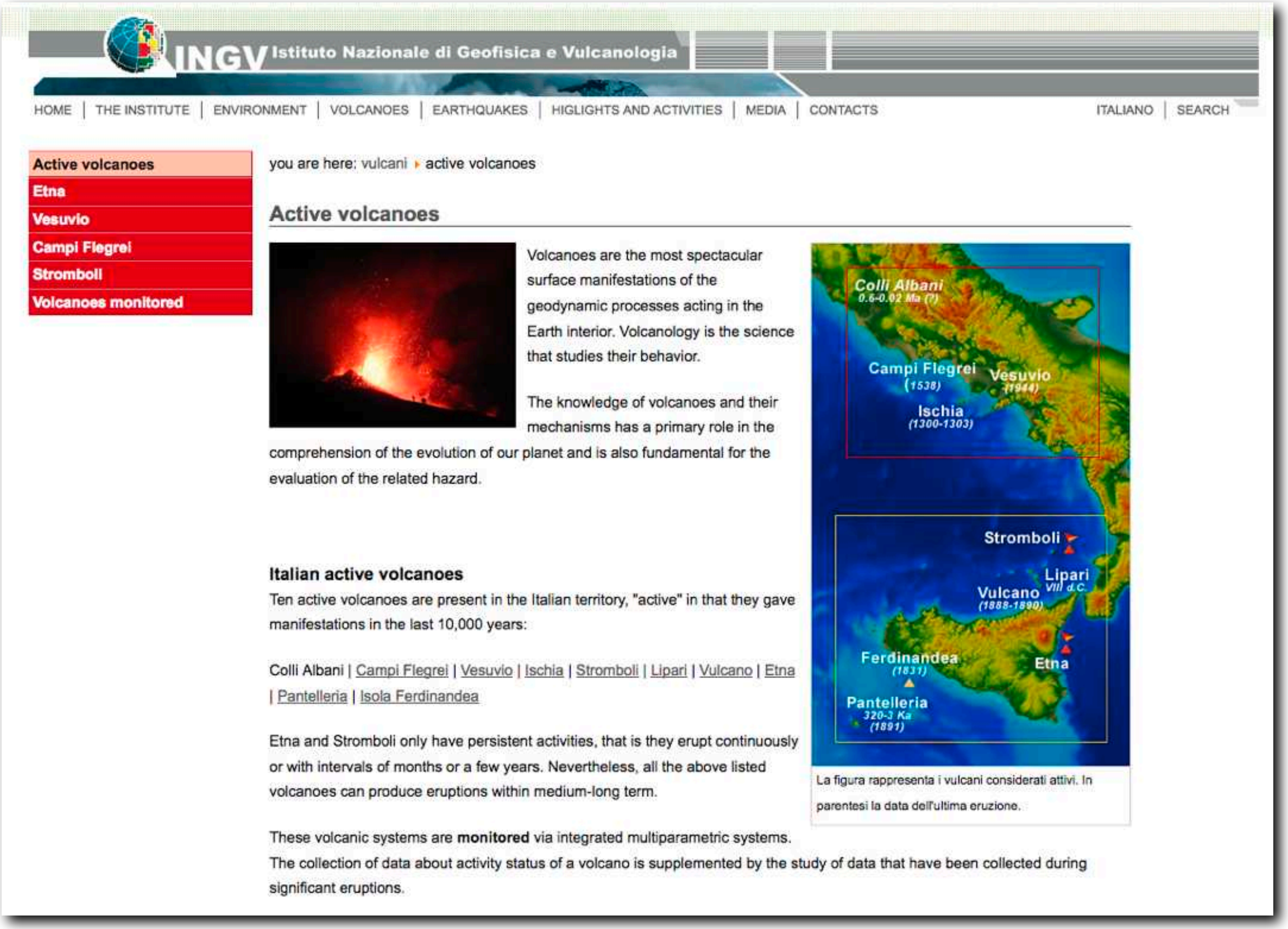
- **All news about:** Agung volcano
- **Information about:** Agung volcano

Agung volcano

Stratovolcano 3142 m (10,308 ft)
Bali, Indonesia, -8.34°S / 115.51°E
Current status: erupting (4 out of 5)
Agung webcams / live data
Agung volcano books | Tours
Agung volcano eruptions:
1808, 1821(?), 1843, 1963-64 (large Plinian eruption on March 16, 1963), 2017
Typical eruption style:
Highly explosive.
Last earthquakes nearby
Latest satellite images

https://www.volcanodiscovery.com/agung/news/66181/Gunung-Agung-volcano-Bali-Indonesia-eruption-has-begun.html

Istituto Nazionale di Geofisica e Volcanologia INGV



INGV Istituto Nazionale di Geofisica e Vulcanologia

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Active volcanoes
Etna
Vesuvio
Campi Flegrei
Stromboli
Volcanoes monitored

you are here: vulcani ‣ active volcanoes

Active volcanoes

Volcanoes are the most spectacular surface manifestations of the geodynamic processes acting in the Earth interior. Volcanology is the science that studies their behavior.

The knowledge of volcanoes and their mechanisms has a primary role in the comprehension of the evolution of our planet and is also fundamental for the evaluation of the related hazard.

Italian active volcanoes

Ten active volcanoes are present in the Italian territory, "active" in that they gave manifestations in the last 10,000 years:

Colli Albani | Campi Flegrei | Vesuvio | Ischia | Stromboli | Lipari | Vulcano | Etna | Pantelleria | Isola Ferdinandea

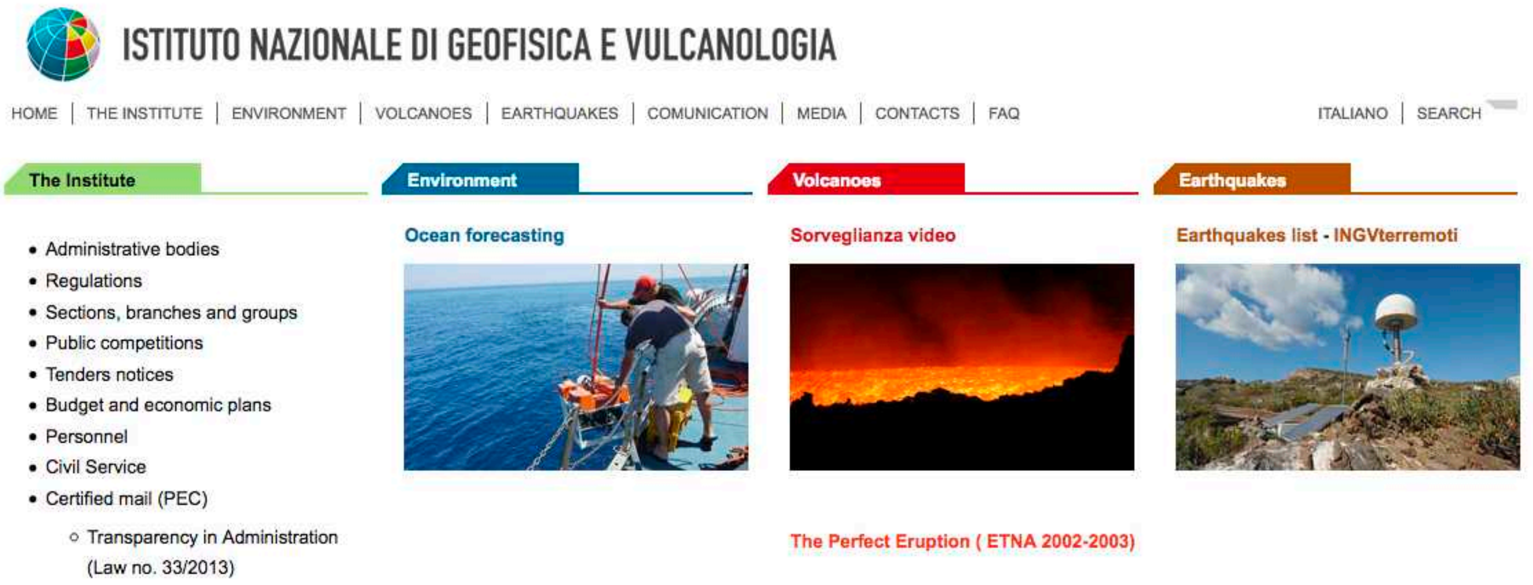
Etna and Stromboli only have persistent activities, that is they erupt continuously or with intervals of months or a few years. Nevertheless, all the above listed volcanoes can produce eruptions within medium-long term.

These volcanic systems are **monitored** via integrated multiparametric systems. The collection of data about activity status of a volcano is supplemented by the study of data that have been collected during significant eruptions.

La figura rappresenta i vulcani considerati attivi. In parentesi la data dell'ultima eruzione.

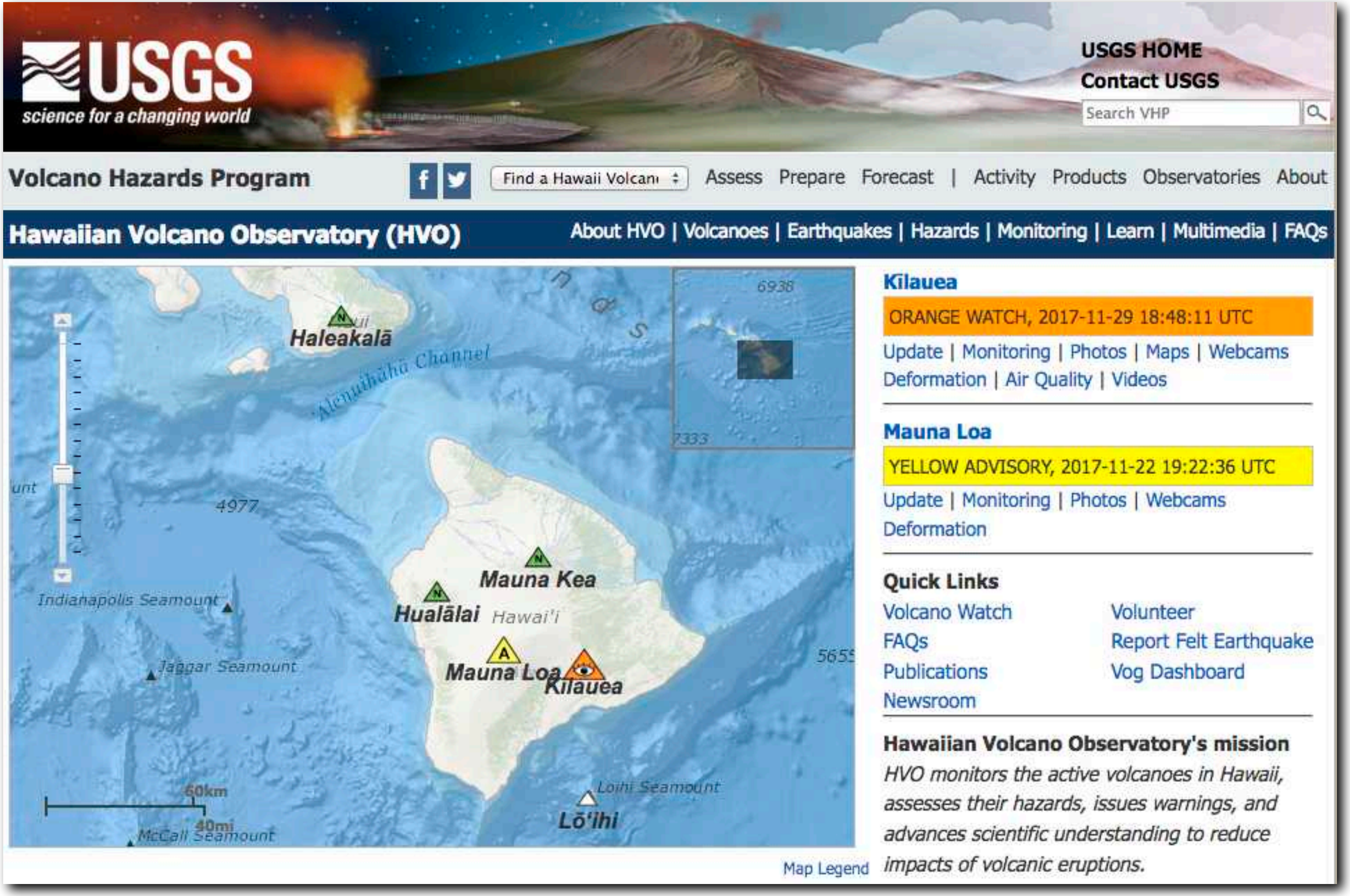
http://www.ingv.it/en/

INGV > Volcanoes



https://www.youtube.com/watch?v=KweKAZx2Hr8

Hawaiian Volcano Observatory

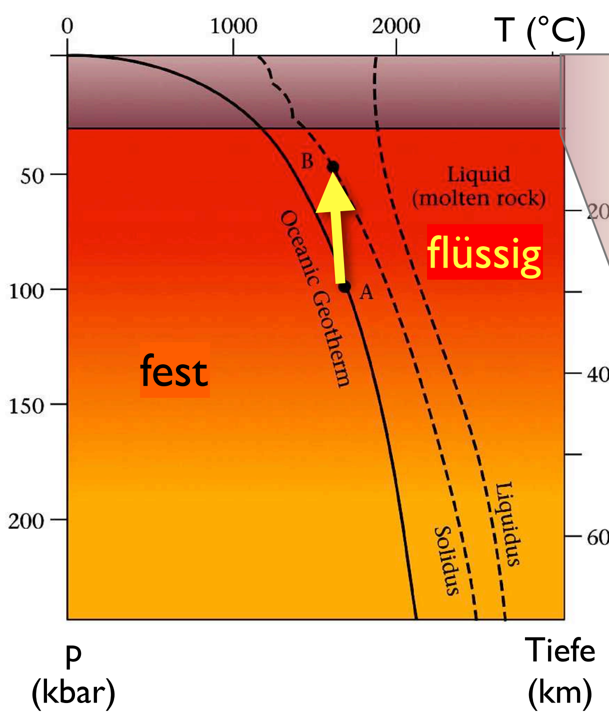


https://volcanoes.usgs.gov/observatories/hvo/

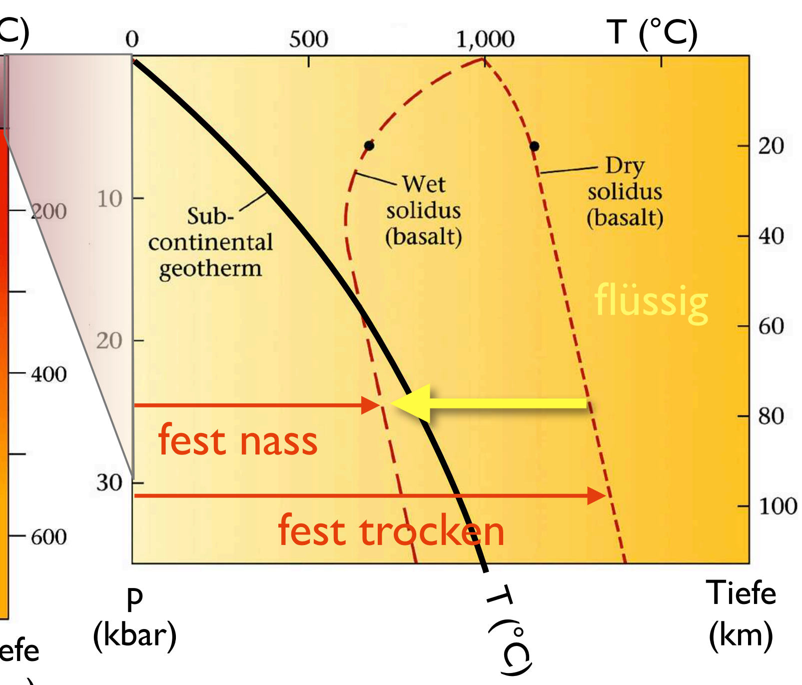
Vulkanismus

Wie gewinnt man Magma aus festem Gestein ?

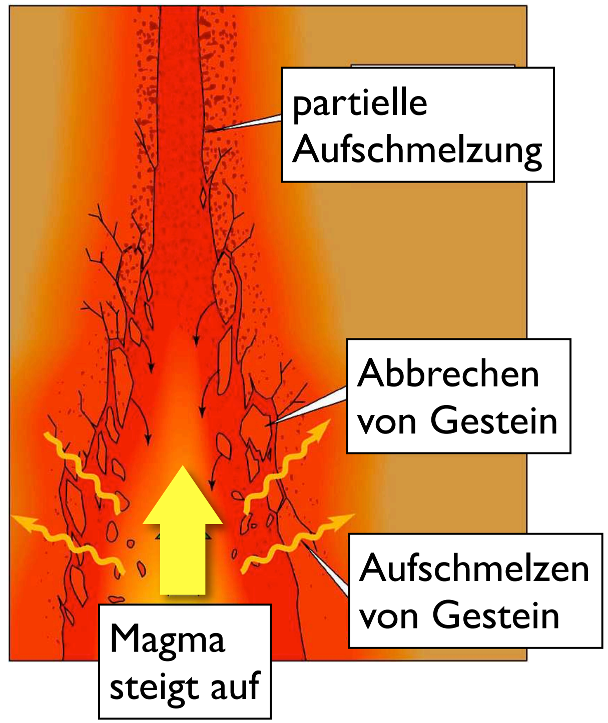
Druckentlastung

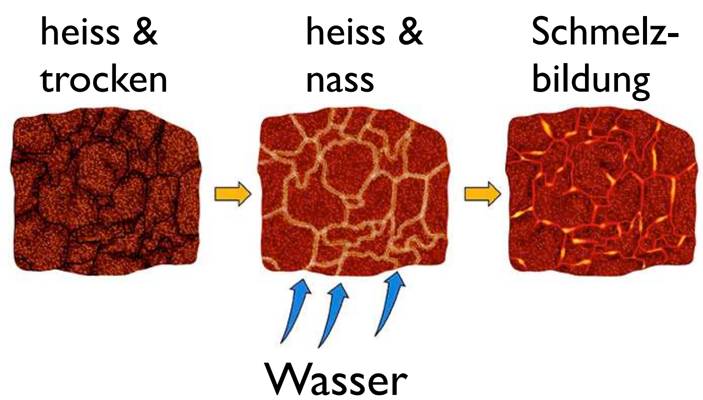


Wasserzufuhr



Wärmeadvektion





Woher kommt die Wärme ? ... aus dem Mantel

Anfangsenergie	
Wärmeverlust kollidierender Partikel bei der kalten Akkretion Kristallisationswärme bei der Erstarrung des festen Kerns	30 - 50% der Erdwärme
Laufend erneuert	
Radioaktiver Zerfall der Isotope Uranium, Thorium, und Kalium	50 - 70%
Reibungswärme durch Gezeitenwirkung des Mondes	wenige %
Total:	≈ 44 TW
zum Vergleich: Energie-Verbrauch der Menschen:	≈ 20 TW

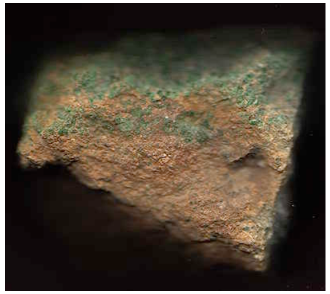
Die wichtigsten magmatischen Gesteine

Plutonite

Granit

Diorit

Gabbro



Peridotit

hell - leicht   dunkel - schwer

grobkörnig

feinkörnig

Vulkanite

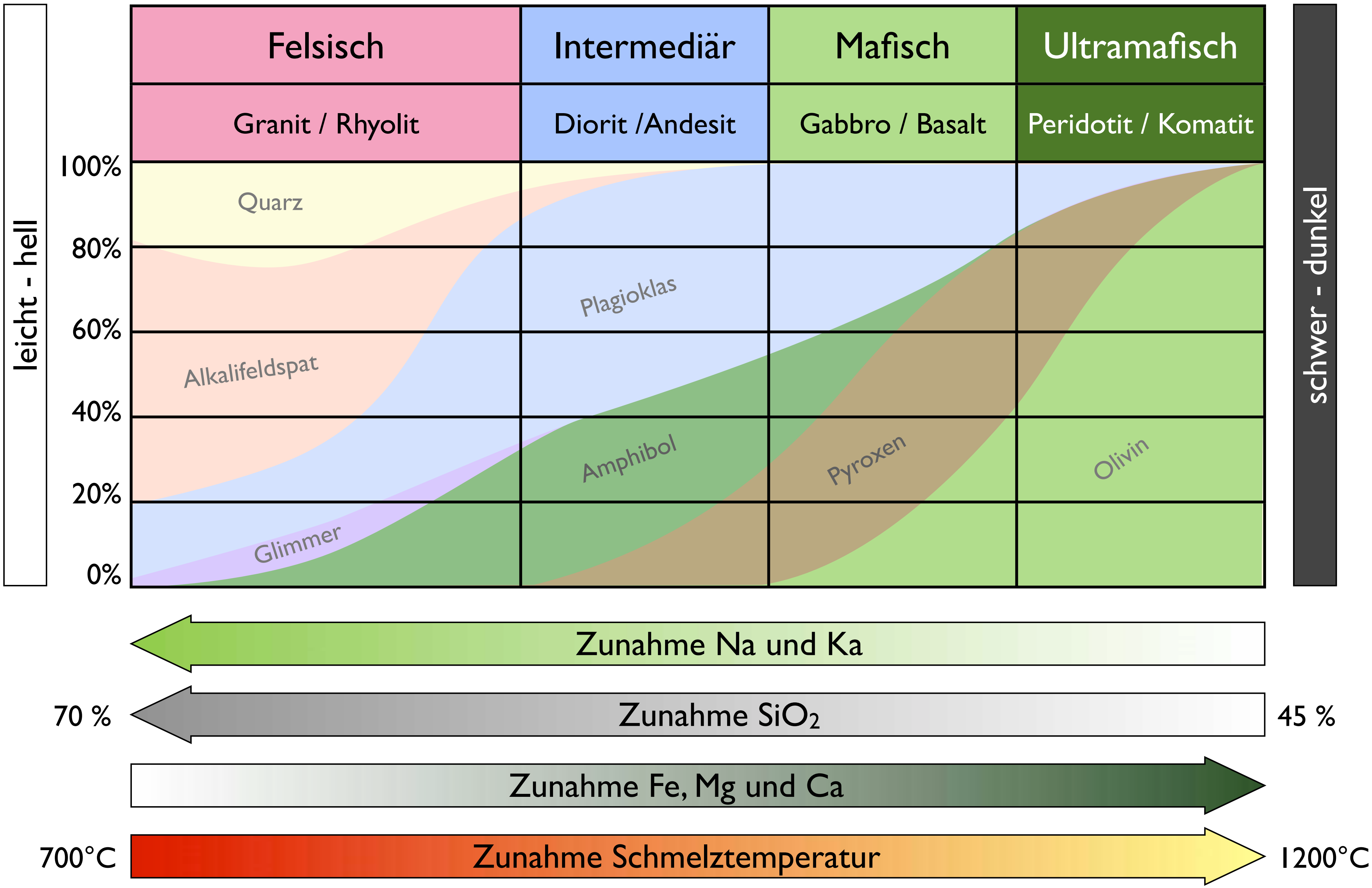
Rhyolit

Andesit

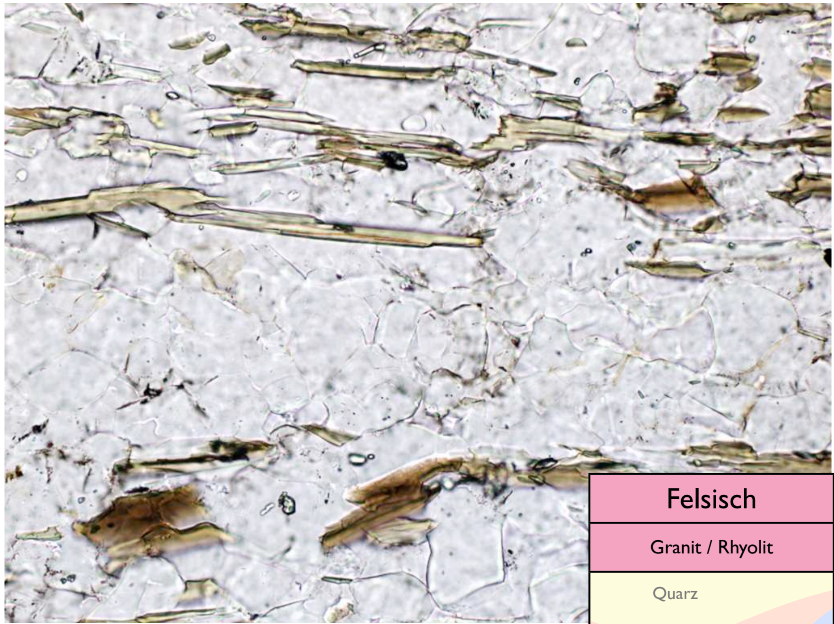
Basalt

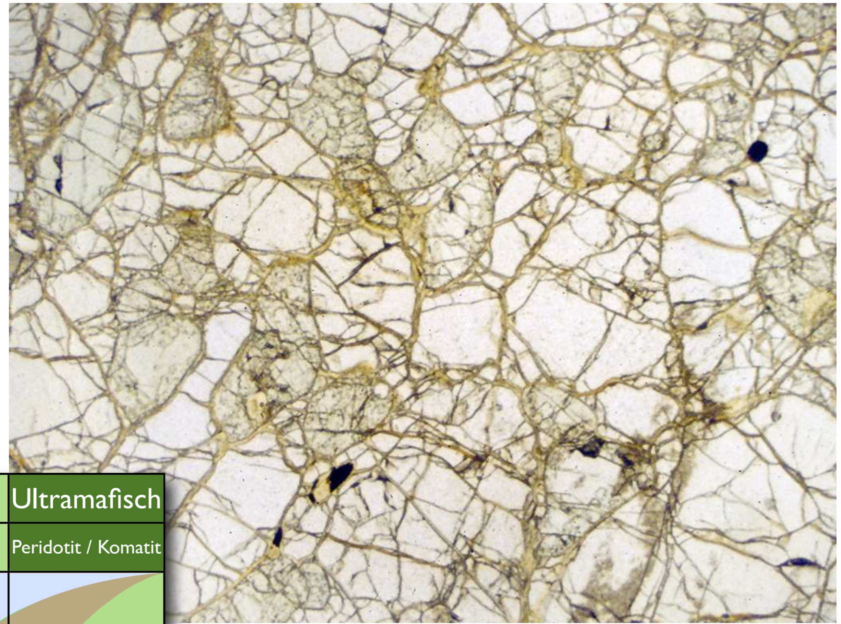
Obsidian

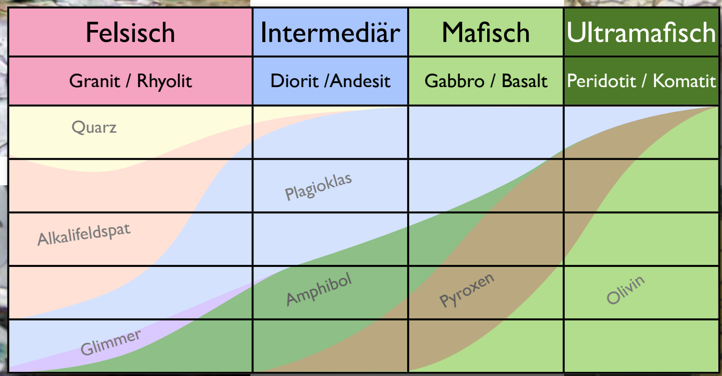
Zusammensetzung magmatischer Gesteine

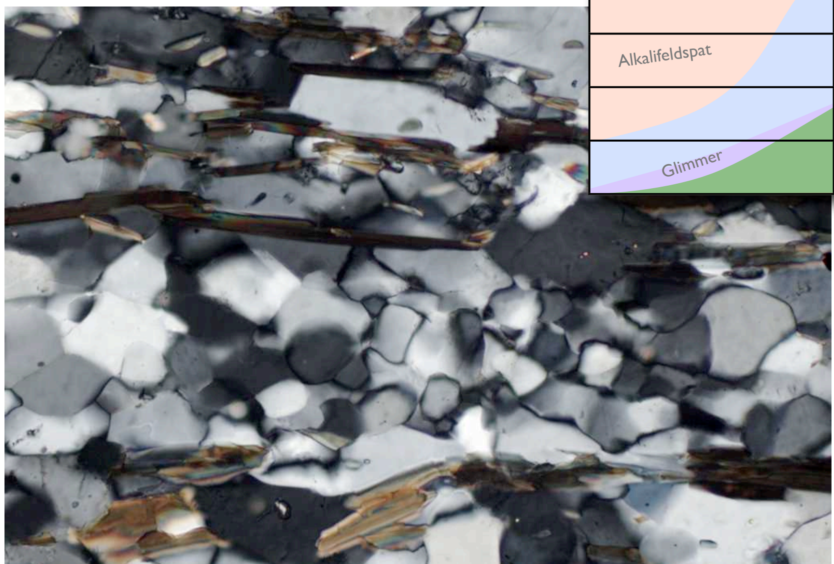


Wir zücken das Mikroskop

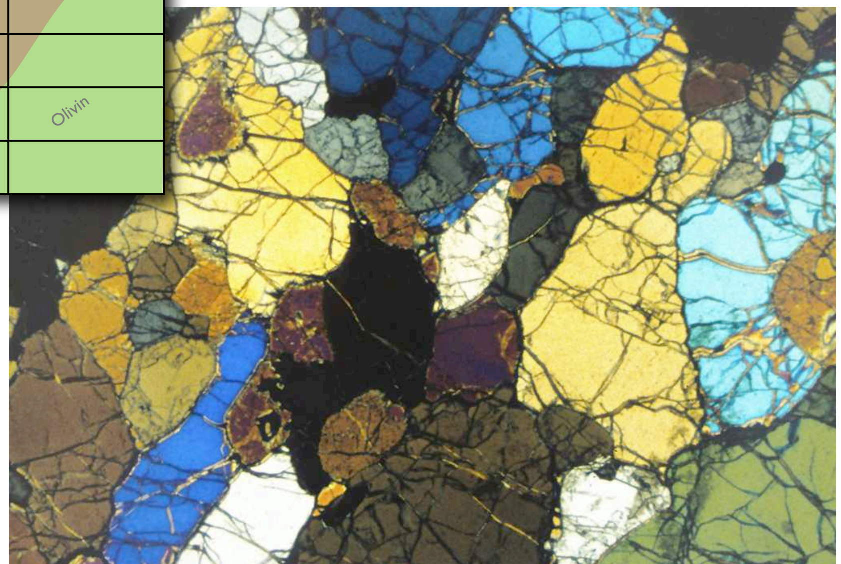








Granit: Feldspat, Quarz, Glimmer



Peridotit: Olivin

Einfluss der Abkühlungsgeschwindigkeit

Tonalit (Adamello)	Rhyolit (Côte d'Azur)	Tuff (Hegau)	Obsidian (Lipari)
Plutonit	Ignimbrit mit Fliessstrukturen	Pyroklastika	Glas

Einfluss der Viskosität

Mafisch = flow

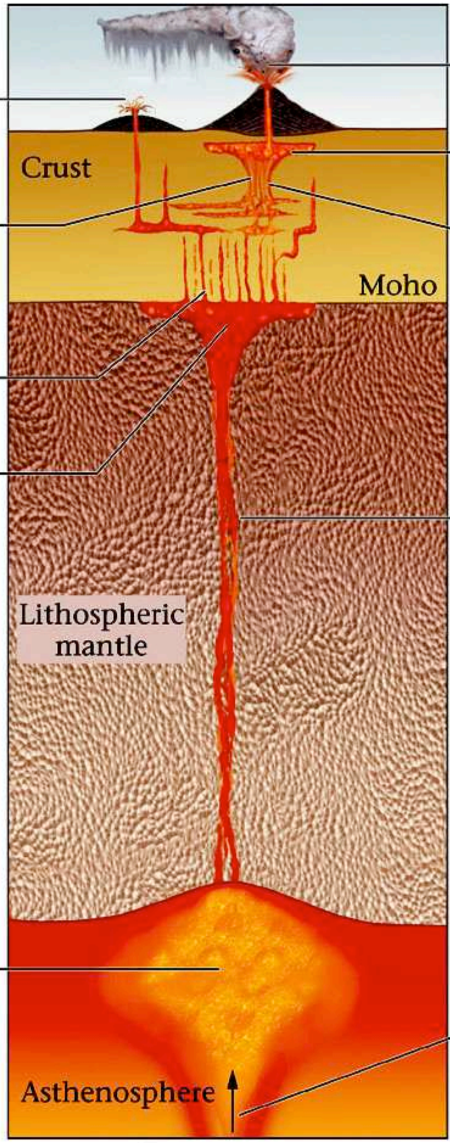
Ausbruch von basaltischer Lava

Aufschmelzung der kontinentalen Kruste durch Wärmezufuhr

Aufstieg von basaltischem (mafischem) Magma

Bildung einer Magmenkammer

Schmelzbildung (Bildung von basaltischem Magma) durch Druckentlastung



Not to scale

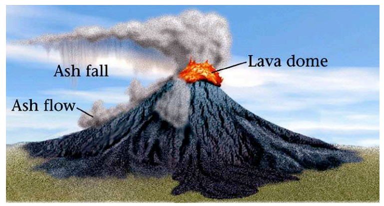
Ausbruch von saurer Lava

Ryolitische Magmenkammer

Aufstieg von rhyolitischem (saurem) Magma

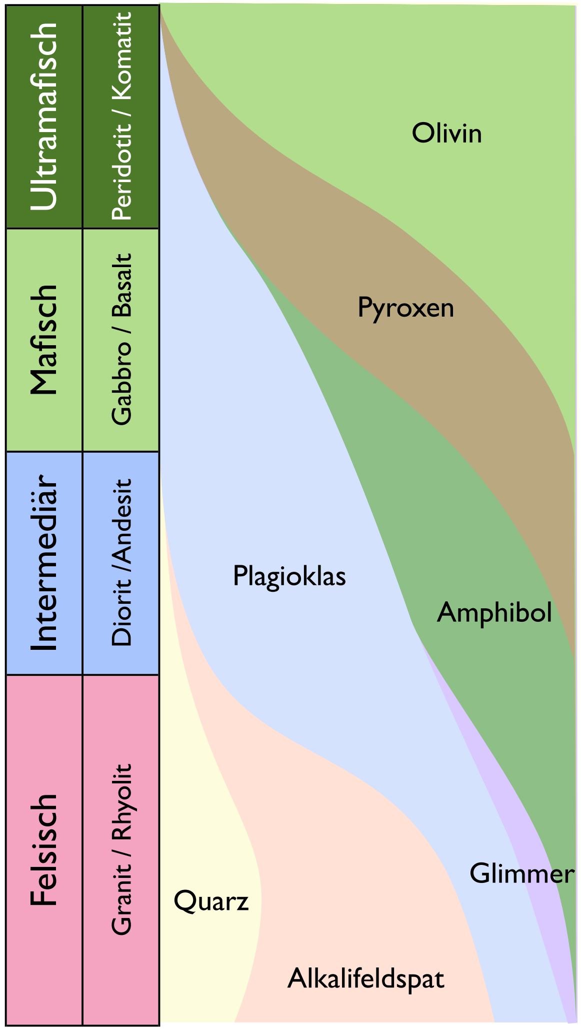
Aufstieg von basaltischem (mafischem) Magma

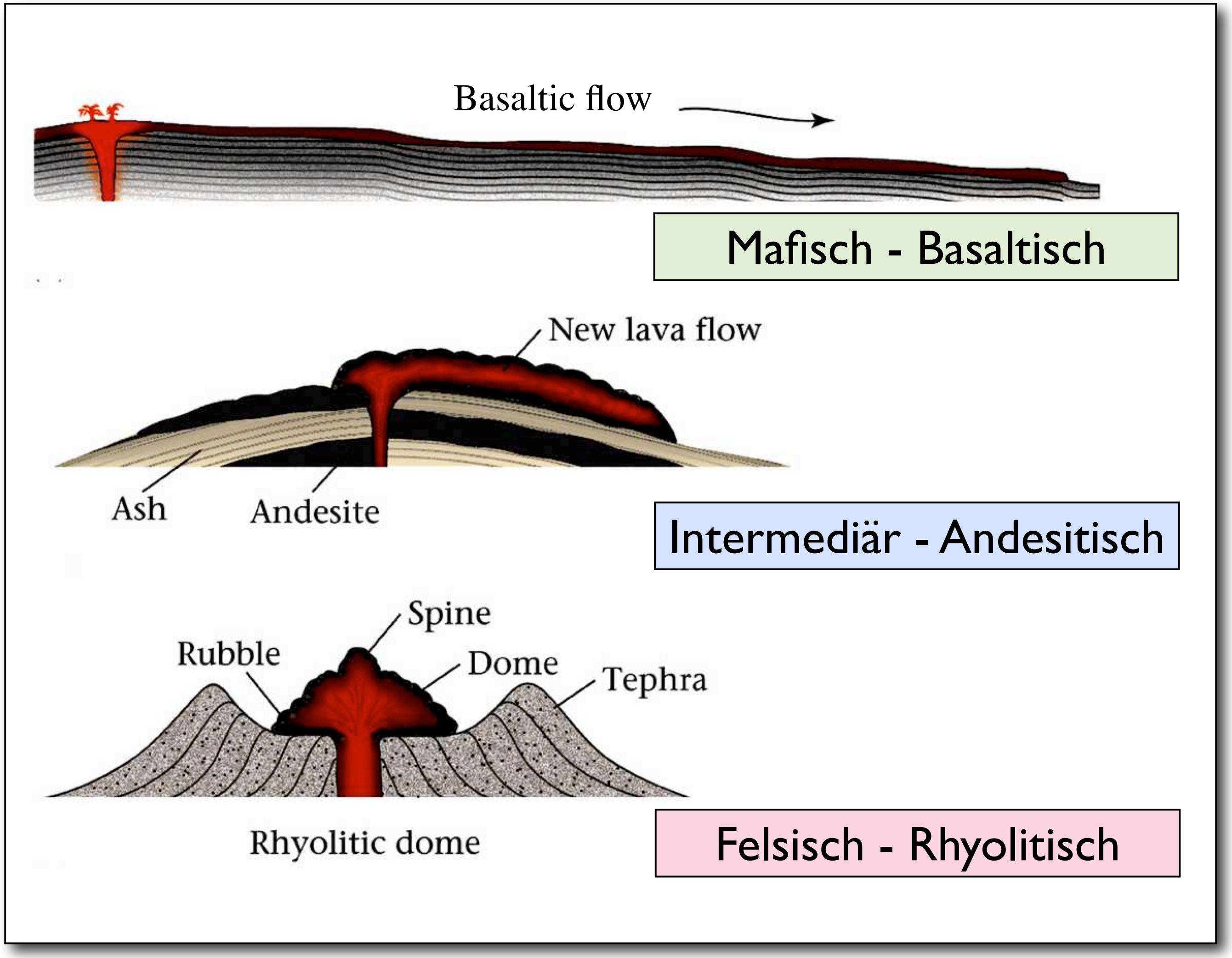
Aufstieg von heisser, aber fester Asthenosphäre (Mantelgestein)



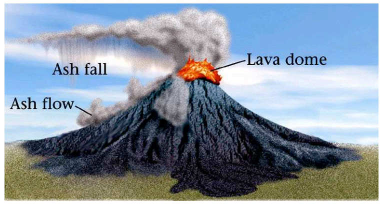
Felsisch = blow

Verschiedene Arten von Vulkanismus





Mafisch
= flow



Felsisch
= blow

Schildvulkan versus Stratovulkan

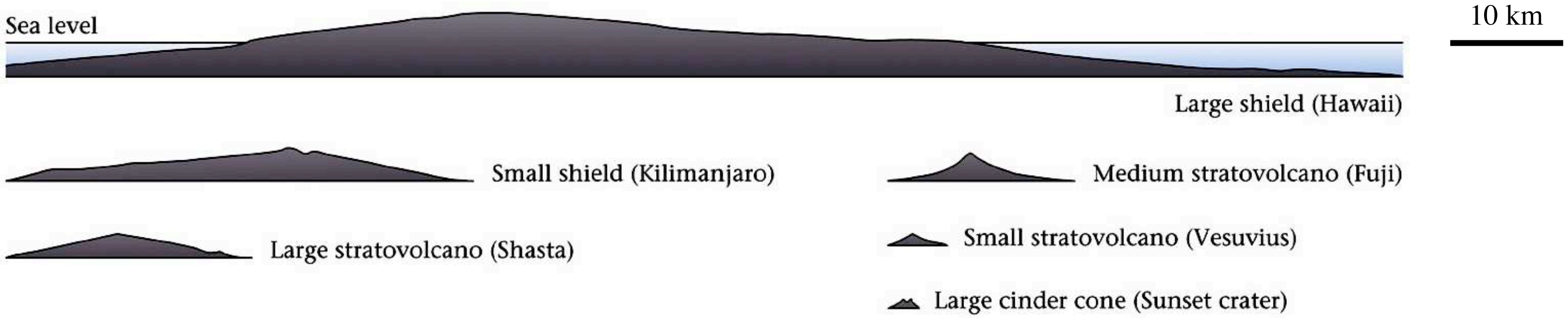
Mauna Loa, Hawaii

Fujiyama, Japan

Vorkommen: Ozean
Basische Zusammensetzung
niederer SiO_2 Gehalt
→ rel. hohe Lavatemperatur (1150°)
→ Magma nieder viskös (leichtfliessend)
wenig Gas im Magma → entweicht
→ wenig Druckaufbau
Effusive Eruption (Flow)
50 - 60 km/h Fliessgeschwindigkeit
Ausdehung in die Breite (H:B = 1: 20)
Böschungswinkel klein (≤ 5°)

Vorkommen: in allen vulkanische Provinzen
Saure Zusammensetzung
hoher SiO_2 Gehalt
→ rel. niedere Lavatemperatur (800°)
→ Magma hoch viskös (zähfliessend)
sehr viel Gas im Magma → Gasblase
→ Druckaufbau
Explosive und effusive Eruption (Blow)
Tephra wird ausgeschleudert, fällt zurück
Lava fliesst aus, erstarrt in der Nähe
hoher Böschungswinkel → Kegelform

Form

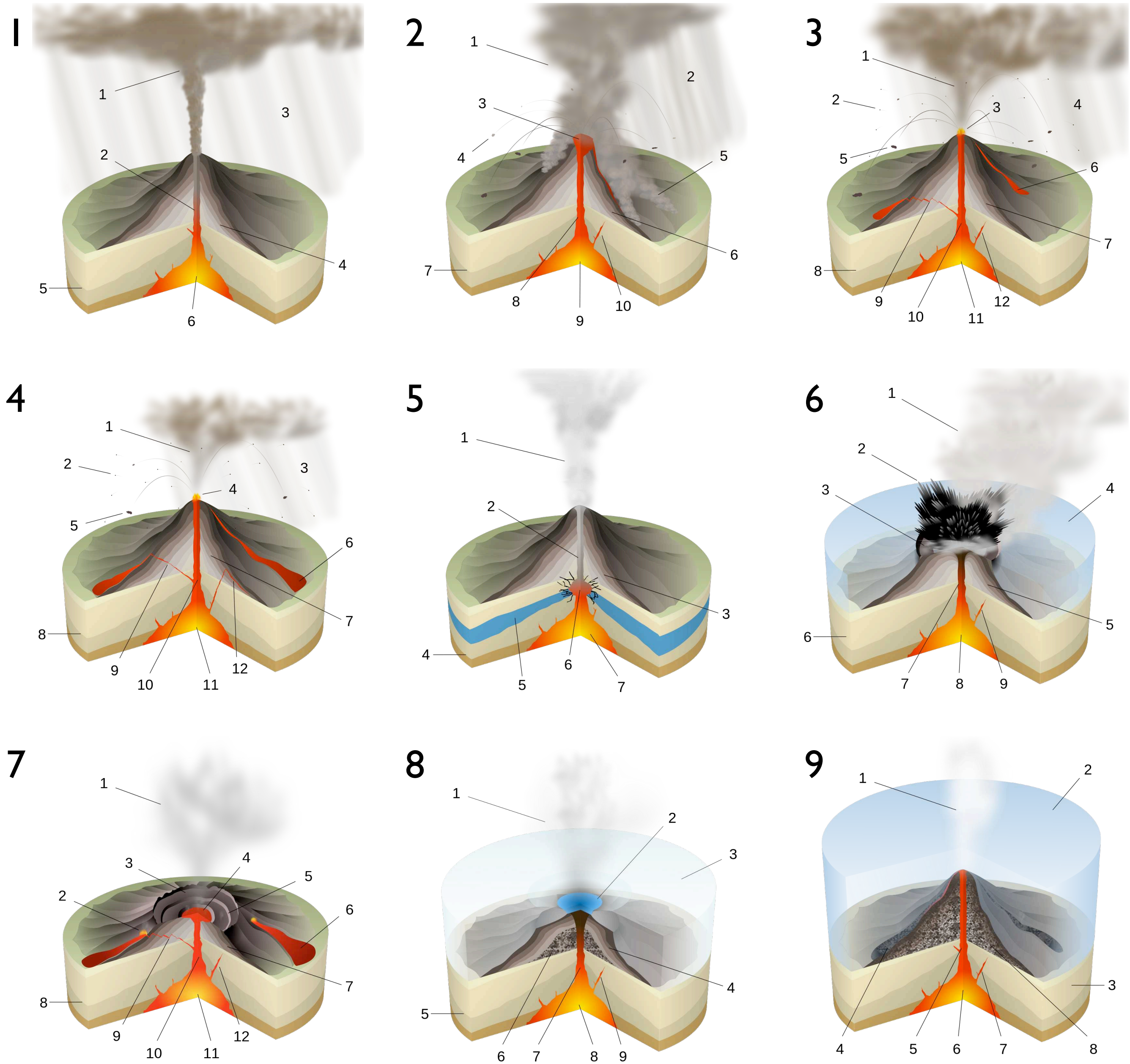


Verschiedene Eruptionsformen

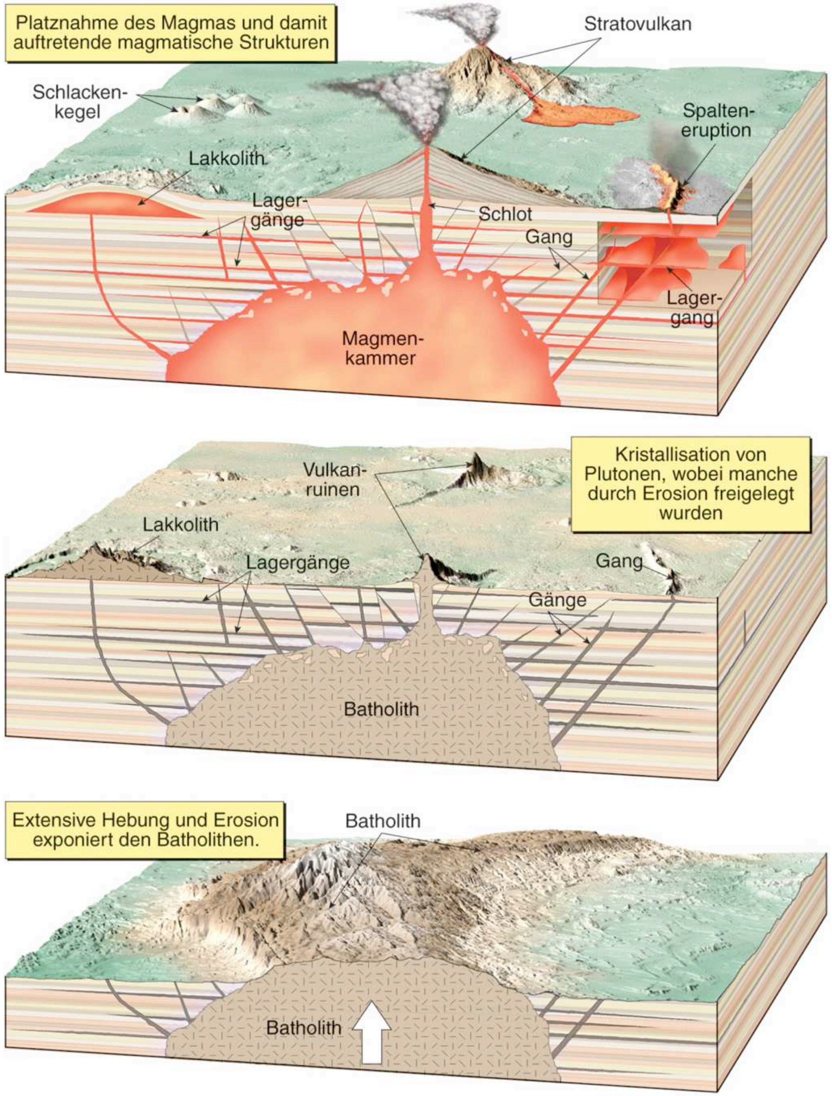
1. Die Plinianische Eruption
2. Peleanische Eruption
3. Vulkanianische Eruption

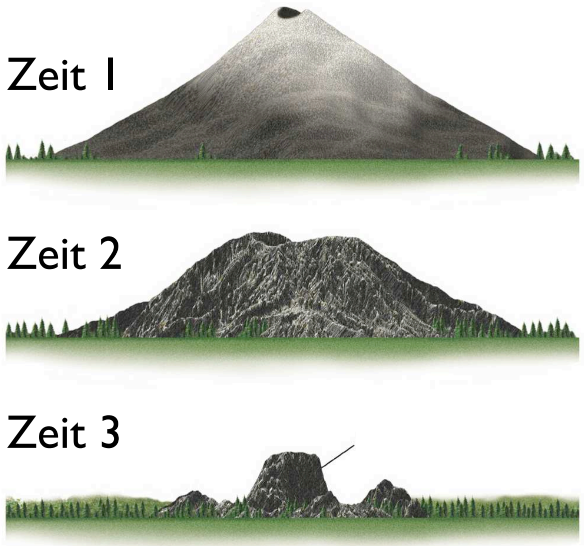
4. Strombolianische Eruption
5. Phreatische Ausbrüche (Wasserdampf-Explosionen)
6. Surtseyanische Eruption

7. Hawaiische Eruption
8. Subglaziale Eruption
9. Submarine Eruption



Wirkung von Hebung und Erosion

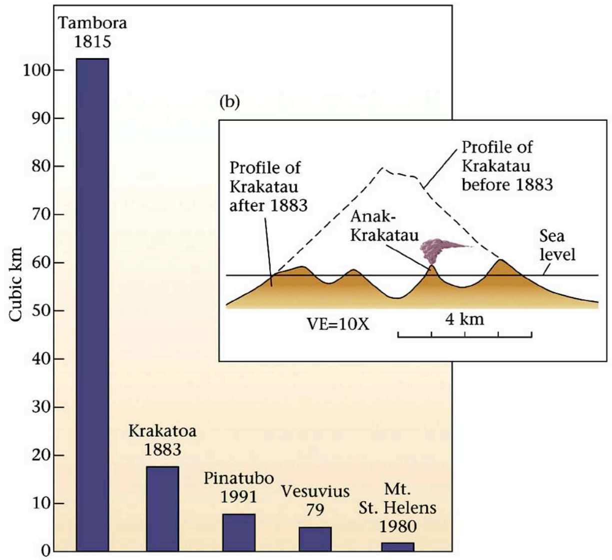




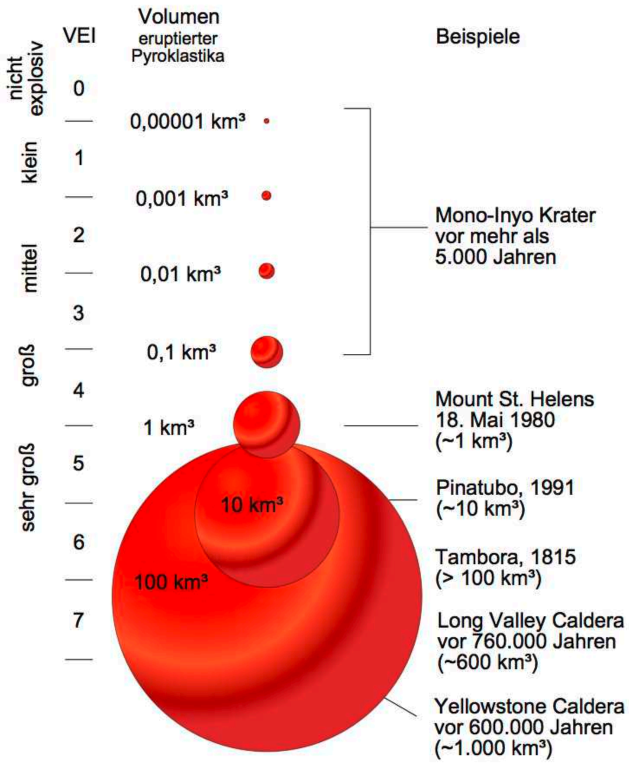
Devil's Tower, Wyoming, U.S.A.

die grössten Vulkanausbrüche

Die grössten Ausbrüche



Eruptions	Country	Location	Year	Column height (km)	Volcanic Explosivity Index
Hatepe (Taupo)	New Zealand	Pacific Ring of Fire	186	51	7
Tambora	Indonesia	Pacific Ring of Fire	**1815**	**43**	**7**
Baekdu	China / North Korea	Pacific Ring of Fire	969	25	6–7
Kuwae	Vanuatu	Pacific Ring of Fire	1452	?	6
Huaynaputina	Peru	Pacific Ring of Fire	1600	46	6
Krakatoa	Indonesia	Pacific Ring of Fire	1883	36	6
Santa María	Guatemala	Pacific Ring of Fire	1902	34	6
Novarupta	USA, Alaska	Pacific Ring of Fire	1912	32	6
Pinatubo	Philippines	Pacific Ring of Fire	1991	34	6
Mount Vesuvius	Italy	Mediterranean	79	30	5
Mt. St. Helens	USA, Washington	Pacific Ring of Fire	1980	19	5



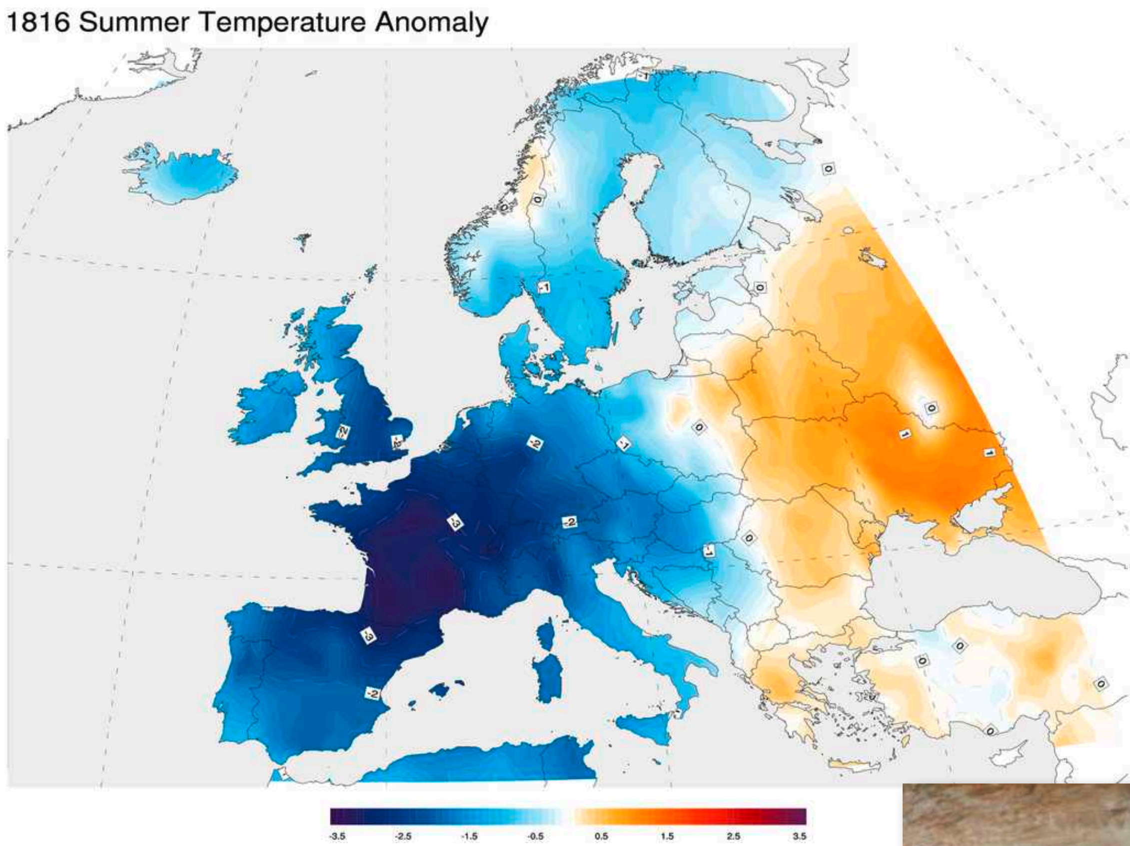
http://de.wikipedia.org/wiki/Liste_großer_historischer_Vulkanausbrüche

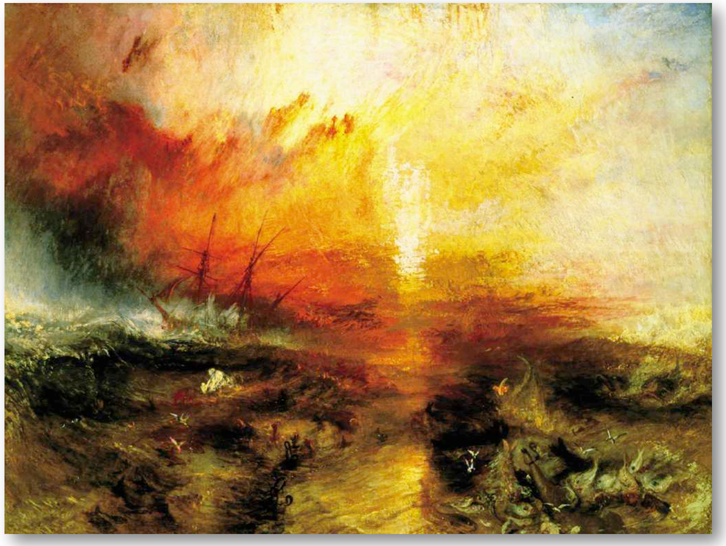
Vulkanexplosivitätsindex

Volcanic Explosivity Index VEI

VEI	Ejecta volume (bulk)	Classification	Description	Plume	Frequency	Tropospheric injection	Stratospheric injection[2]
		Examples					
0	$< 10^4$ m^3	Hawaiian	Effusive	< 100 m	continuous	negligible	none
		Kīlauea, Piton de la Fournaise, Erebus					
1	$> 10^4$ m^3	Hawaiian / Strombolian	Gentle	100 m – 1 km	daily	minor	none
		Nyiragongo (2002), Raoul Island (2006), Stromboli (continuous since Roman times to present)					
2	$> 10^6$ m^3	Strombolian / Vulcanian	Explosive	1–5 km	fortnightly	moderate	none
		Unzen (1792), Cumbre Vieja (1949), Galeras (1993), Sinabung (2010)					
3	$> 10^7$ m^3	Vulcanian / Peléan/Sub-Plinian	Catastrophic	3–15 km	3 months	substantial	possible
		Lassen Peak (1915), Nevado del Ruiz (1985), Soufrière Hills (1995), Nabro (2011)					
4	> 0.1 km^3	Peléan / Plinian/Sub-Plinian	Cataclysmic	> 10 km (Plinian or sub-Plinian)	18 months	substantial	definite
		Laki (1783), Mayon (1814), Pelée (1902), Galunggung (1982), Eyjafjallajökull (2010), Calbuco (2015)					
5	> 1 km^3	Peléan/Plinian	Paroxysmic	> 10 km (Plinian)	12 years	substantial	significant
		Vesuvius (79), Fuji (1707), Mount Tarawera (1886), Mount Agung (1963), St. Helens (1980), Mount Hudson (1991), Puyehue (2011)					
6	> 10 km^3	Plinian / Ultra-Plinian	Colossal	> 20 km	50 - 100 yrs	substantial	substantial
		Laach Lake Volcano (c. 12,900 BC), Veniaminof (c. 1750 BC), Lake Ilopango (535), Huaynaputina (1600), Krakatoa (1883), Santa Maria (1902), Novarupta (1912), Pinatubo (1991)					
7	> 100 km^3	Ultra-Plinian	Super-colossal	> 20 km	500 - 1,000 yrs	substantial	substantial
		Mazama (c. 5600 BC), Thera (c. 1620 BC), Taupo (180), Baekdu (946), Samalas (Mount Rinjani) (1257), Tambora (1815)					
8	> 1000 km^3	Ultra-Plinian	Mega-colossal	> 20 km	> 50,000 yrs[3][4]	vast	vast
		La Garita Caldera (26.3 Ma), Yellowstone (630,000 BC), Toba (74,000 BC), Taupo (25,360 BC)					

Tambora, 10. April, 1815





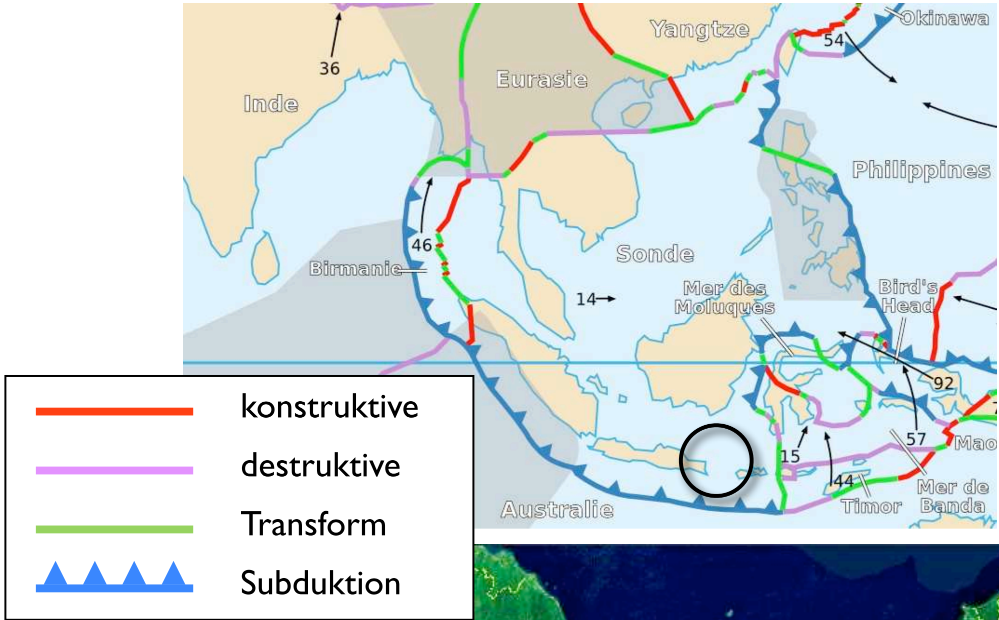
Flint Castle 1838
J. M. W. Turner (1775-1851)

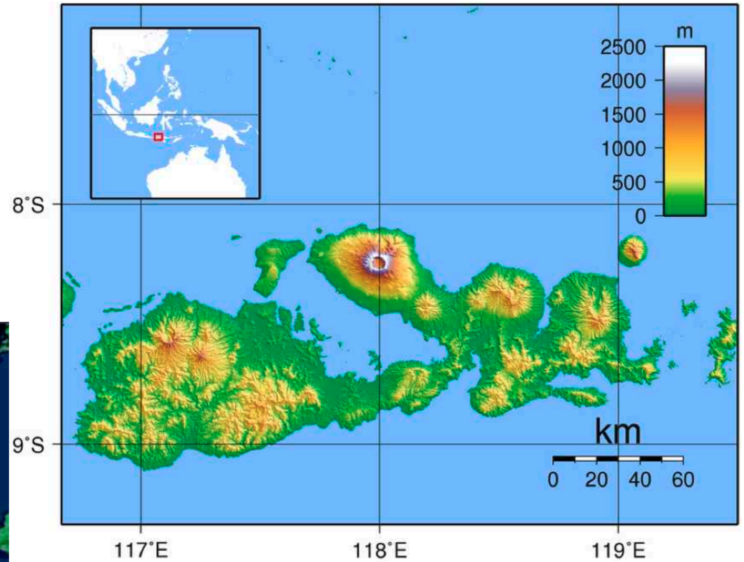
Das Jahr ohne Sommer:
"Eighteen hundred and froze to death"

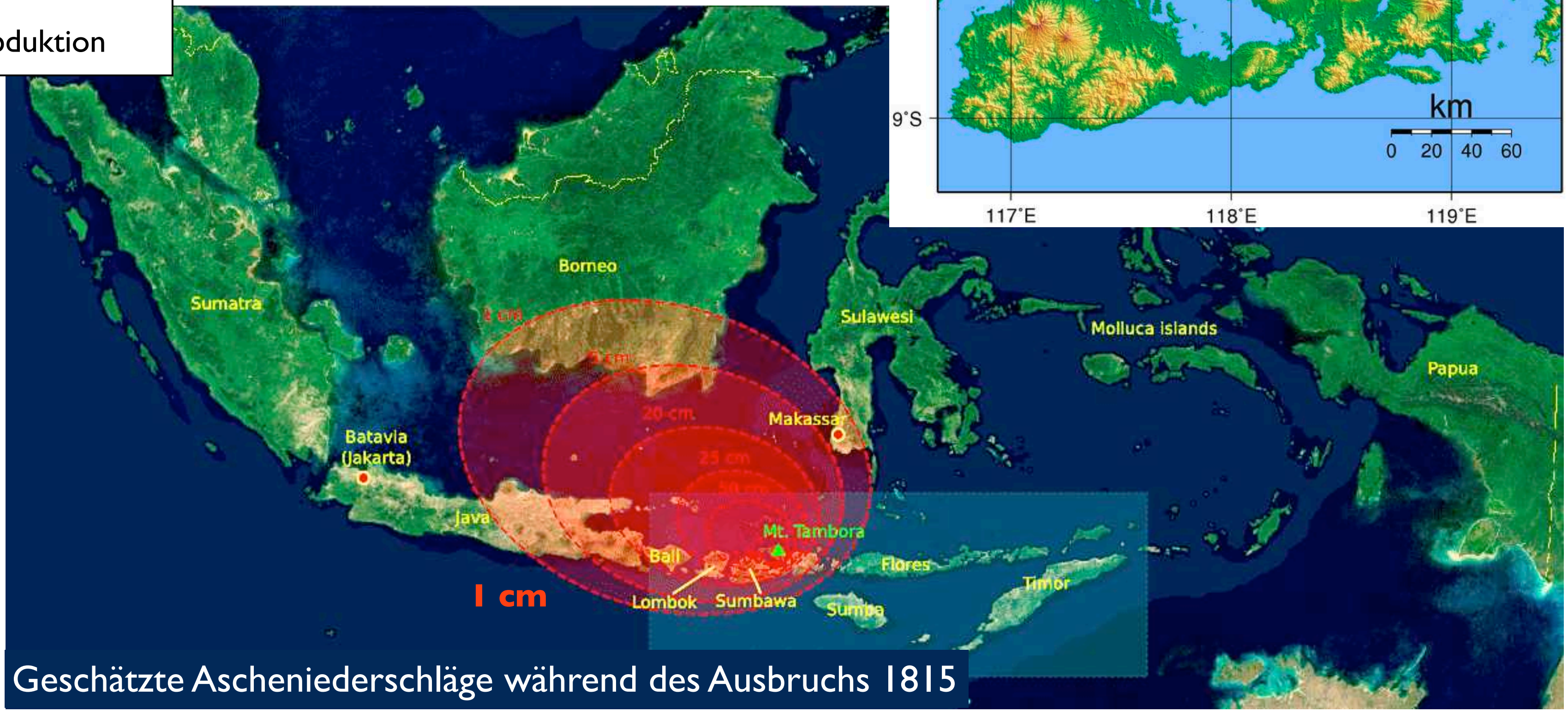
Chichester Channel 1828
J. M. W. Turner (1775-1851)

Tambora - Subduktionszone

Schichtvulkan

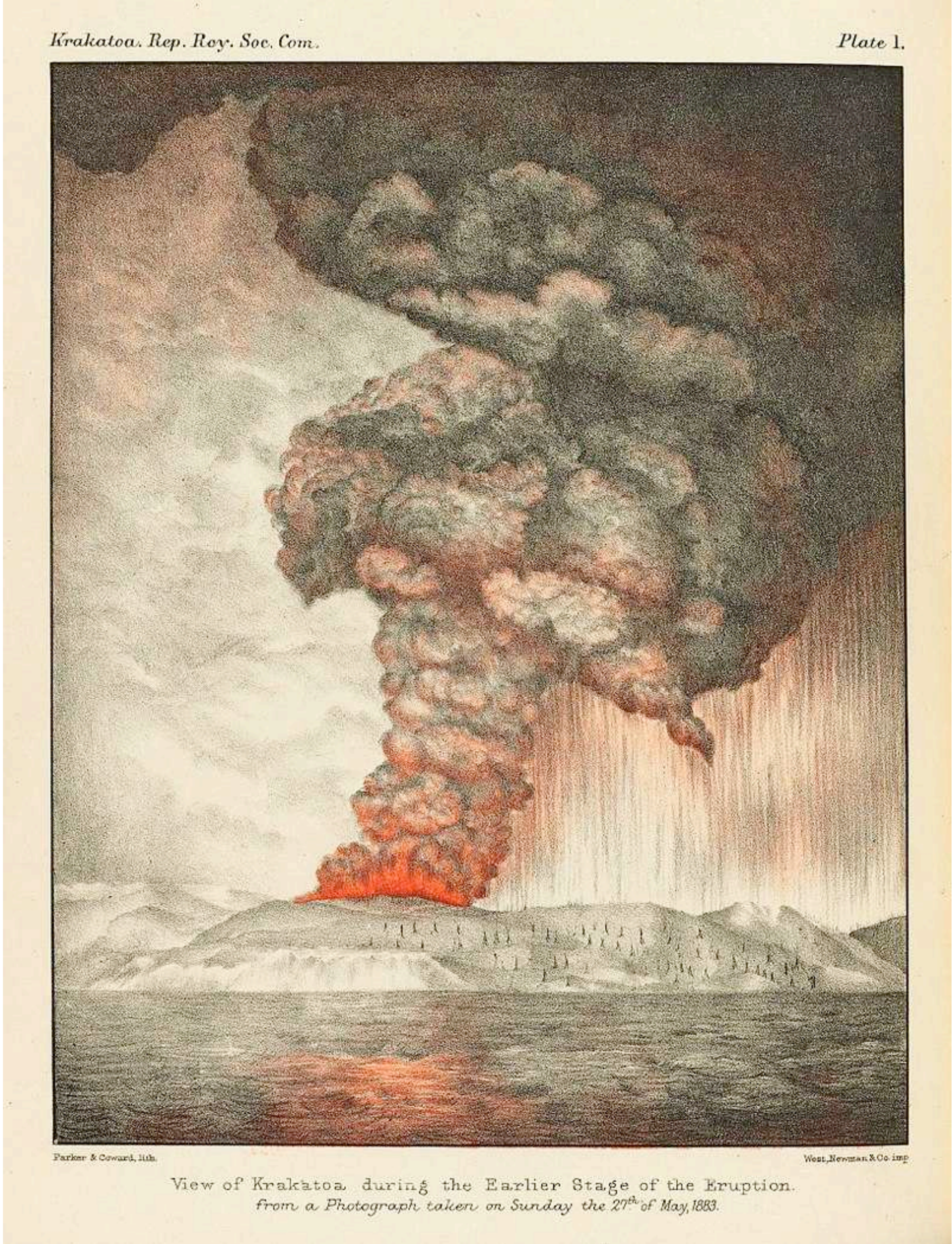


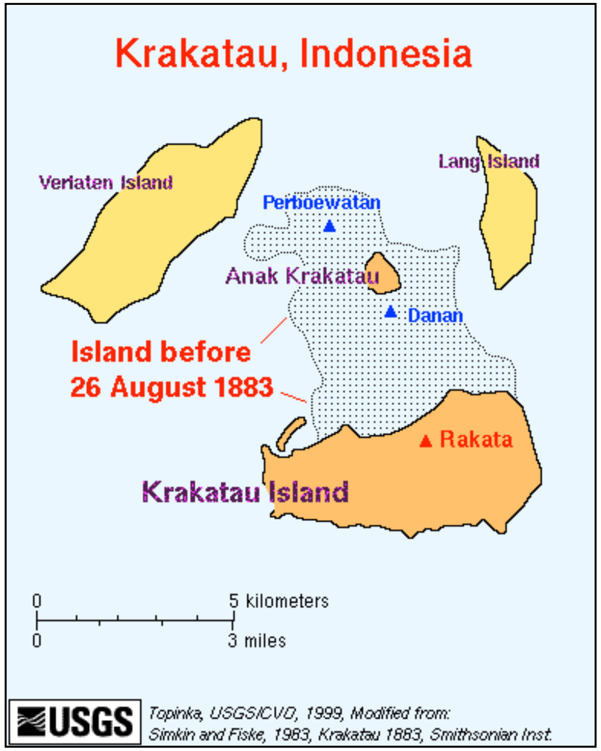




Geschätzte Ascheniederschläge während des Ausbruchs 1815

Krakatau, 26.-27. August 1883





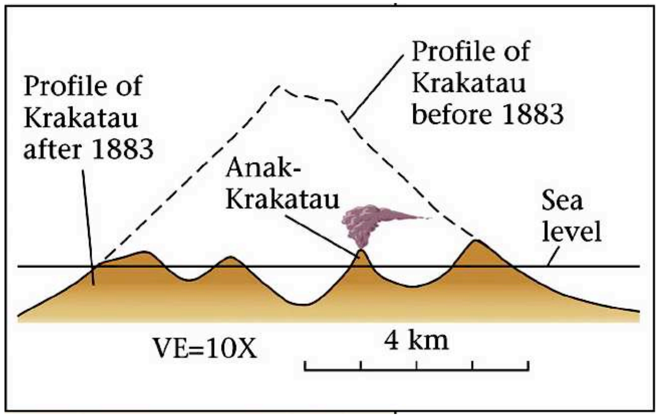
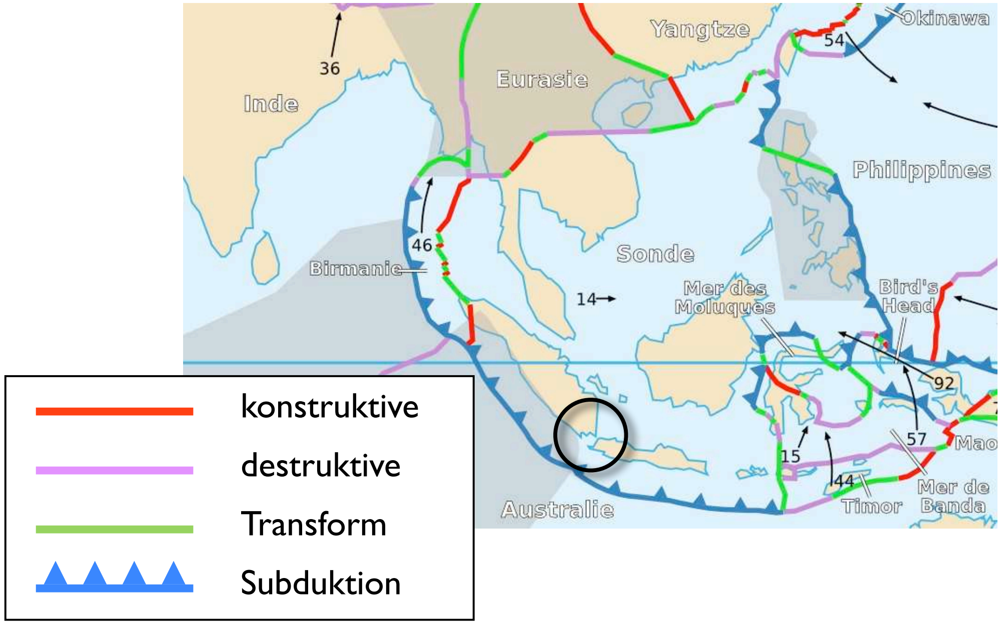
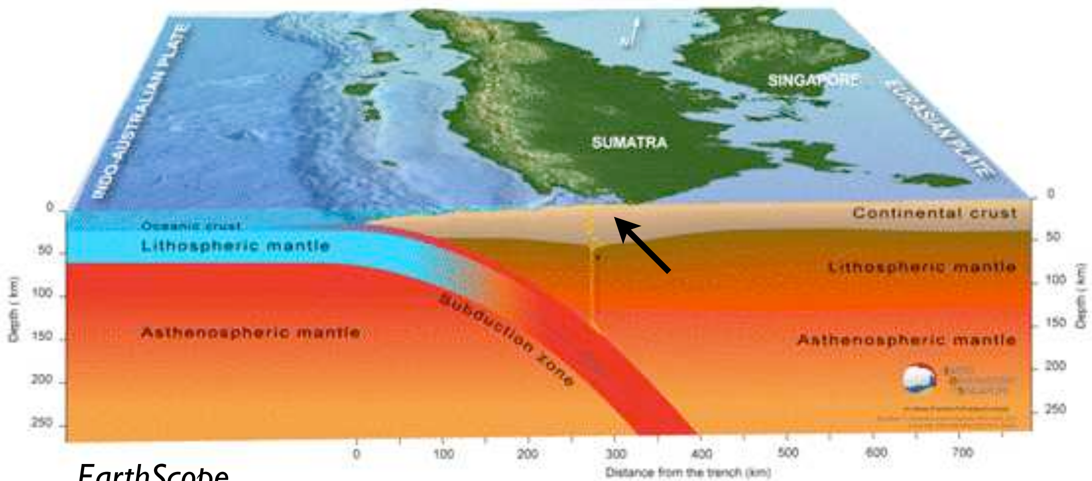


Image published as Plate 1 in The eruption of Krakatoa, and subsequent phenomena. Report of the Krakatoa Committee of the Royal Society (London, Trubner & Co., 1888)

Krakatau - Schichtvulkan - Subduktionszone

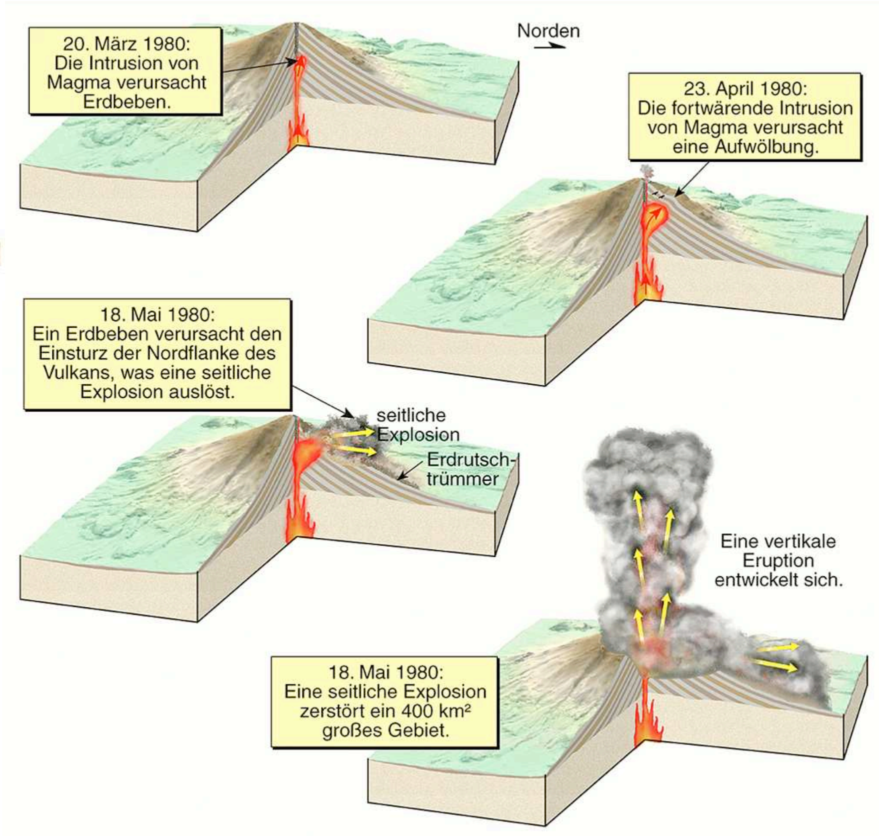
Schichtvulkan





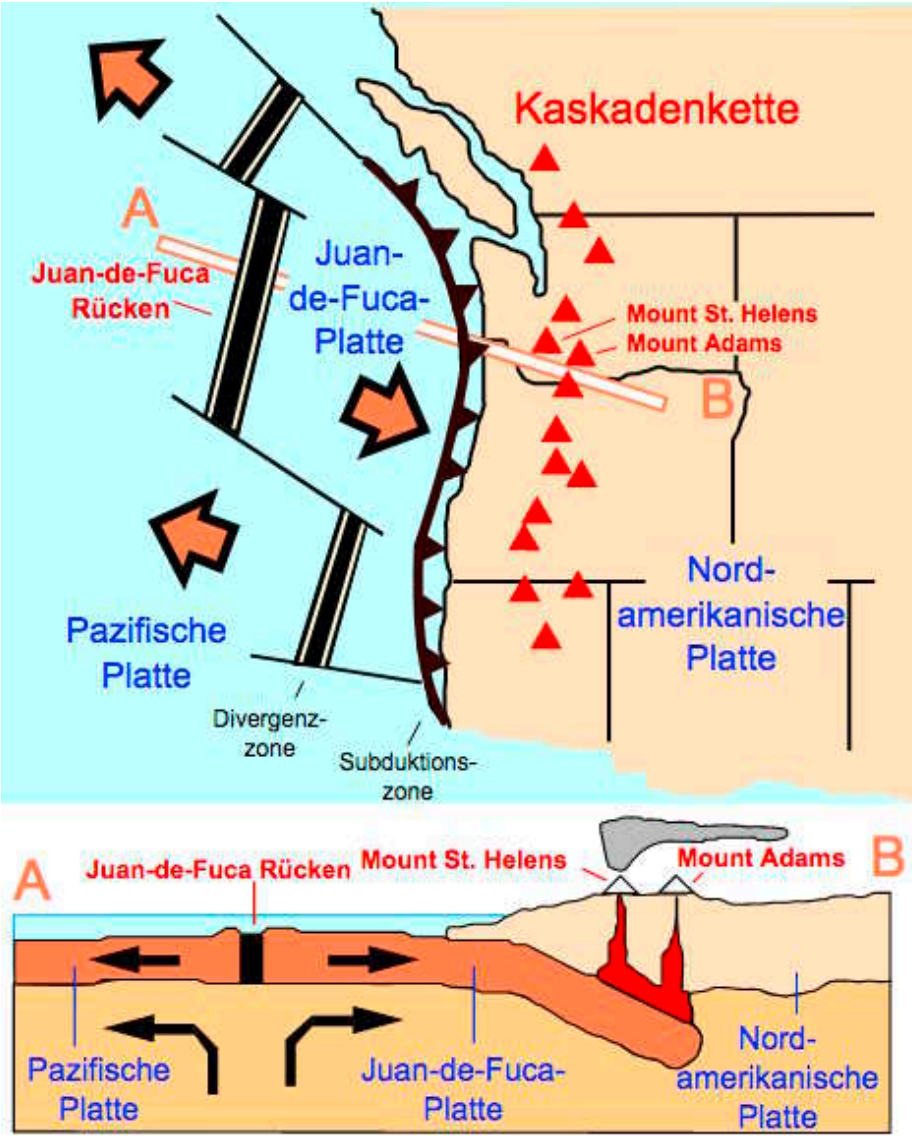
EarthScope

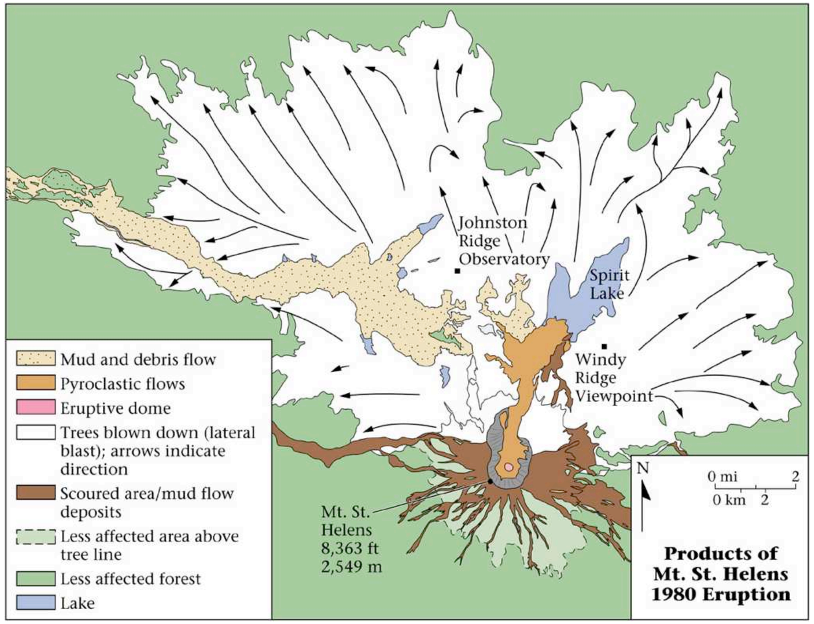
Mount St Helens, 18. Mai 1980



Mount St Helens - kontinentaler Vulkanbogen

Schichtvulkan





Mount St Helens

one day before the eruption, photographed from the Johnston ridge
four months after the eruption, photographed from ± the same location

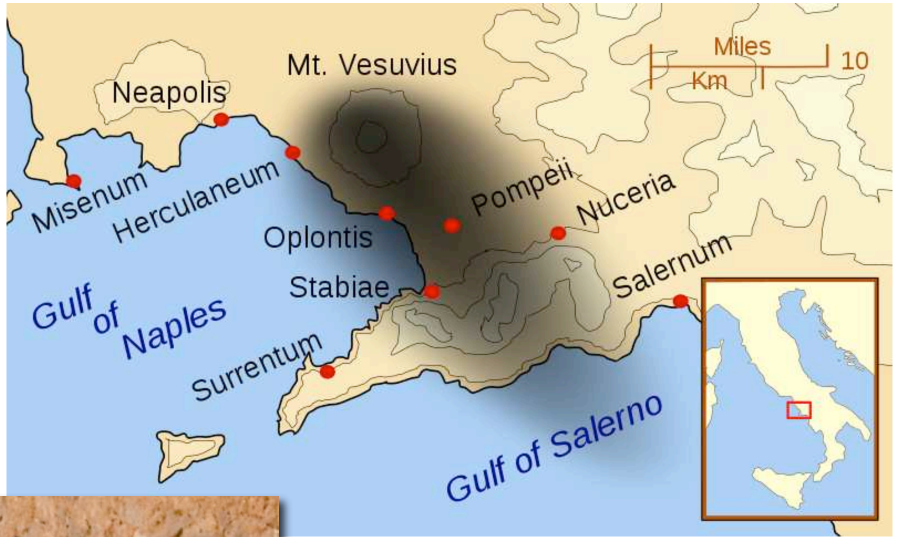
Mount St Helens

Mount St. Helens: Ausbruch am 18. Mai 1980 um 08:32 Uhr Pazifischer Standardzeit
Appearance of the "Whaleback" in February 2005

Vesuv, 24. August, 79 n. Chr.

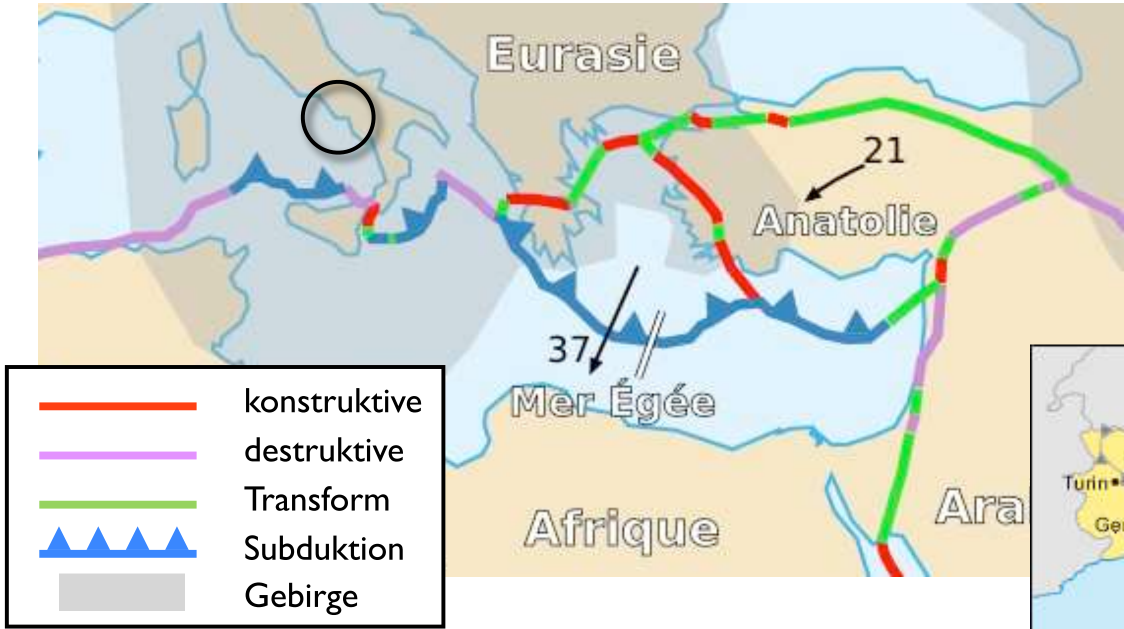
Augenzeuge Plinius der Jüngere (Briefe an den römischen Geschichtsschreiber Cornelius Tacitus).
Beschreibt Ausbruch des Vesuvs und Untergang von Pompeji und Herculaneum im Jahr 79 n. Chr. - Sein Onkel Plinius der Ältere fand bei diesem Ausbruch den Tod.

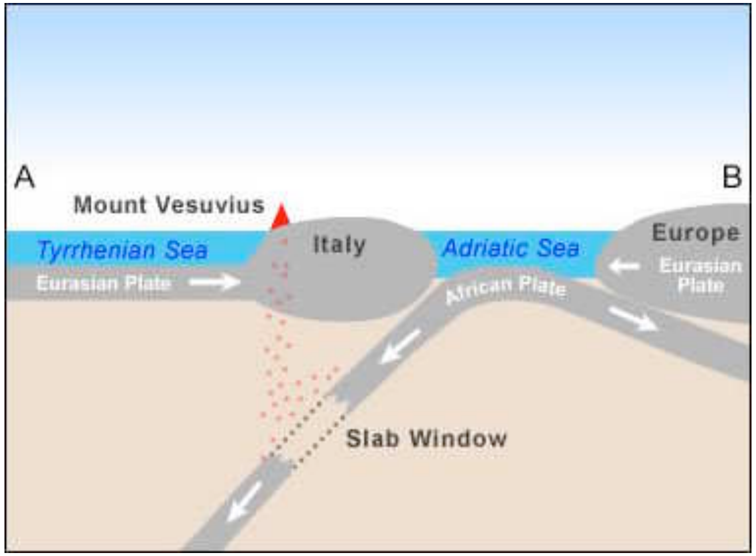
→ "Plinianische" Eruption



Vesuv - Subduktionszone

Schichtvulkan



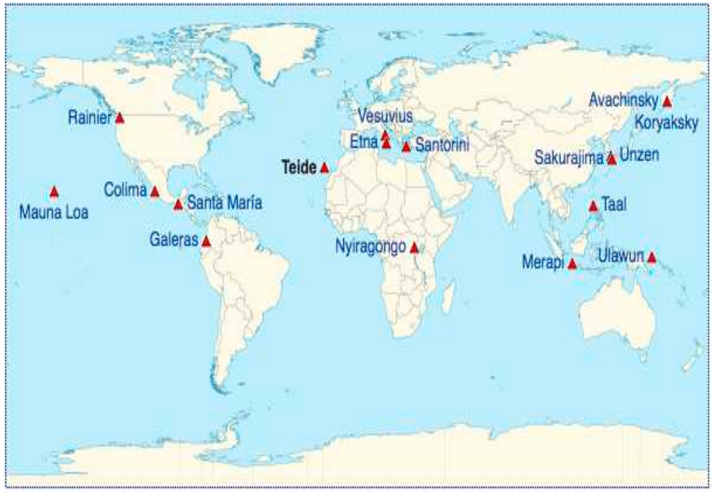


über der Subduktionszone
Afrika - Eurasia

Decade Volcanoes

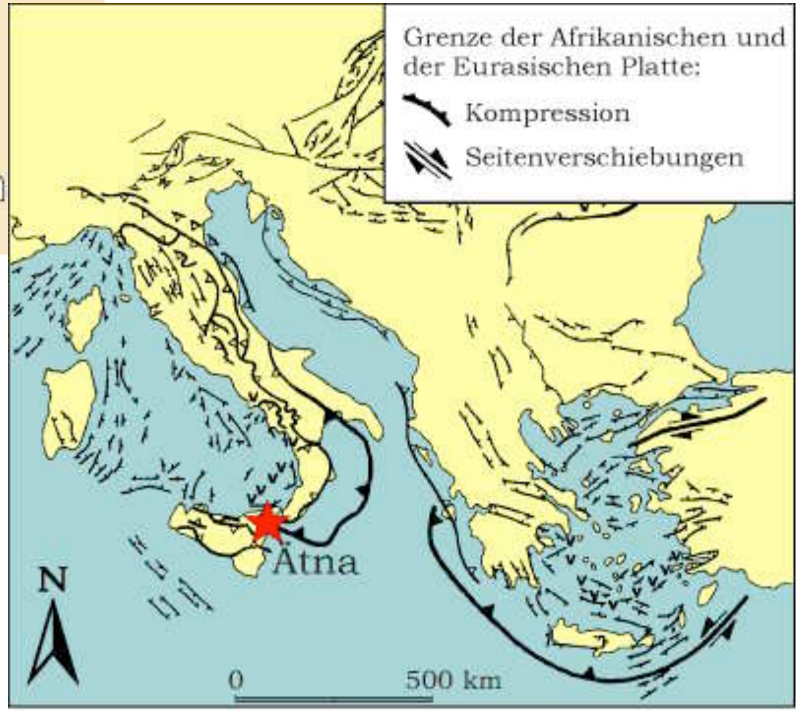
Decade Volcanoes

Volcano	Region	Country
Avachinsky-Koryaksky	Kamchatka	Russia
Colima	Jalisco	Mexico
Galeras	Nariño	Colombia
Mauna Loa	Hawaii	United States
Mount Etna	Sicily	Italy
Mount Merapi	Central Java	Indonesia
Mount Nyiragongo	North Kivu	Democratic Republic of the Congo
Mount Rainier	Washington	United States
Mount Vesuvius	Campania	Italy
Mount Unzen	Nagasaki/Kumamoto	Japan
Sakurajima	Kagoshima	Japan
Santa María	Quetzaltenango	Guatemala
Santorini	South Aegean	Greece
Taal Volcano	Calabarzon	Philippines
Teide	Canary Islands	Spain
Ulawun	East New Britain/West New Britain	Papua New Guinea



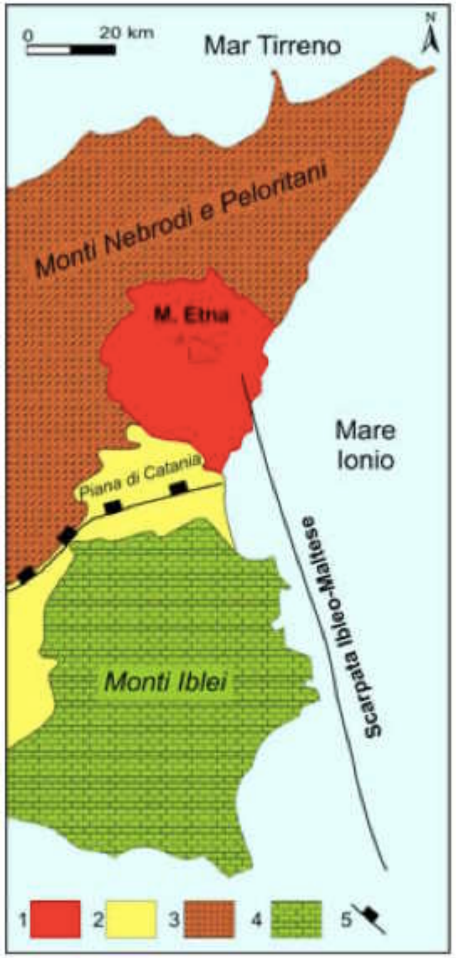
The Decade Volcanoes Project
= part of the UN-sponsored International Decade for Natural Disaster Reduction (1990s)
Decade Volcanoes were identified by the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).

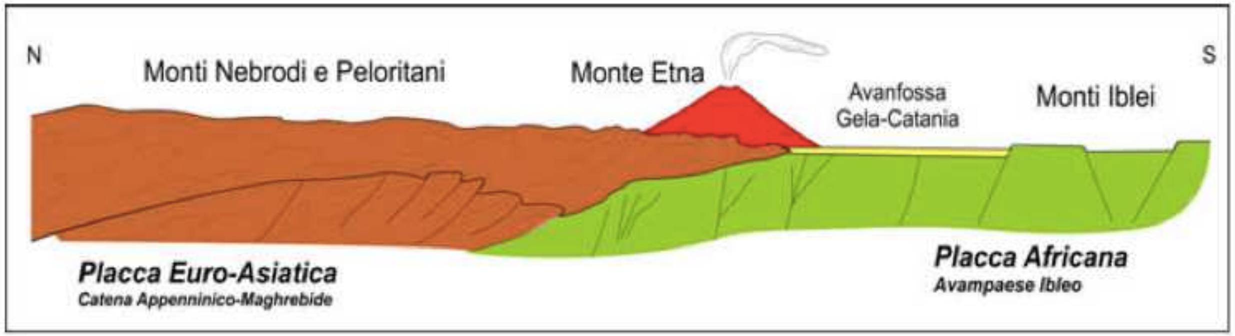
Ätna - Subduktionszone



über der Subduktionszone
Afrika - Eurasia

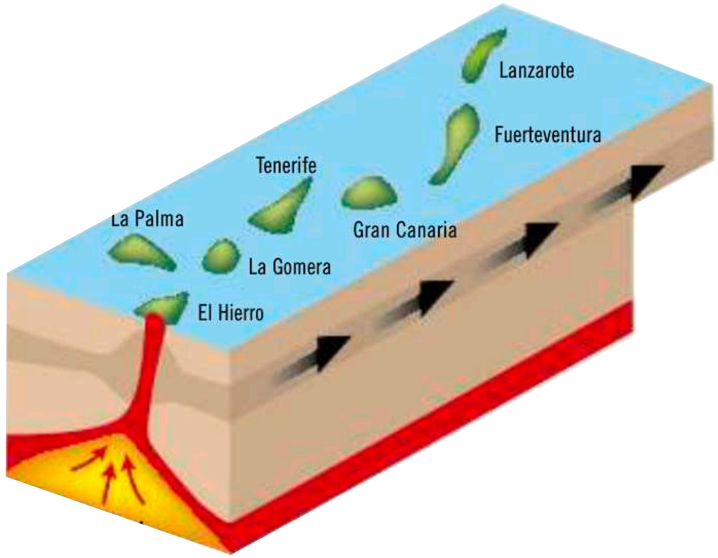
Ätna, 26. Okt. 2013



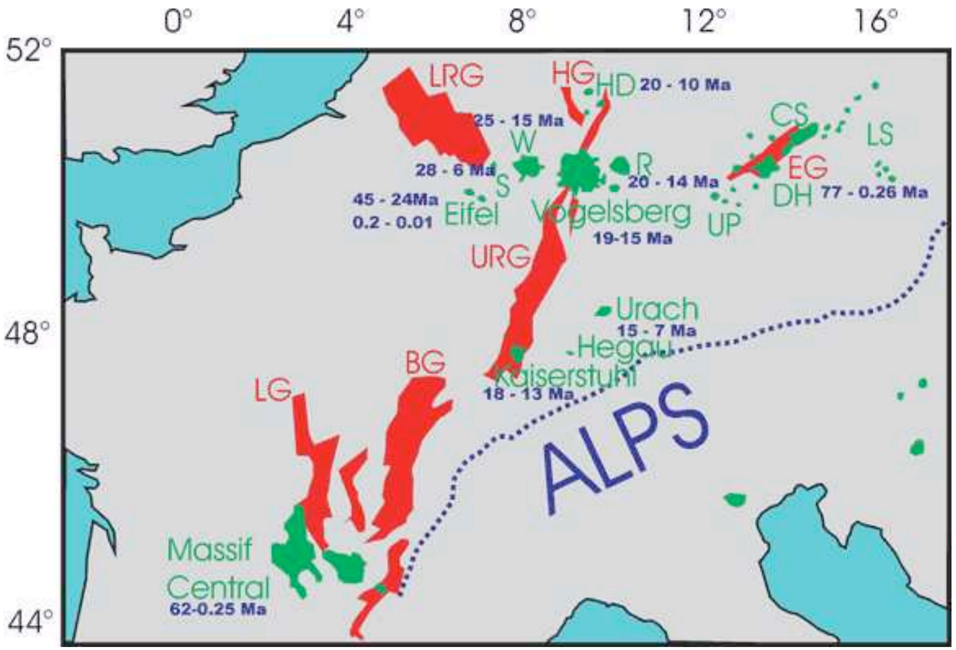


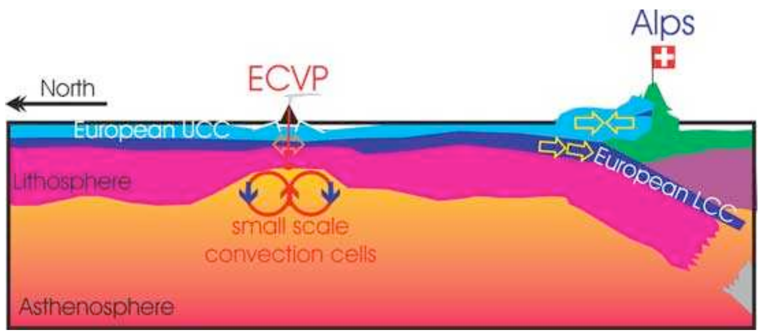
Teife Tenerifa - Hotspot

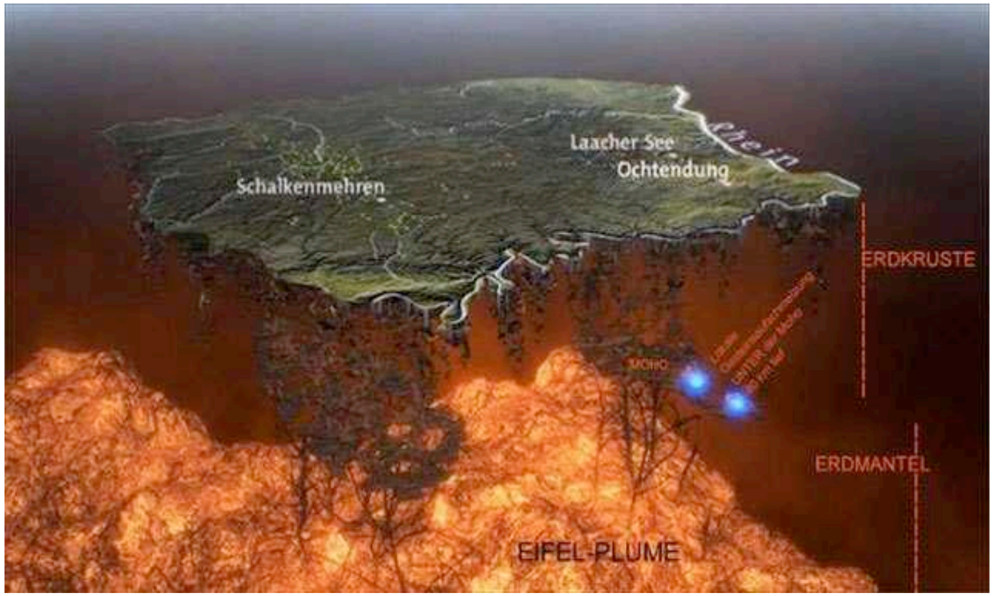
El Teide
= hispanisierte Form des Guanchen-Begriffes Echeyde. Bezeichnet die Wohnung des bösen Dämonen Guayota, welcher den Sonnengott Magec dort gefangen hielt. Die Guanchen baten ihren obersten Gott Achamán um Hilfe. Dieser verjagte Guayota, befreite den Sonnengott Magec und verschloss die obere Öffnung des Echeyde mit einem Stopfen, dem sogenannten Pan de Azúcar (Zuckerbrot) oder Pilón (Zuckerhut).



Eifel - Hotspot ?







nein!

The European Cenozoic Volcanic Province is not caused by mantle plumes.
www.mantleplumes.org/Europe.html

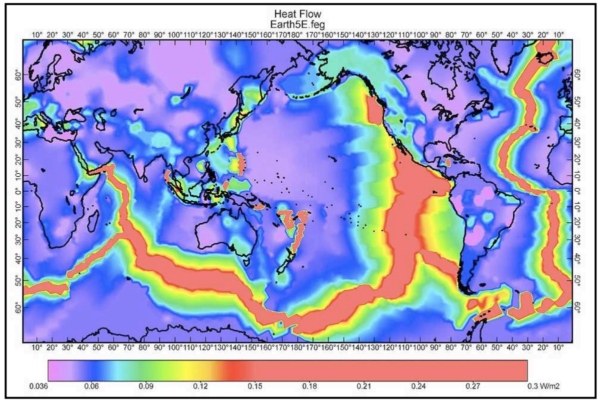
ja!

... hofft das seismologische Eifel-Plume Project
https://volcanohotspot.wordpress.com/2017/08/19/my-personal-field-trip-to-the-maar-diatreme-volcanoes-of-the-eifel-volcanic-field-de/

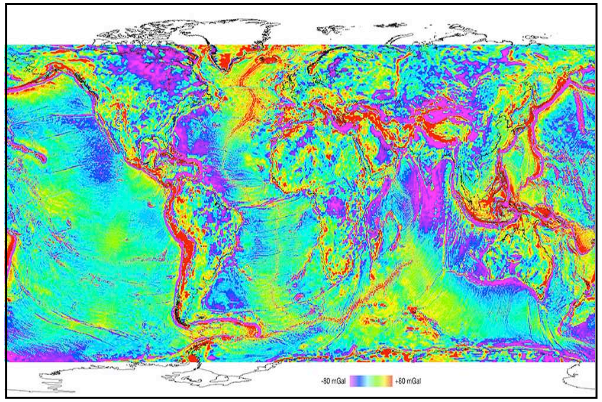
Plattengrenzen

wie sich Plattengrenzen verraten

1- Wärmefluss → konstruktive

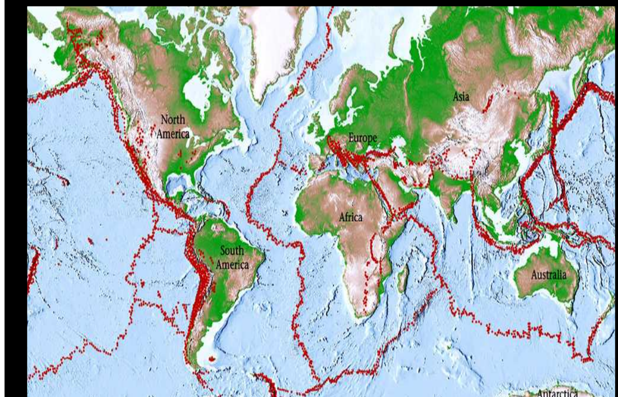


2- Schwereanomalien → destruktive

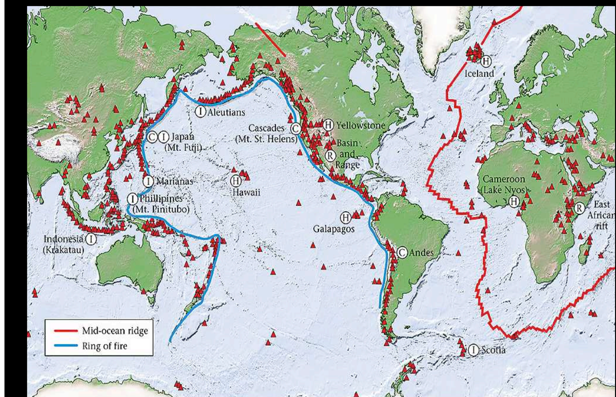


NORGES GEOLOGISKE UNDERSØKELSE · NGU ·

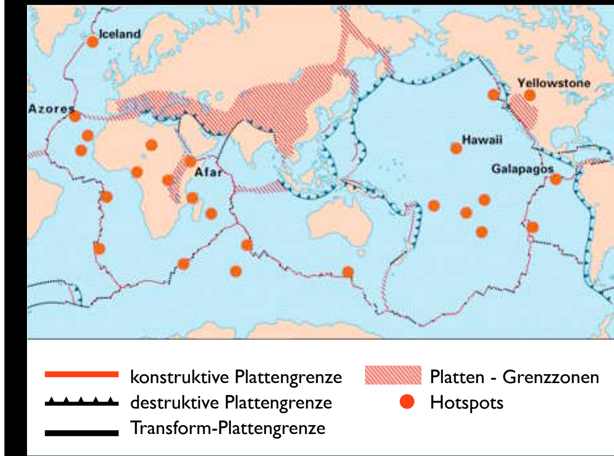
3- Erdbeben → alle

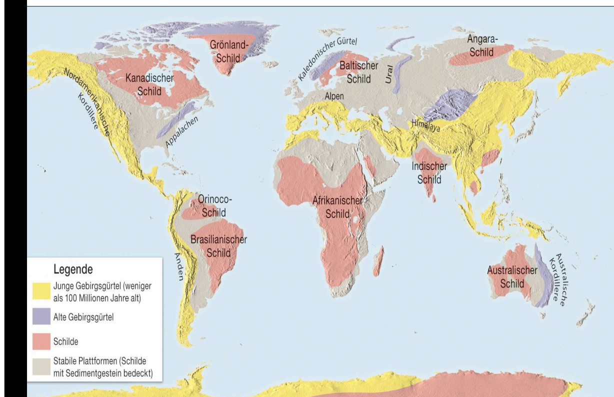


4- Vulkanismus → alle



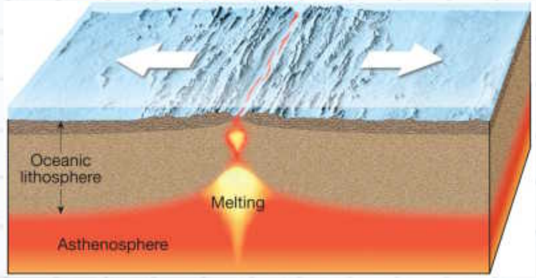
5- Deformation
→ destruktive





direkt - von Auge - beobachtbar

Steckbrief: Konstruktive Plattengrenze

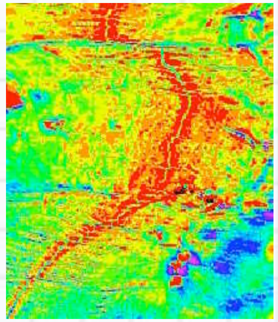


Wärmefluss

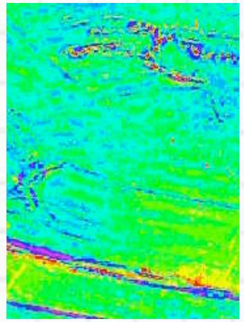
sehr hoch > 100 mWm^{-2}

Freiluft-Anomalie

positiv bei langsamem Spreading: Reykjanes Rücken
undeutlich bei schnellem Spreading: Ostpazifischer Rücken



Reykianes Ridge



East Pacific Rise

Erdbeben

seicht: Hypozentrum < 50 km
Herdflächenlösungen zeigen Dehnung (Abschiebung)

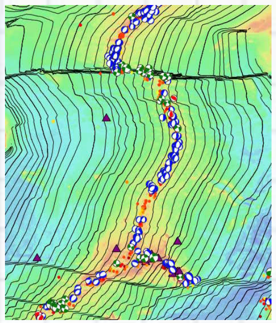
Vulkanismus

basisch (leichtfliessend): Schildvulkane, Pillowlaven
mafische Gesteine: Gabbro - Basalt
Hydrothermalquellen

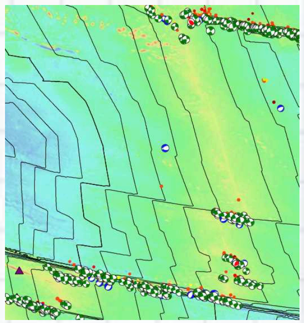
Deformation

Grabenbildung

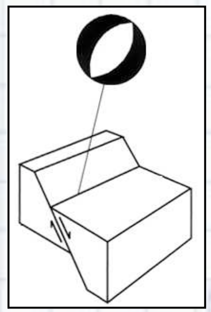
Hypozentrum 0 - 50 km



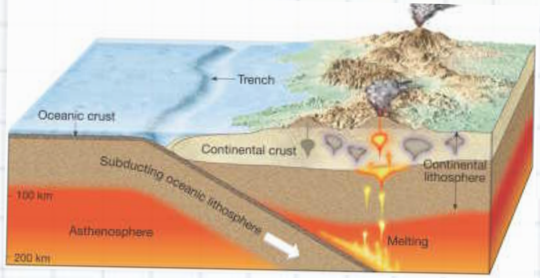
Reykianes Ridge



East Pacific Rise



Steckbrief: Destruktive Plattengrenze

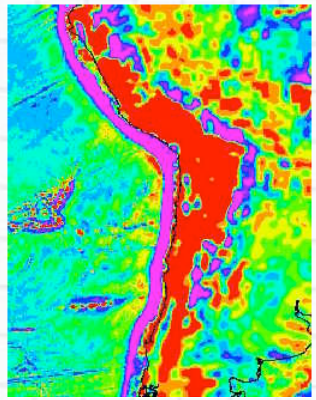


Wärmefluss

unauffällig
über abtauchender Platte eher tief 40 - 50 mWm^{-2}
über jungem Gebirge 60 - 80 mWm^{-2}

Freiluft-Anomalie

hoher Kontrast Kontrast an Plattengrenze
negativ im Tiefseegraben - positiv über Gebirgen

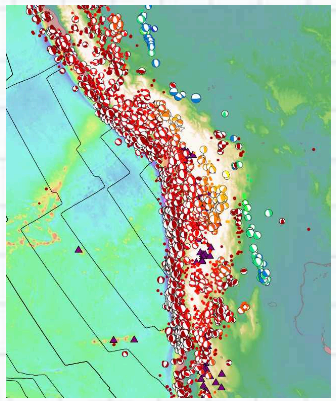

Anden

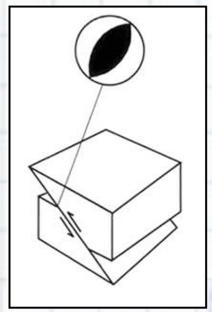
Erdbeben

tief: Hypozentrum bis 700 km (Tiefbeben, Tsunami)
Herdflächenlösungen zeigen Kompression (Überschiebung)

Vulkanismus

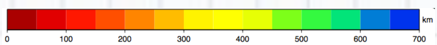
explosiv: Stratovulkane
intermediäre Gesteine: Diorit - Andesit


Anden



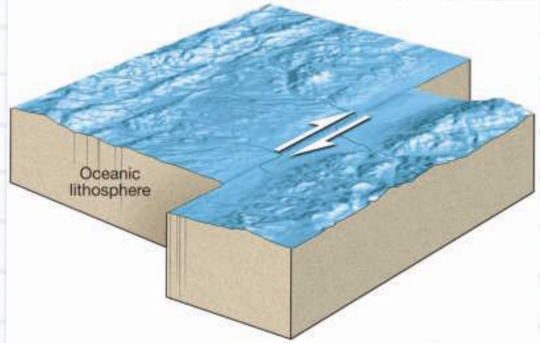
Deformation

Inselbögen
Gebirgsbildung



Hypozentrum 0 - 700 km

Steckbrief: Transform-Plattengrenze

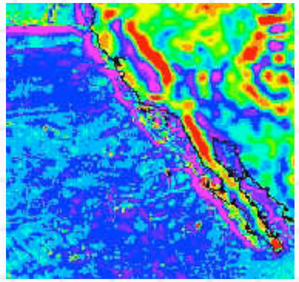


Wärmefluss

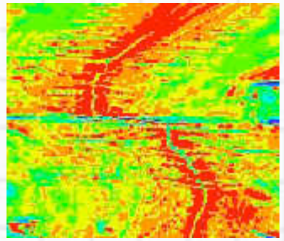
unauffällig
in der Nähe von Spreizungsrücken: hoch > 100 mWm^{-2}

Freiluft-Anomalie

unauffällig
nur durch Versatz sichtbar



San Andreas Fault



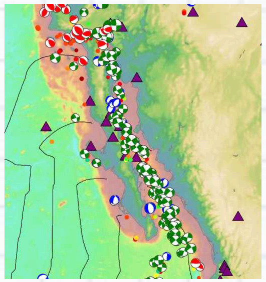
Gibbs Fracture Zone (Reykjanes Rücken)

Erdbeben

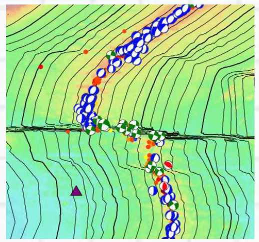
seicht: Hypozentrum < 50 km
Herdflächenlösungen: Scherung (Blattverschiebung)

Vulkanismus

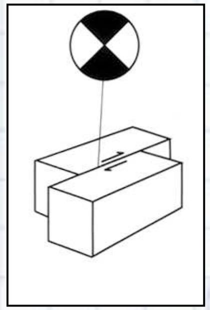
nicht ausgeprägt
in der Nähe von Spreizungsrücken:
Hydrothermalquellen



San Andreas Fault



Gibbs Fracture Zone (Reykjanes Rücken)



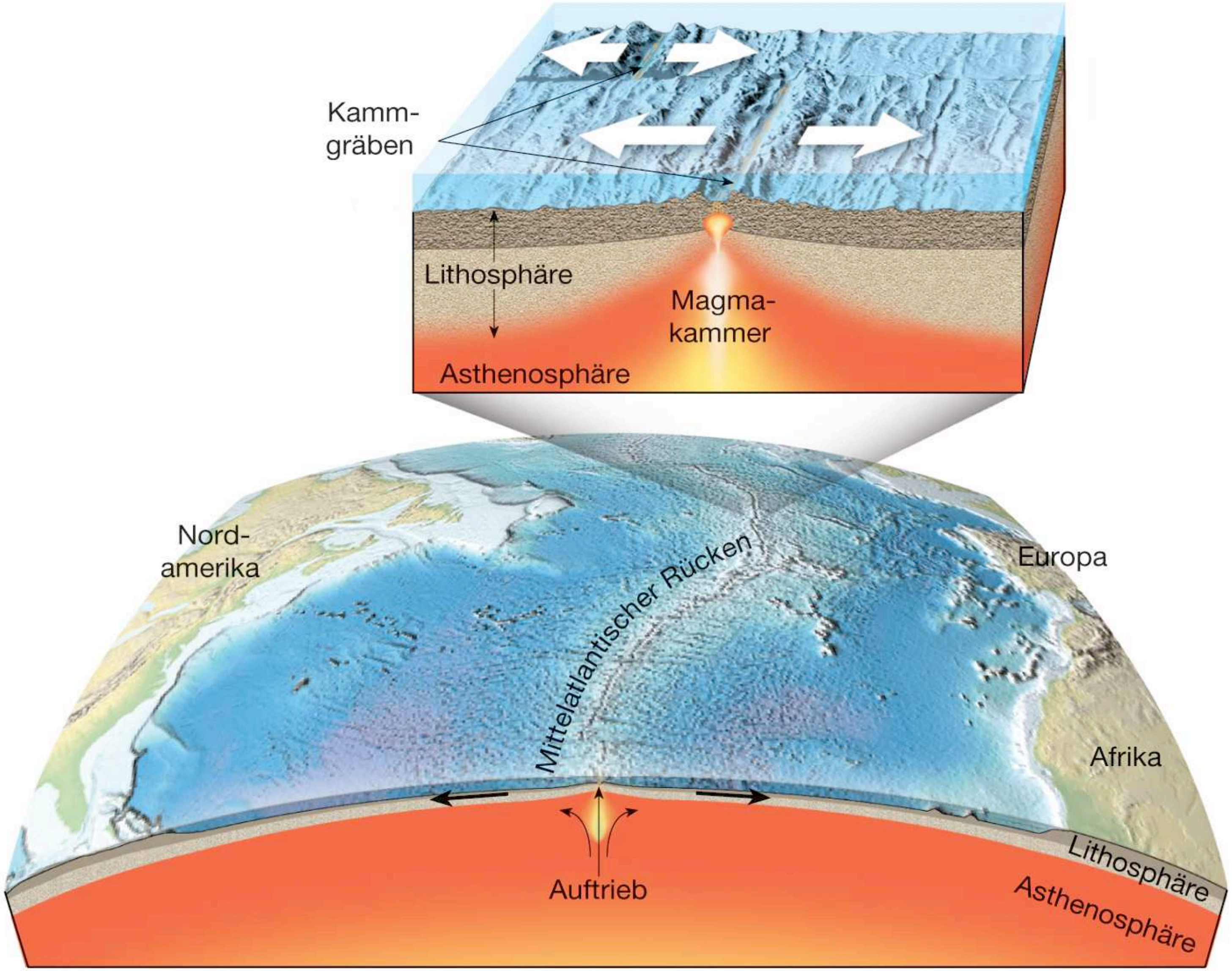
Deformation

Verwerfung ± Aufwerfung oder Grabenbildung

Hypozentrum 0 - 50 km

Steckbrief: konstruktive Plattengrenzen

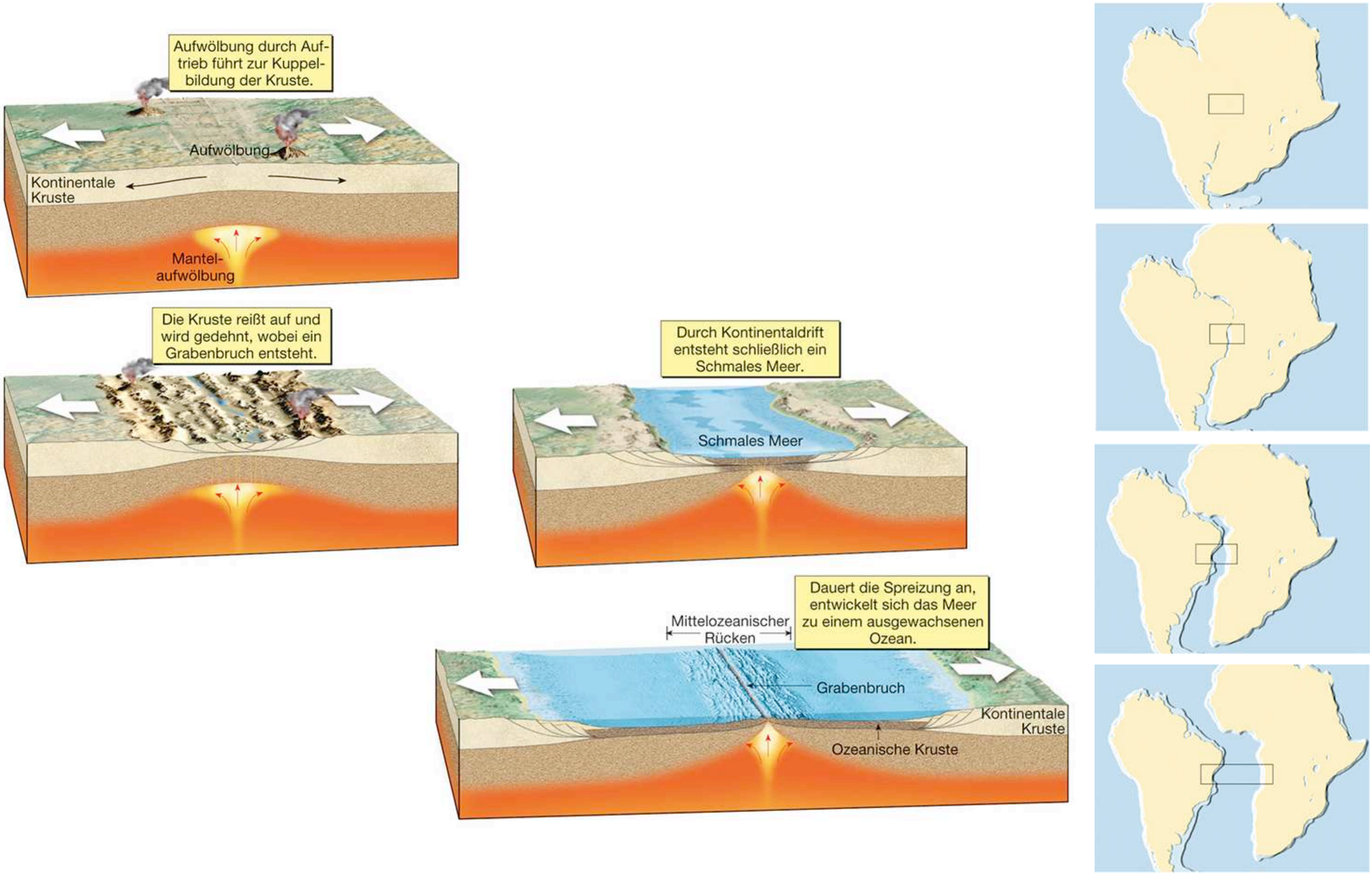
Konstruktive Plattengrenzen



(physikalisch)
konstruktiv
=
(kinematisch) divergent
=
(geometrisch) distensiv

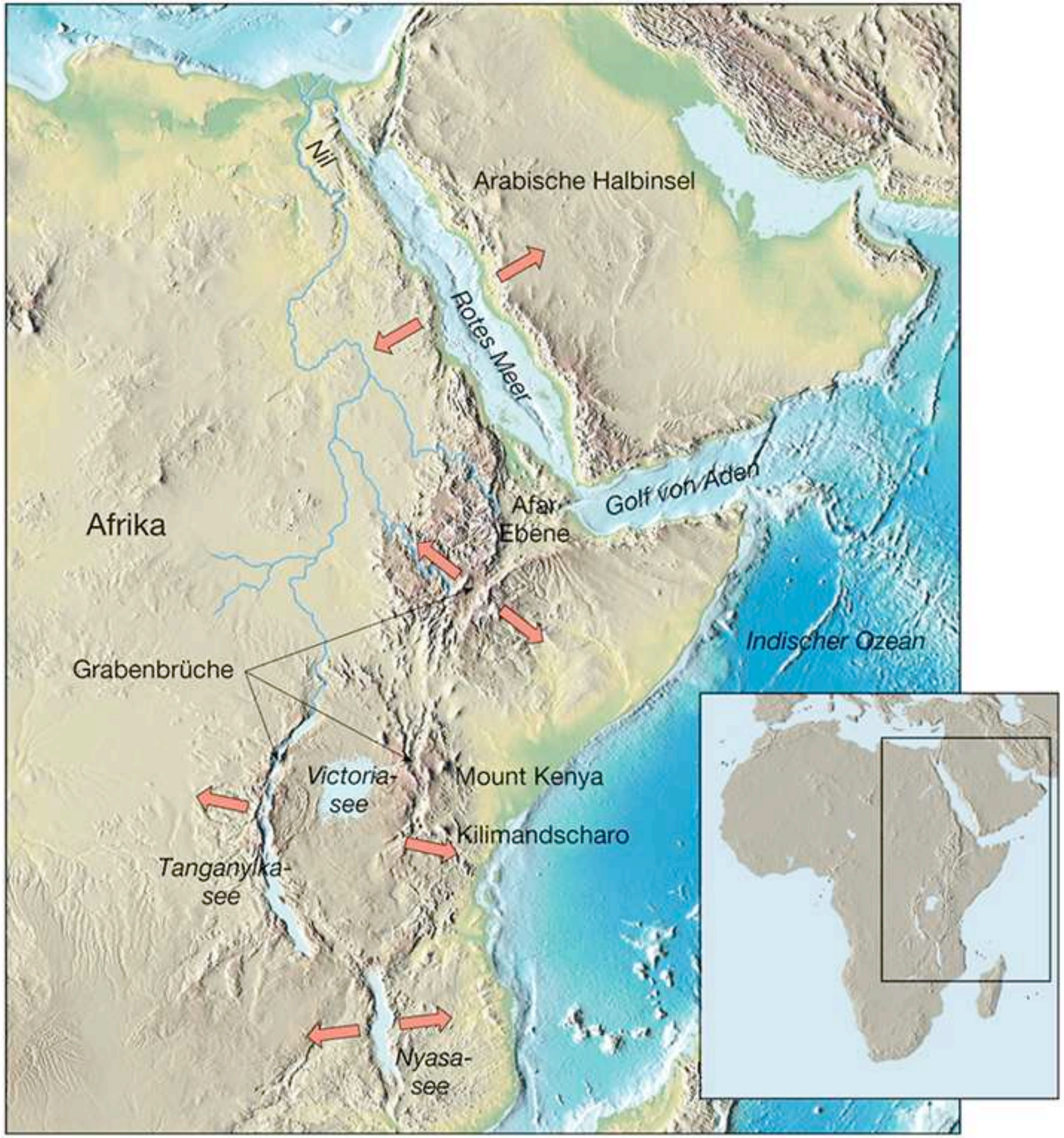
Abbildung 2.21: Die meisten divergenten Plattengrenzen befinden sich an den Kämmen der Ozeanischen Rücken.

vom kontinentalen Grabenbruch zum Ozean



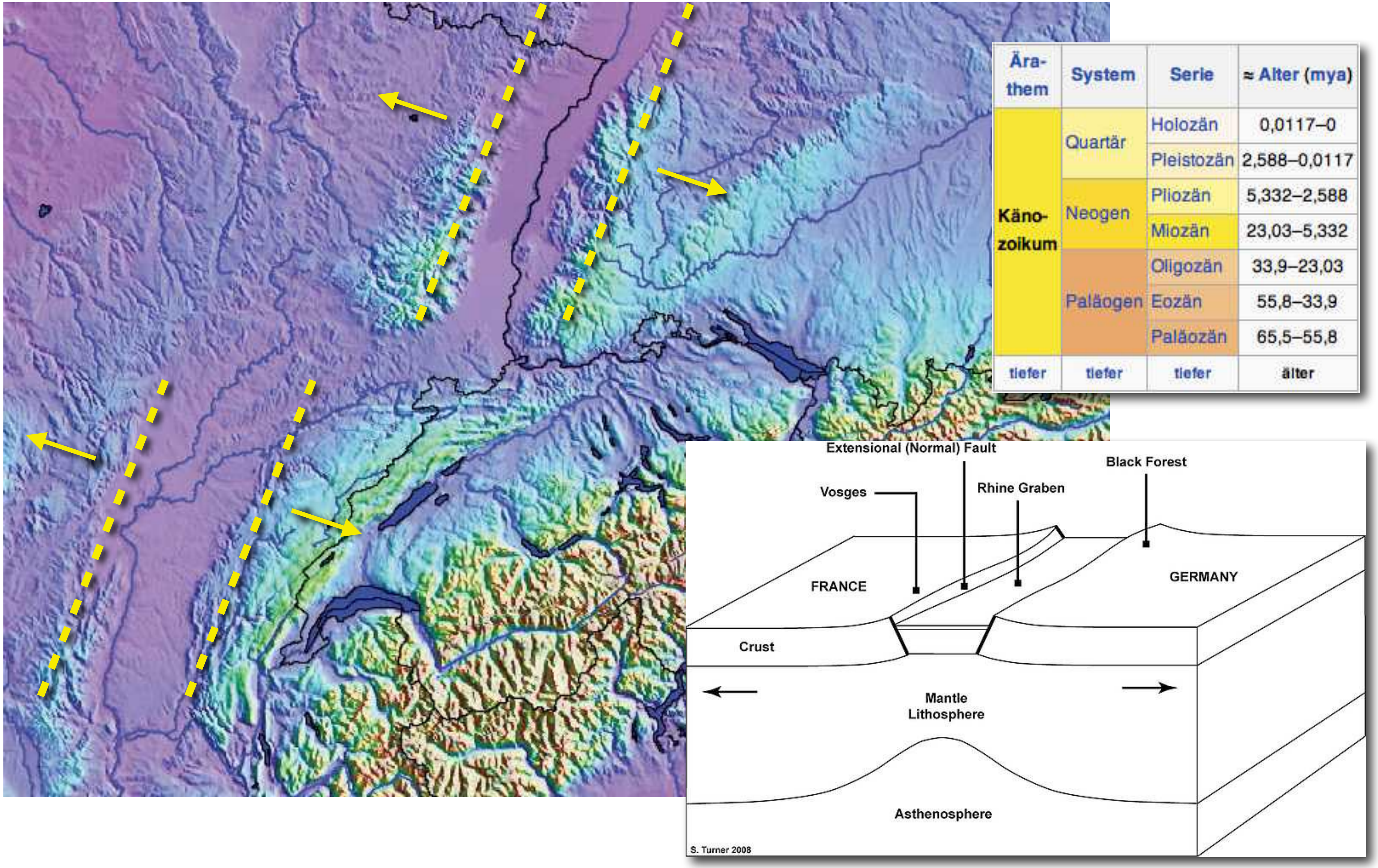
Beispiel: Ostafrikanischer Grabenbruch

aktuell
aktiv



Beispiel: Rheingraben Bressegraben

Eozän - Miozän



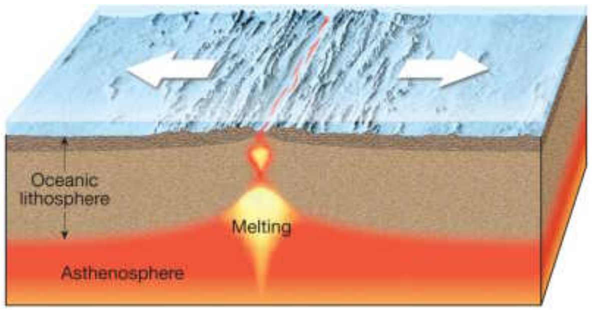
Ära-them	System	Serie	≈ Alter (mya)
Känozoikum	Quartär	Holozän	0,0117–0
		Pleistozän	2,588–0,0117
	Neogen	Pliozän	5,332–2,588
		Miozän	23,03–5,332
	Paläogen	Oligozän	33,9–23,03
		Eozän	55,8–33,9
		Paläozän	65,5–55,8
tiefer	tiefer	tiefer	älter

http://en.wikipedia.org/wiki/File:Rhinegrabencross.jpg

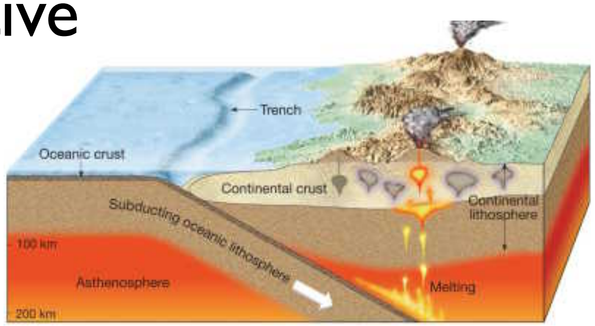
Steckbrief: destruktive Plattengrenzen

destruktive Plattengrenzen: 3 Typen

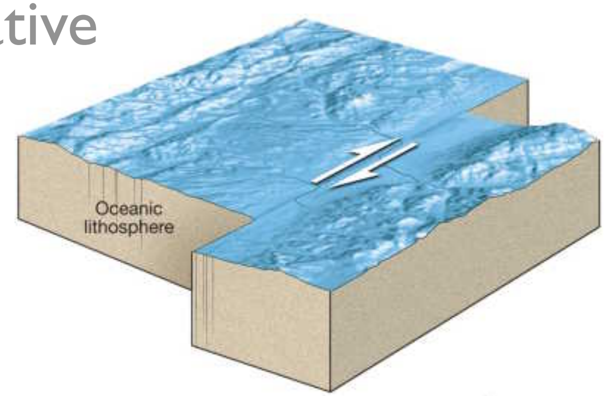
konstruktive

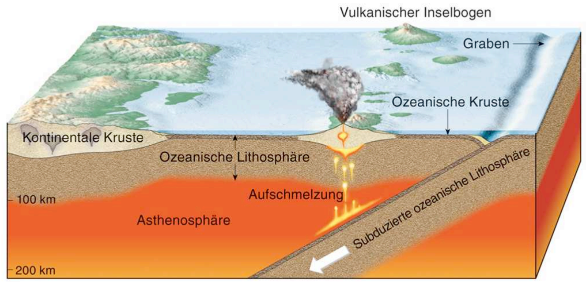


destruktive

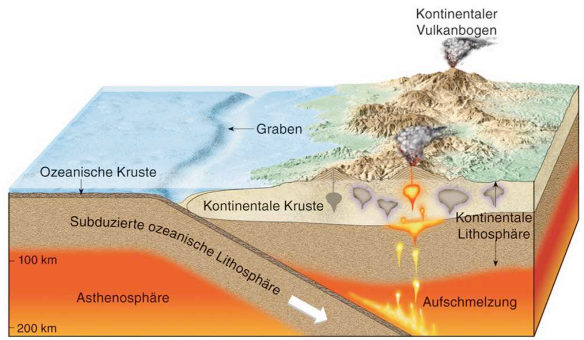


konservative

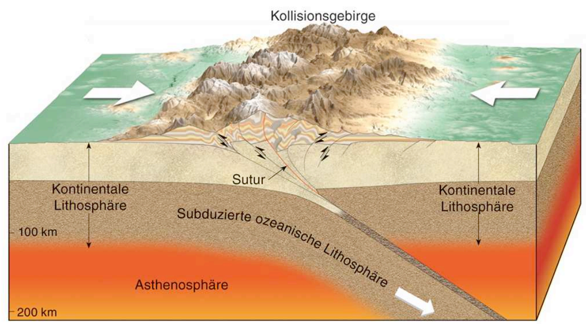




Ozean - Ozean

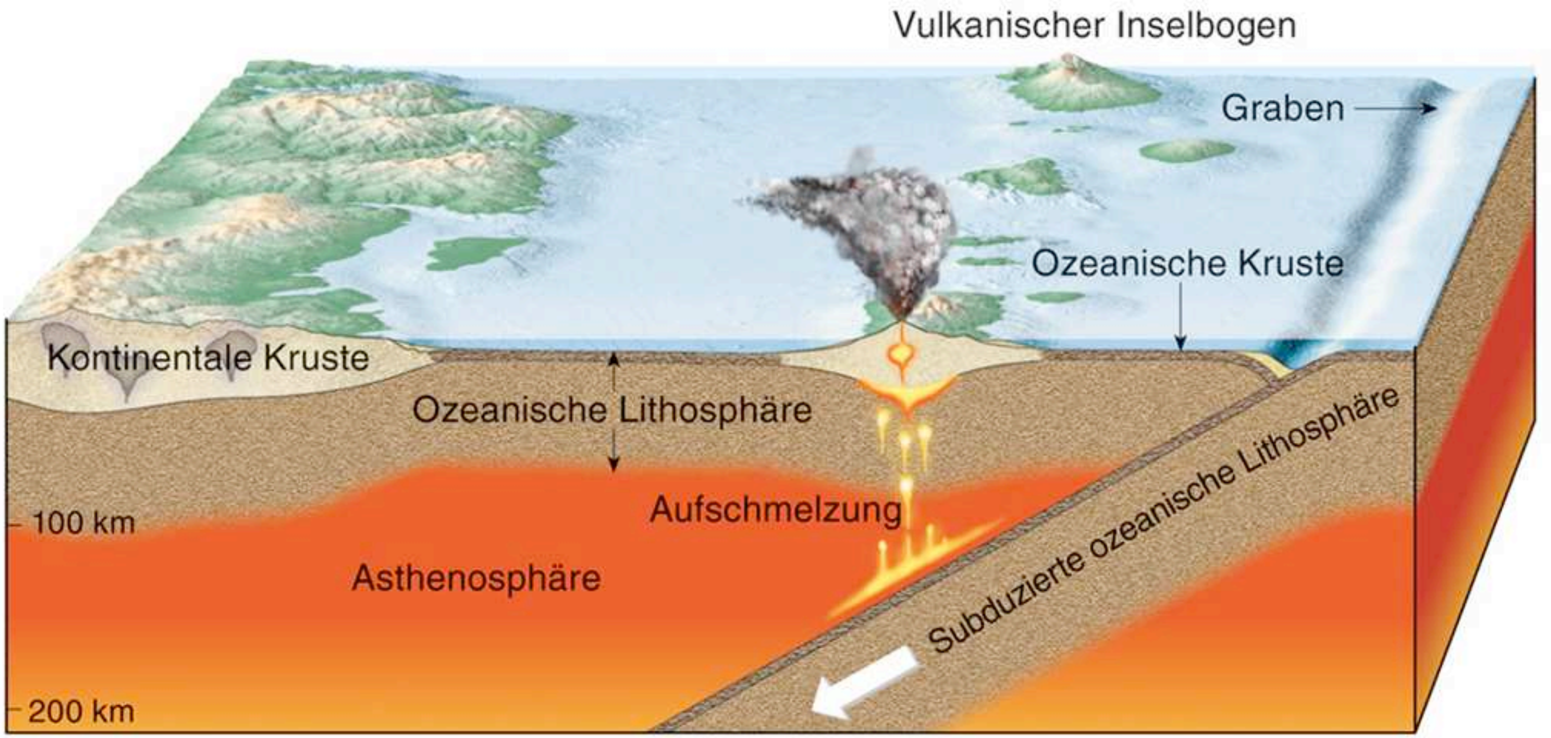


Ozean - Kontinent



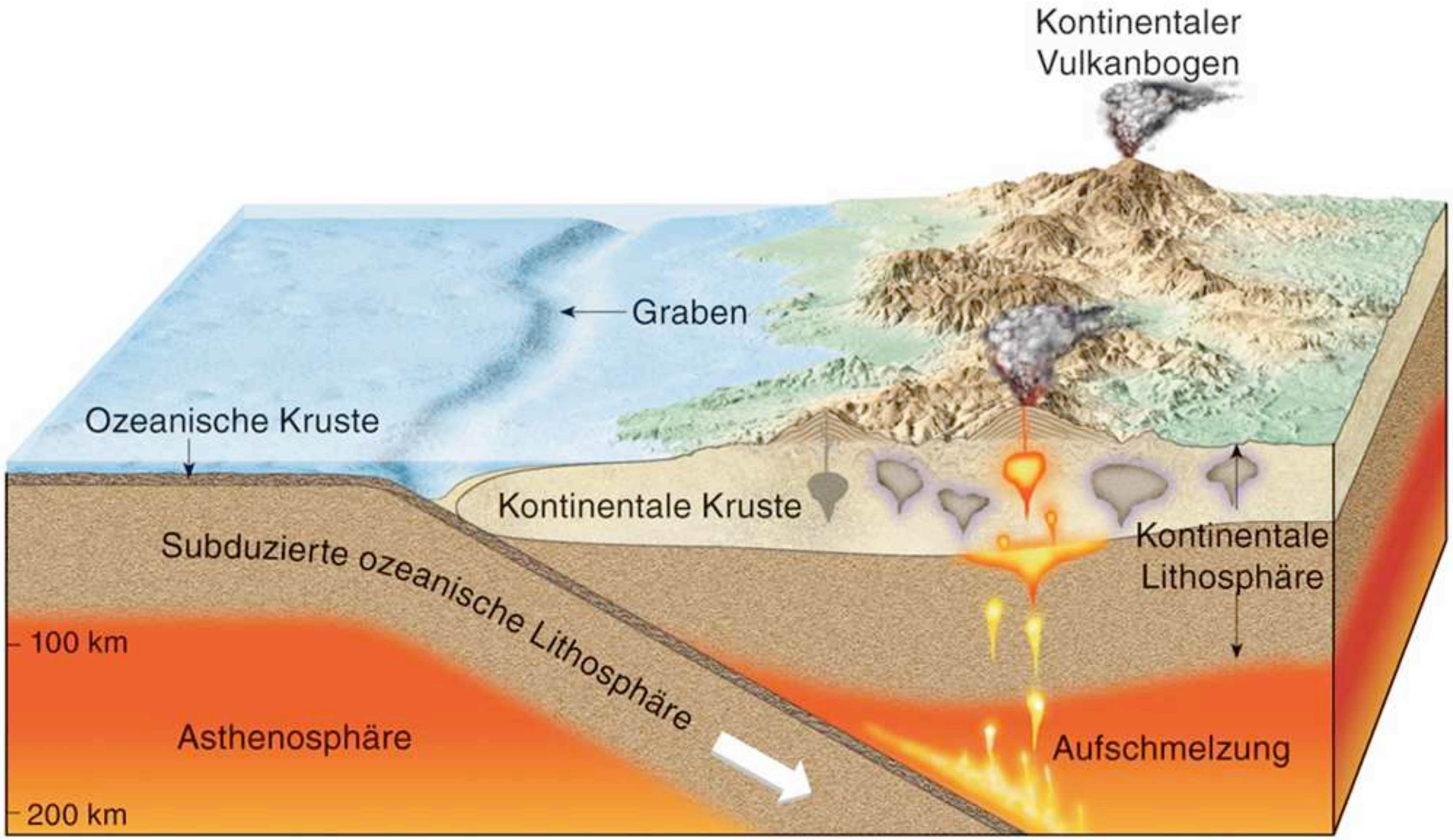
Kontinent - Kontinent

Ozean - Ozean



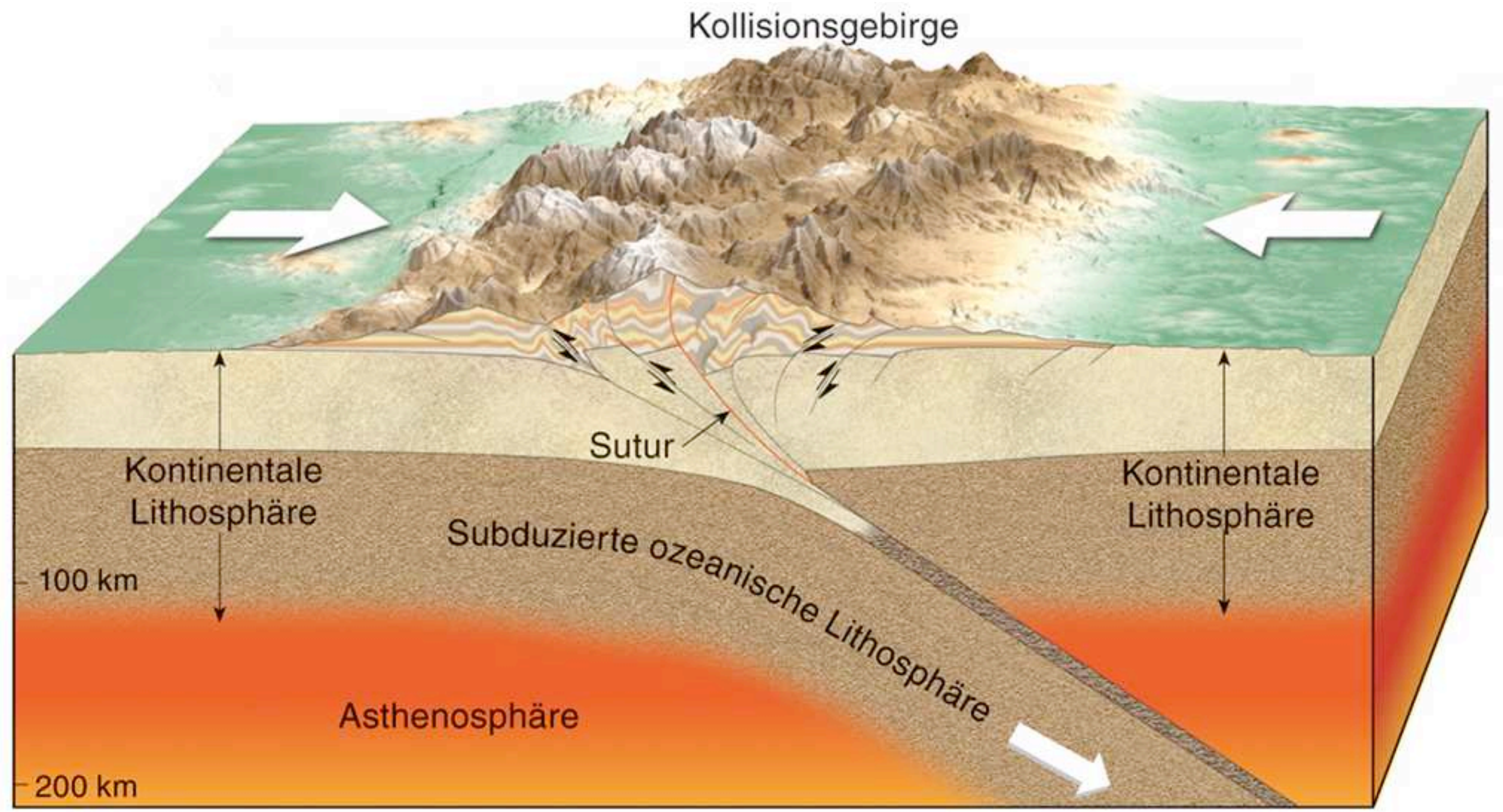
dichtere Platte sinkt hinunter
Vulkanismus am Ozenanboden
Vulkanische Inselbögen: Japan, Aleuten, Tonga

Ozean - Kontinent



dichtere Platte (= ozeanische) sinkt hinunter
Aufschmelzung in überschobener Platte
Kontinentale Vulkanbögen: Anden, Cascades (USA)

Kontinent - Kontinent

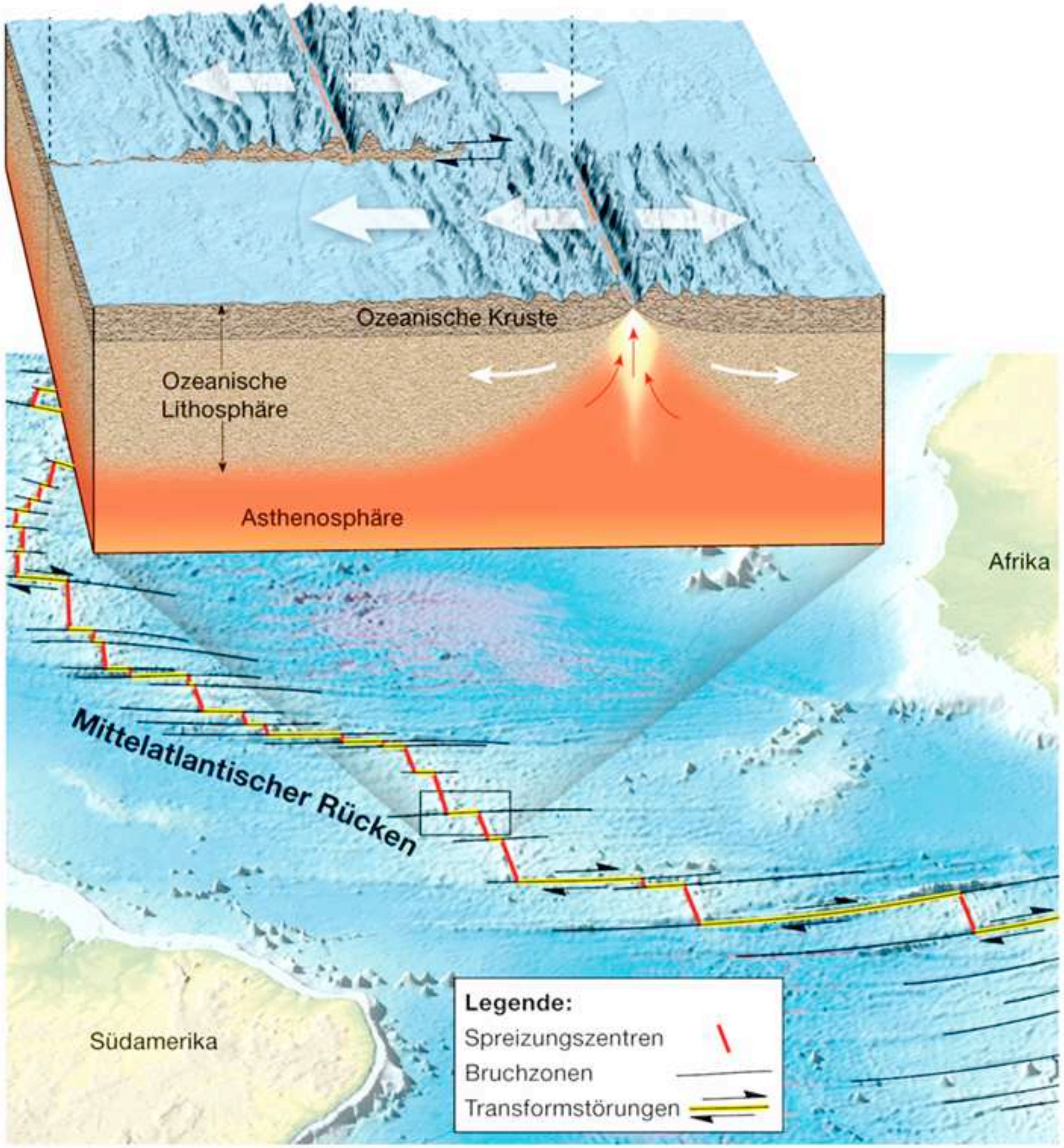


Fortgesetzte Subduktion → kontinentale Kollision
dichtere Platte wird subduziert
Kollisionsgebirge: Himalaya, Alpen, Appalachen

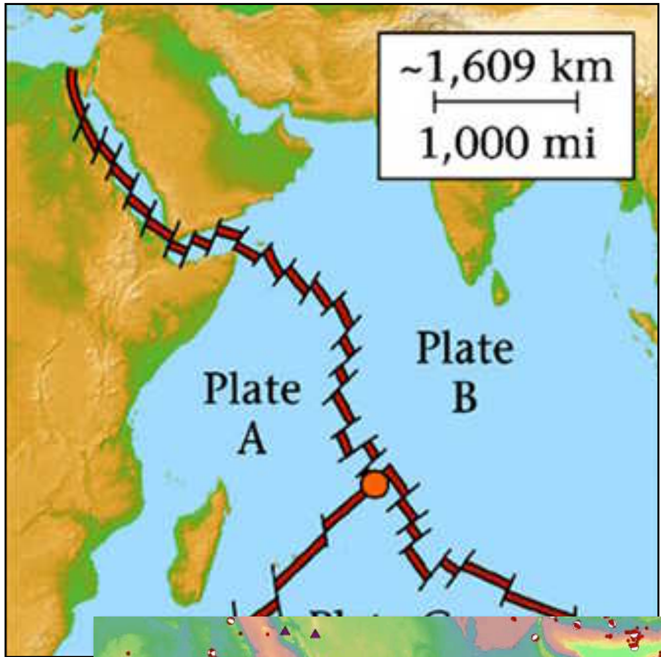
Steckbrief: konservative (Transform-) Plattengrenzen

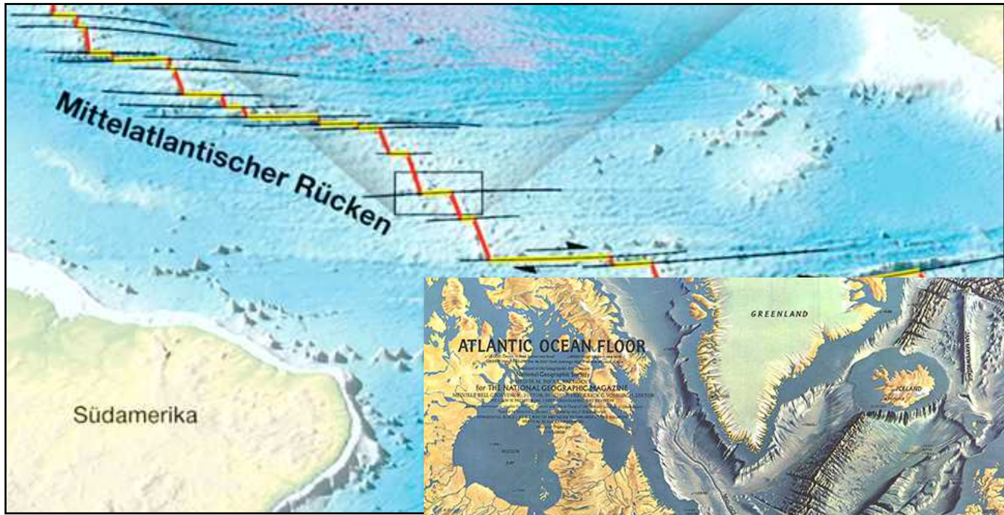
Konservative Plattengrenzen

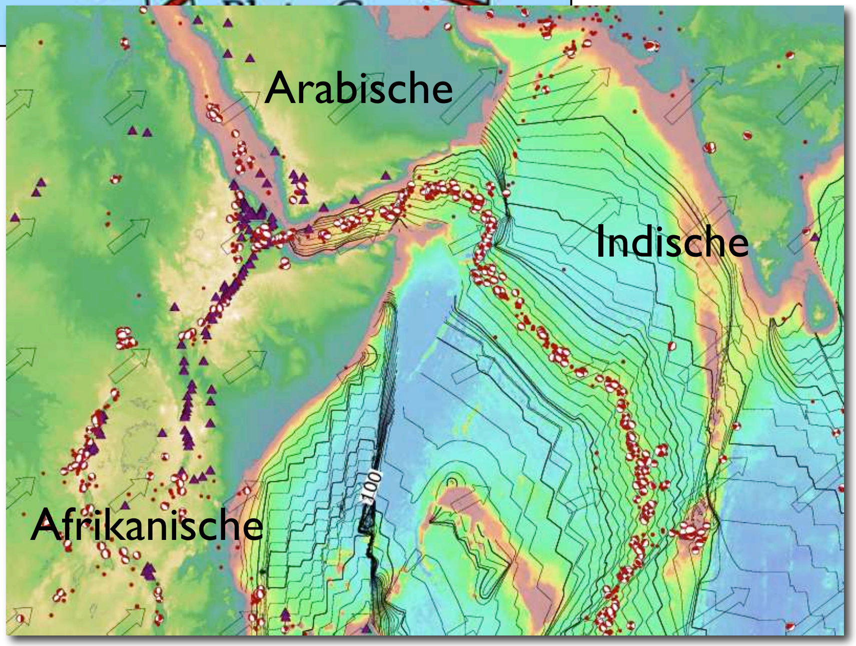
Transformbrüche
Transformstörungen

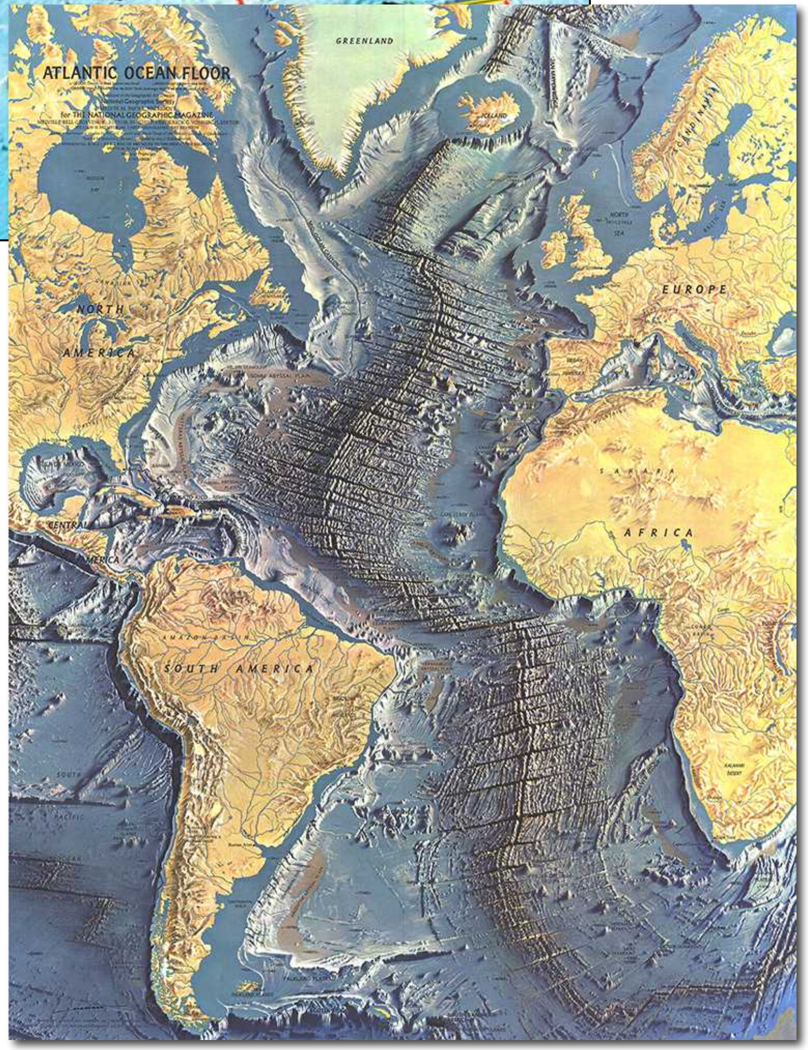


Transform - Plattengrenzen

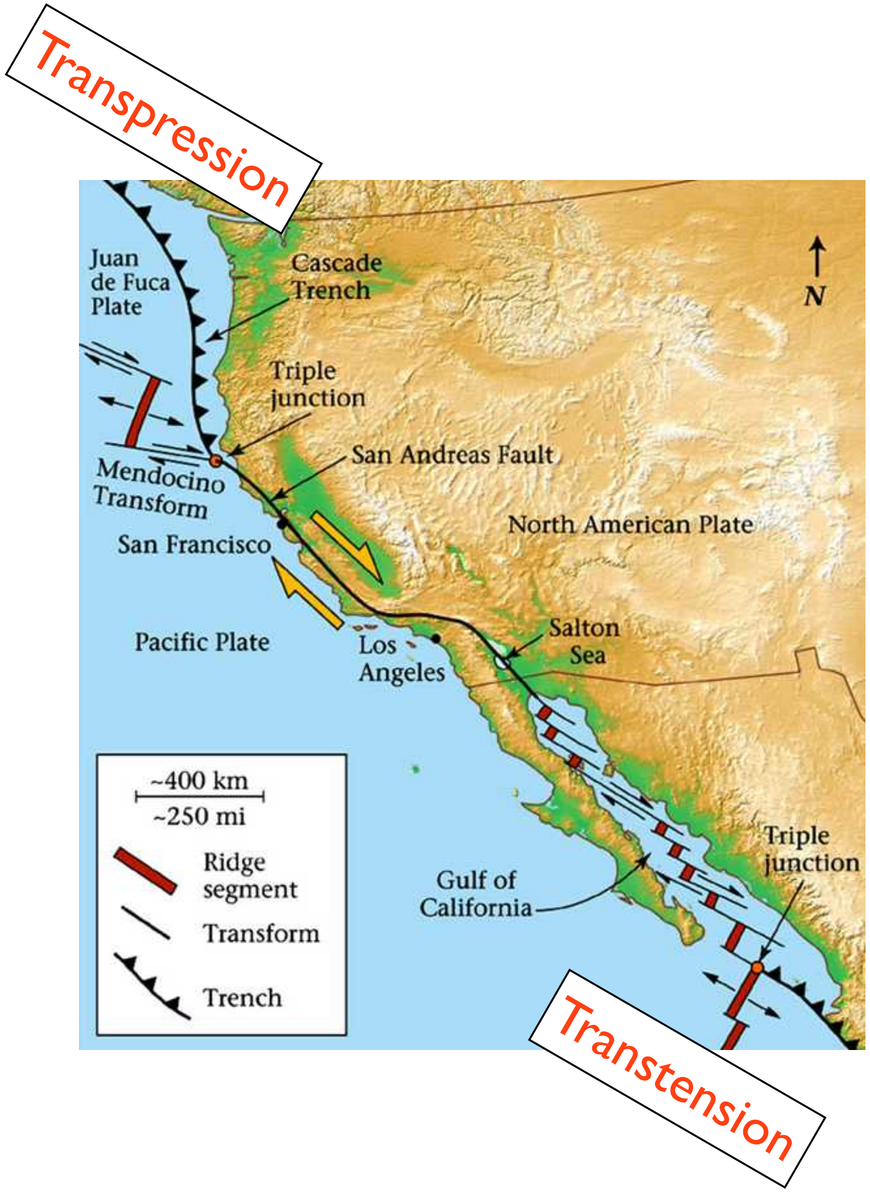




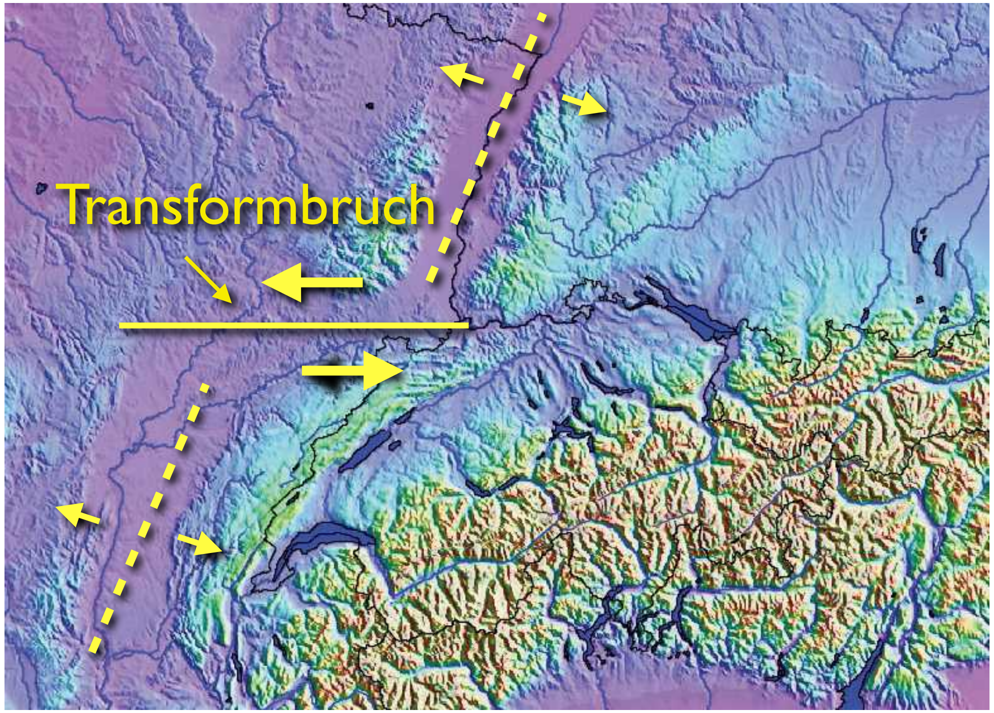




Transform - Plattengrenzen



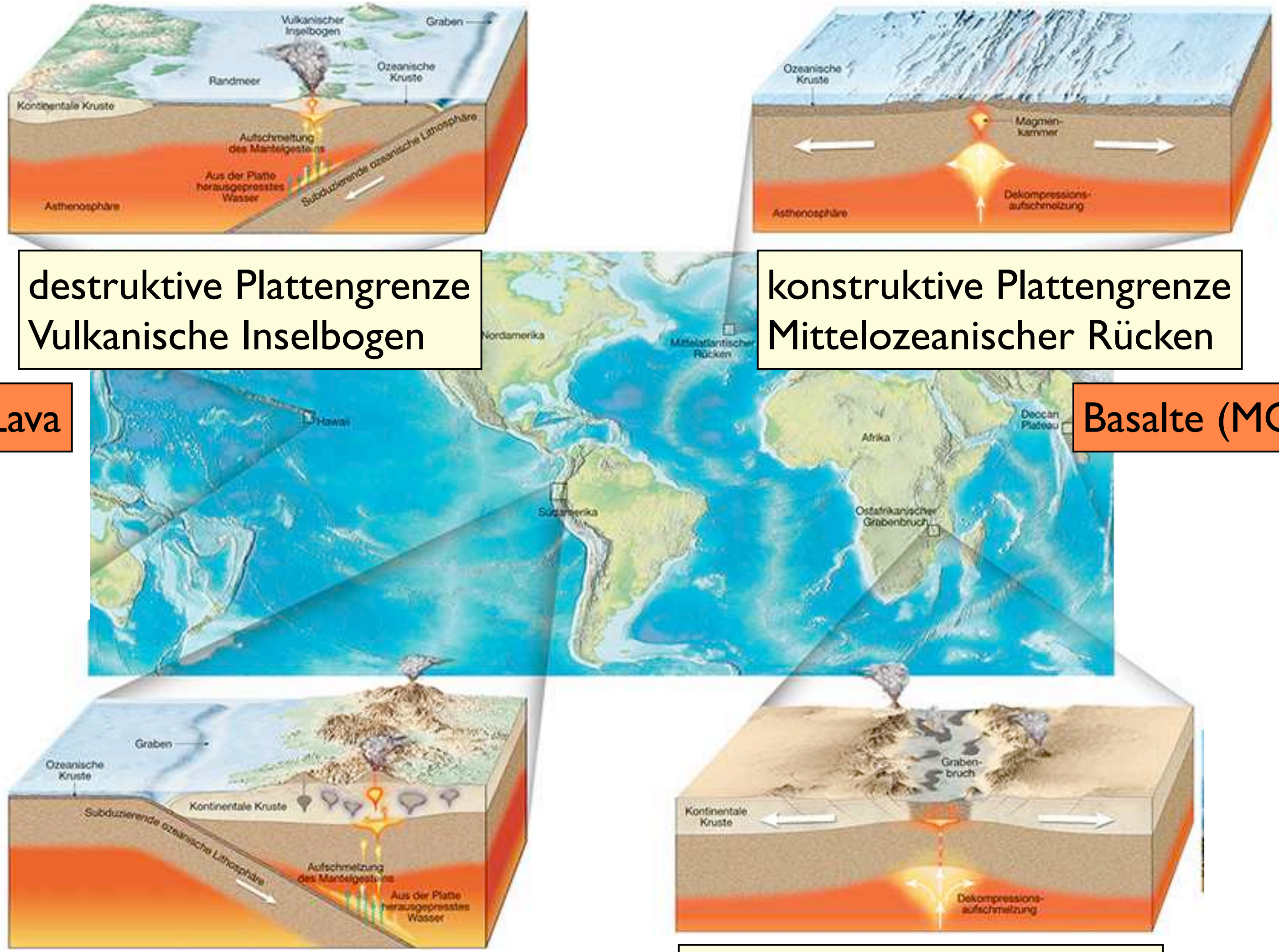
Rhein - Graben



Bresse- Graben

Vulkanismus und Rifting

Welcher Vulkanismus an welcher Plattengrenze ?



destruktive Plattengrenze
Vulkanische Inselbogen

Basaltische Lava

konstruktive Plattengrenze
Mittelozeanischer Rücken

Basalte (MORB), Kissenlava

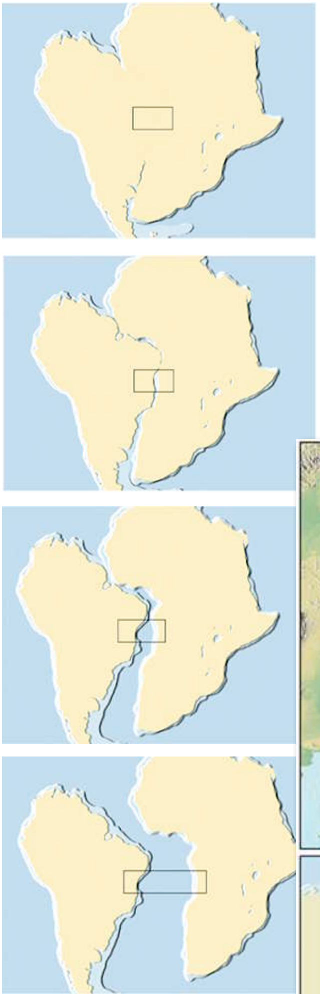
destruktive Plattengrenze
Kontinentaler Vulkanbogen

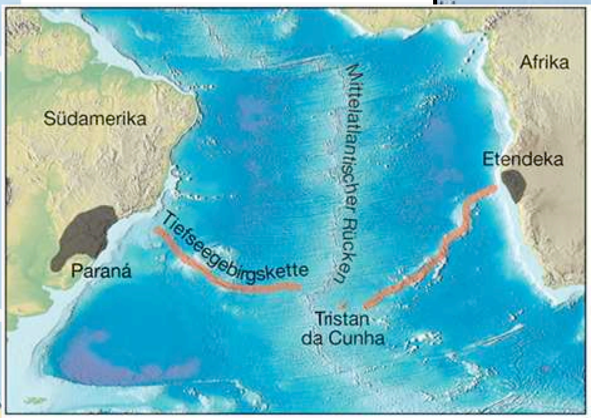
Andesitische - rhyolitische Lava

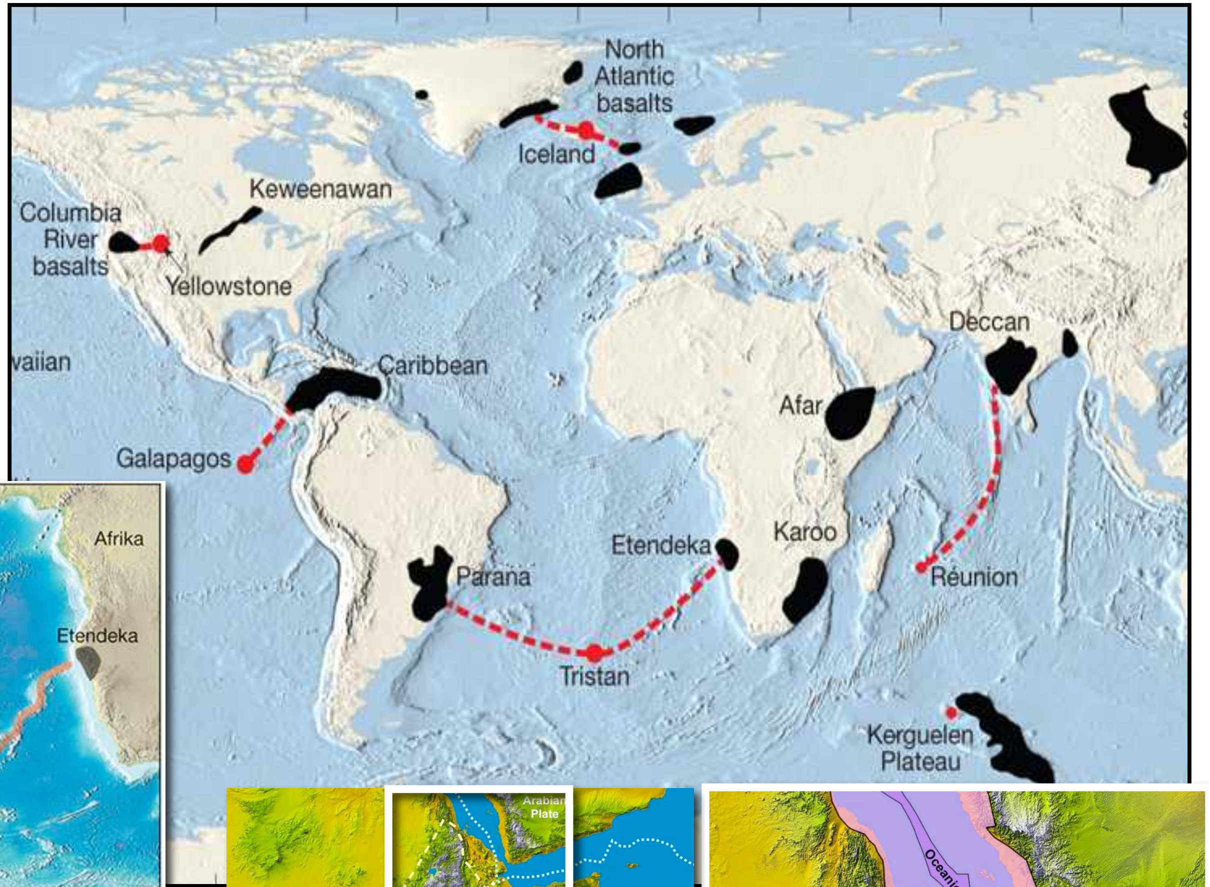
konstruktive Plattengrenze
Rifting Stadium

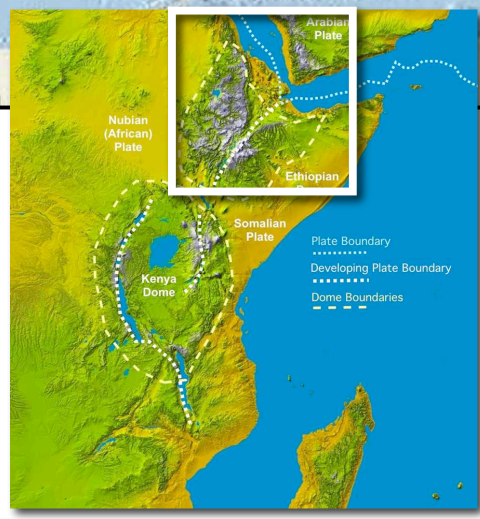
Flutbasalte & Spezielle

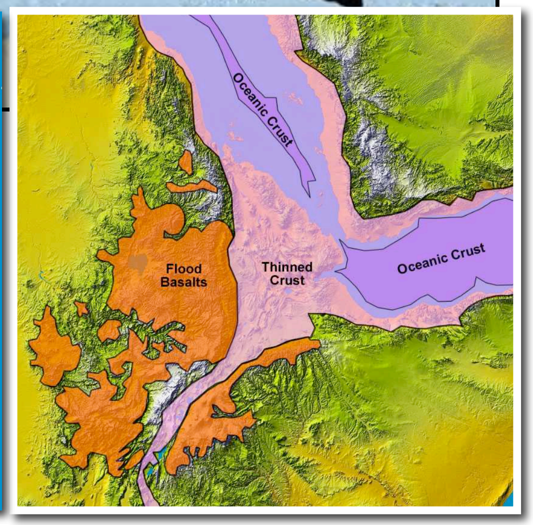
Plateaubasalte und Hotspot Trails



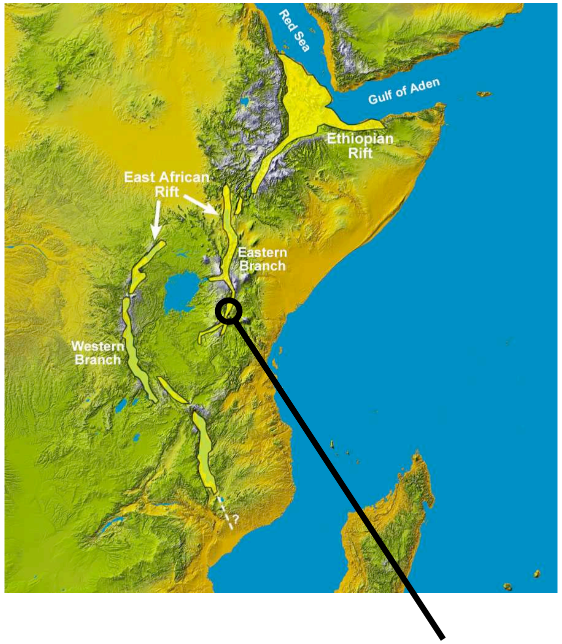








Ost-Afrikanisches Rift: Ein Kontinent zerbricht



Oldoinyo Lengai

Oldoinyo Lengai Lava, ca. 2 Tage alt

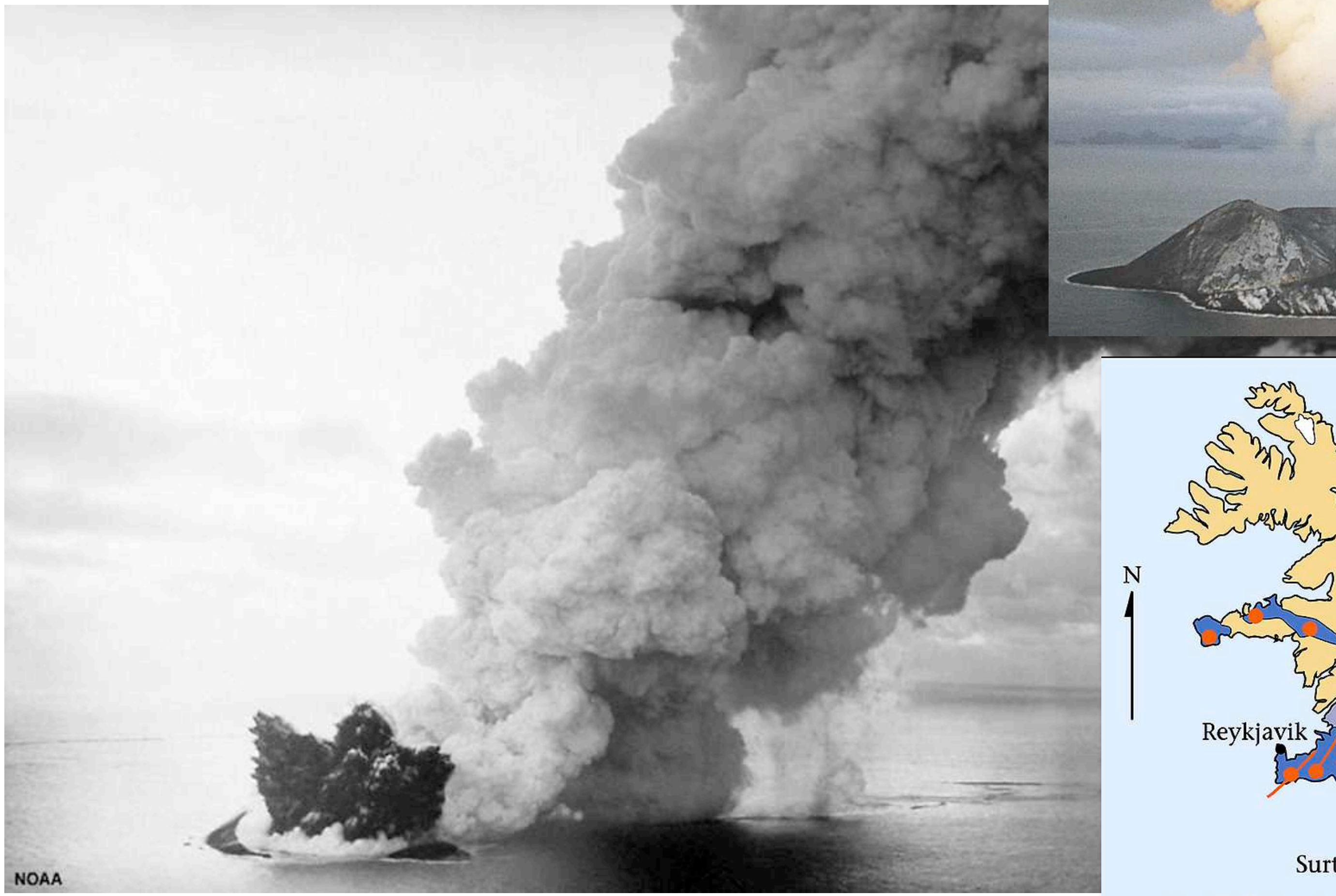
Probennahme (B. Marty and T. Fischer)

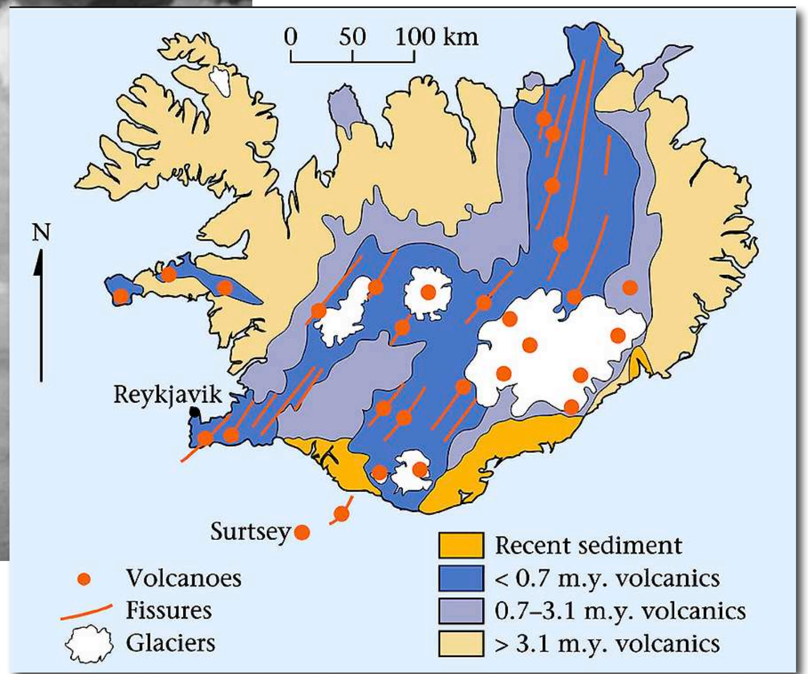
Einziger aktiver Karbonatit Vulkan der Welt

- Zusammensetzung:
  typisch Ozeanrücken-Mantel mit $\geq$30 % CO_2
- Sehr niedrige Viskosität:
  dünnflüssig, sprudelt fast wie Waser
  fliesst aus bei ~540°C
- An der Oberfläche wird das CO_2 - nach Erkalten - fest

Island: auf dem Mittelozeanischen Rücken

Surtsey Eruption 1963

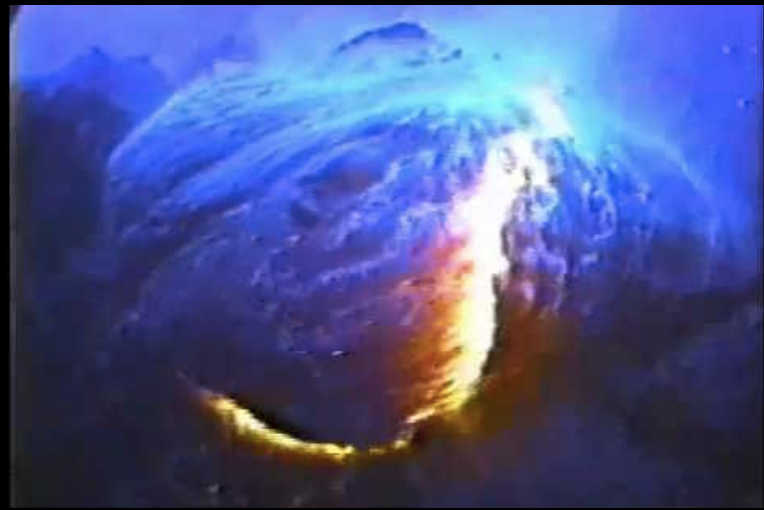




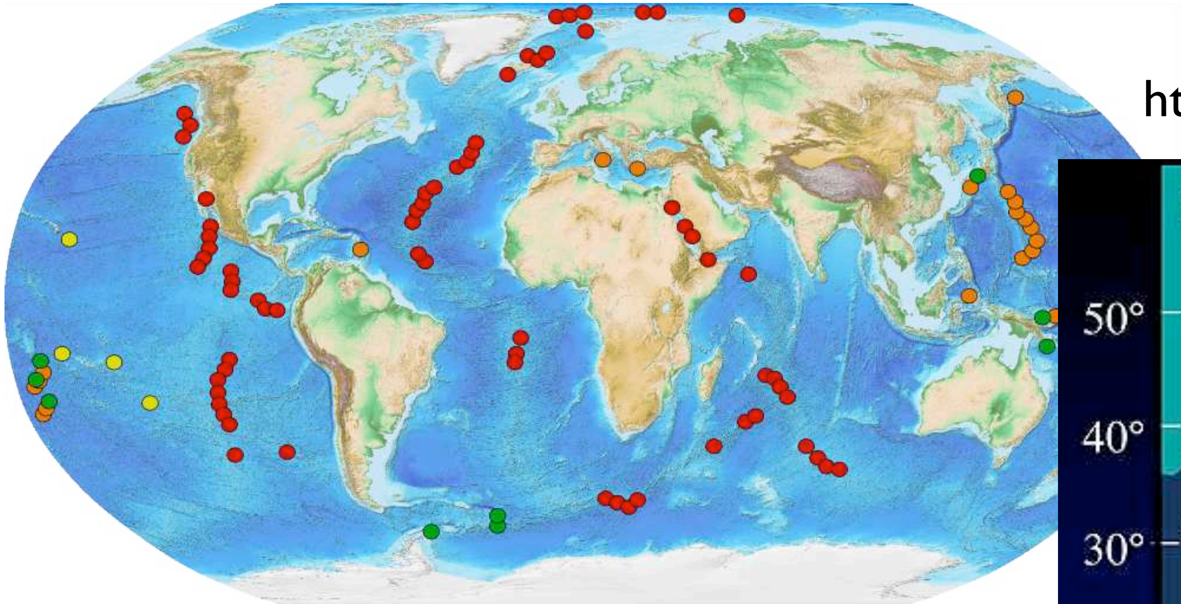
Hydrothermalfelder

Bildung von Kissenlava (pillow lava)

https://www.youtube.com/watch?v=DdIUuUY0L9c



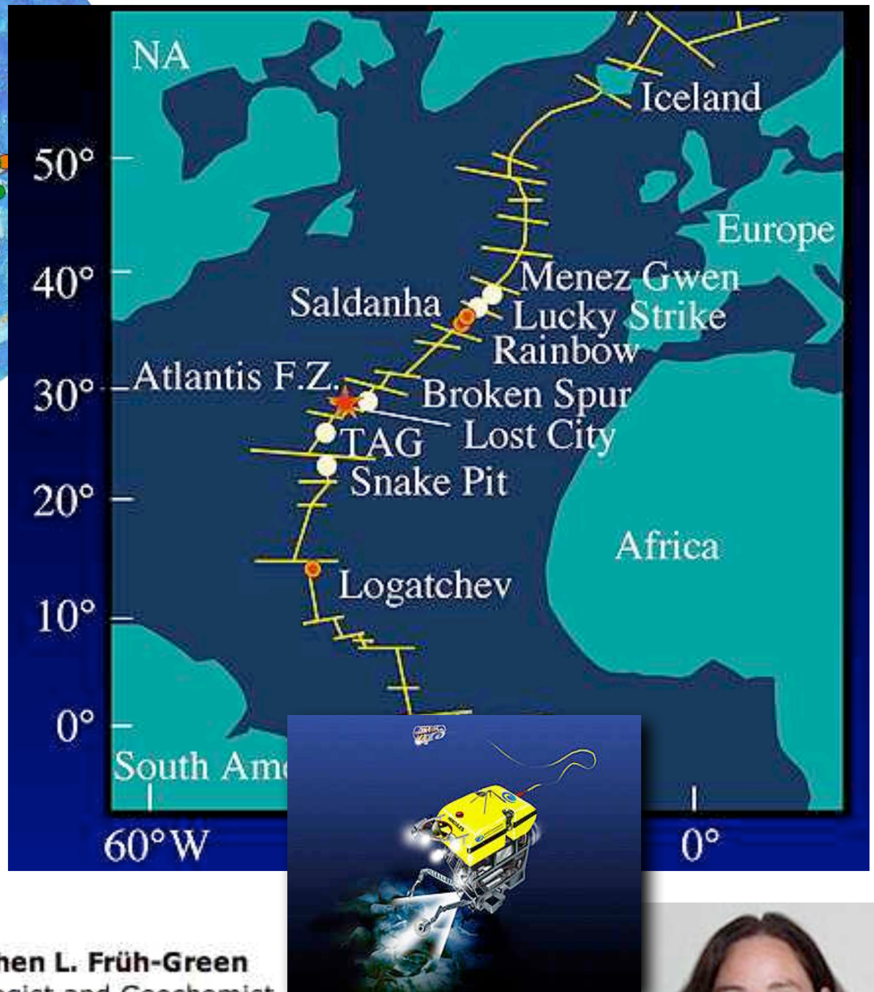
Hydrothermalfelder



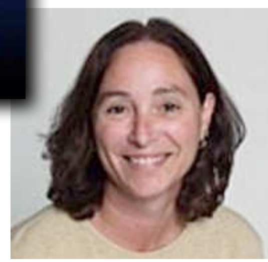
gelb = Hotspot
rot = Mittelozeanische Rücken
grün = Back-arc Spreizungsrücken
orange = Vulkanbögen

Hydrothermalfelder
sind assoziert mit Vulkanismus
an Land: heisse Quellen, Funarolen, Geisire
unter Wasser: schwarze und weisse Raucher

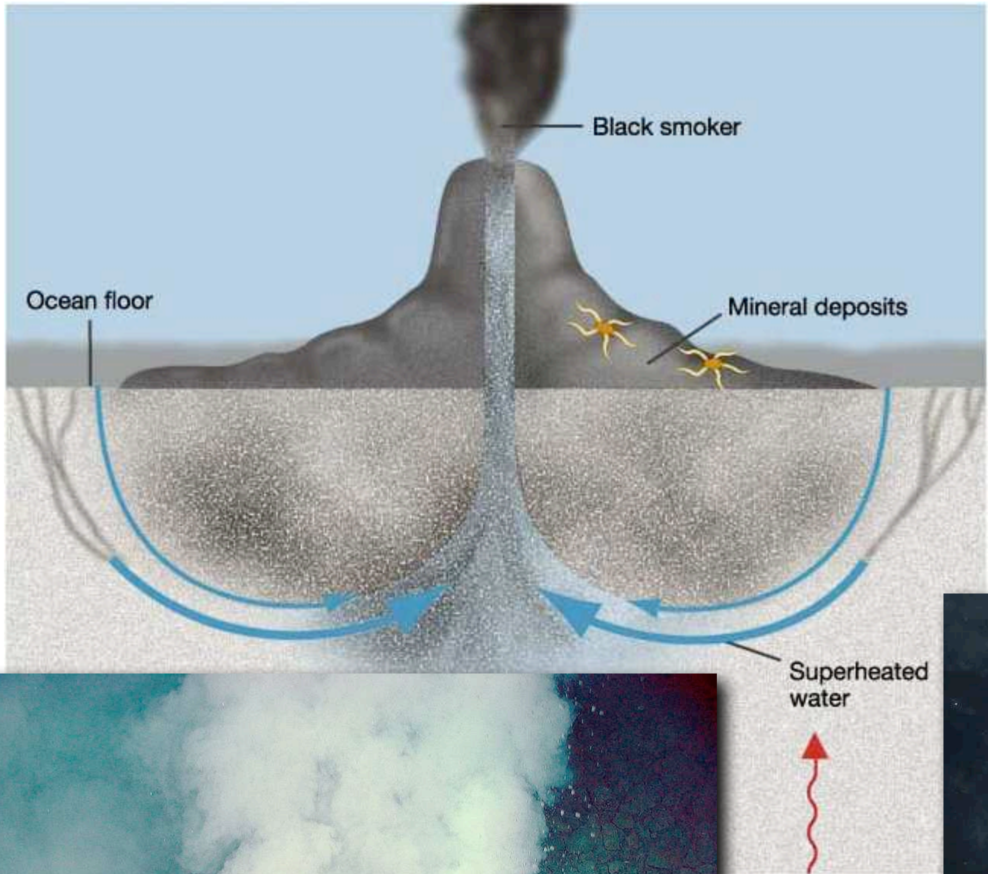
http://www.lostcity.washington.edu/

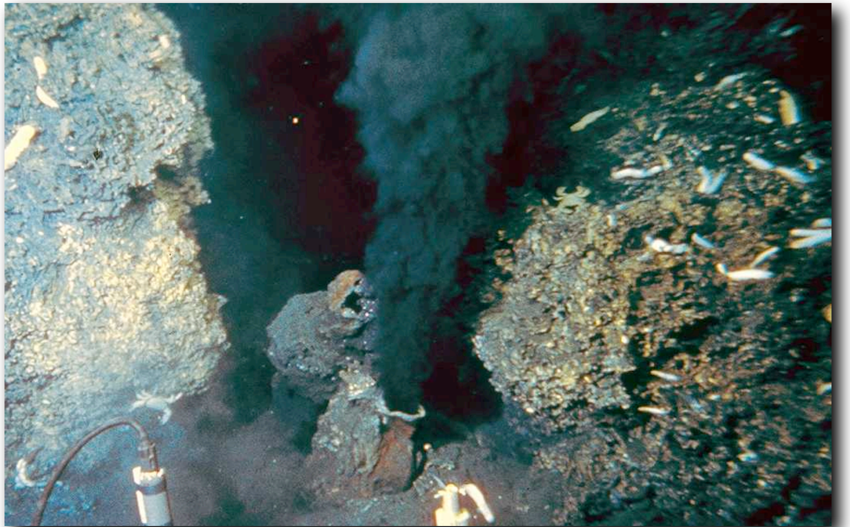


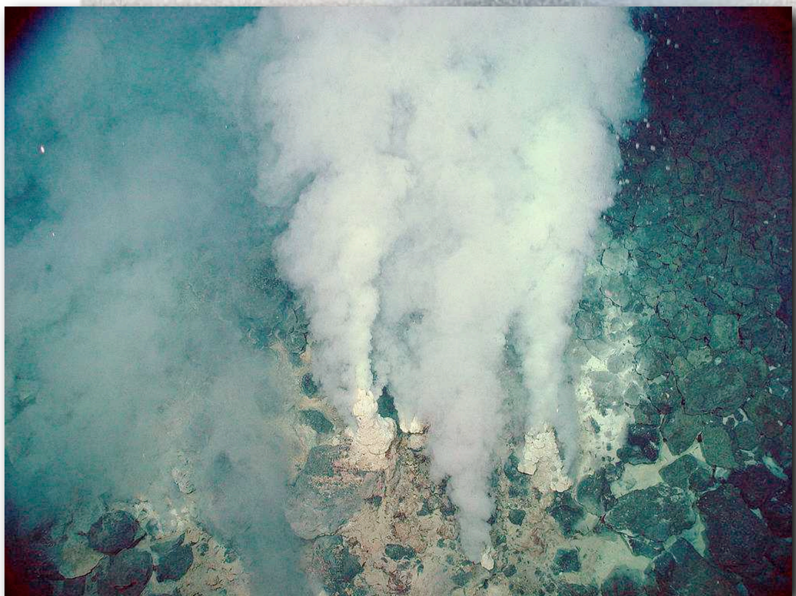
Gretchen L. Früh-Green
Petrologist and Geochemist
Department of Earth Sciences
ETH-Zurich, Switzerland
shore-based

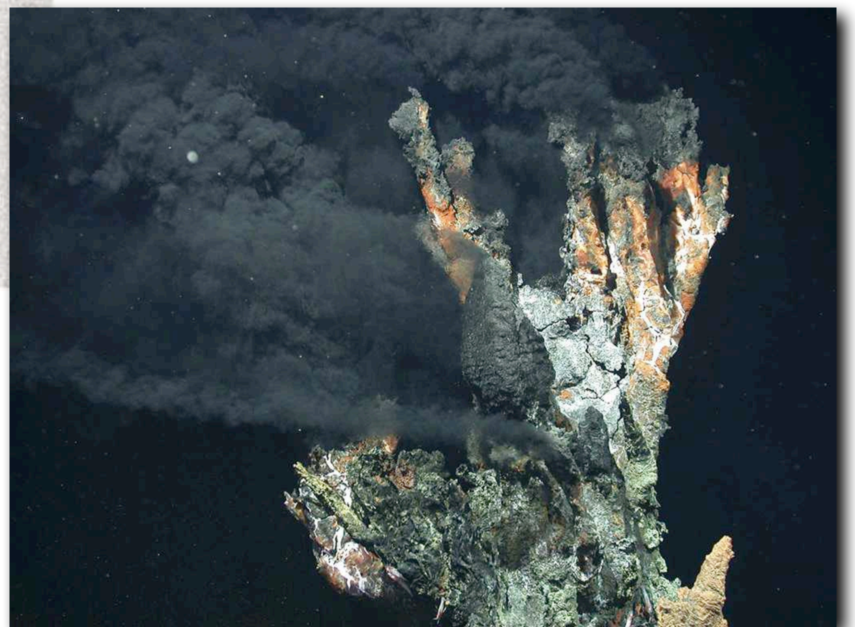


Schwarze und weisse Raucher

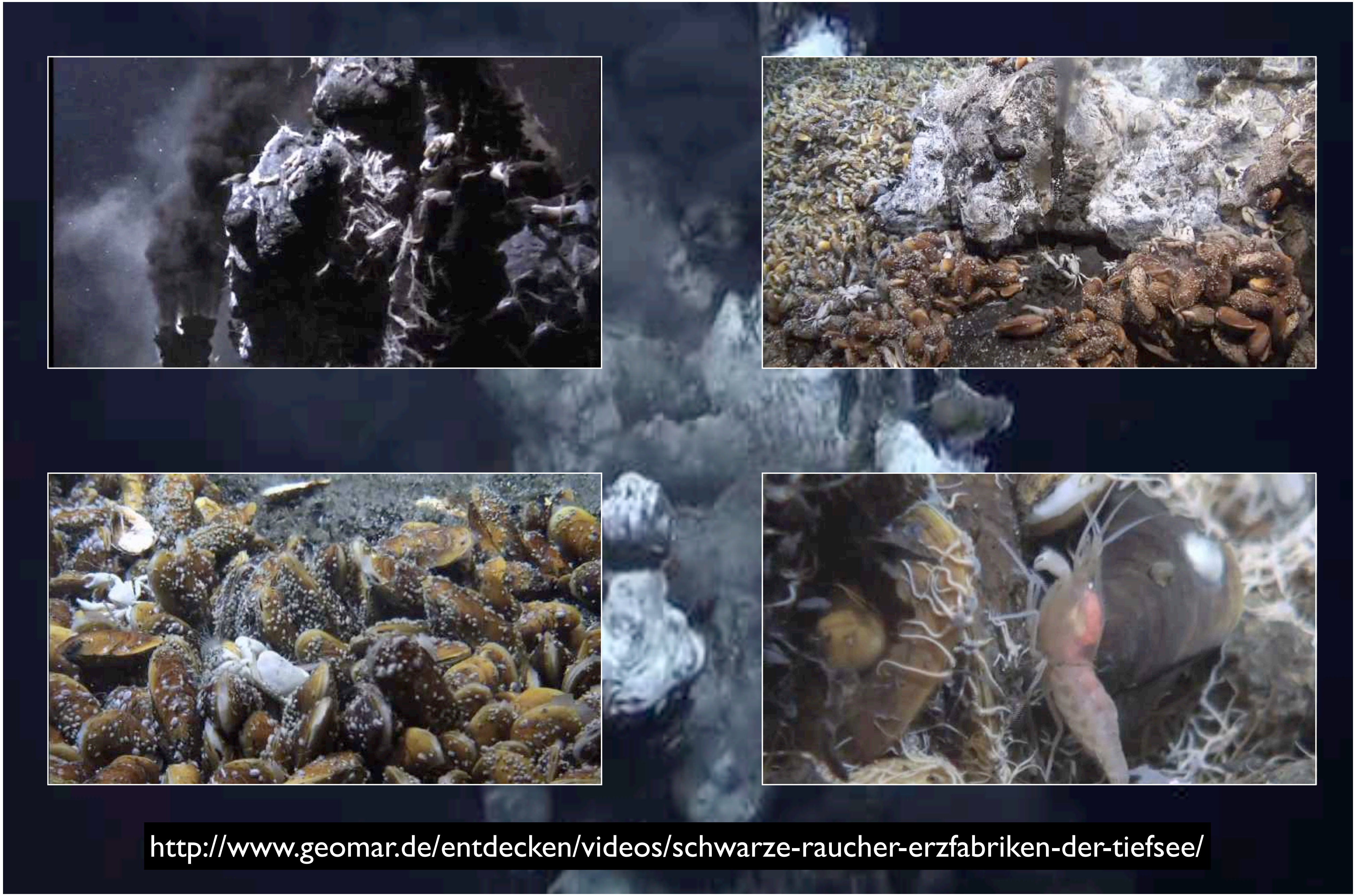




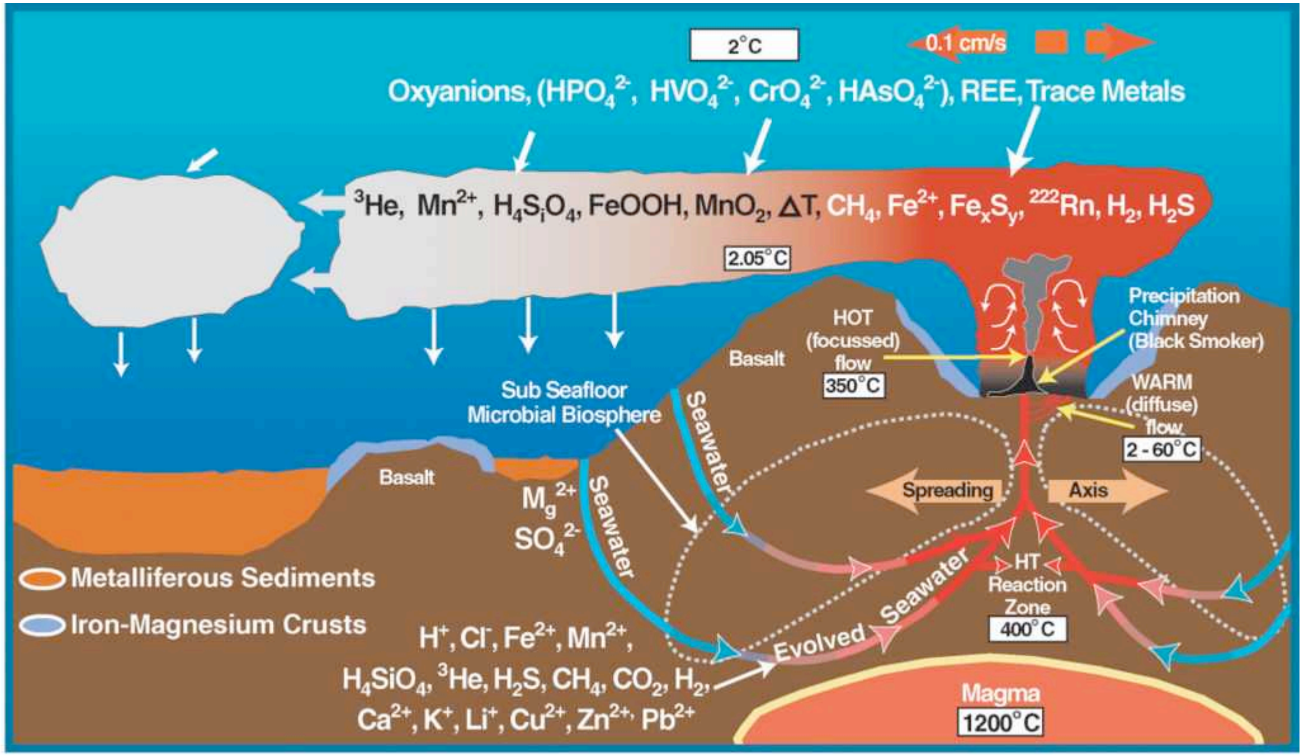




ROV Kiel nach Twin Sisters



Chemosynthese versus Photosynthese



Riftia pachyptila (Bartwurm)
bis zu 3m lang (nur im Pazifik)
Symbiose mit Schwefelbakterium
Filamente (rot=Hämoglobin)

Lebensbasis für Tiere =
chemosynthetisch aktive Bakterien und Archäen

Bartwürmer, Venus-/Miesmuscheln, Spinnenkrabben,...etc.
haben kein Verdauungssystem sondern Symbionten