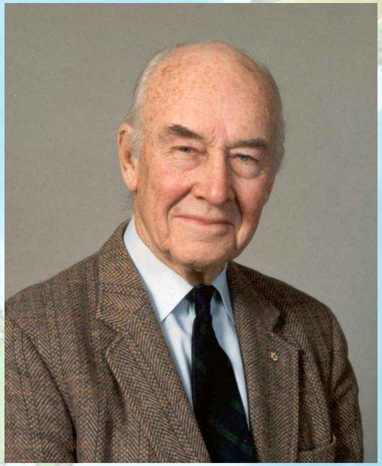
Did the Atlantic Ocean close and then re-open?

Gliederung

- Wilson‘s Indizien und Zeugnisse
    - Fossilienverteilung
    - Geometrie der Küstenlinien
    - Paläoklima und Gesteine
    - Verformungen an der Suturzone
- Geschichte des Nord-Atlantiks in Verbindung mit dem Wilson-Zyklus
- Exkurs: Hotspots

Wilson's Indizien und Zeugnisse



- **John Tuzo Wilson (1908-1993) kanadischer Geophysiker/Geologe**

MUSTER

HUMBOLDT FERNLEHR INSTITUT

ZEUGNIS

Frau Susanne WINTER

geboren am 15. 12. 1965
hat vom 07. 08. 2007 bis 04. 02. 2008 an unserem Fernlehrgang

Marketing

teilgenommen. - Der Lehrgang umfasst die Gebiete

Marktwirtschaft	Distributionsgestaltung
Merkmale des Marketings	Marketing-Mix
Marktleistungsgestaltung	Handelsmarketing
Preisgestaltung	Investitionsgütermarketing
Werbung	Direct-Marketing
Verkaufsförderung	Marktforschung
Öffentlichkeitsarbeit	Käuferverhalten

Frau Winter hat die in den Lehrbriefen gestellten Aufgaben gelöst.
Die Gesamtleistung wurde mit „**Sehr gut**" bewertet.
Frau Winter hat eine schriftliche Abschlussprüfung in Klausur am 18. 02. 2008 mit „**Sehr gut**" bestanden.

Wien, 25. 02. 2008

DIE PRÜFUNGSKOMMISSION:

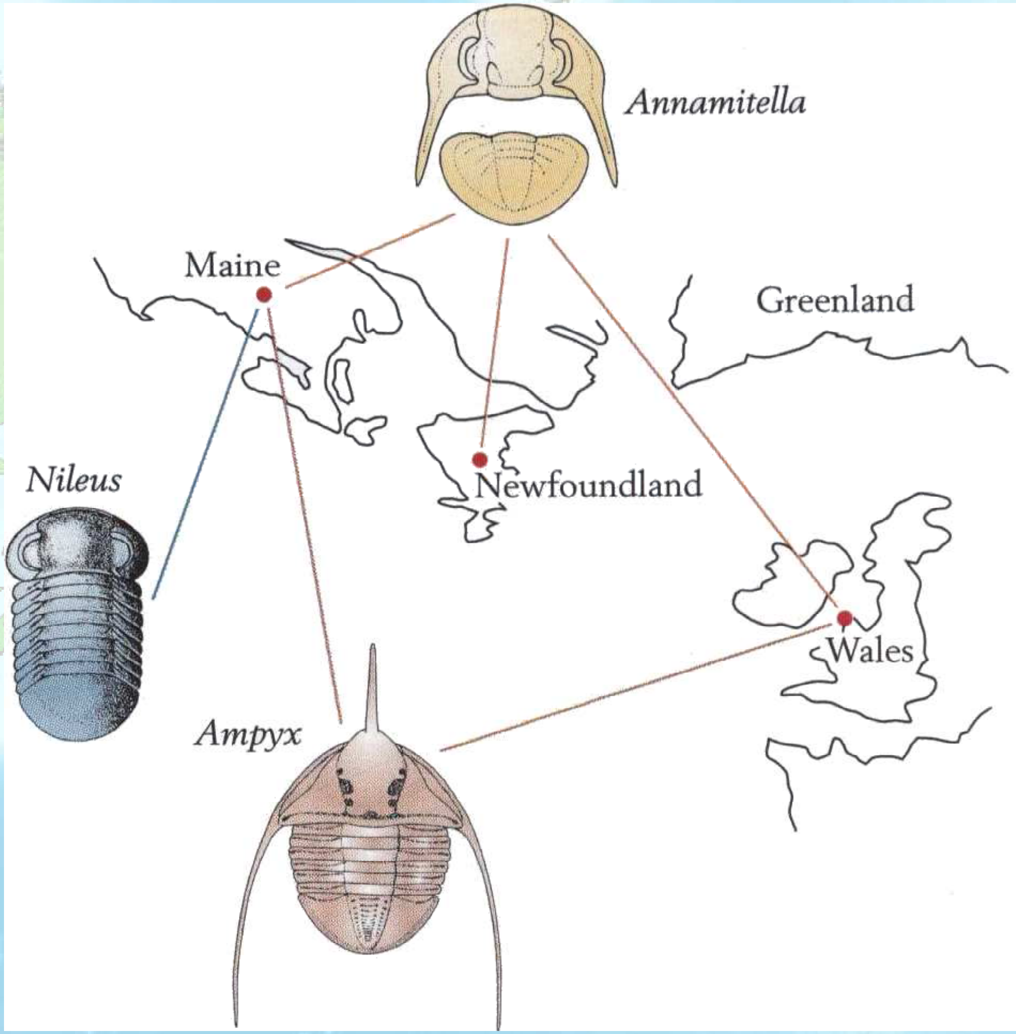
Mag. Franz Straka
Prokurist

KommR Eva Braunstein
Direktorin

Reg. Rat OStR DI Hartwig Rais
Pädagogischer Leiter

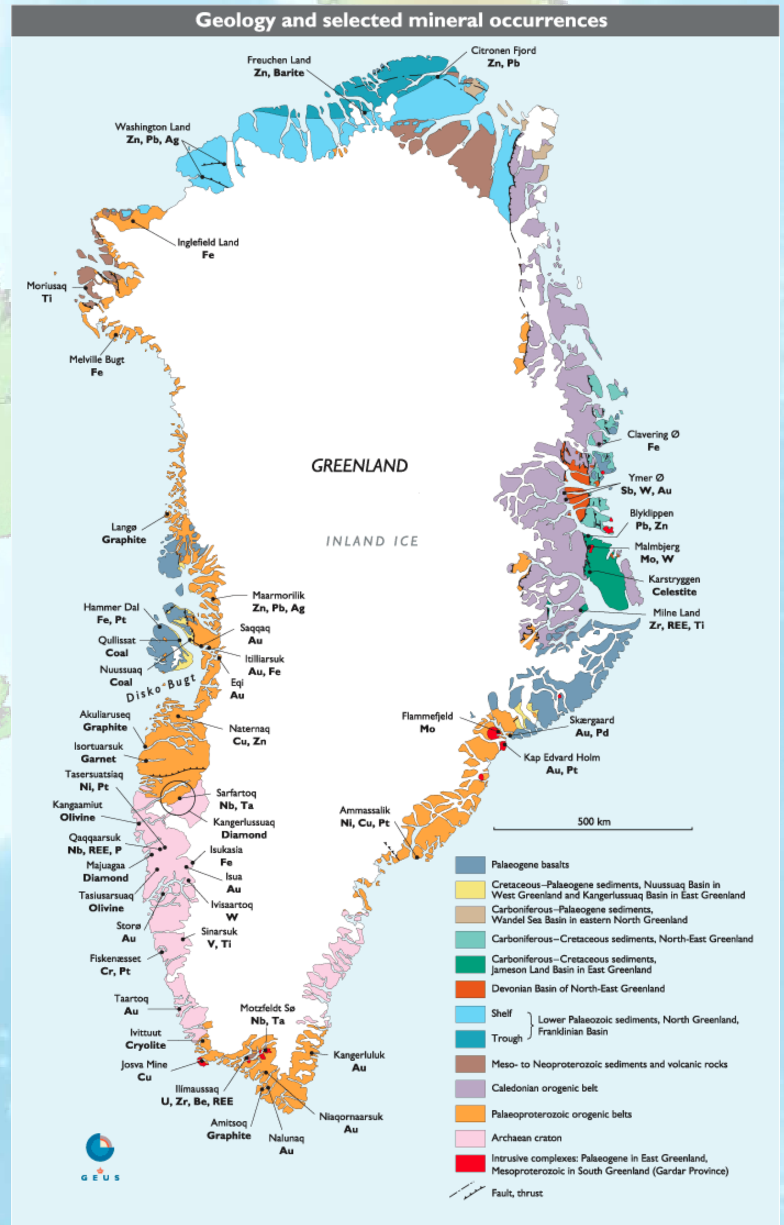
Wilson‘s Indizien und Zeugnisse

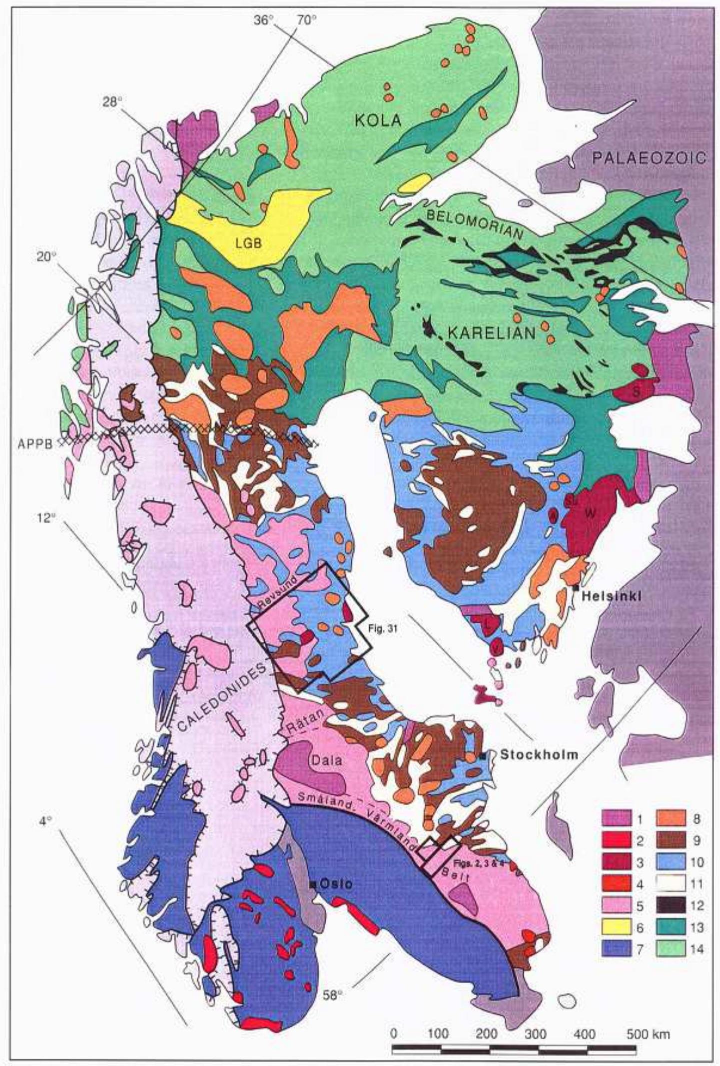
-Fossilienverteilung-



- **gleiche Fossilien in unterschiedlichen Regionen**
- **unterschiedliche Fossilien in gleichen Regionen**
- **einige Fossilien in sehr begrenzten Regionen**

Wilson's Indizien und Zeugnisse
-Geometrie der Küstenlinien-

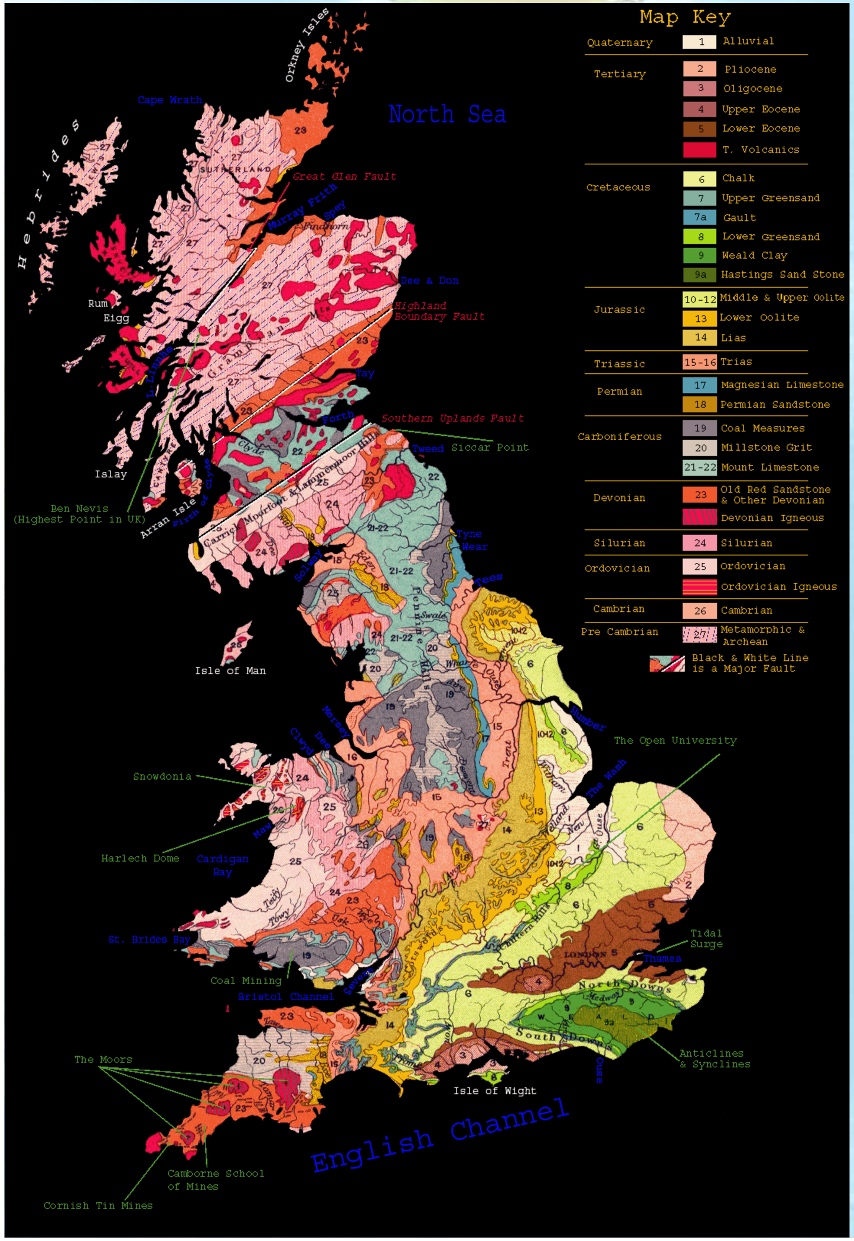




Lithological subdivision of the Fennoscandian shield. 1. Jotnian sedimentary rocks, <1.50, >1.26 Ga. 2. Late Sveconorwegian intrusions, c. 1.00–0.85 Ga. 3. The Fennoscandian rapakivi complexes, c. 1.65–1.50 Ga. 4. Younger anorogenic intrusives in SE Sweden, c. 1.40–1.35 Ga. 5. The Transscandinavian Igneous Belt, c. 1.85–1.65 Ga. 6. The Lapland Granulite Belt, c. 2.0–1.9 Ga. 7. The Southwest Scandinavian Domain, c. 1.76–0.90 Ga. 8. "Late orogenic" Svecofennian intrusives, c. 1.84–1.77 Ga. 9. Early orogenic Svecofennian intrusives, c. 1.95–1.86 Ga. 10. Early Svecofennian sedimentary supracrustals, pre-1.86 Ga. 11. Early Svecofennian volcanics, c. 1.90–1.87 Ga. 12. Archaean greenstone belts and basins, c. 2.9–2.7 Ga. 13. Earliest Proterozoic cover of the Archaean craton, c. 2.5–2.0 Ga. 14. Archaean crust, c. 3.1–2.6 Ga. Frames outline areas of subsequent maps. Modified from Gaál & Gorbatschev (1987). APPB is the Archean-Proterozoic palaeoboundary of Öhlander et al. (1987, 1993).

Wilson‘s Indizien und Zeugnisse

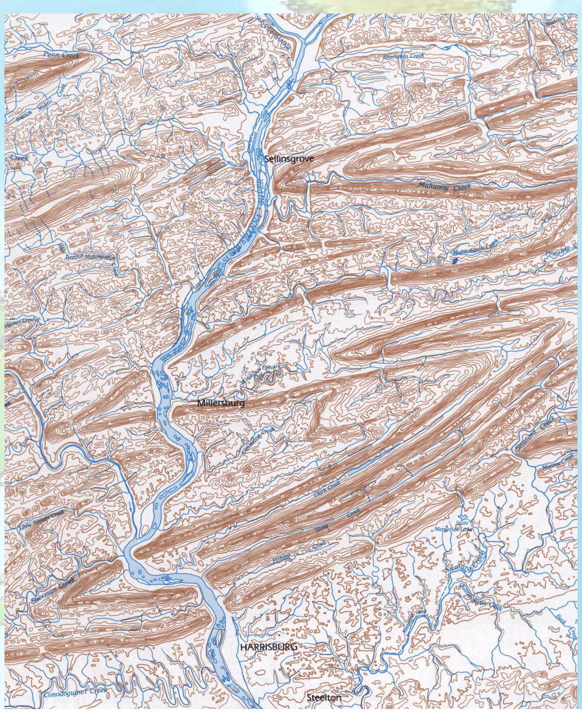
-Paläoklima und Gesteine-



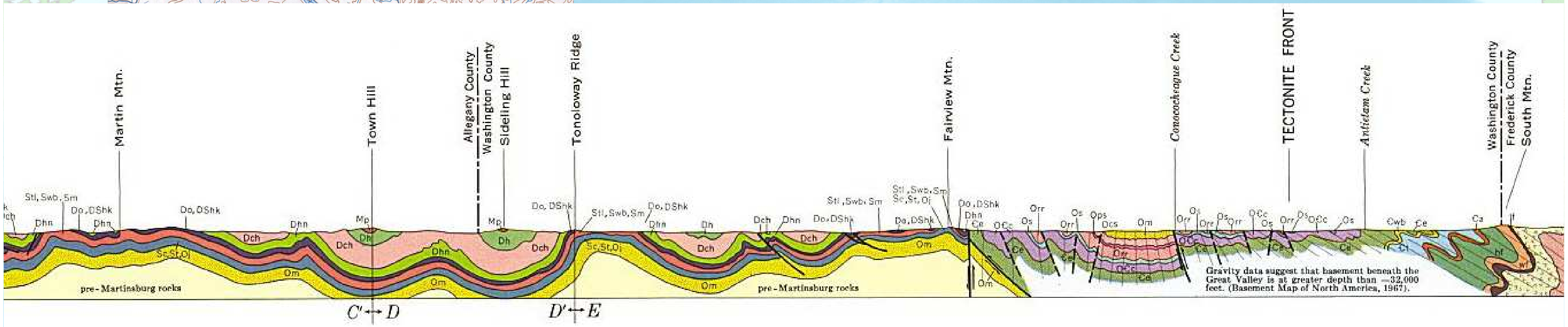
- während der Ozeanschließung im mittleren Paläozoikum zunehmend arides Klima
- marine Sedimente durch typische aride Ablagerungen (alluviale Fächer) ersetzt
- Entstehung des für Devon typischen „Old Red Sandstone“

Wilson‘s Indizien und Zeugnisse

-Verformungen an der Suturzone-



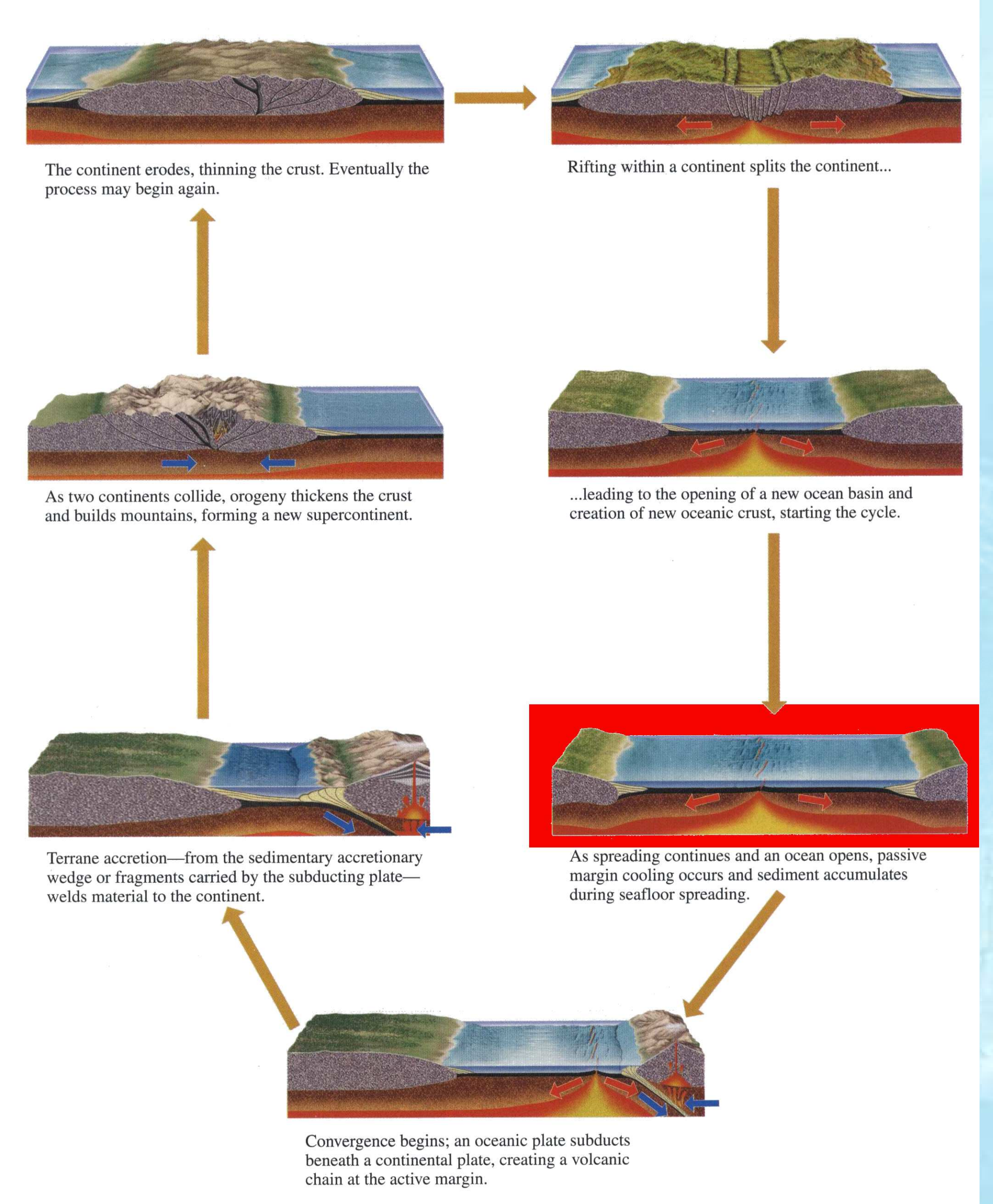
- durch kontinentale Kollision entstanden Faltungen, sowie Auf- und Abschiebungen



Geschichte des Nord-Atlantiks

in Verbindung mit dem Wilson-Zyklus

Wilson-Zyklus (1)



- offener Ozean
- Bildung neuer ozeanischer Kruste entlang eines mittelozeanischen Rückens
- Spreizungsrate größer als Subduktionsrate
  → Ozean öffnet sich weiter

Geschichte des Nord-Atlantiks

Triassic	Middle	245.0 ± 1.5
	Lower/Early	251.0 ± 0.7
Permian	Lopingian	260.4 ± 0.7
	Guadalupian	270.6 ± 0.7
	Cisuralian	299.0 ± 0.8
Carbon-iferous	Pennsylvanian	318.1 ± 1.3
Carbon-iferous	Mississippian	359.2 ± 2.5
Devonian	Upper/Late	385.3 ± 2.6
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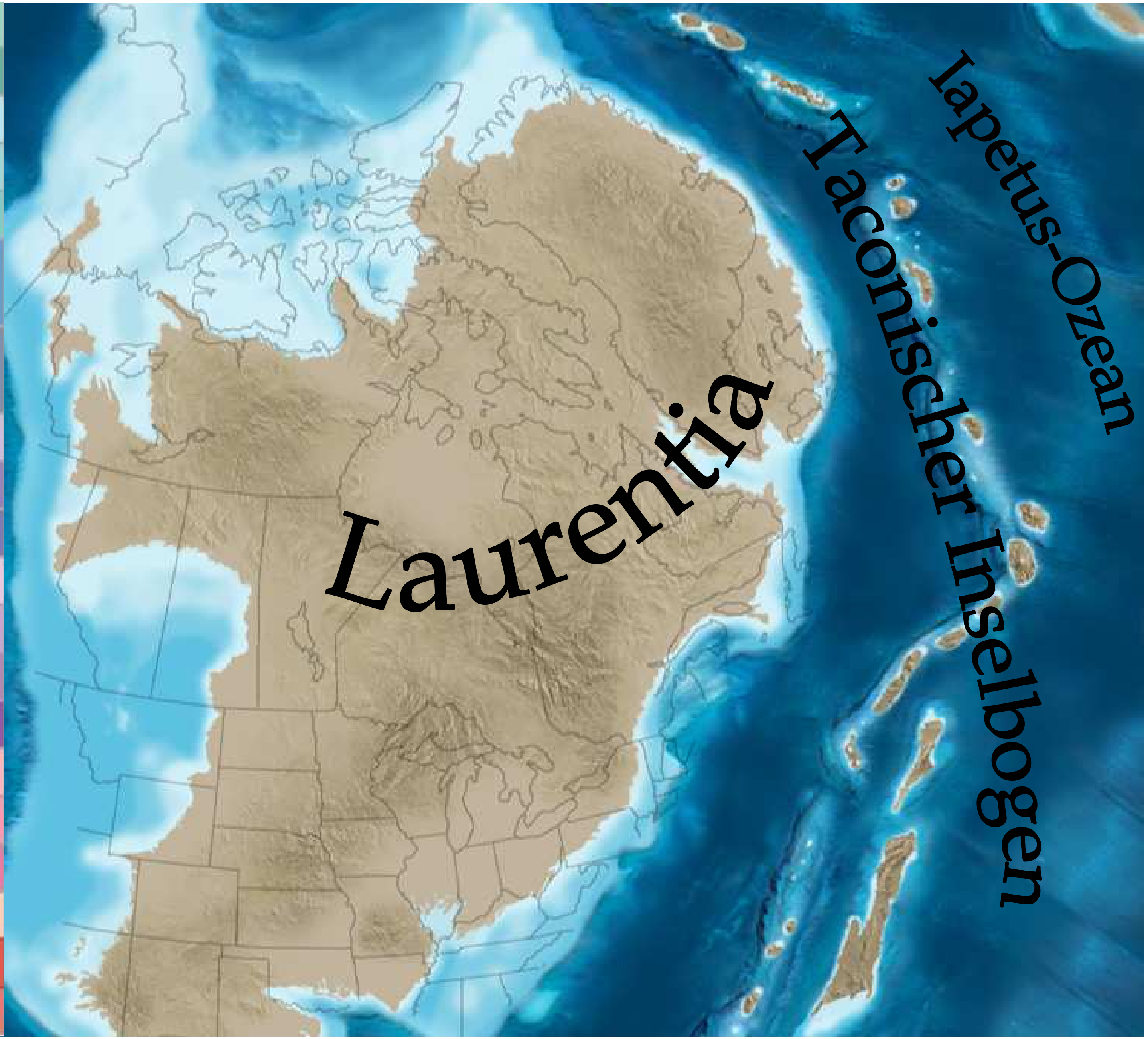

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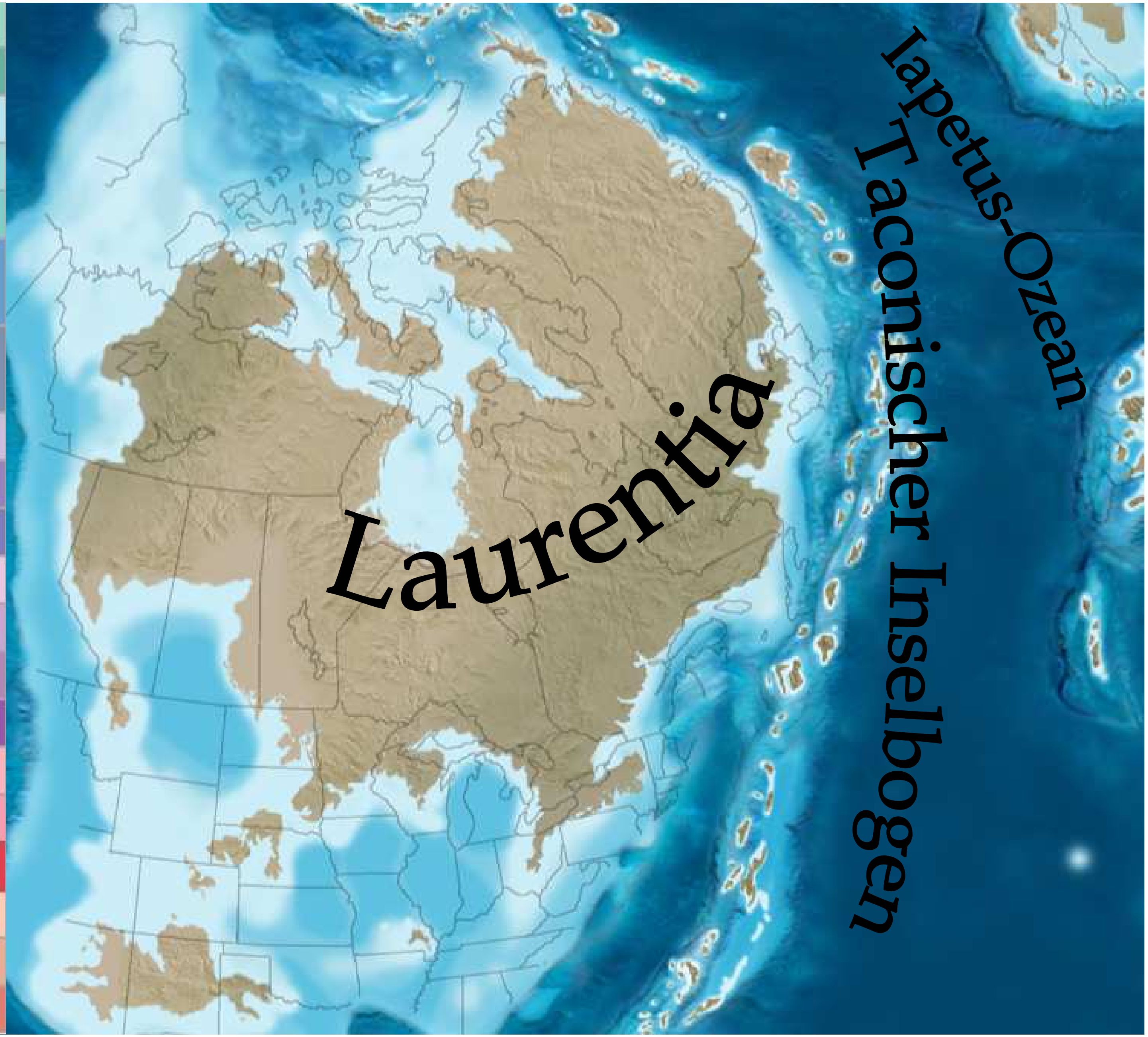

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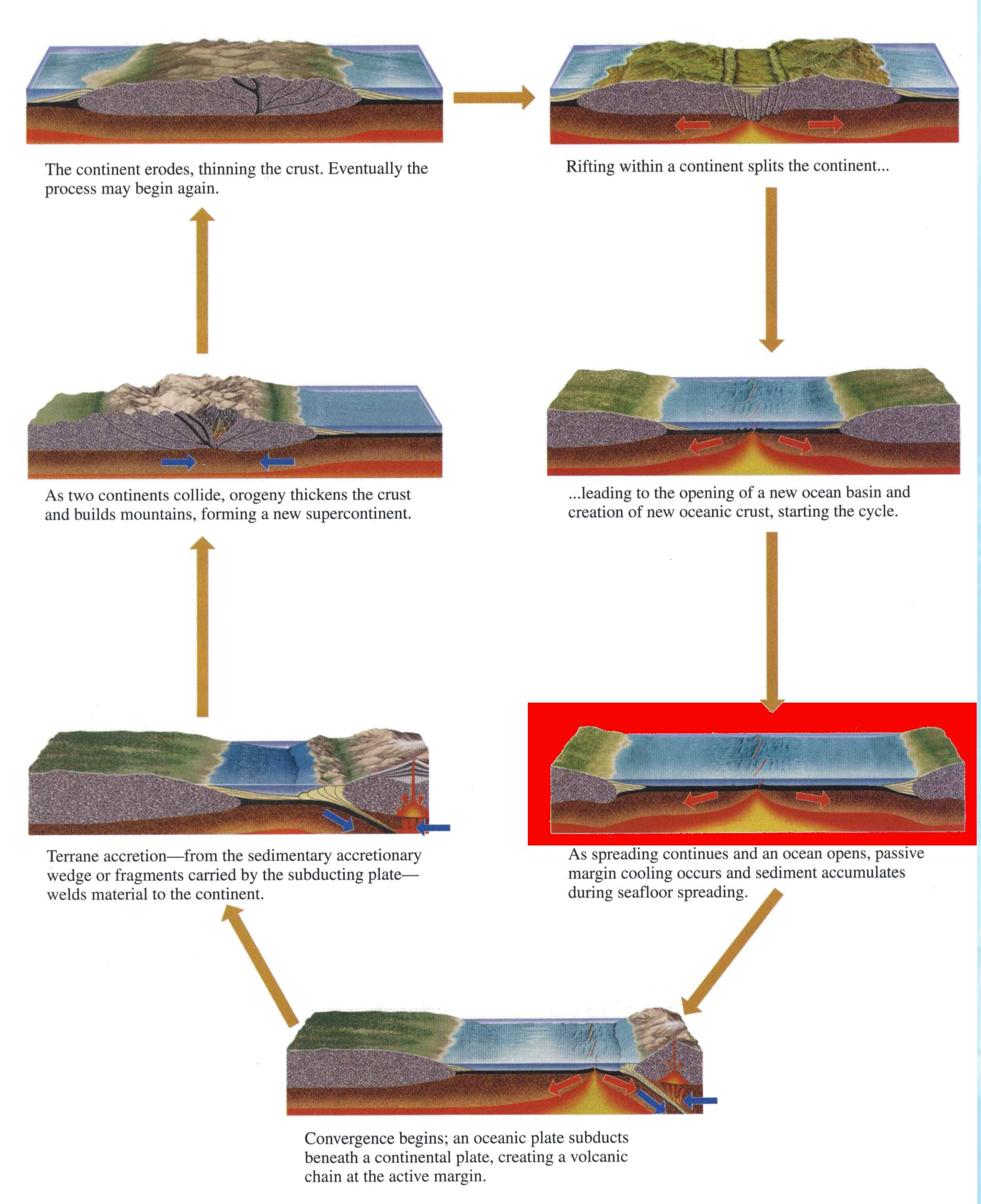
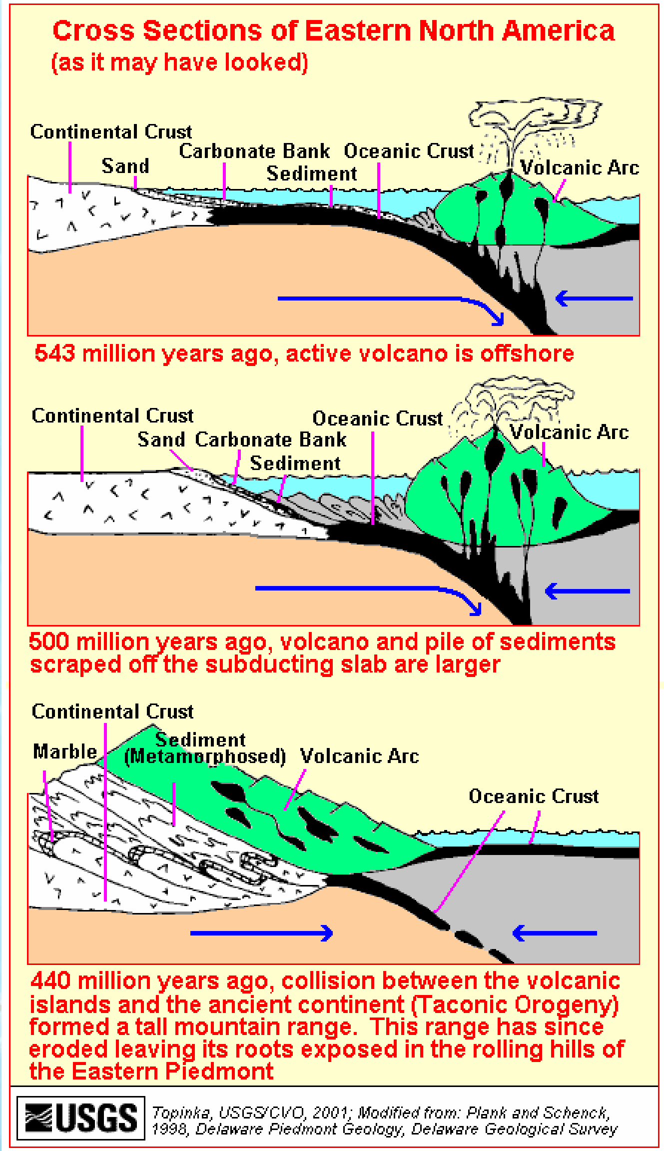
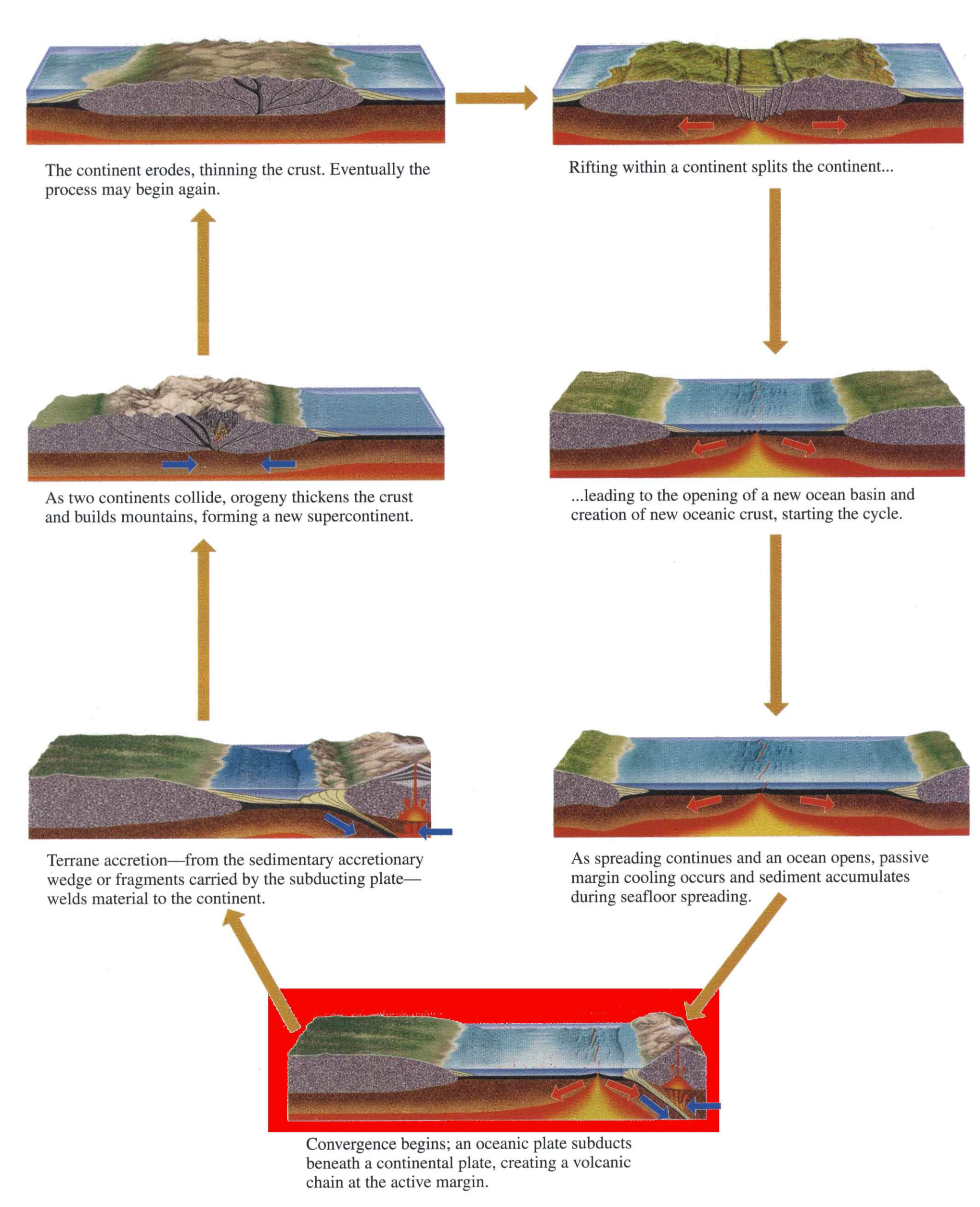
Wilson-Zyklus (1)



Taconische Orogenese

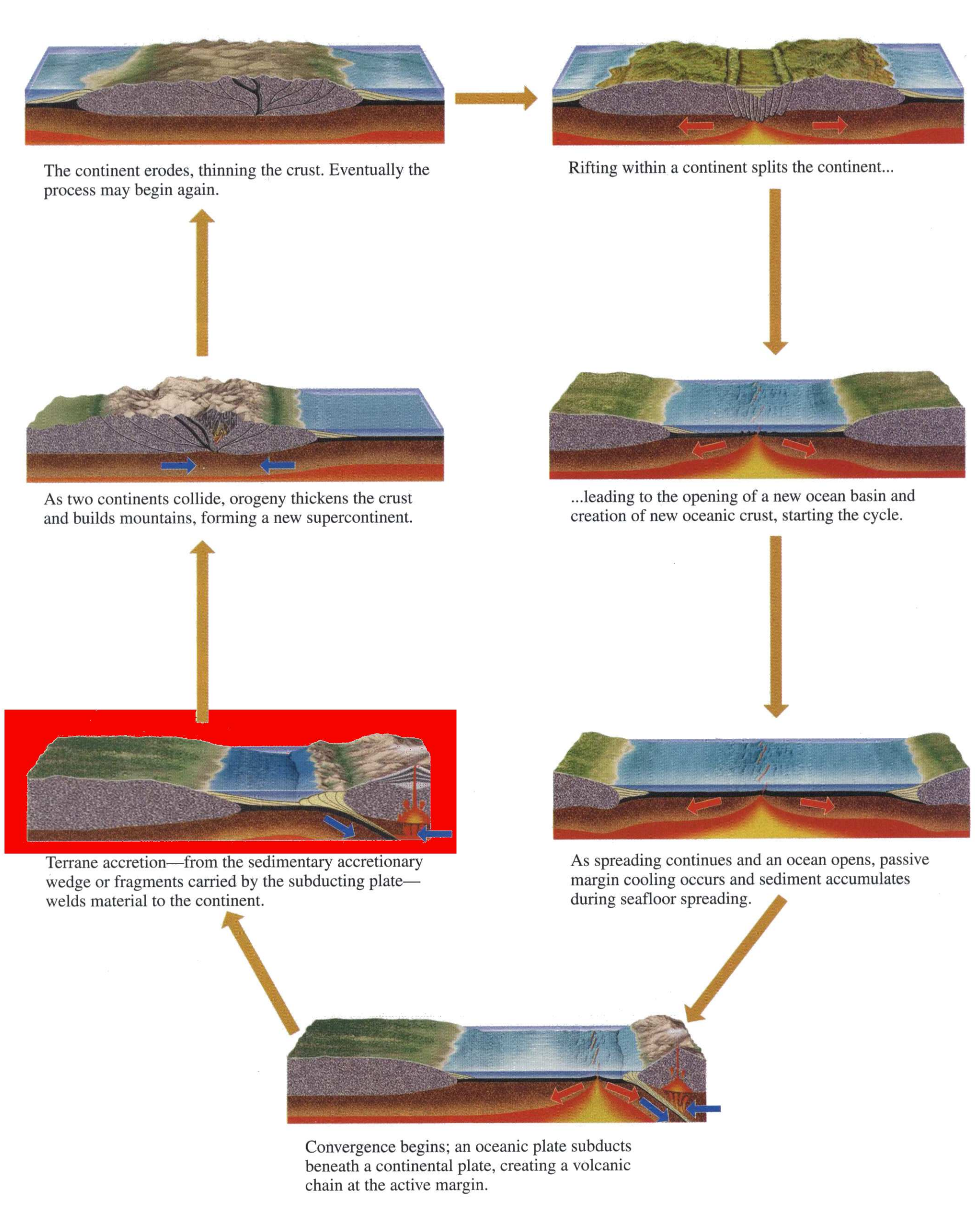


Wilson-Zyklus (2)



- offener Ozean
- Spreizungsrate geringer als Subduktionsrate
- langsame Schließung des Ozeans

Wilson-Zyklus (3)



- offener Ozean
- mittelozeanischer Rücken wird subduziert
- keine weitere Spreizung
- → Ozean wird schnell geschlossen

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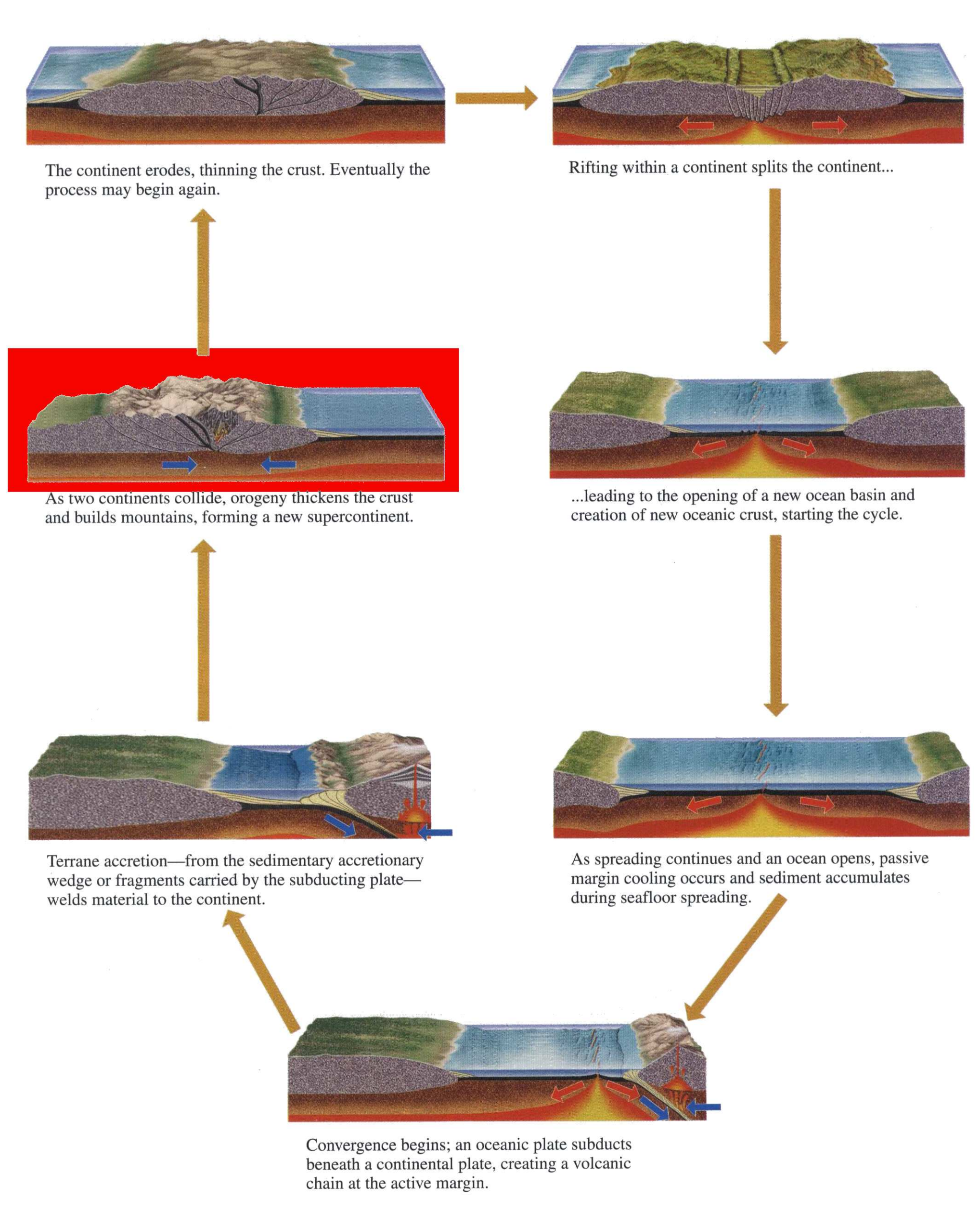
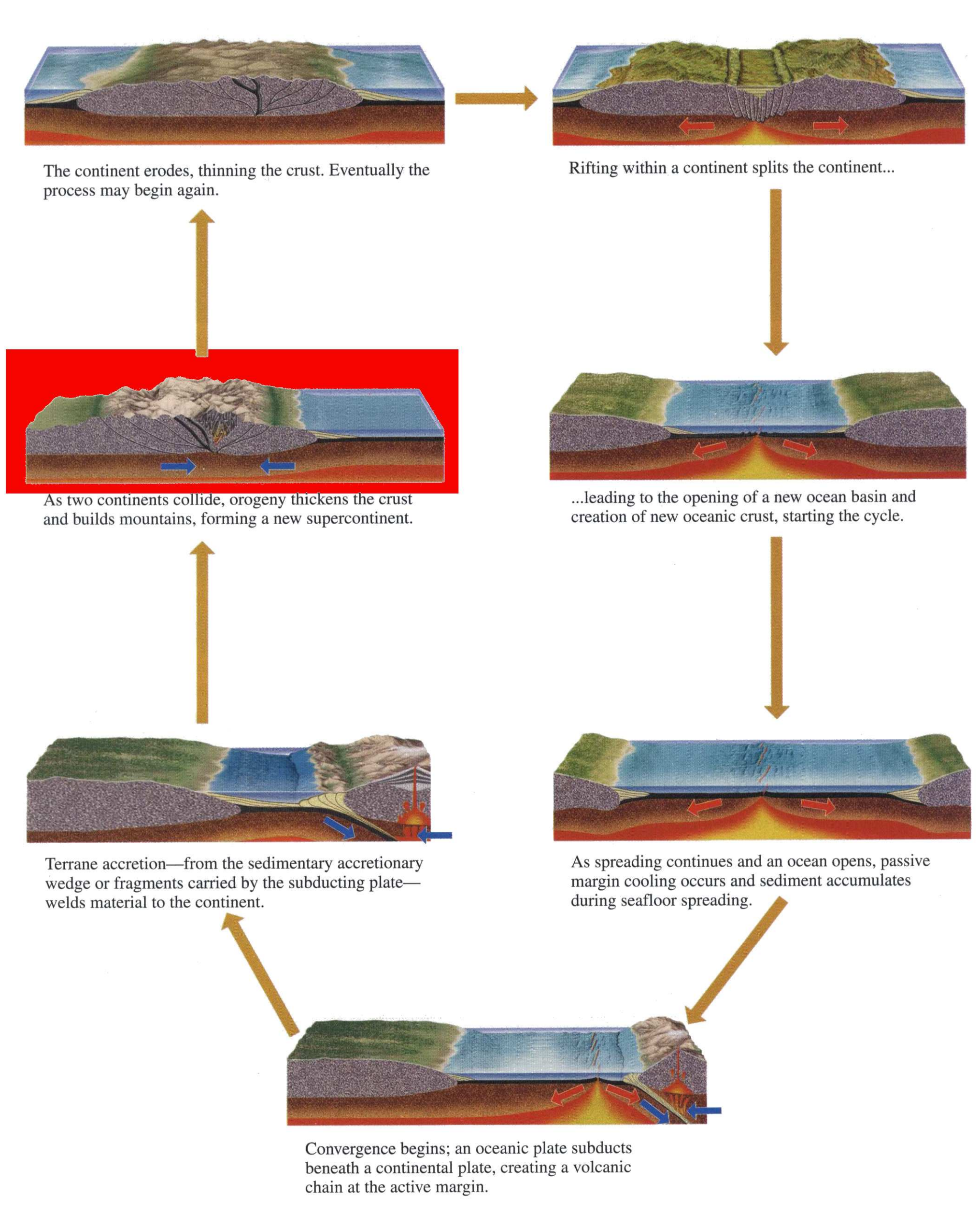
Wilson-Zyklus (4)

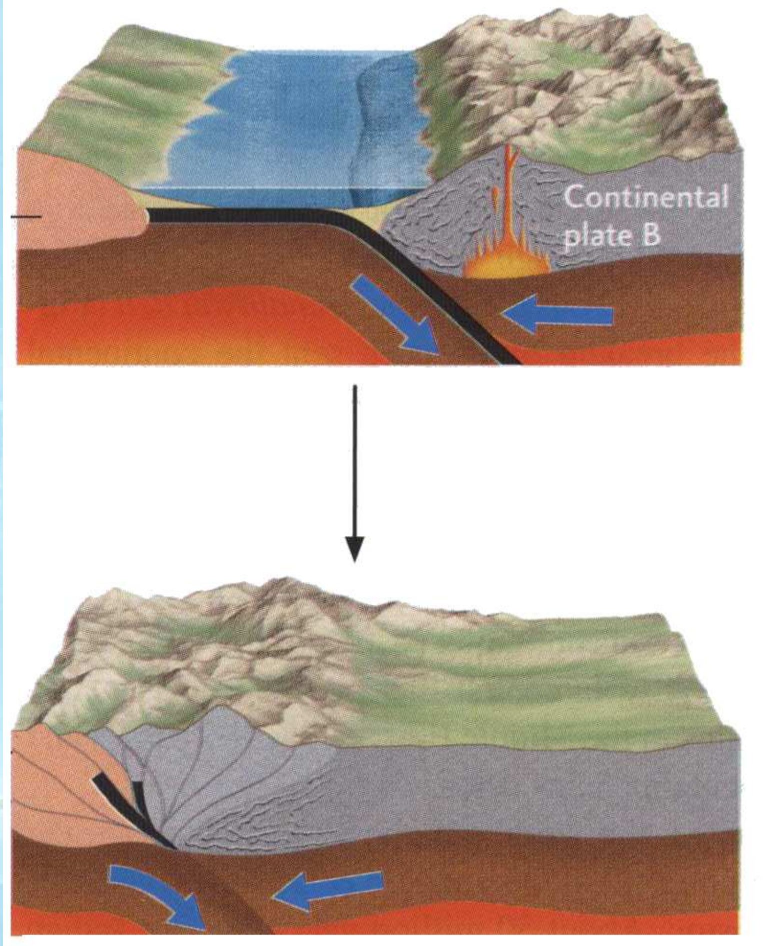


- Ozean geschlossen
- Kollision zweier Kratone
- keine Subduktion!
- statt dessen: Faltung, Auftürmung des Krustengesteins
- → Bildung von Gebirgen

Wilson-Zyklus (4)



- **Bildung von Gebirgen (Orogenese)**



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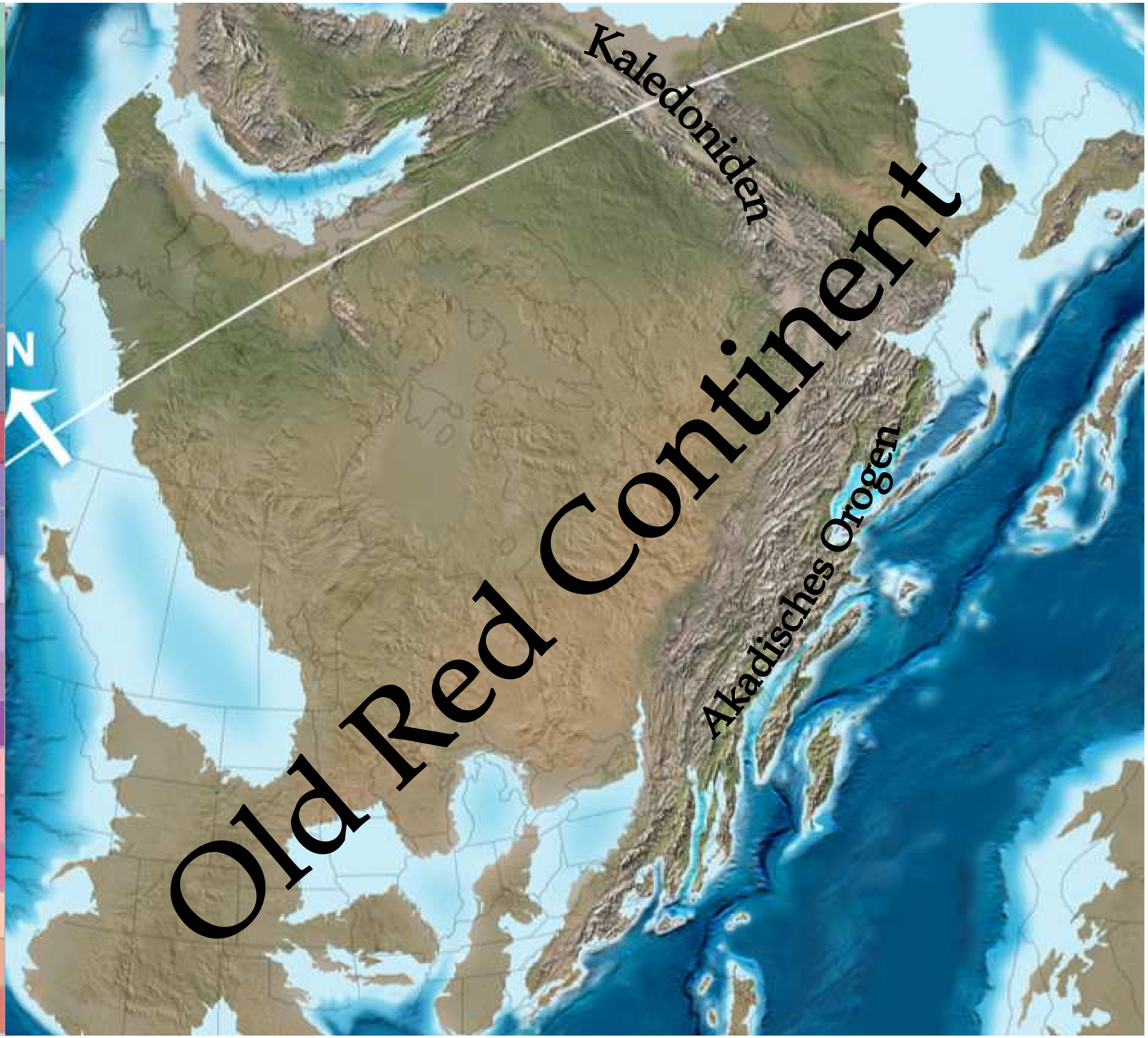

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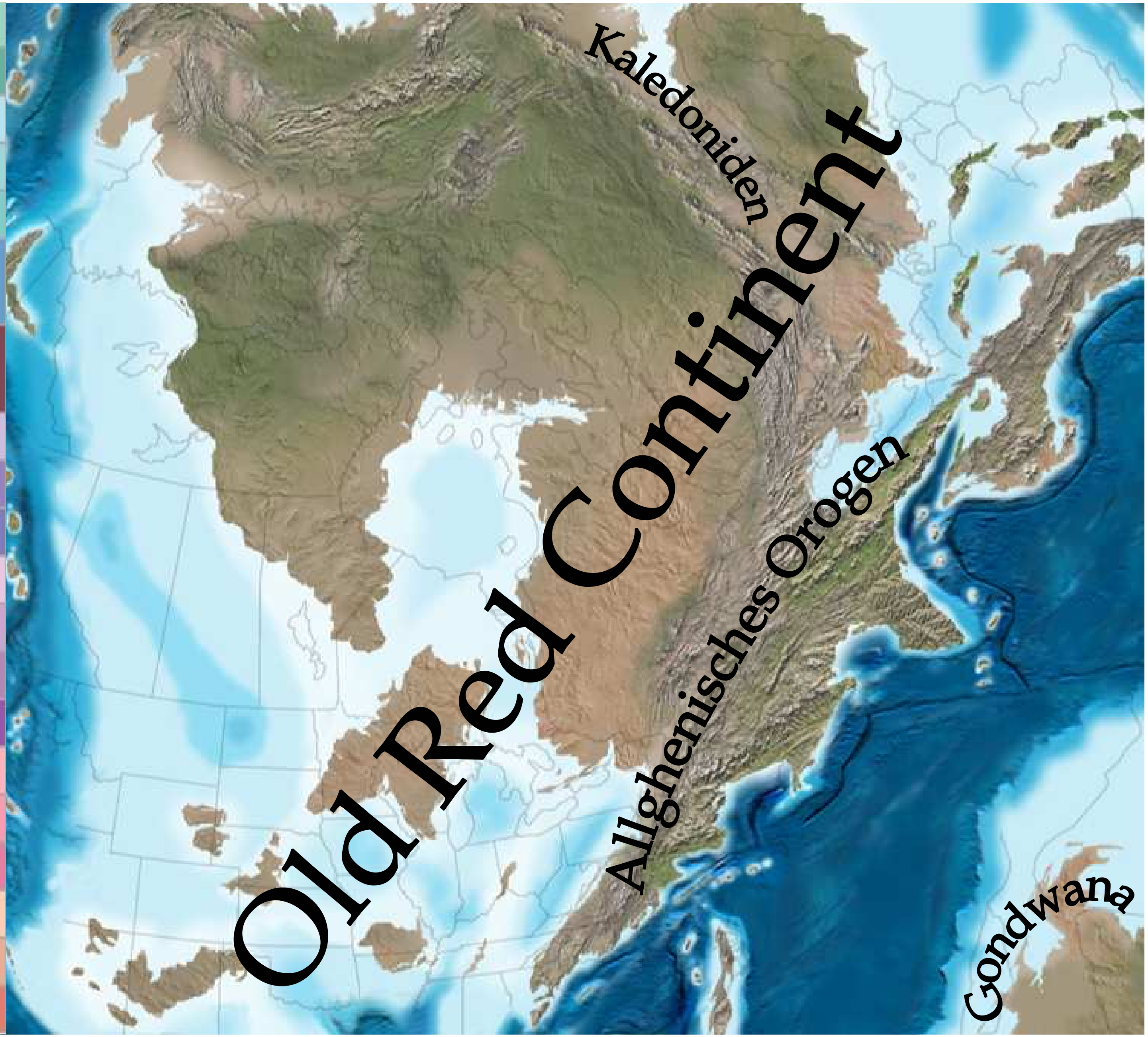

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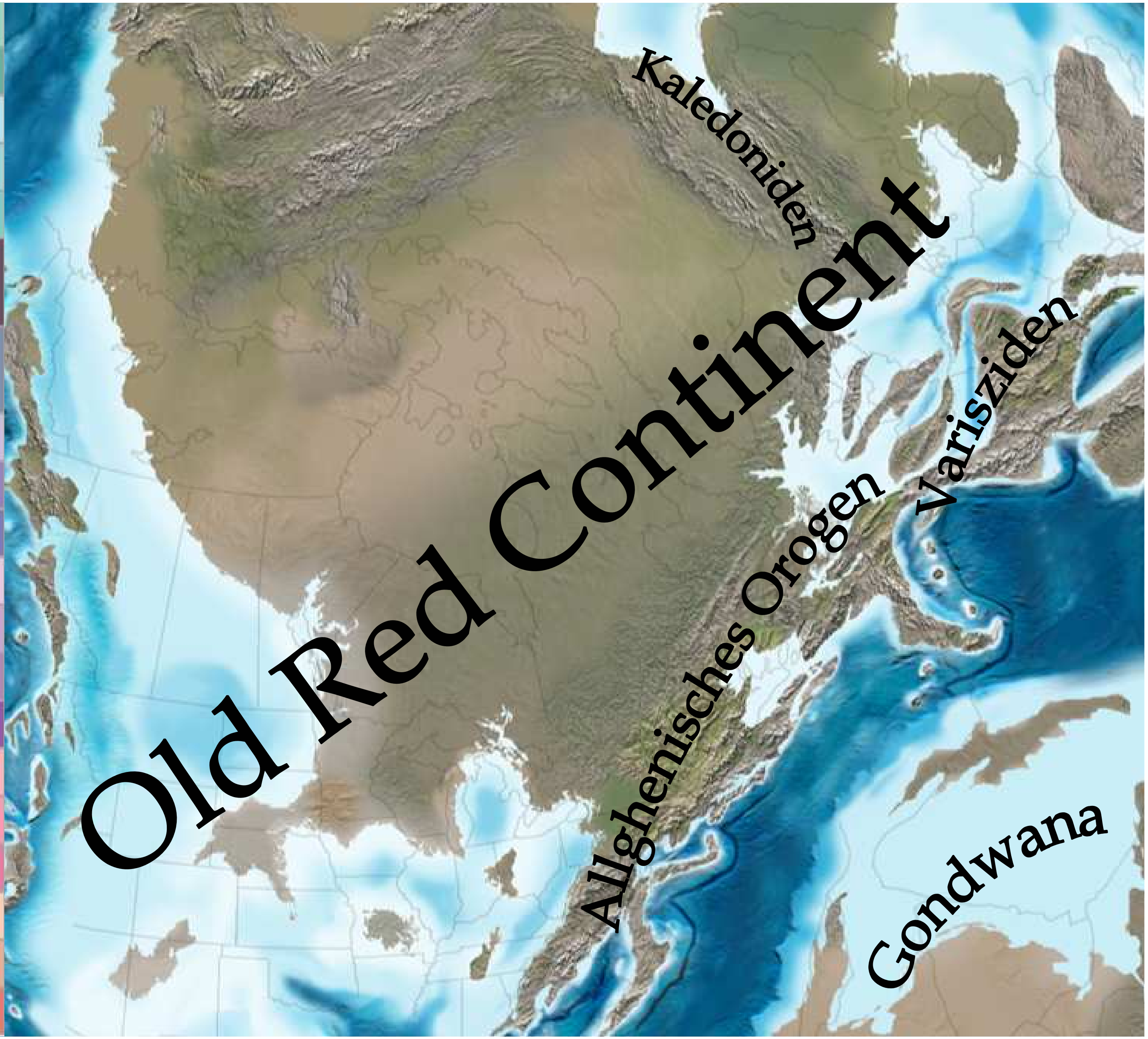

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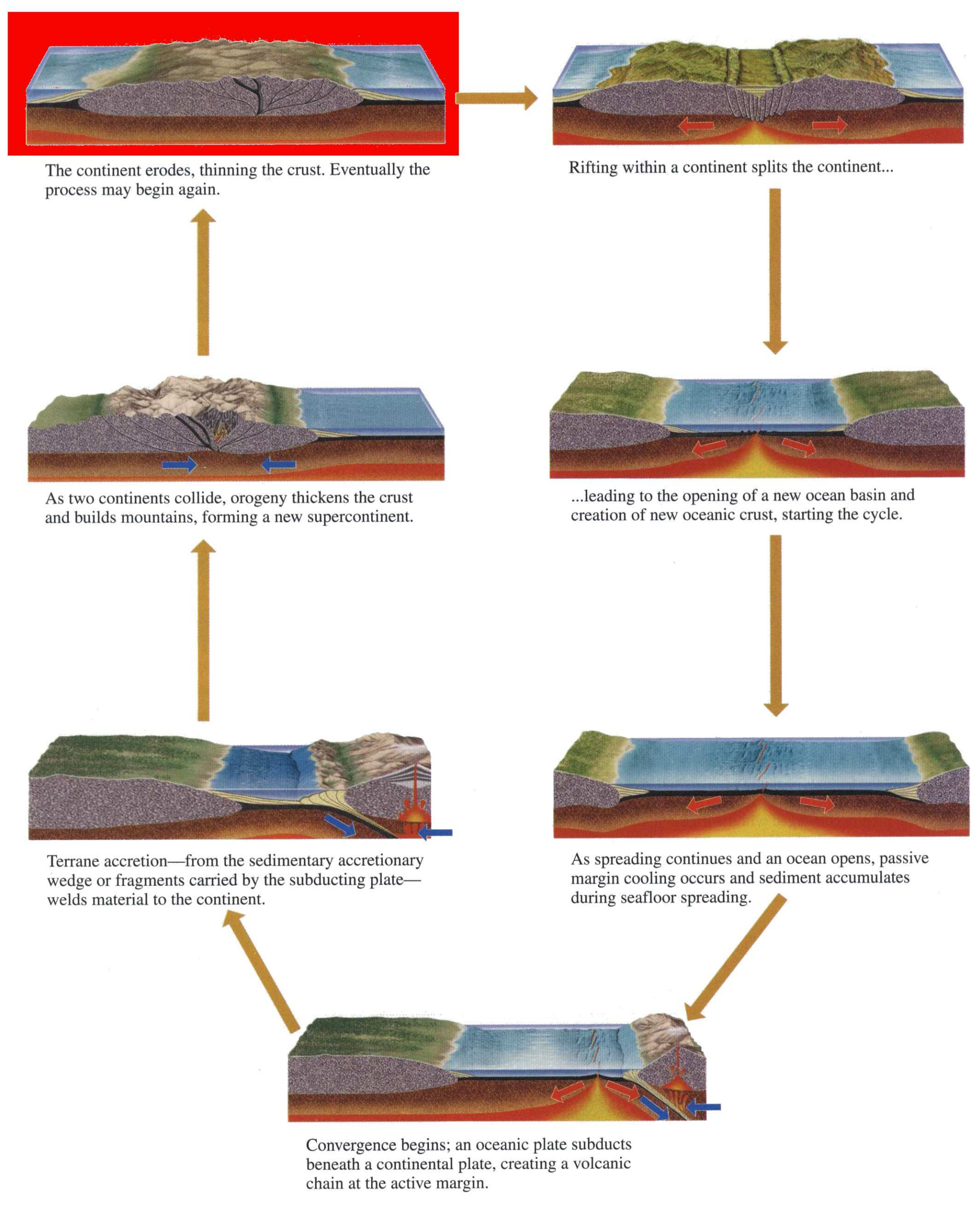
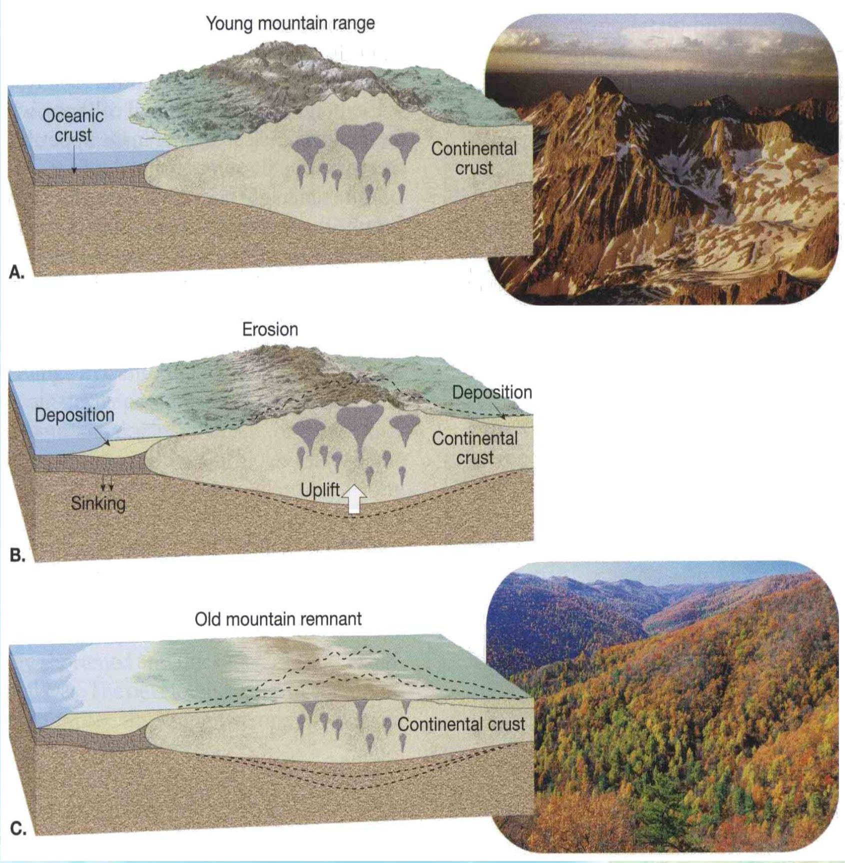
Wilson-Zyklus (5)



- **Gebirgserosion**



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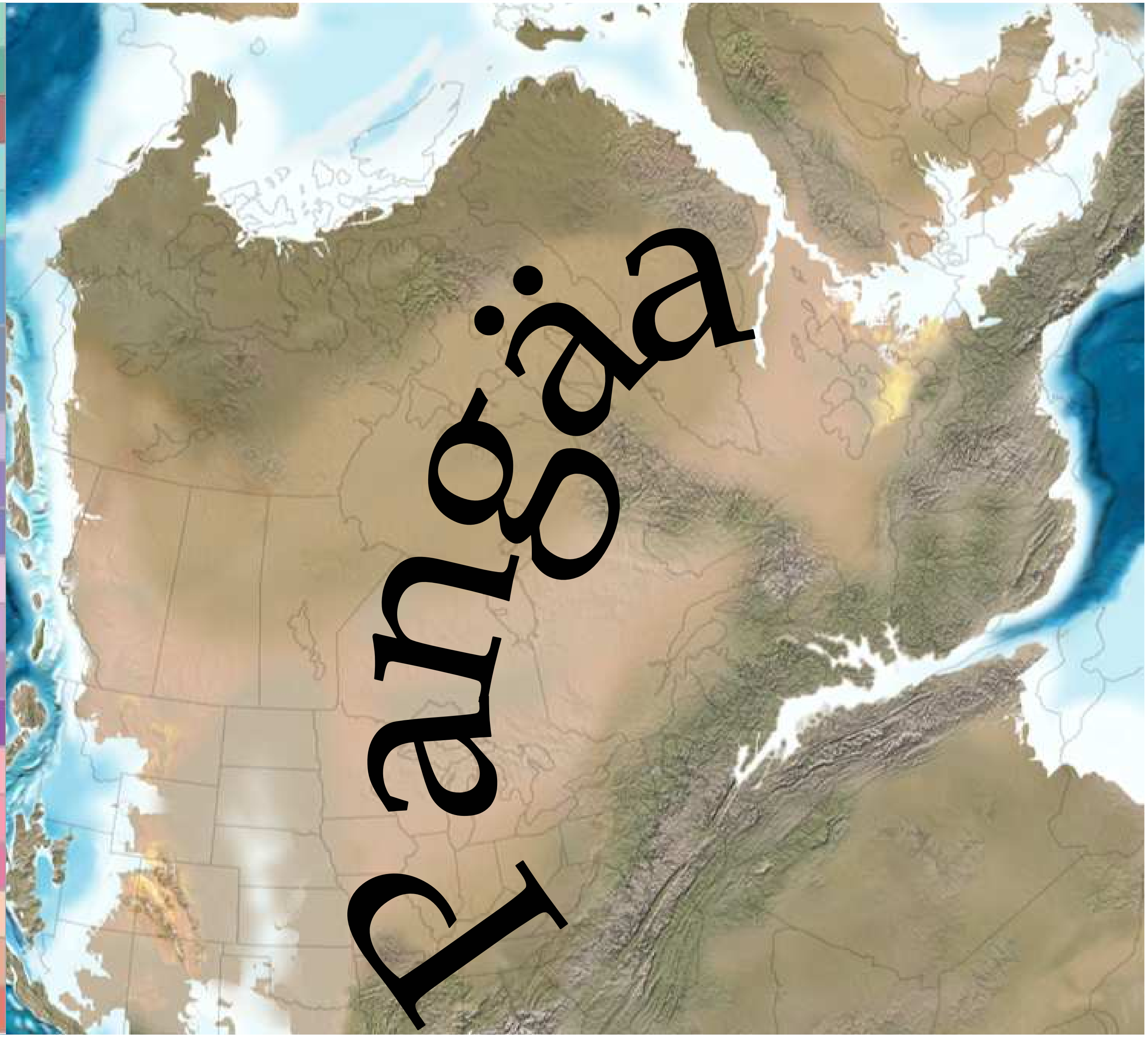
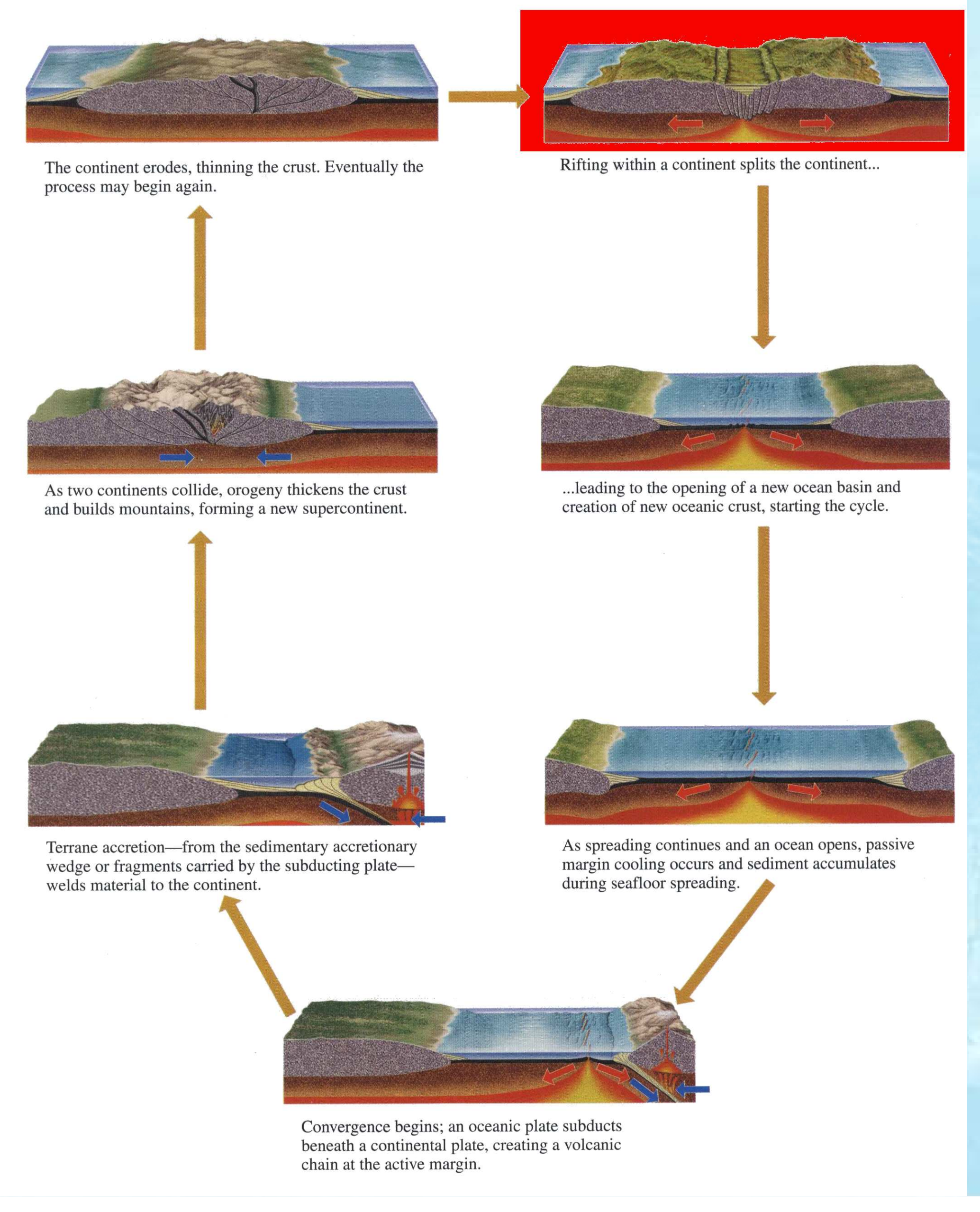
Cambrian	Furongian	501.0 ± 2.0
	Middle	513.0 ± 2.0
	Lower/Early	542.0 ± 1.0



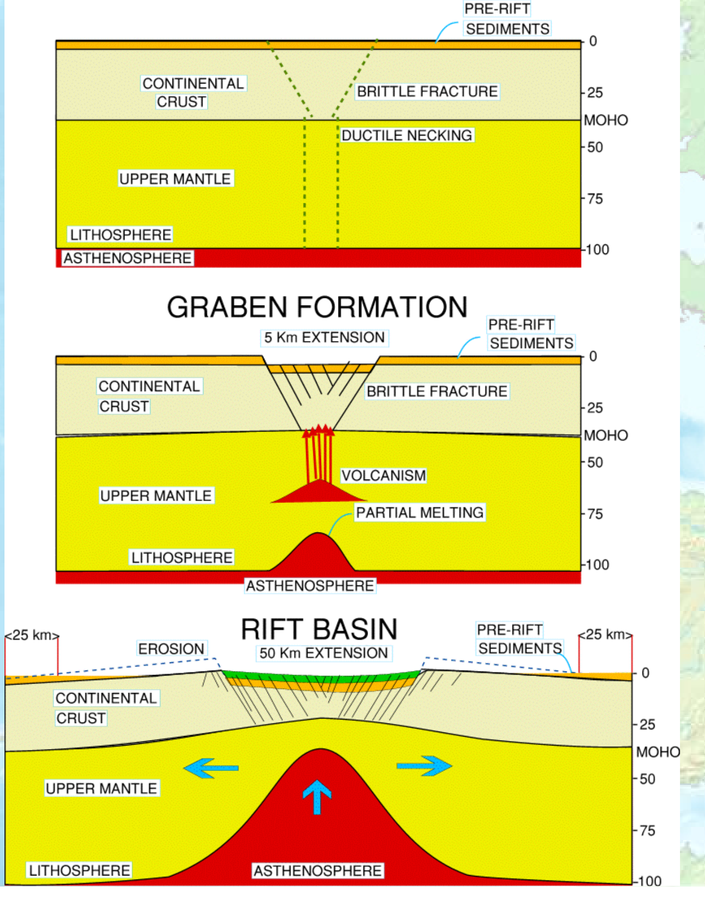
Geschichte des Nord-Atlantiks

Triassic	Middle	245.0 ± 1.5
	Lower/Early	251.0 ± 0.7
Permian	Lopingian	260.4 ± 0.7
	Guadalupian	270.6 ± 0.7
	Cisuralian	299.0 ± 0.8
Carbon-iferous	Pennsylvanian	318.1 ± 1.3
Carbon-iferous	Mississippian	359.2 ± 2.5
Devonian	Upper/Late	385.3 ± 2.6
	Middle	397.5 ± 2.7
	Lower/Early	416.0 ± 2.8
Silurian	Pridoli	418.7 ± 2.7
	Ludlow/Cayugan	422.9 ± 2.5
	Wenlock	428.2 ± 2.3
	Llandovery	443.7 ± 1.5
Ordovician	Upper/Late	460.9 ± 1.6
	Middle	471.8 ± 1.6
	Lower/Early	488.3 ± 1.7
Cambrian	Furongian	501.0 ± 2.0
	Middle	513.0 ± 2.0
	Lower/Early	542.0 ± 1.0

Wilson-Zyklus (6)



- **Rifting durch vulkanische Aktivität verursacht**




Exkurs:
Hotspots

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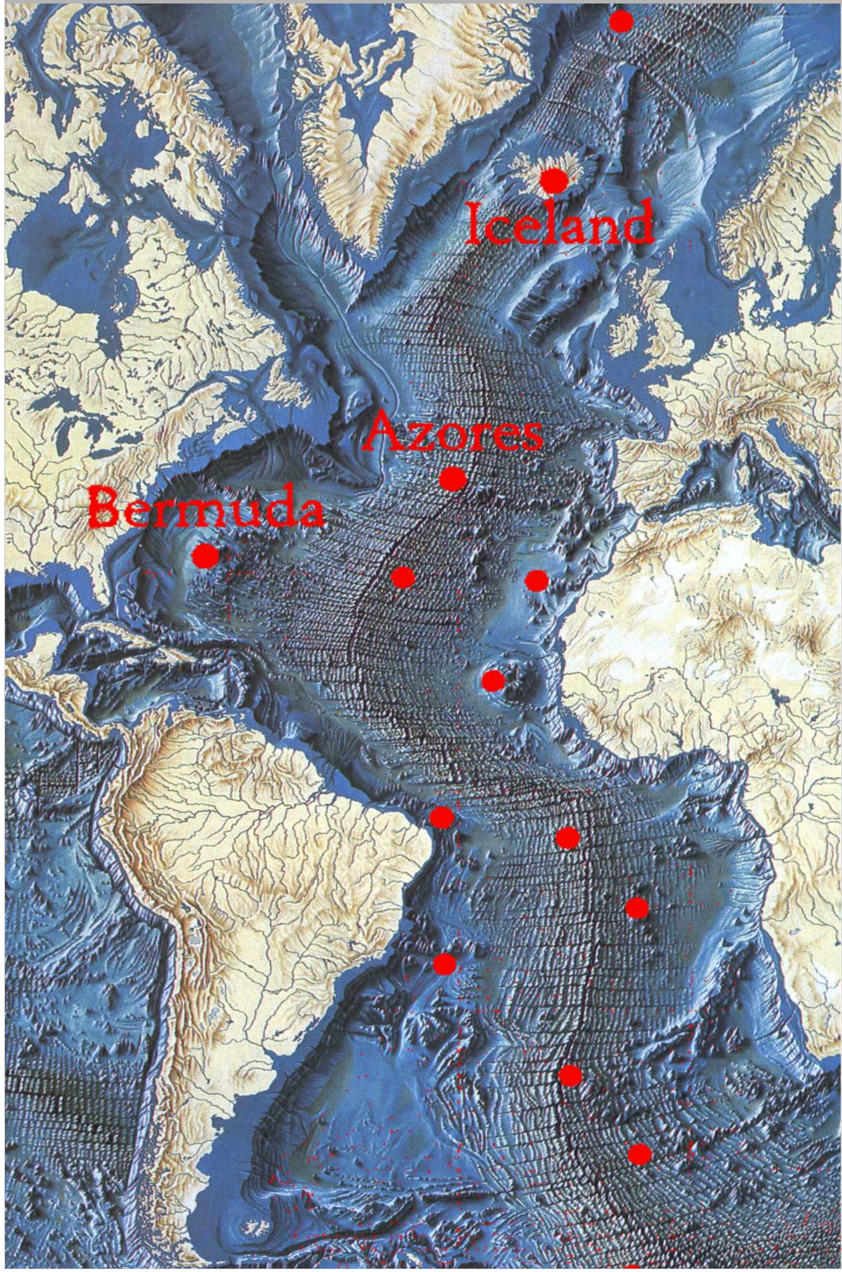
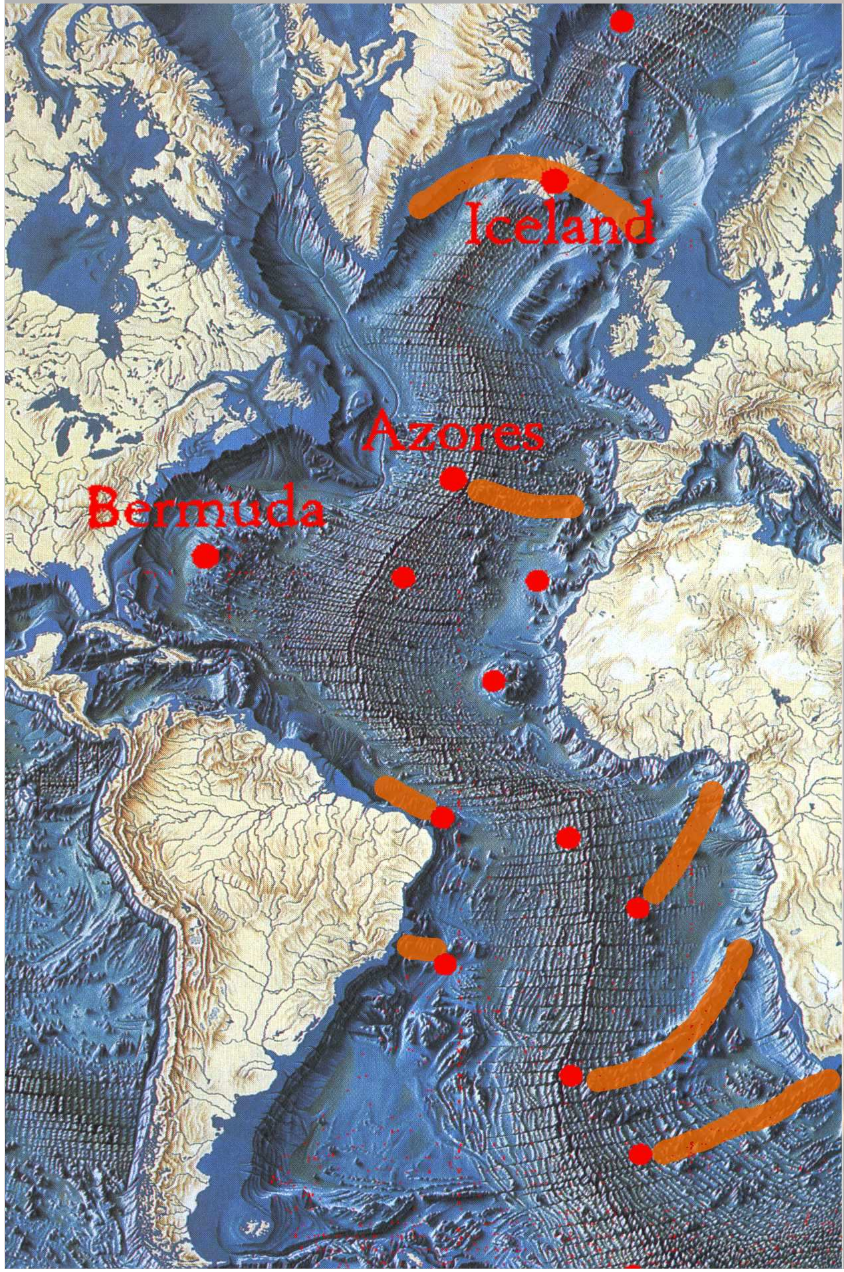


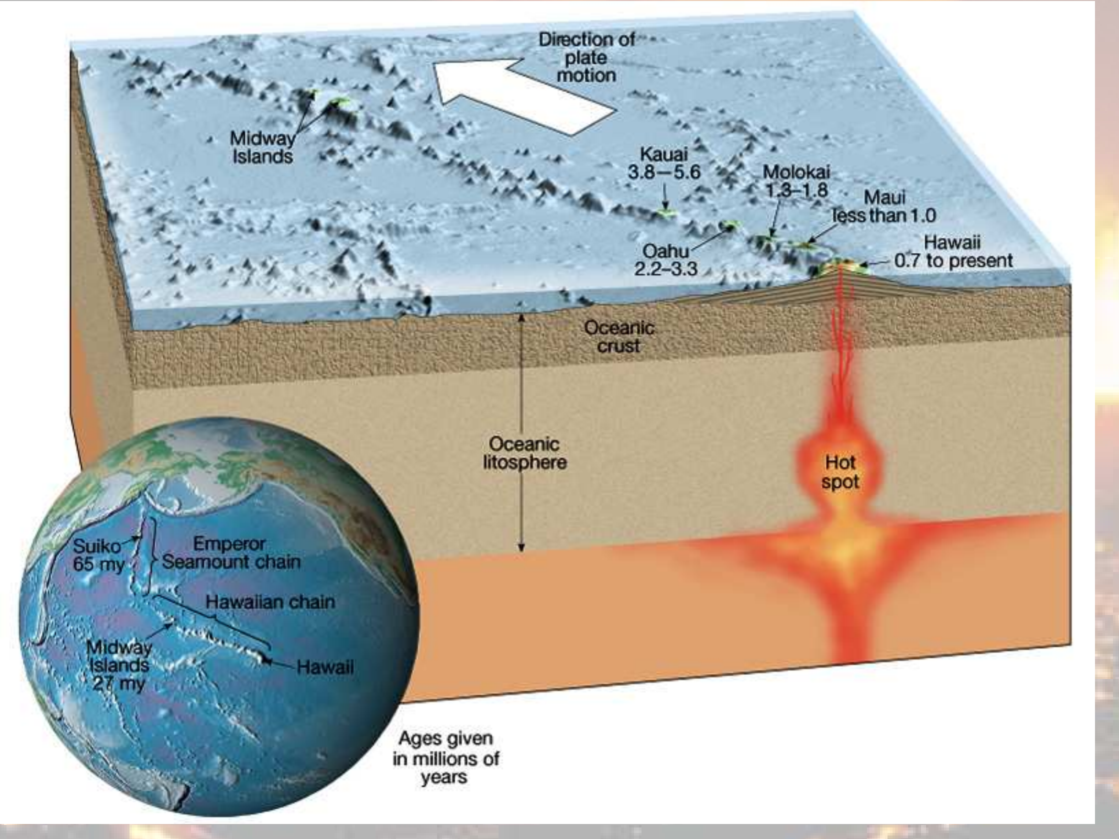
- entlang des atlantischen Spreizungszentrum relativ viele Hotspots

Exkurs: Hotspots



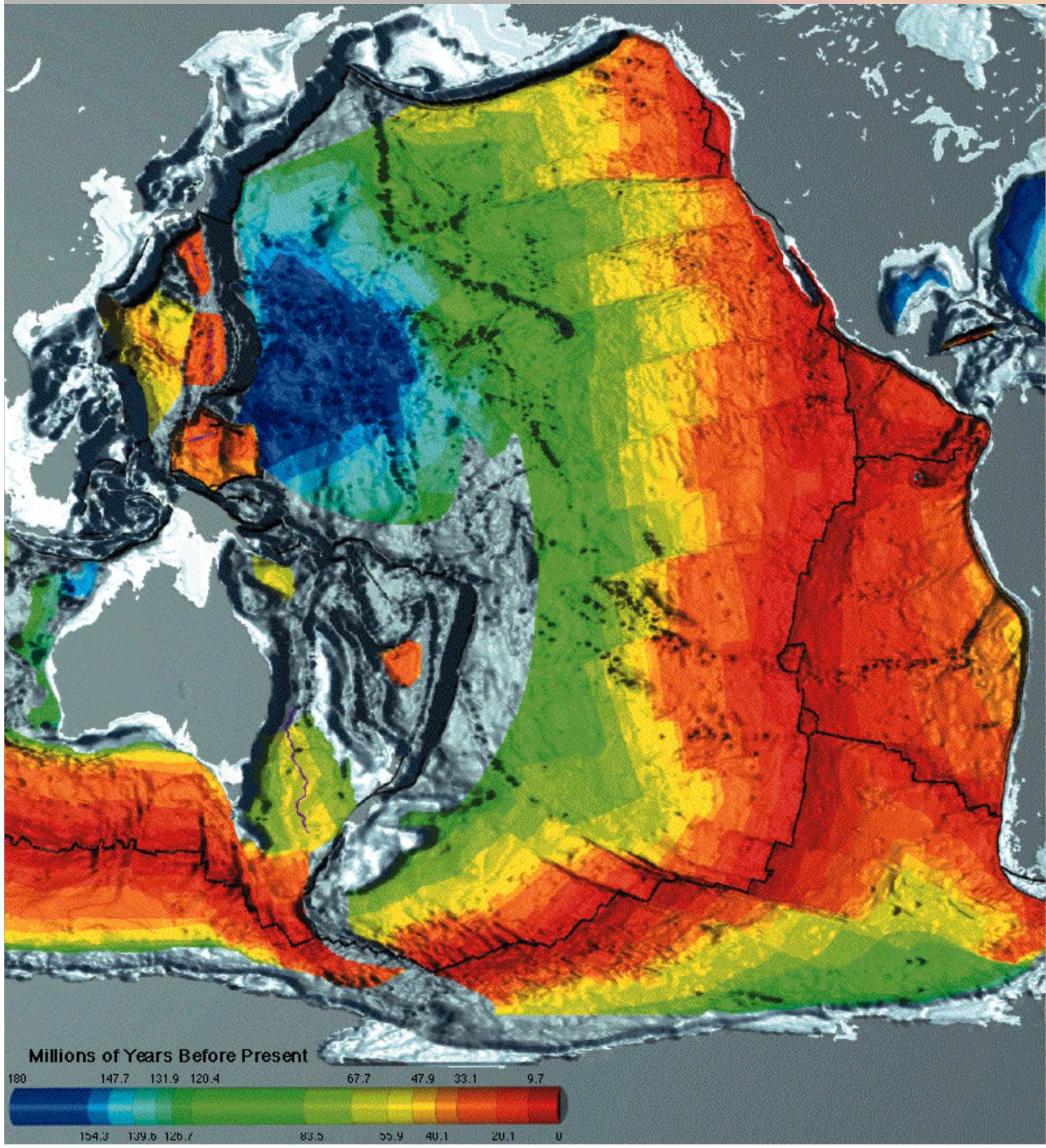
- Atlantik zeigt vom Spreizungszentrum und den Hotspots wegzeigende Bergketten (Seamount-chains)
- die meisten Erhebungen sind jedoch unter dem Meeresspiegel

Exkurs: Hotspots



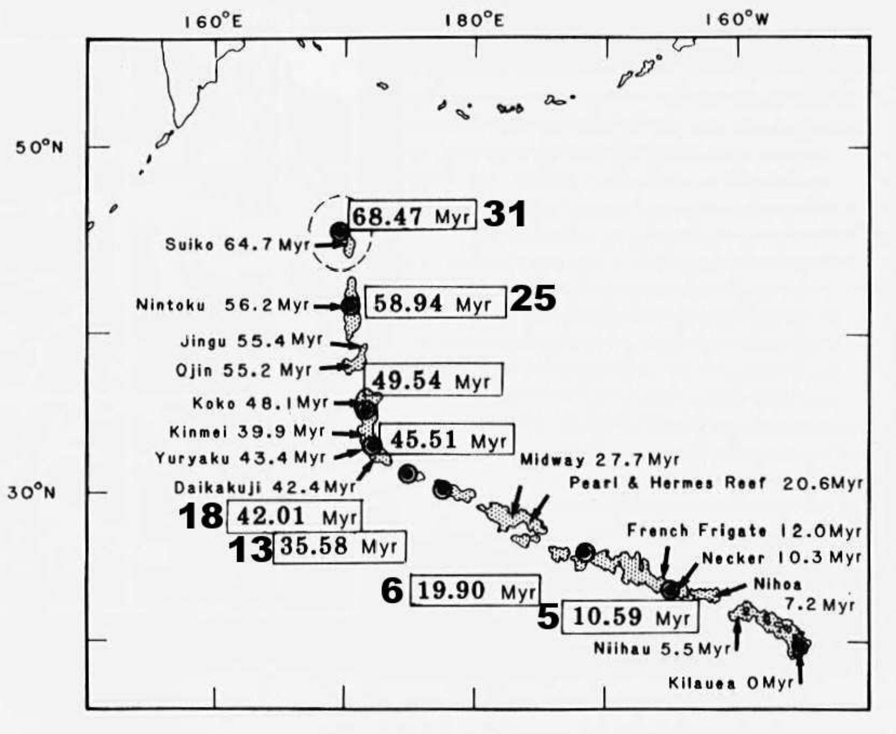
- Platte bewegt sich über den relativ fest sitzenden Hotspot → Berge vom „Fließband“
- → je weiter ein sea-mount vom Hotspot entfernt ist, desto älter ist die Erhebung

Exkurs: Hotspots



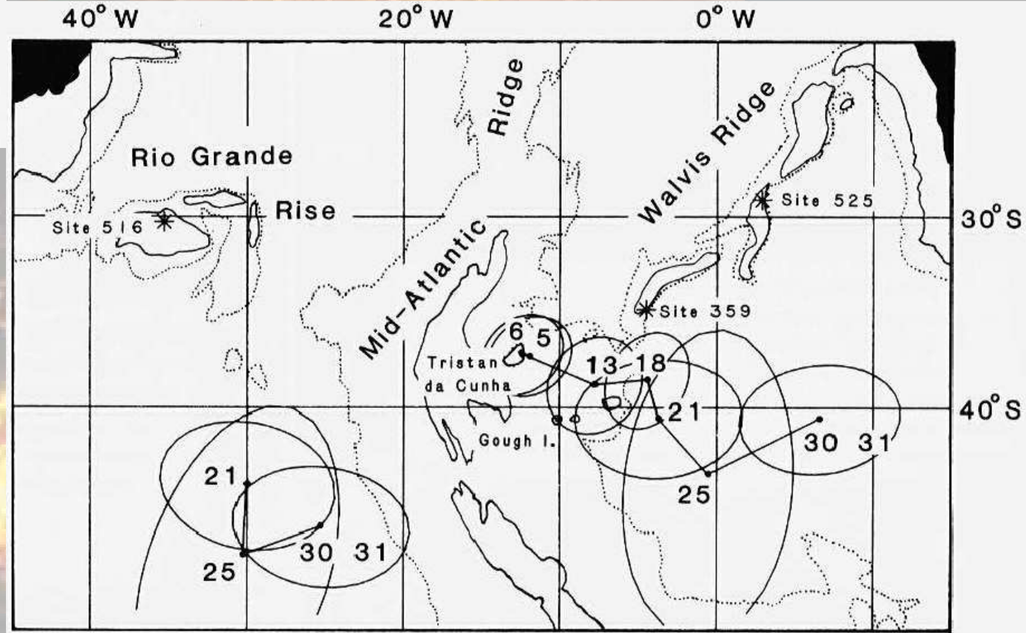
- Wenn Hotspots „fest sitzen“, wie kam es zum „Knick“ in der Hawaii-Emperor-Bergkette?
- Hot-Spots müssen Eigenbewegung haben
- Ermittlung der Bewegungsrate durch Vergleich von paläomagnetischen Messungen entlang von Seamount-chains

Exkurs: Hotspots



- **<u>Annahme:</u> Mantelplumes seien zueinander fixiert**

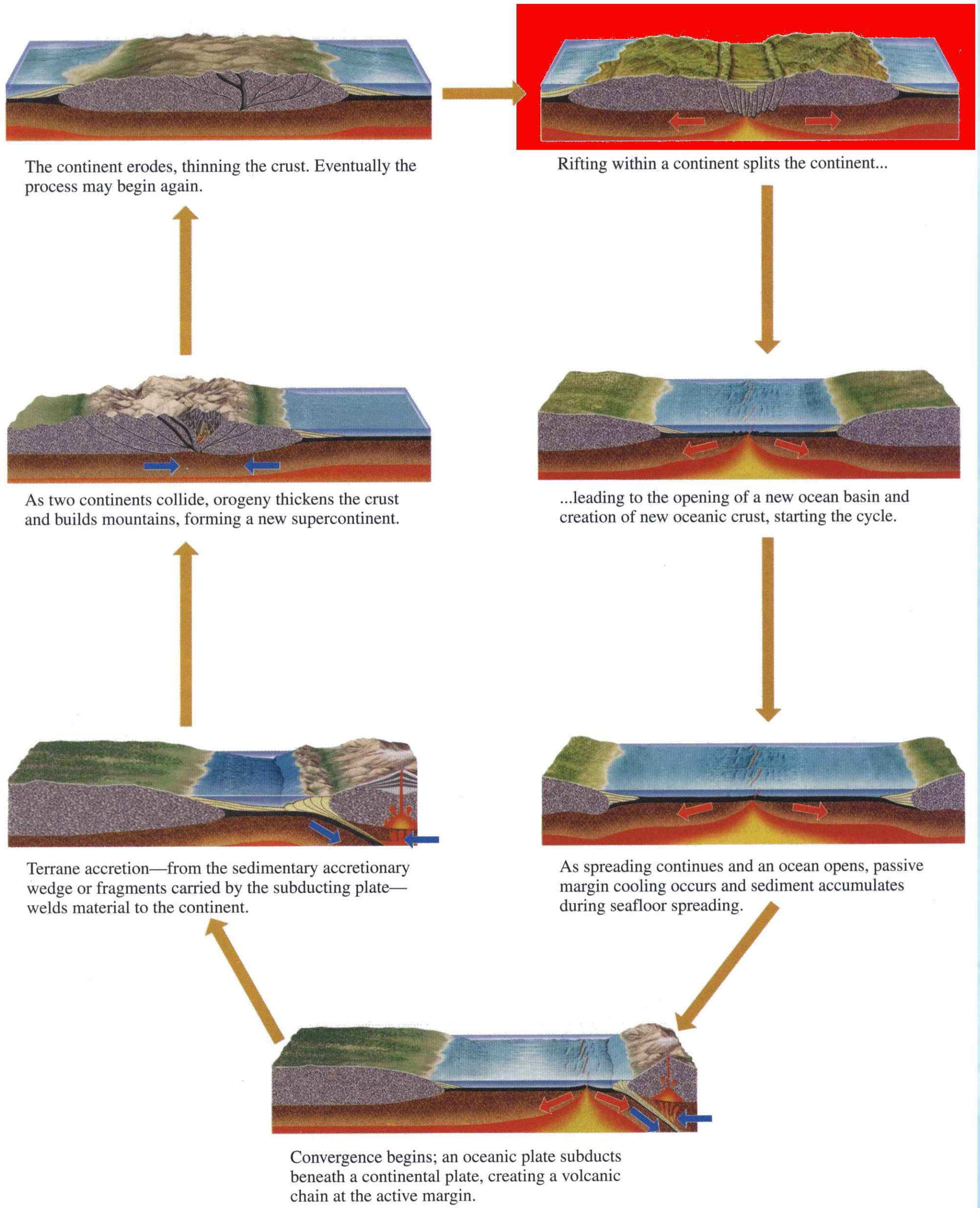
- **<u>Beobachtung:</u> errechnete Position des Mantelplumes weicht von der Position des korrespondierenden Seamounts ab**



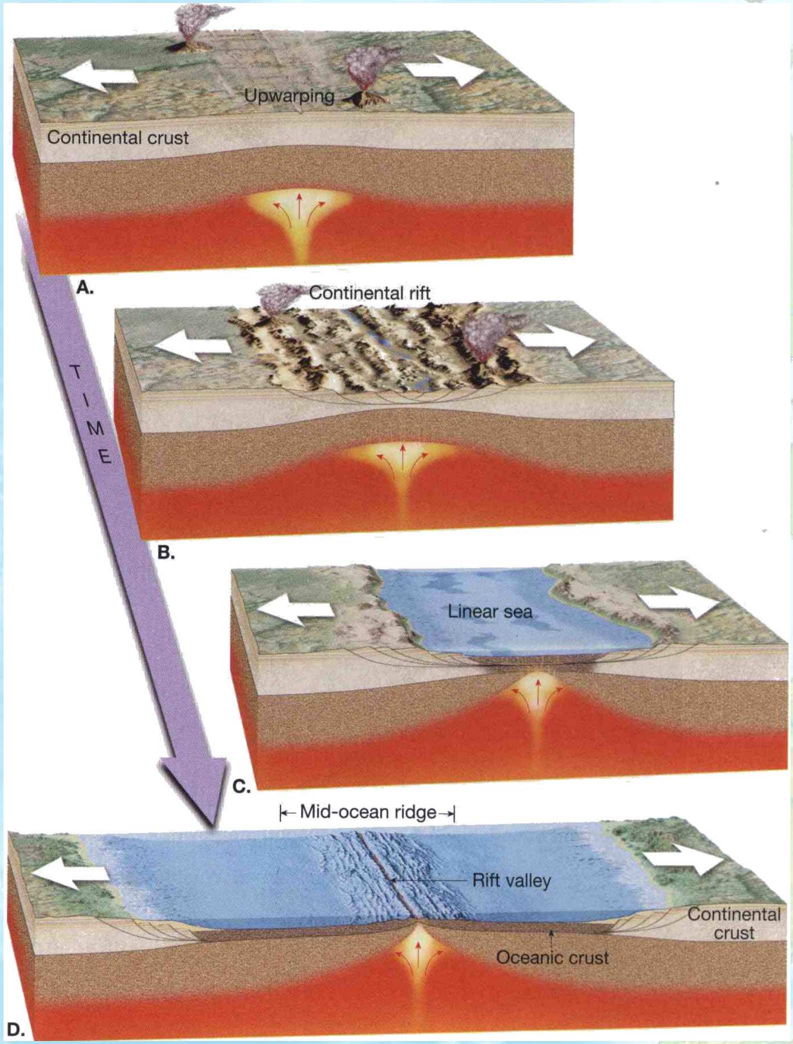
- **<u>Folgerung:</u> zusätzlich zur Kontinentalbewegung liegt eine Eigenbewegung der Mantelplumes vor**

- **Bewegungsrate variiert stark (7 mm/a – 30 mm/a)**

Wilson-Zyklus (6)



Öffnung des Kontinents



Geschichte des Nord-Atlantiks

Neogene (Tertiary/ Quaternary)	Holocene (Quaternary)	0.011430 ± 0.00013
	Pleistocene (Quaternary)	2.588 ± 0.005
	Pliocene (Quaternary)	5.332 ± 0.005
	Miocene (Tertiary)	23.03 ± 0.05
Paleogene (Tertiary)[3]	Oligocene (Tertiary)	33.9 ± 0.1
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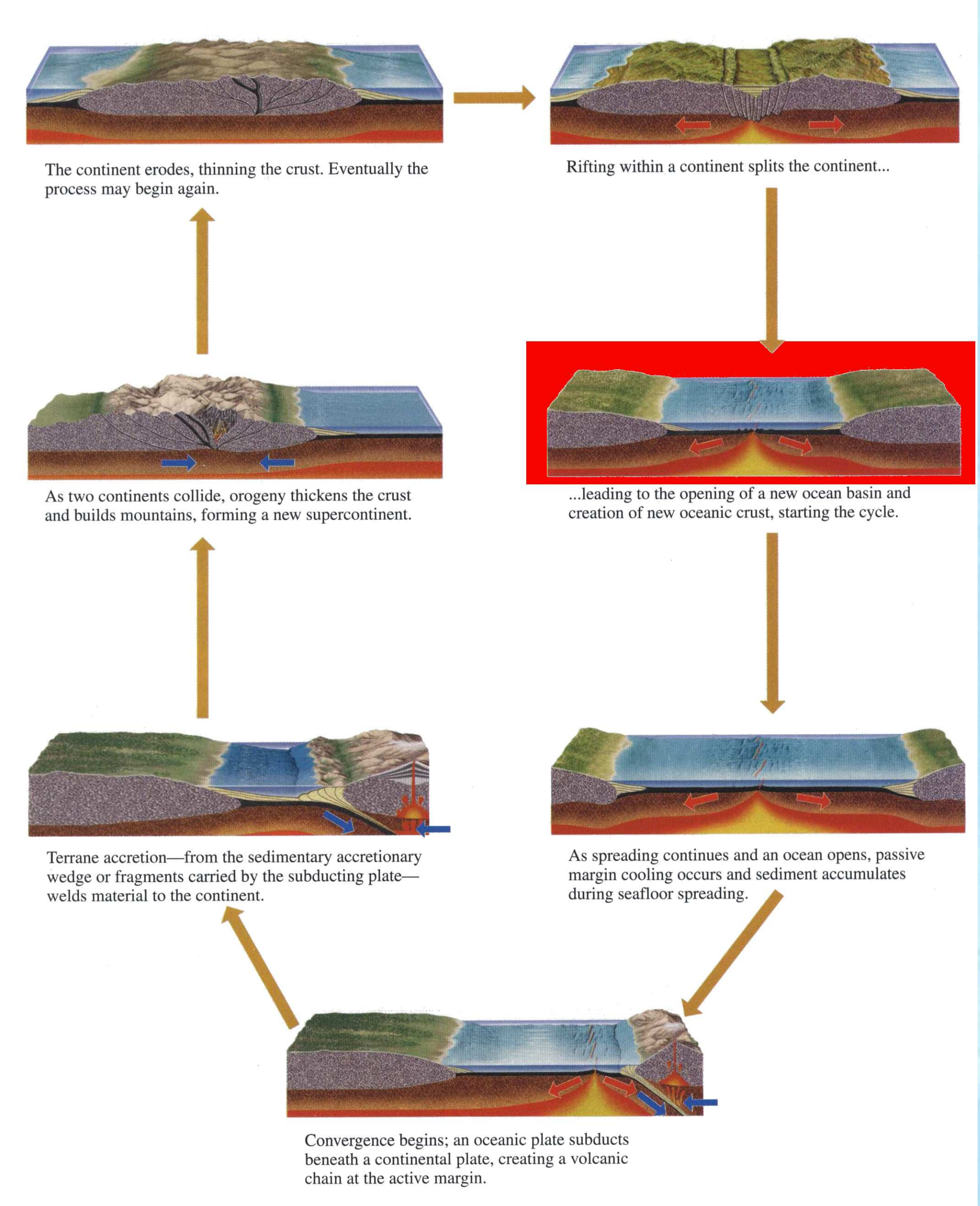
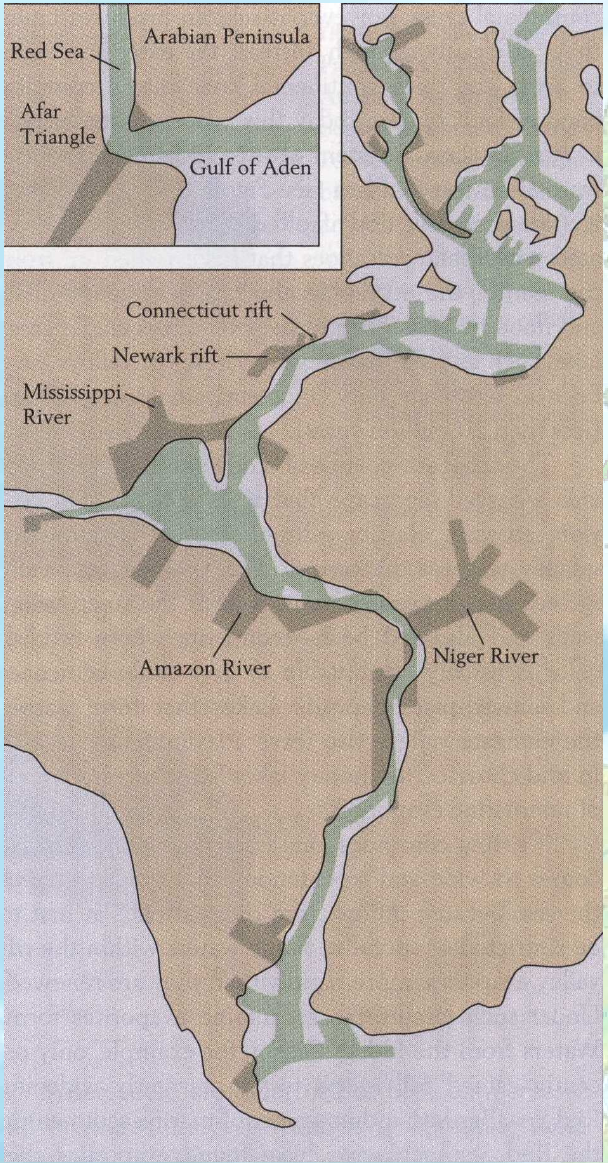
Wilson-Zyklus (7)



Spreizung des Atlantiks



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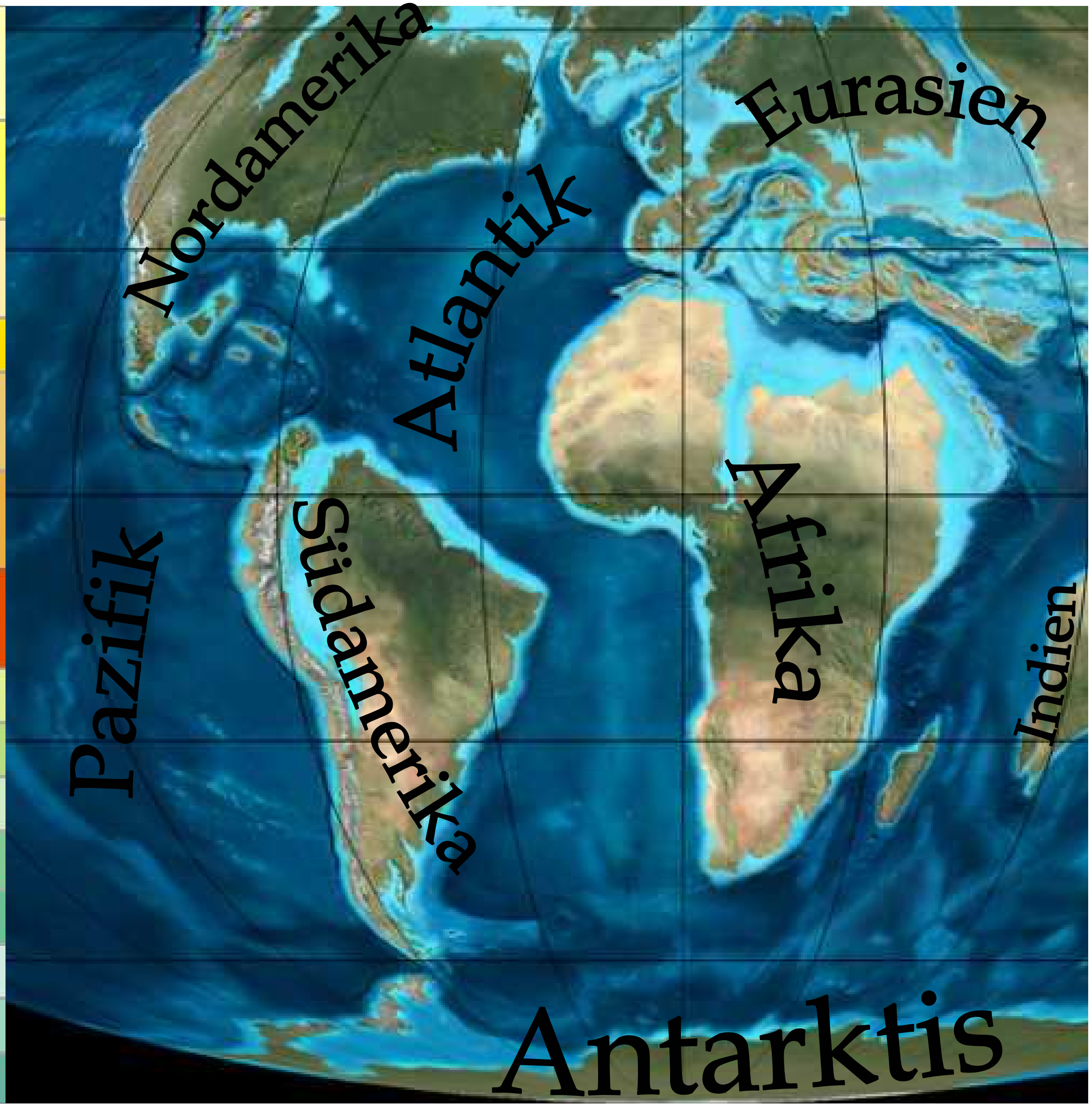

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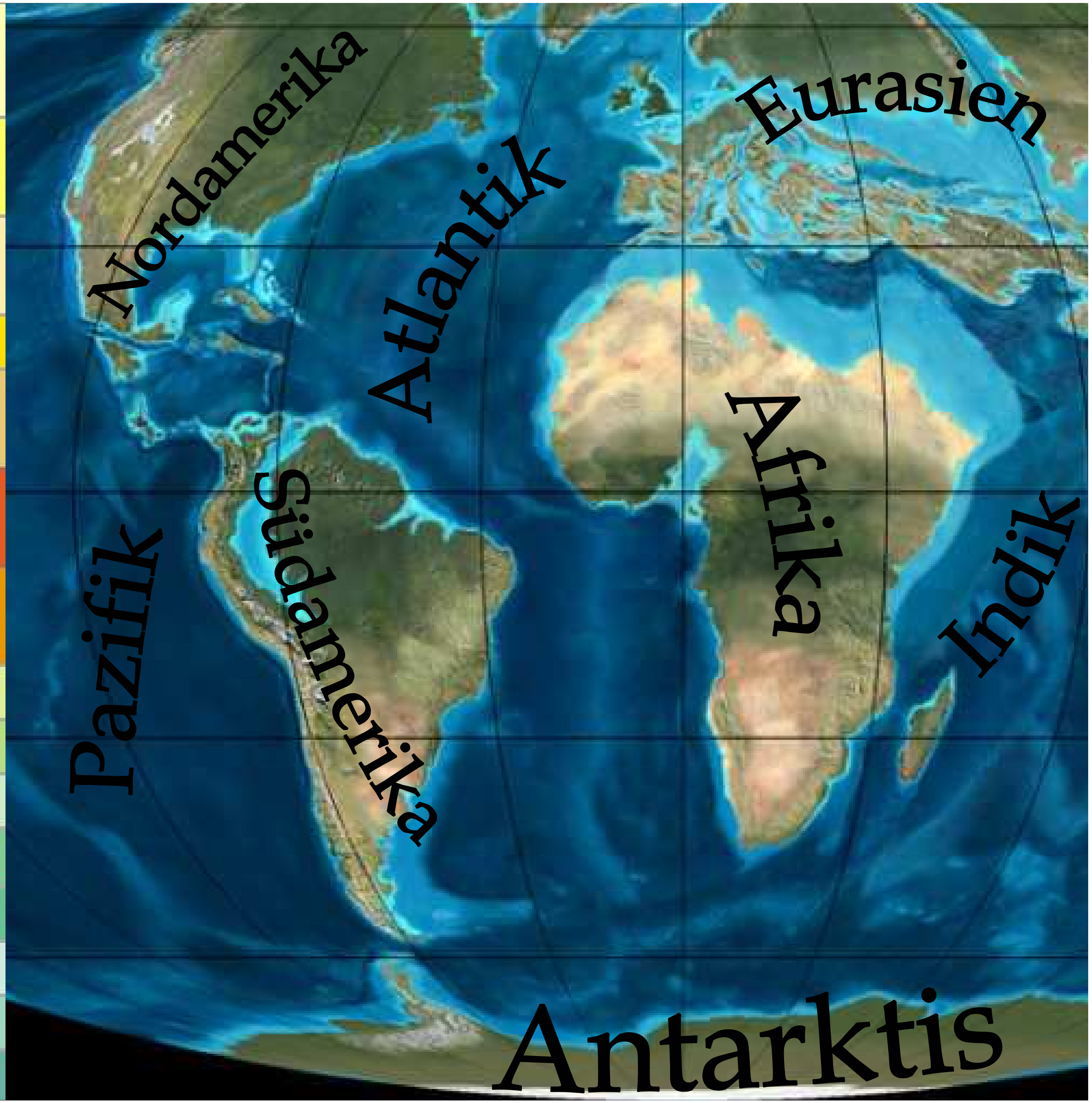

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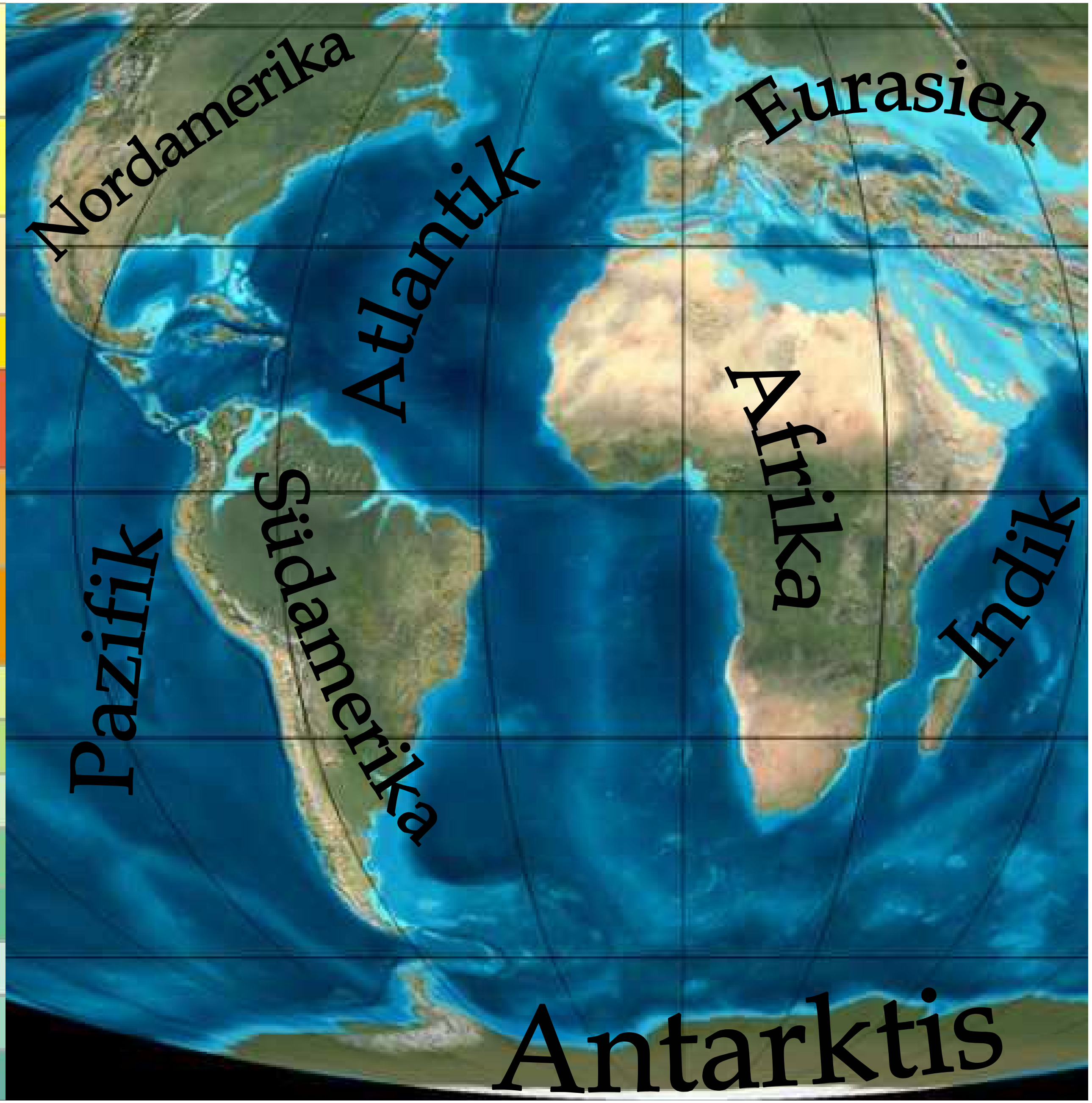

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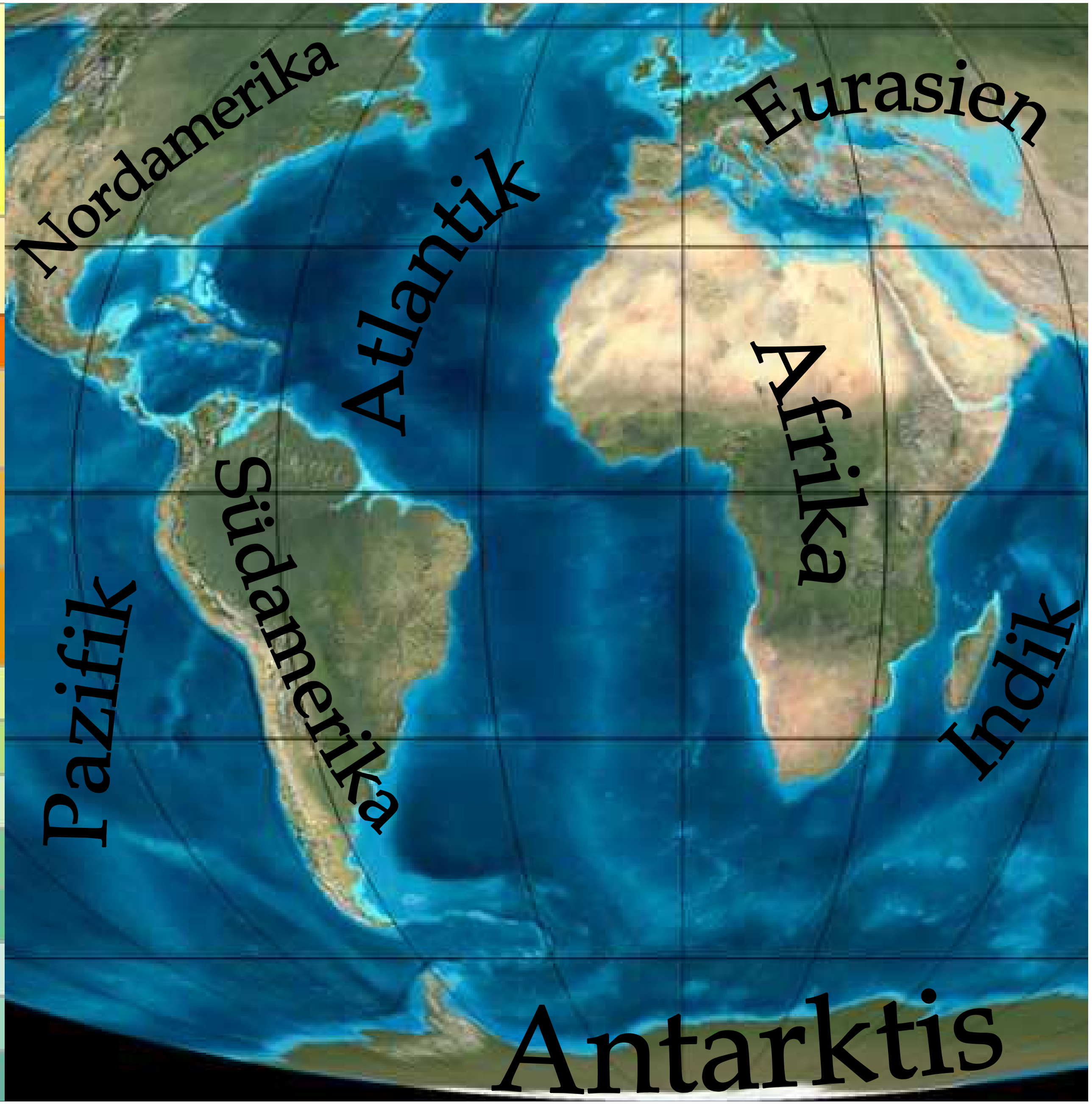

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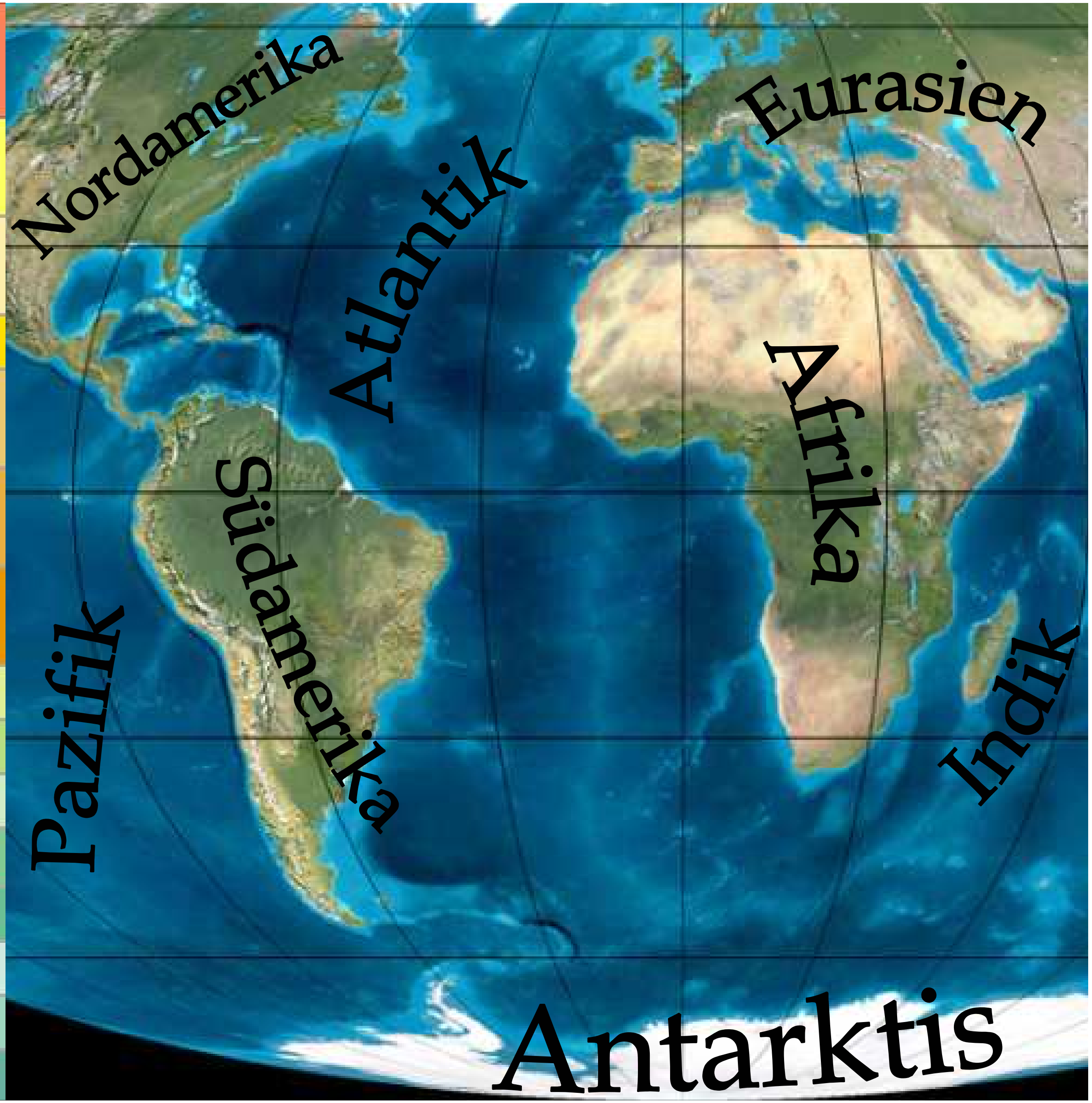
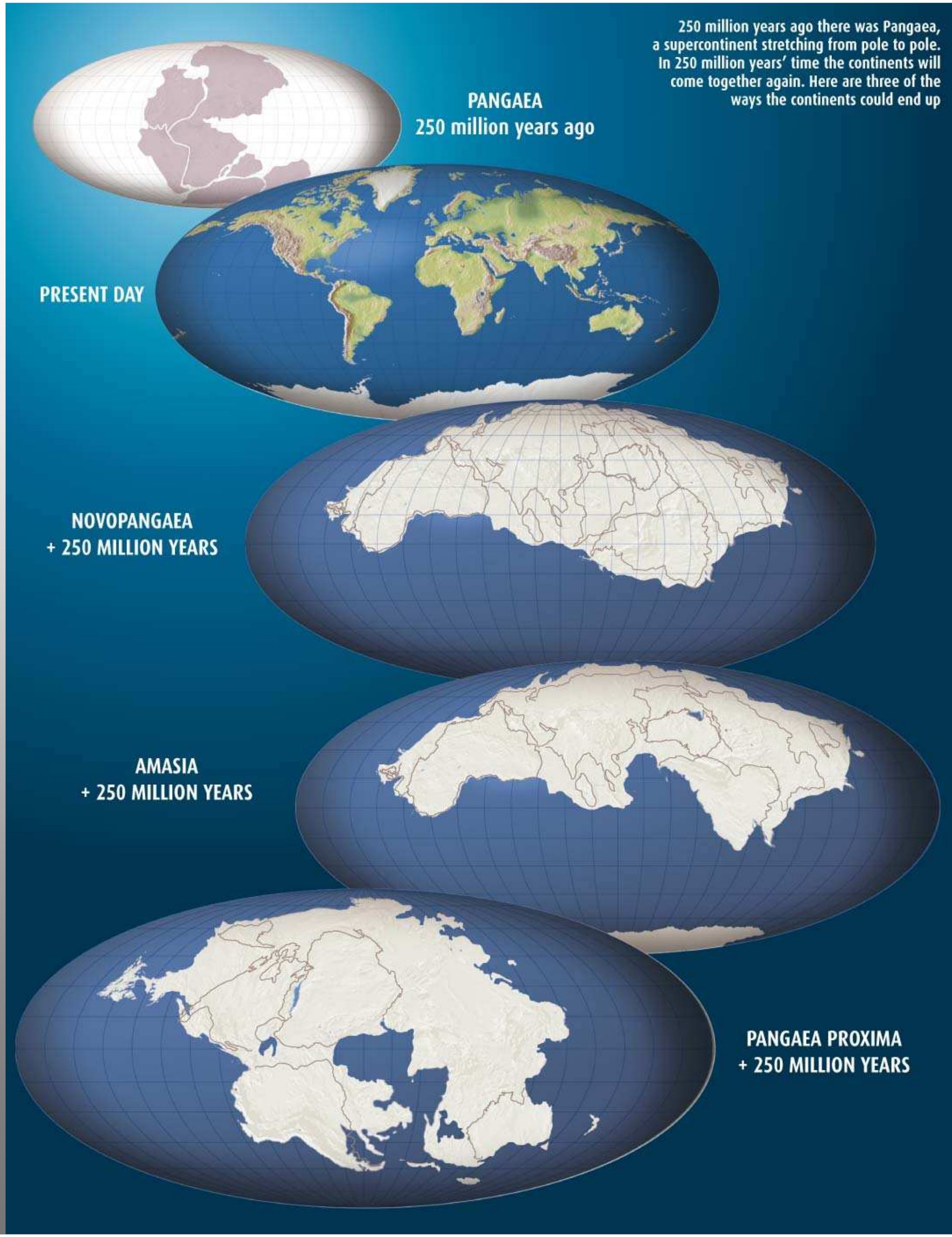


ENDE?



NICHT WIRKLICH!