Associazioni di strutture tettoniche

Dalla scala dell'affioramento alla scala regionale

Immagini e fotografie tratte da:

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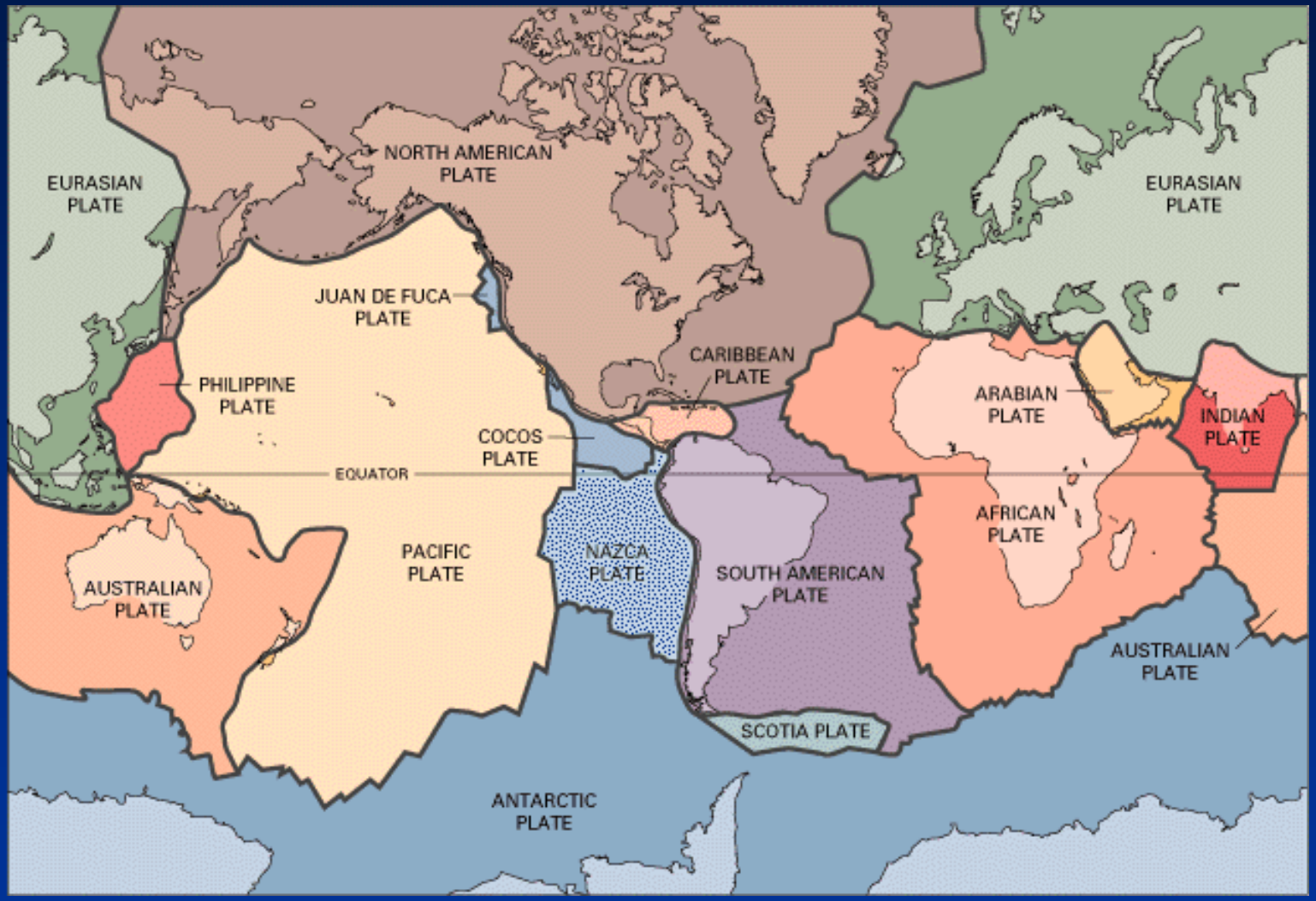
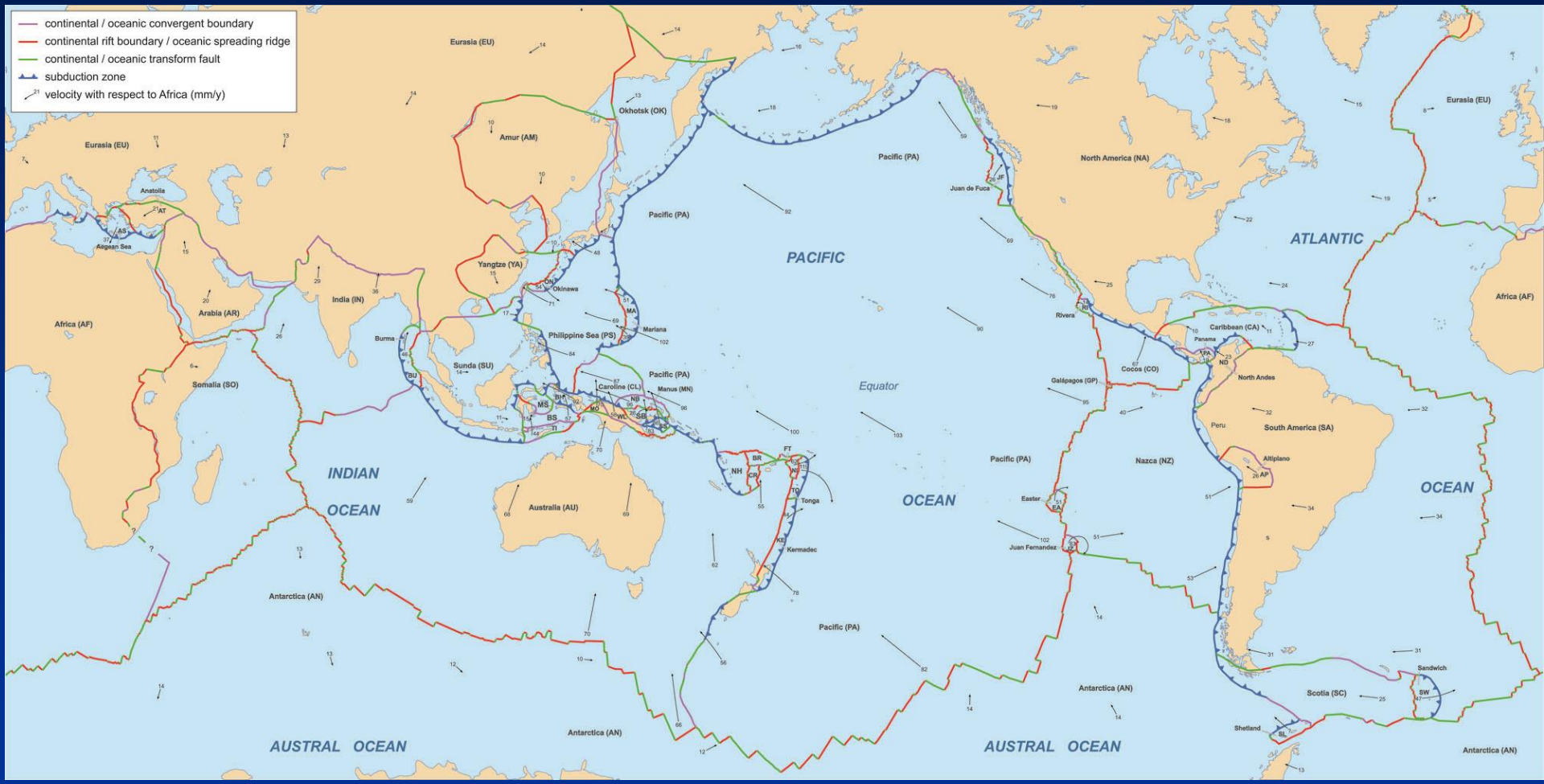
Placche tettoniche (semplificate)



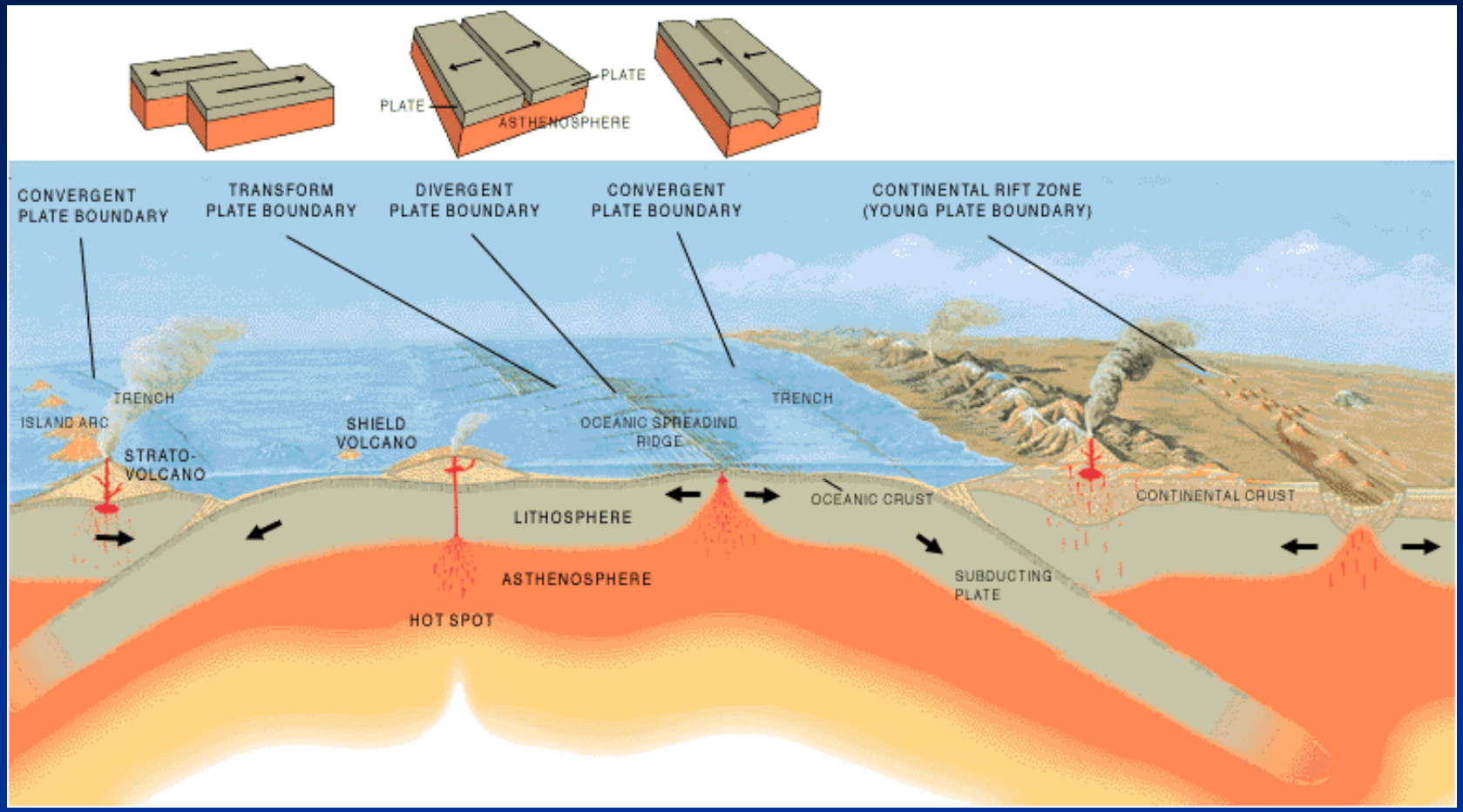
Da "The dinamic Earth" in USGS Web Site

Placche tettoniche e limiti tra placche



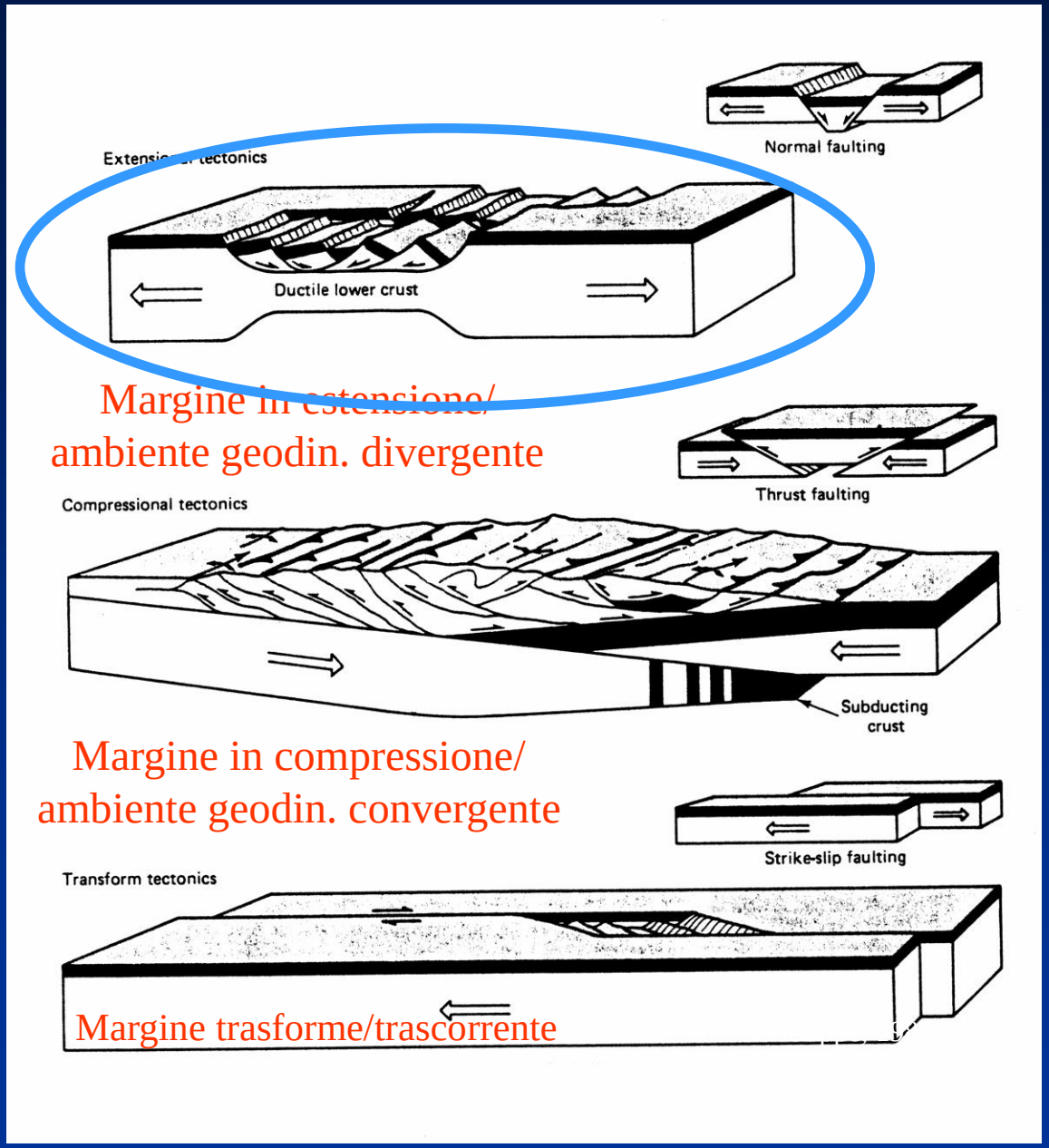
https://commons.wikimedia.org/wiki/File:Tectonic_plates_boundaries_detailed-en.svg

Tipo di margini di placca e ambienti geodinamici



http://factsanddetails.com/world/cat51/sub323/item2212.html

Tipo di margini di placca e ambienti geodinamici



Da Suppe, 1985

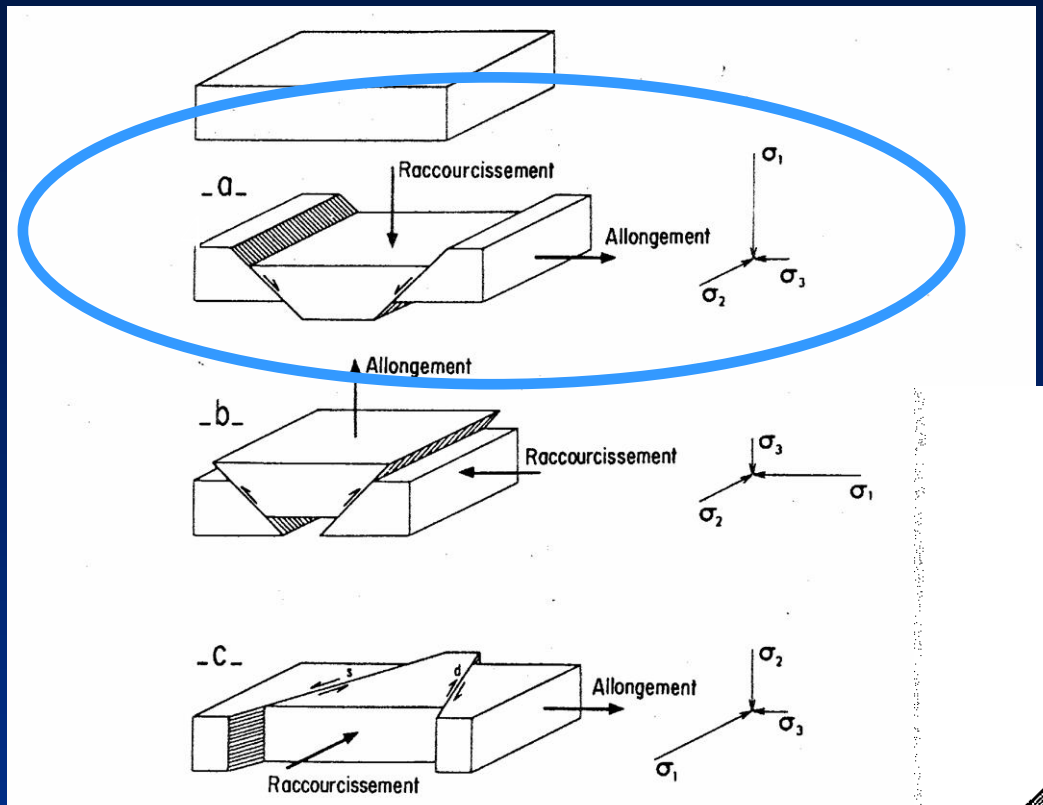
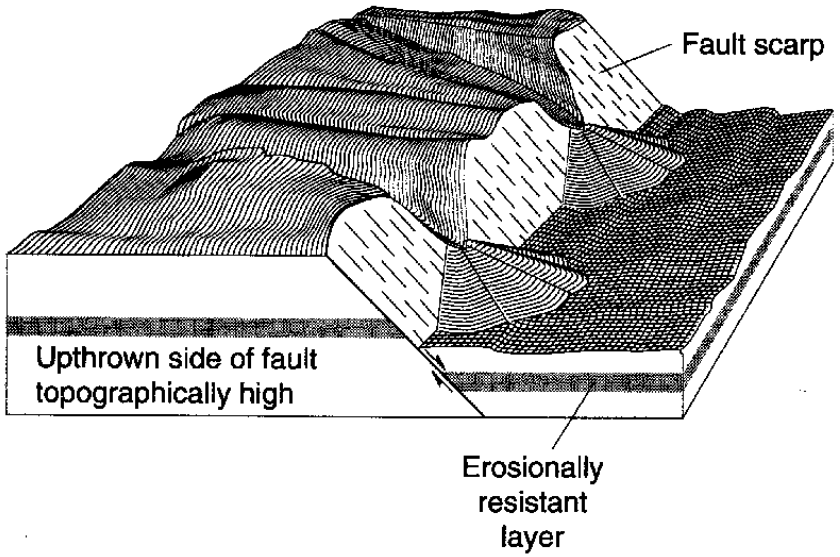


Fig. 5.12 - Systèmes de failles conjuguées. a- Failles normales conjuguées, gr
Failles inverses conjuguées, horst. c- Décrochements dextre et senestre conjugu
çon.(Blès et Feuga, 1981. BRGM éd., Orléans).

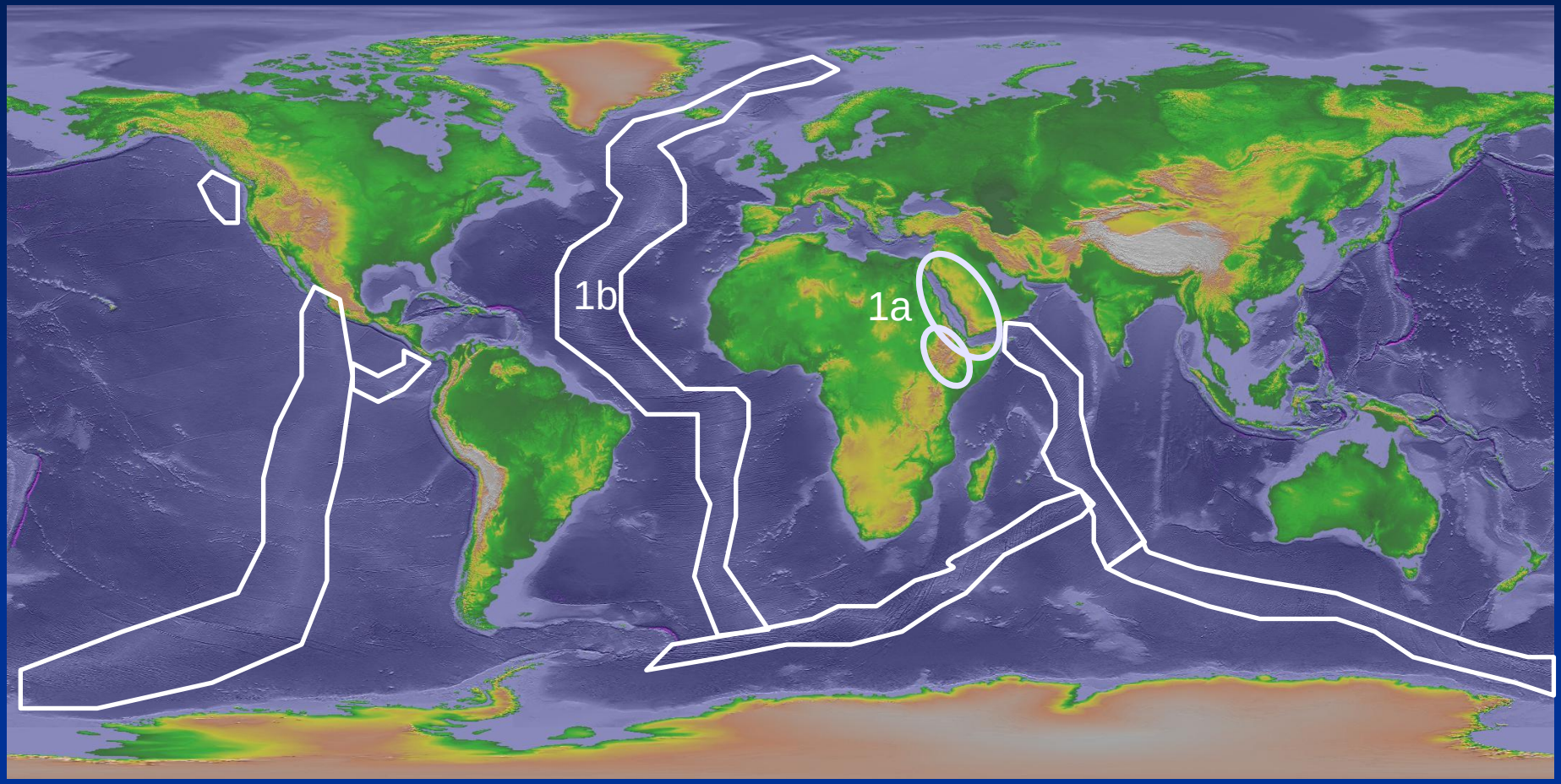
Da Nicolas, 1984



Da Hatcher, 1995

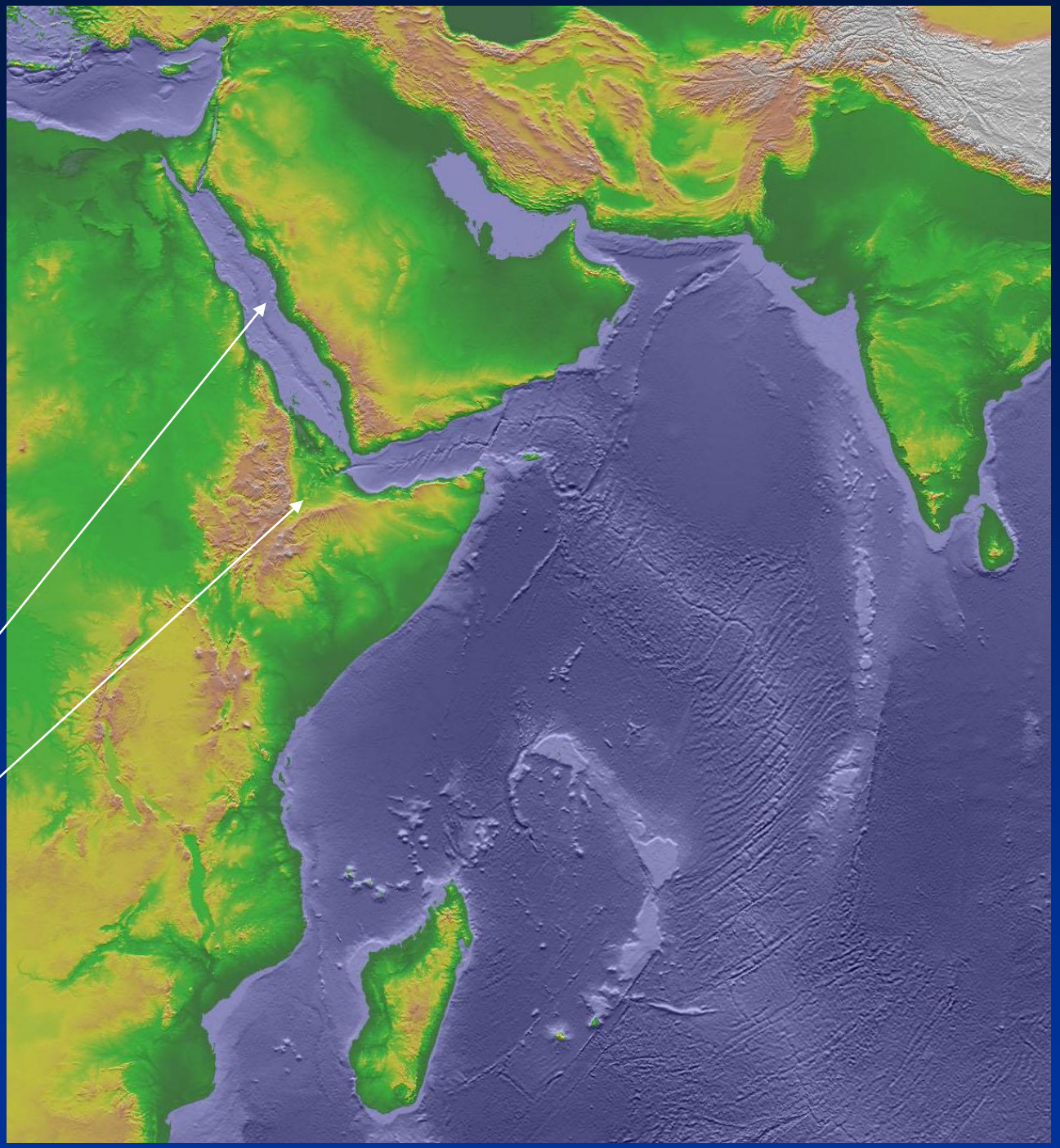
Associazioni di faglie normali

1) associazioni estensionali in ambienti geodinamici divergenti



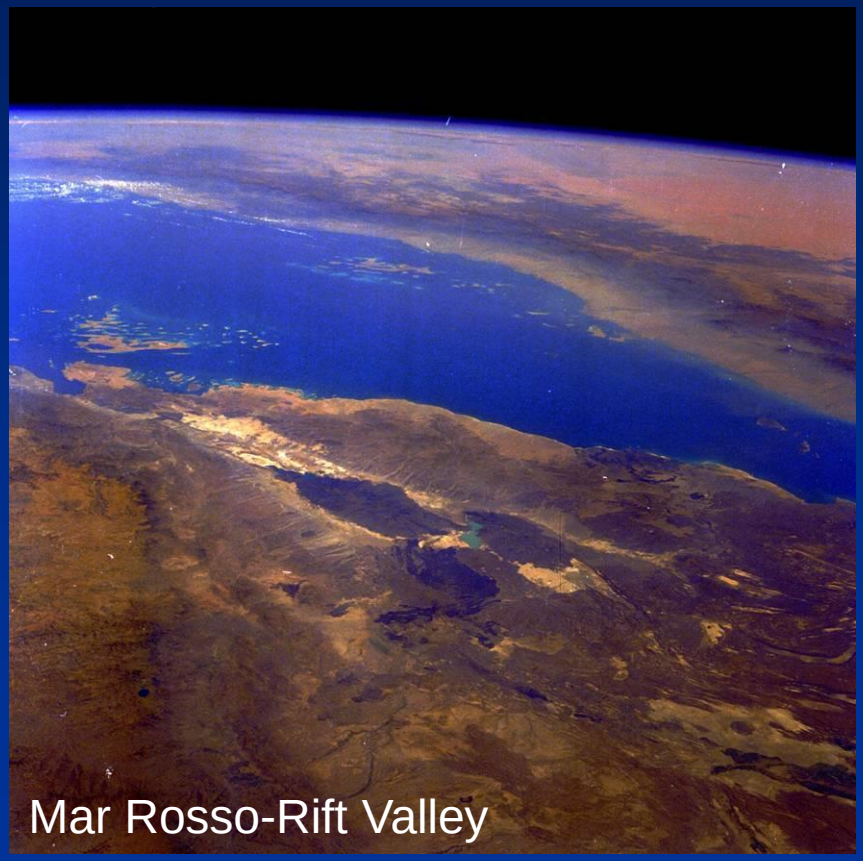
Shaded reliefs e batimetria da NOAA National Centers for Environmental Information (NCEI)

1a) estensione e assottigliamento di crosta continentale che porta a crosta oceanica (*from rift to drift*)

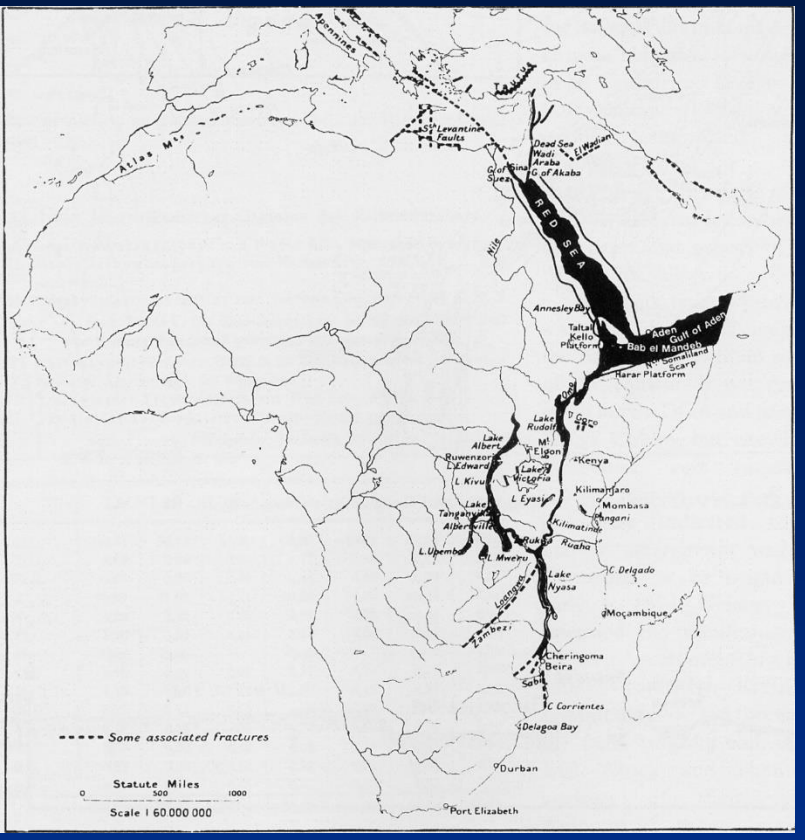


Associazioni estensionali, ambienti geodinamici divergenti

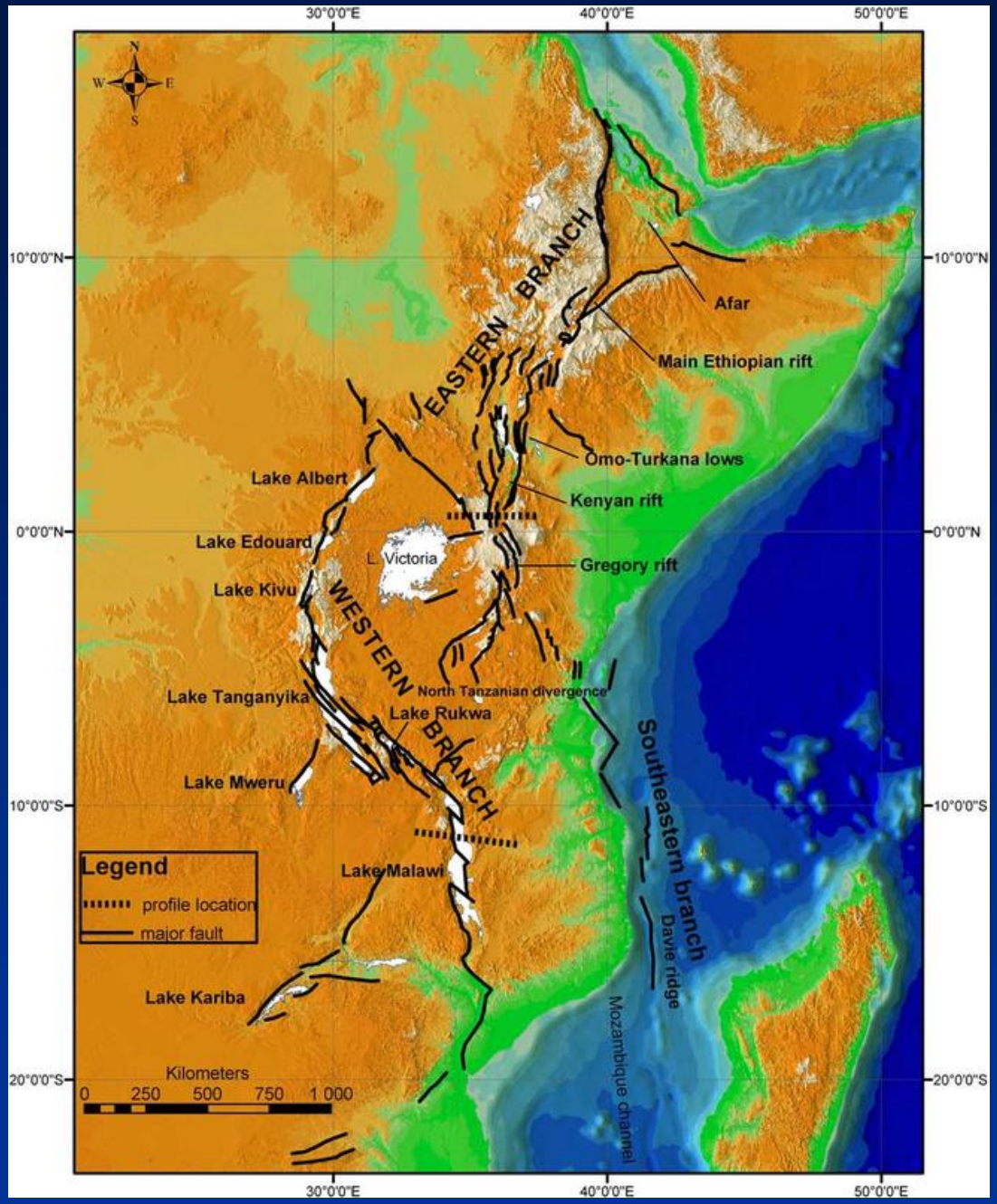
1a) estensione e assottigliamento crosta continentale che porta a crosta oceanica (*from rift to drift*)



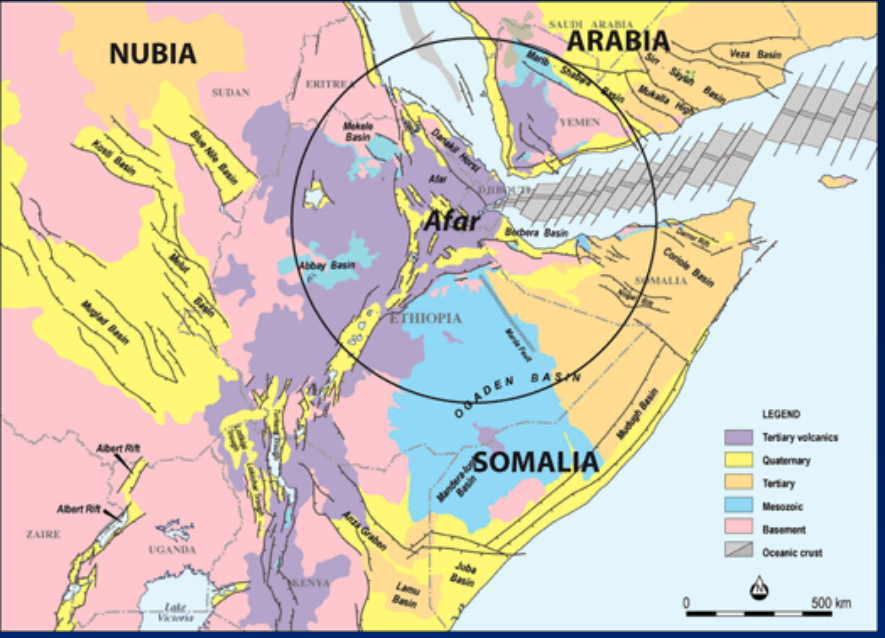
Da Earth from Space, NASA (eol.jsc.nasa.gov)



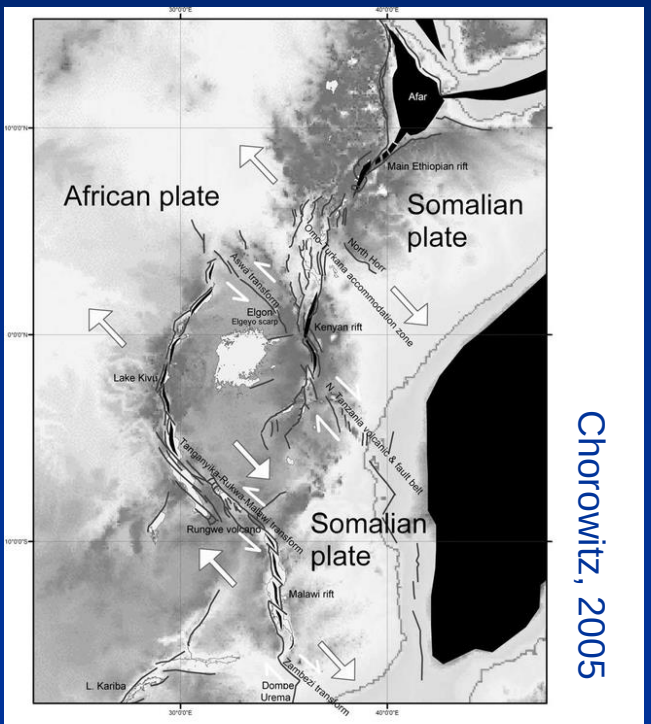
J. Gregory's 1920 map of the East African rift v.



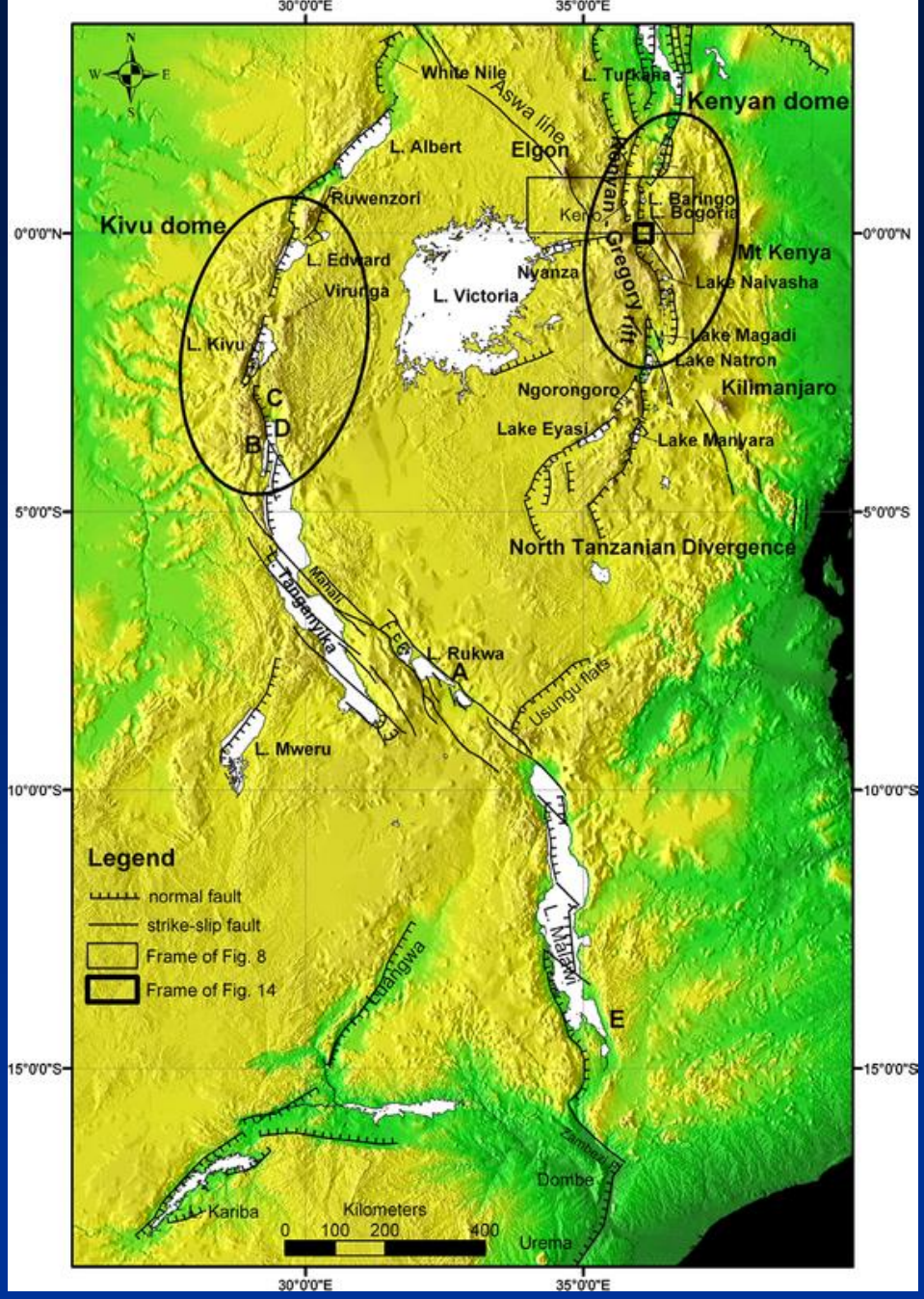
Chorowitz, 2005



Mège et al., 2015



Chorowitz, 2005



Chorowitz, 2005

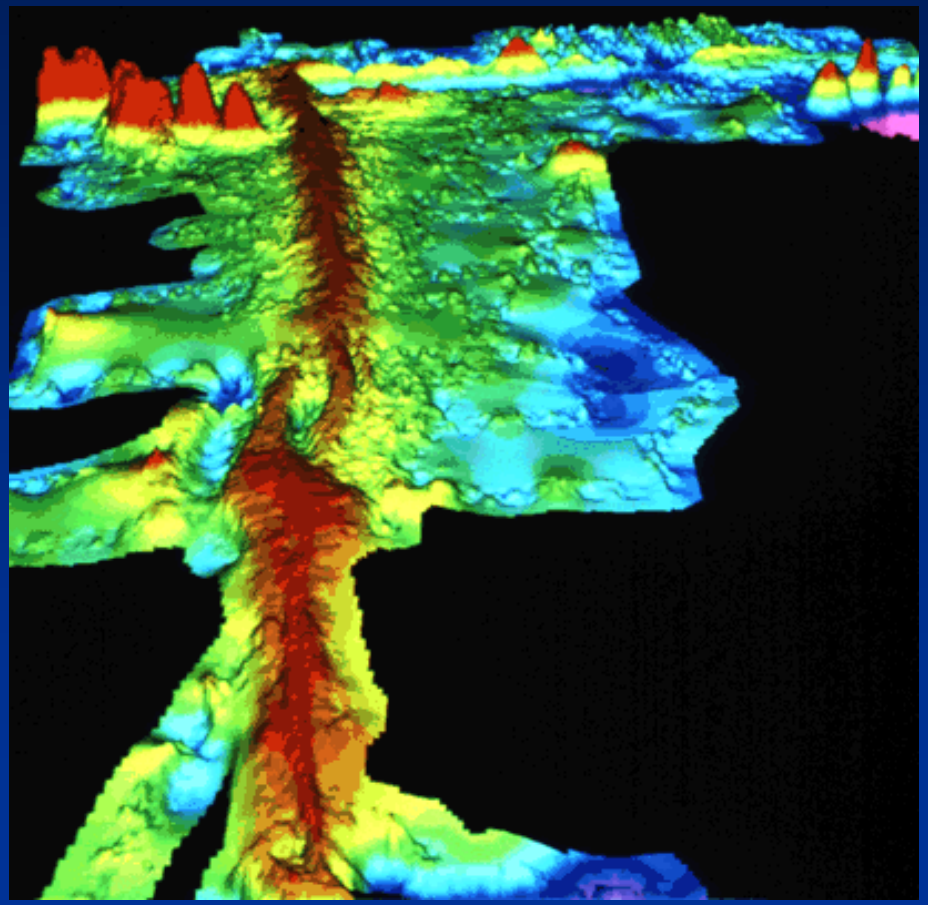
associazioni estensionali, ambienti geodinamici divergenti

1b) formazione di crosta oceanica, dorsali !!

Islanda, zona di dorsale Thingvellir national park

Da Oddur Sigurdsson, National Energy Authority, Iceland

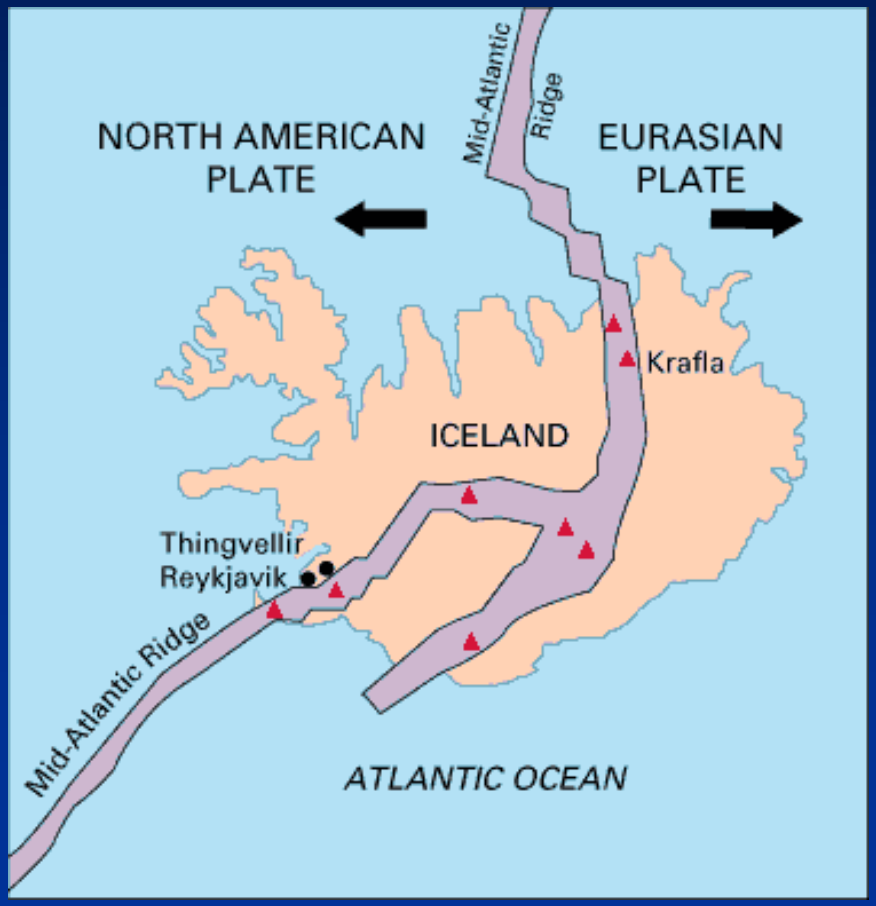
Zona di dorsale medio-oceanica pacifica

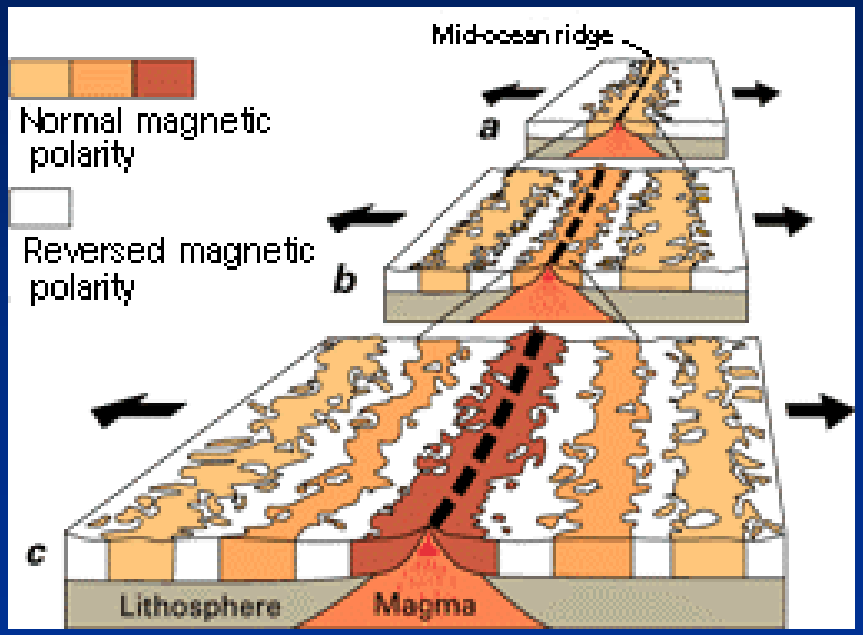


https://pubs.usgs.gov/gip/dynamic/topomap.html (from Stacey Tighe, University of Rhode Island)

associazioni estensionali, ambienti geodinamici divergenti

Formazione di crosta oceanica, dorsali !!



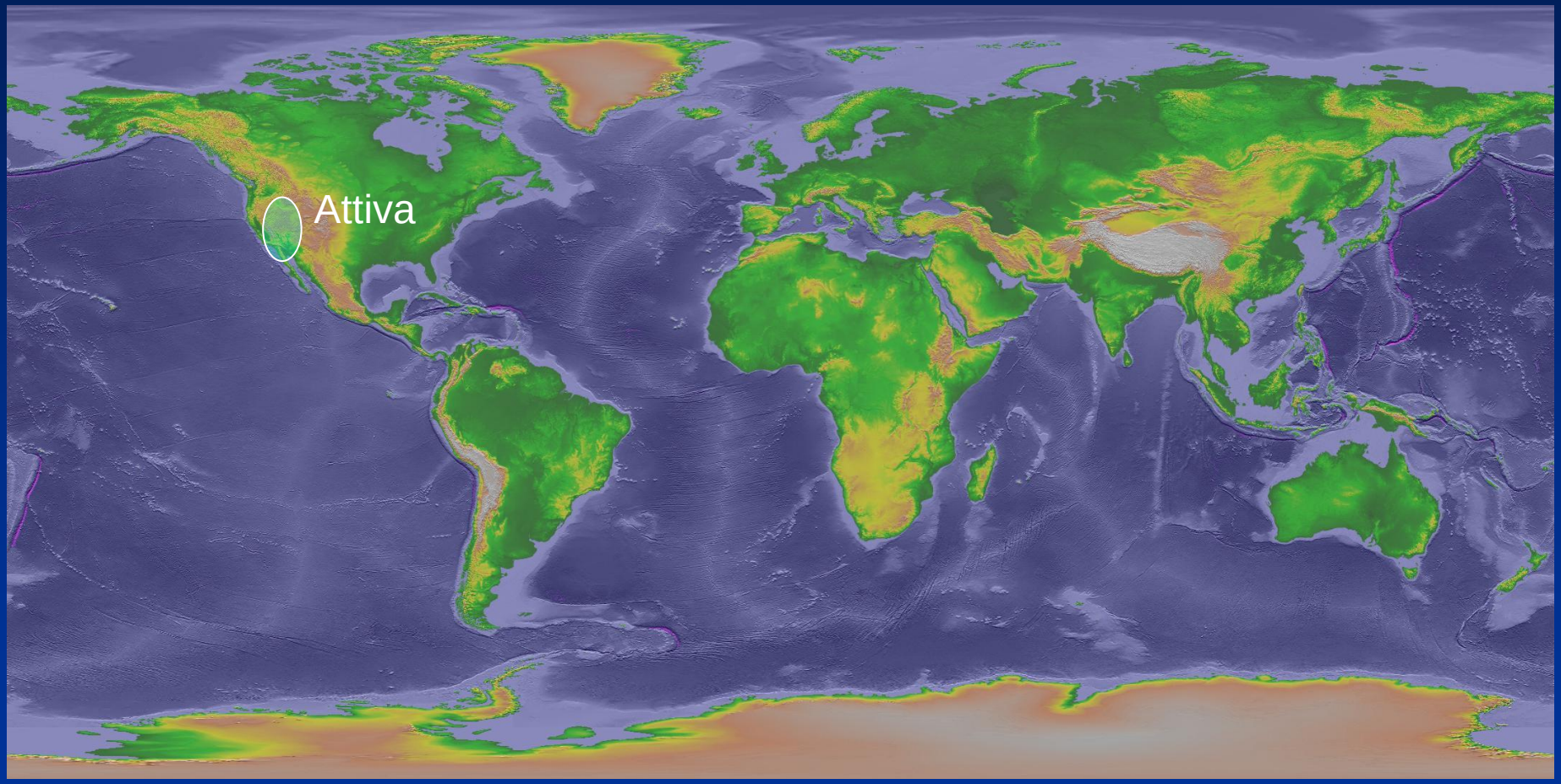


http://factsanddetails.com/world/cat51/sub323/item2212.html

USGS: https://pubs.usgs.gov/gip/dynamic/understanding.html

Associazioni di faglie normali

2a) associazioni estensionali in ambienti geodinamici divergenti prossimi a margini trascorrenti/convergenti

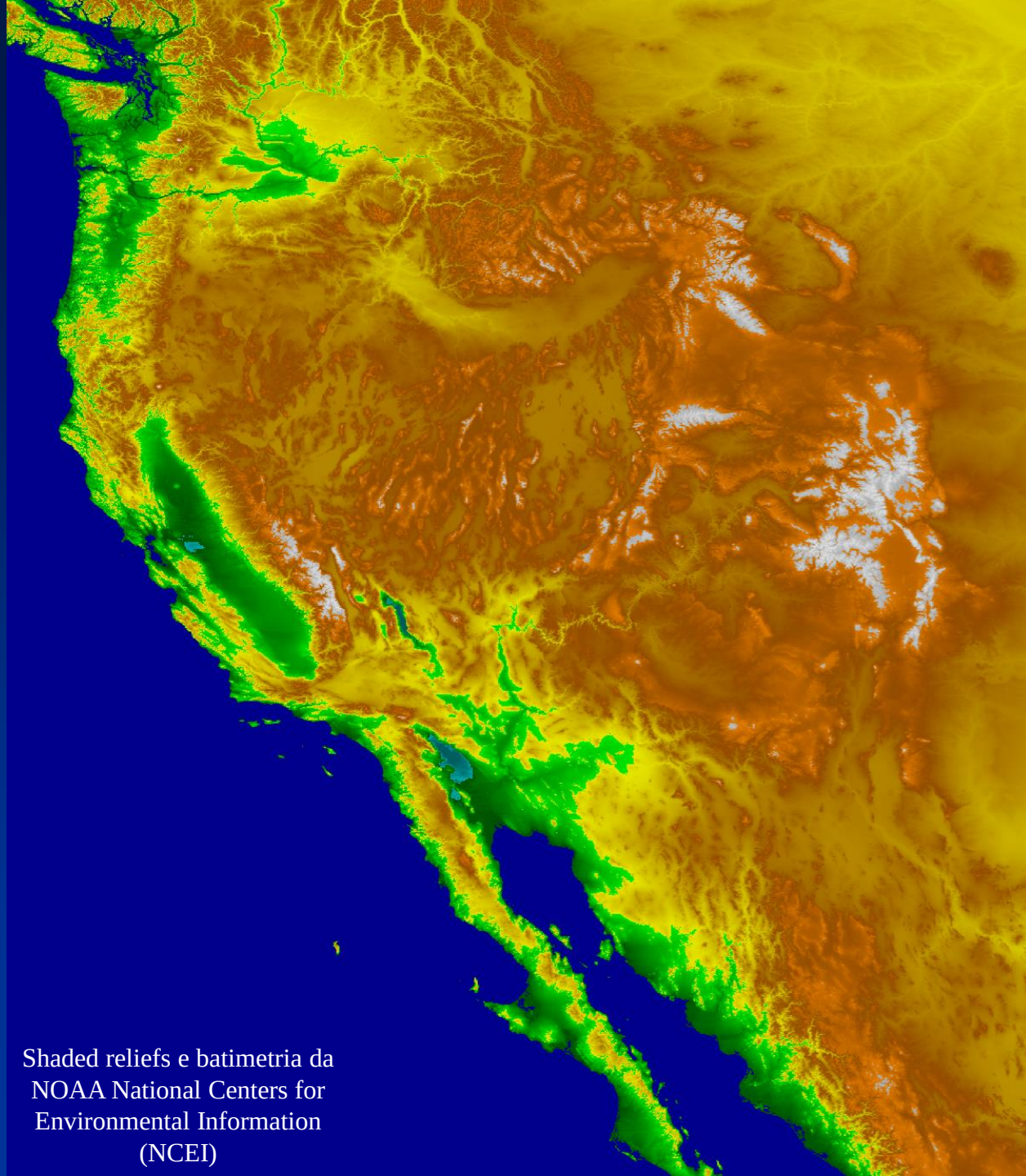


Shaded reliefs e batimetria da NOAA National Centers for Environmental Information (NCEI)

Associazioni estensionali in ambienti geodinamici divergenti prossimi a margini trascorrenti/

convergenti

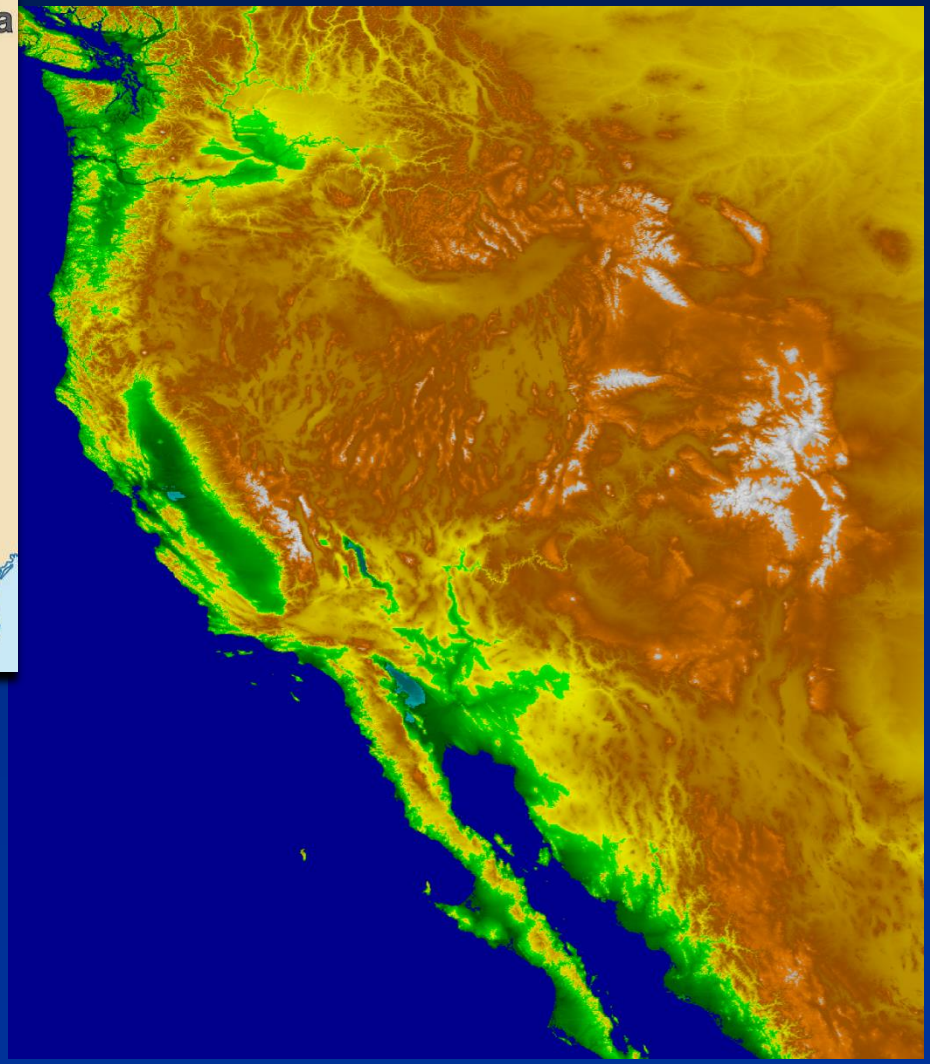
Basin & Range, estensione intra-continentale



Shaded reliefs e batimetria da NOAA National Centers for Environmental Information (NCEI)

https://commons.wikimedia.org/wiki/File:Tectonic_plates_boundaries_detailed-en.svg

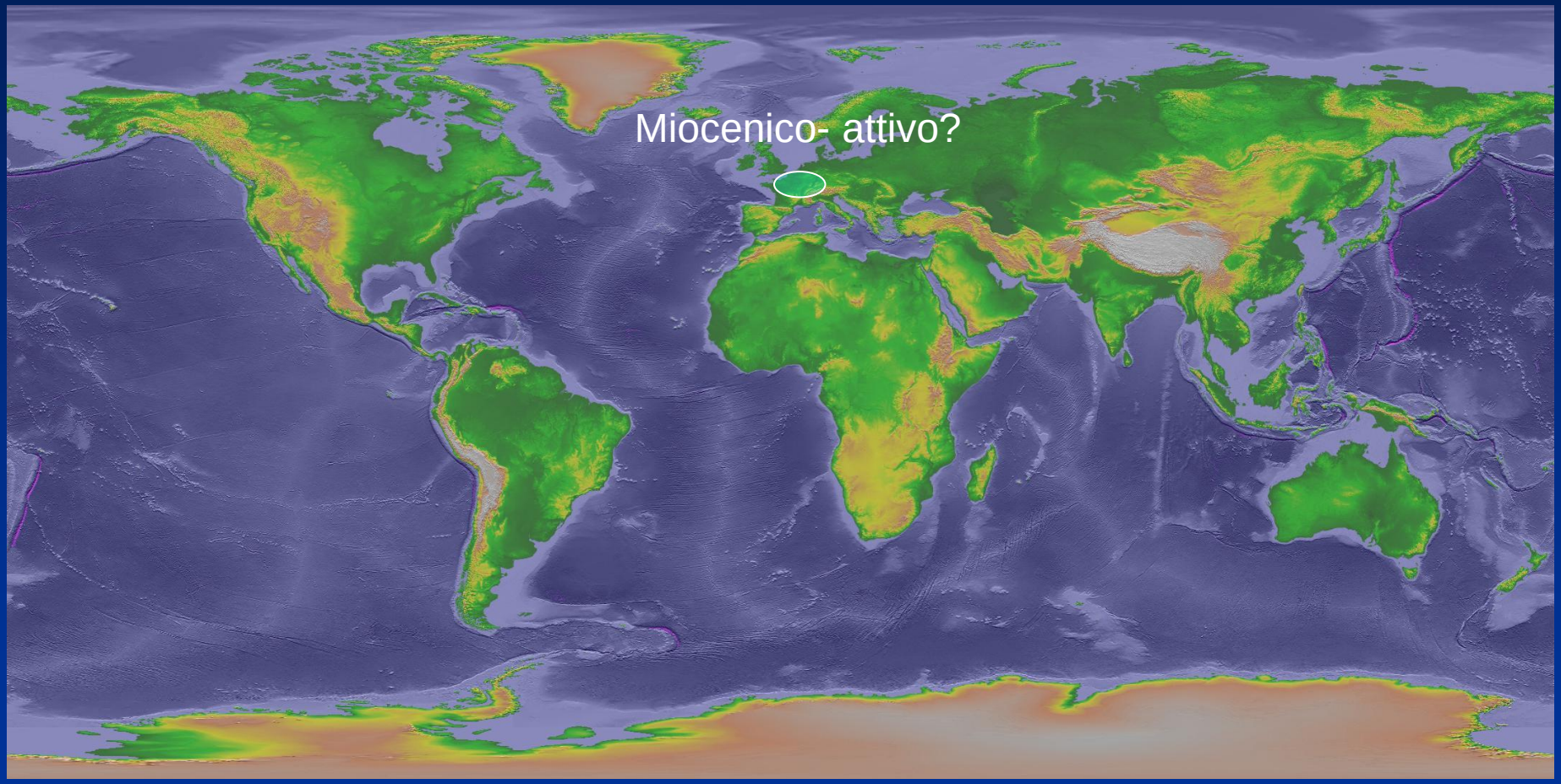
Shaded reliefs e batimetria da NOAA National Centers for Environmental Information (NCEI)



Basin & Range, estensione intra-continentale, situazione tettonica e geodinamica regionale

Associazioni di faglie normali

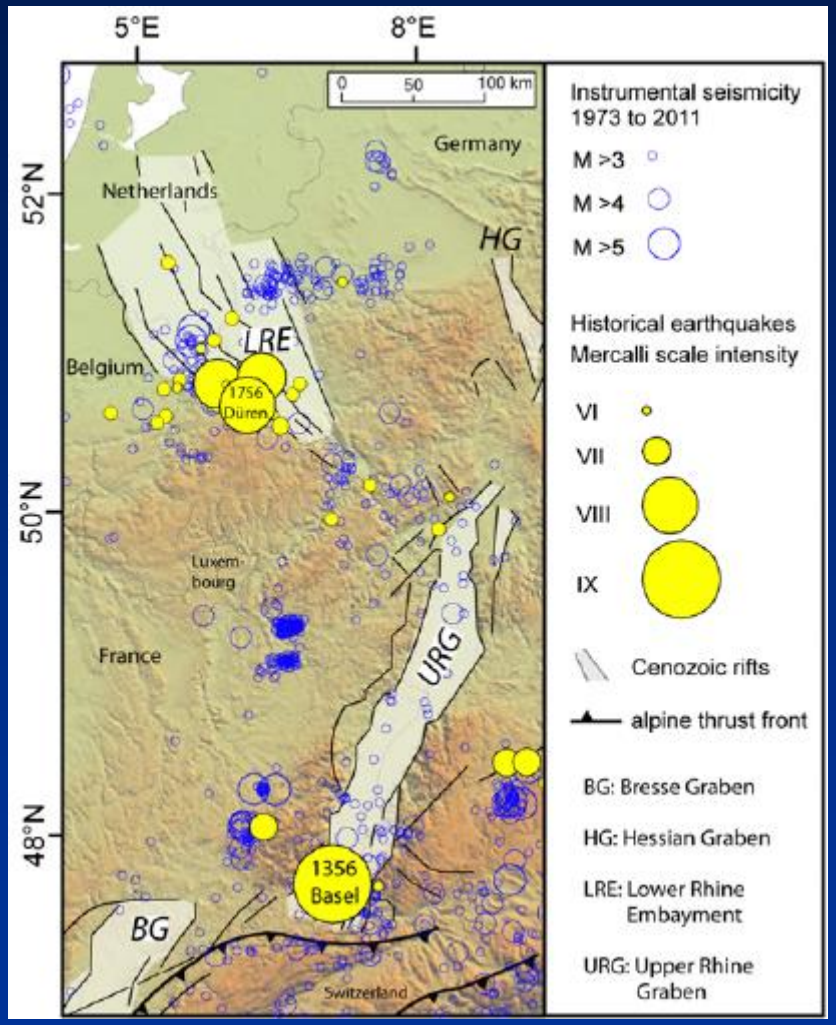
2b) associazioni estensionali in ambienti geodinamici divergenti prossimi a margini convergenti



Shaded reliefs e batimetria da NOAA National Centers for Environmental Information (NCEI)

Associazioni estensionali in ambienti geodinamici divergenti prossimi a margini convergenti

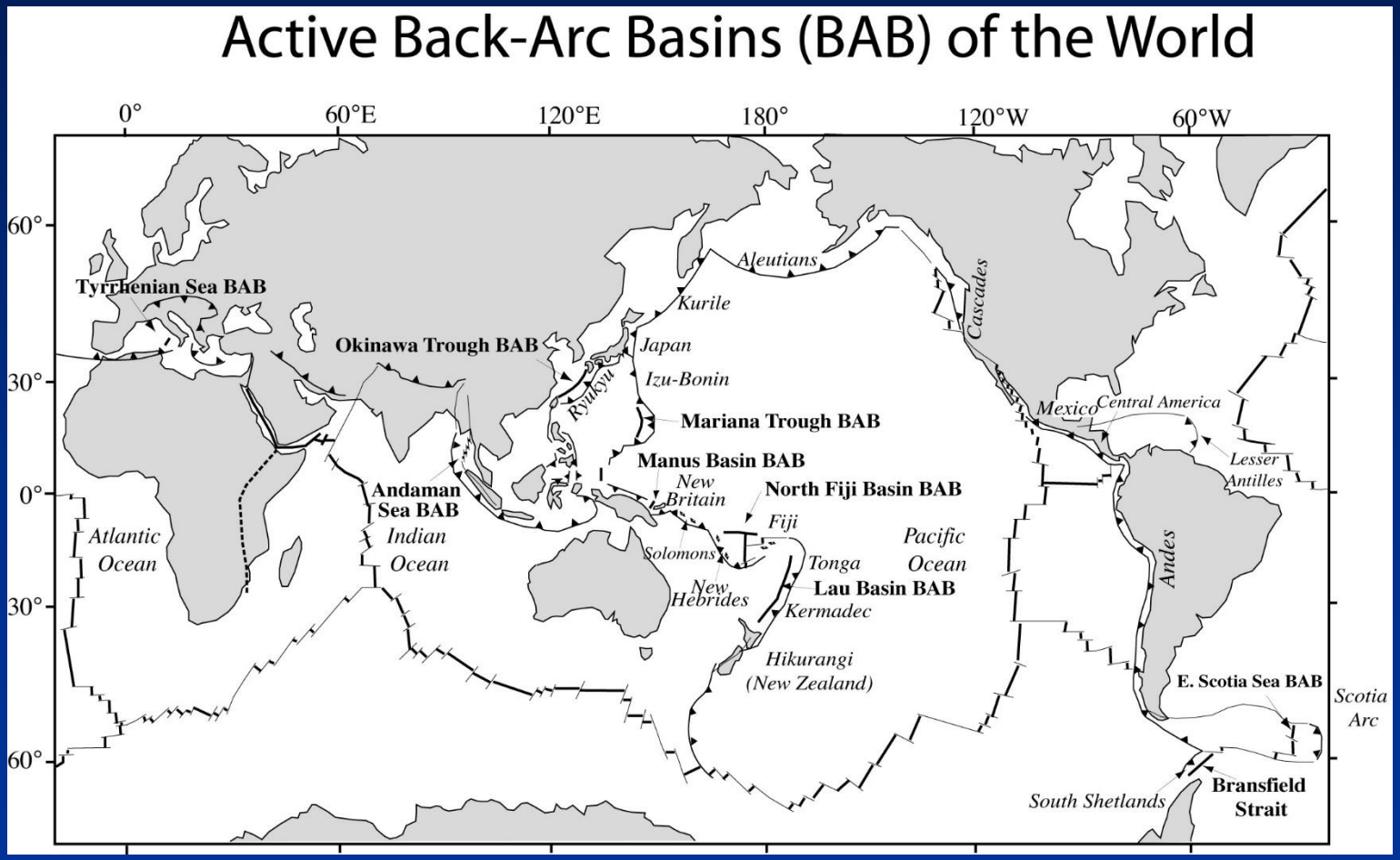
https://en.wikipedia.org/wiki/European_Cenozoic_Rift_System



Da Kuebler, 2012

Associazioni di faglie normali

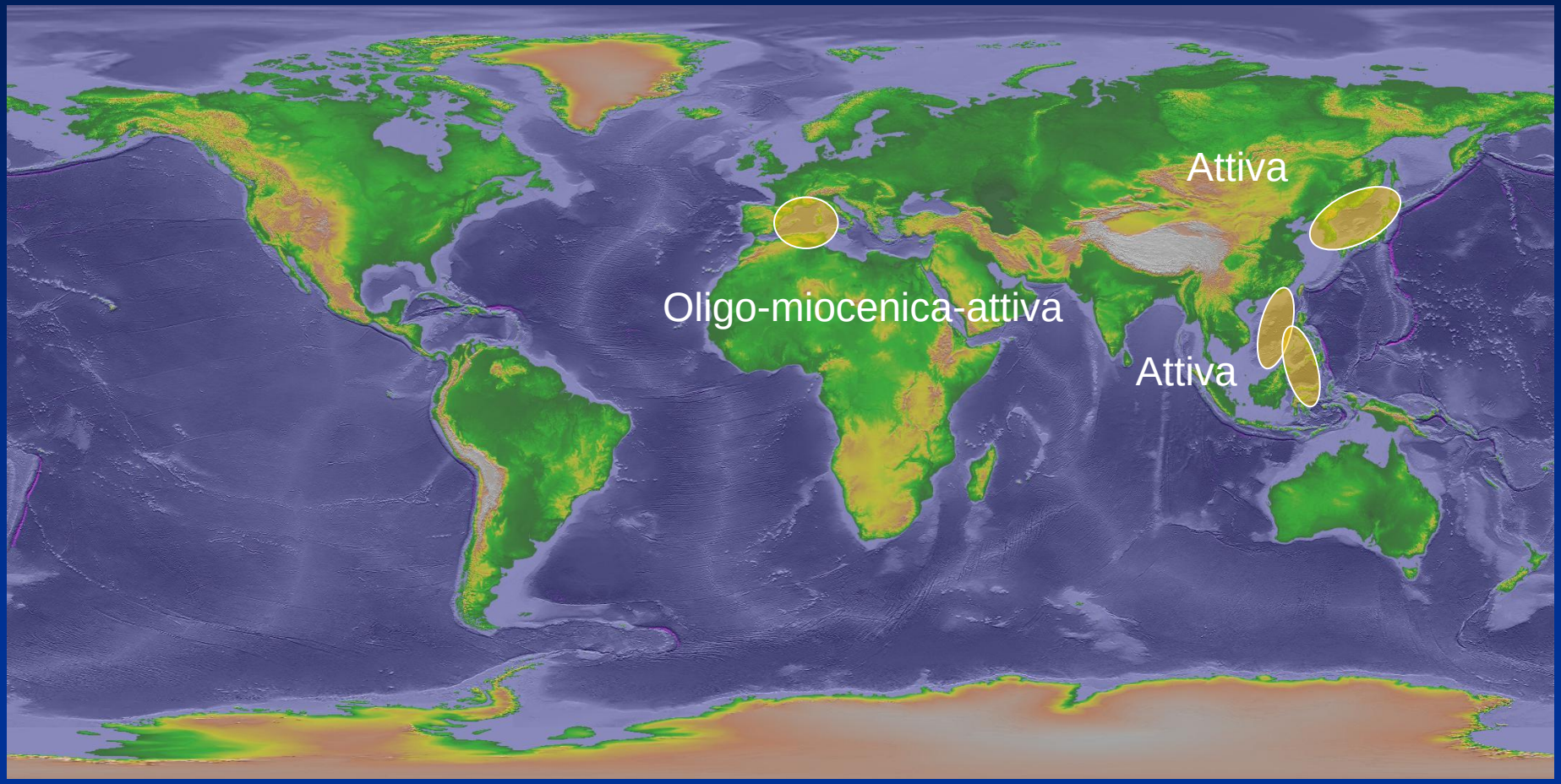
3) associazioni estensionali dovute ad ambienti geodinamici convergenti!!!



Da Wikipedia e da Guinot & Segonzac, 2017

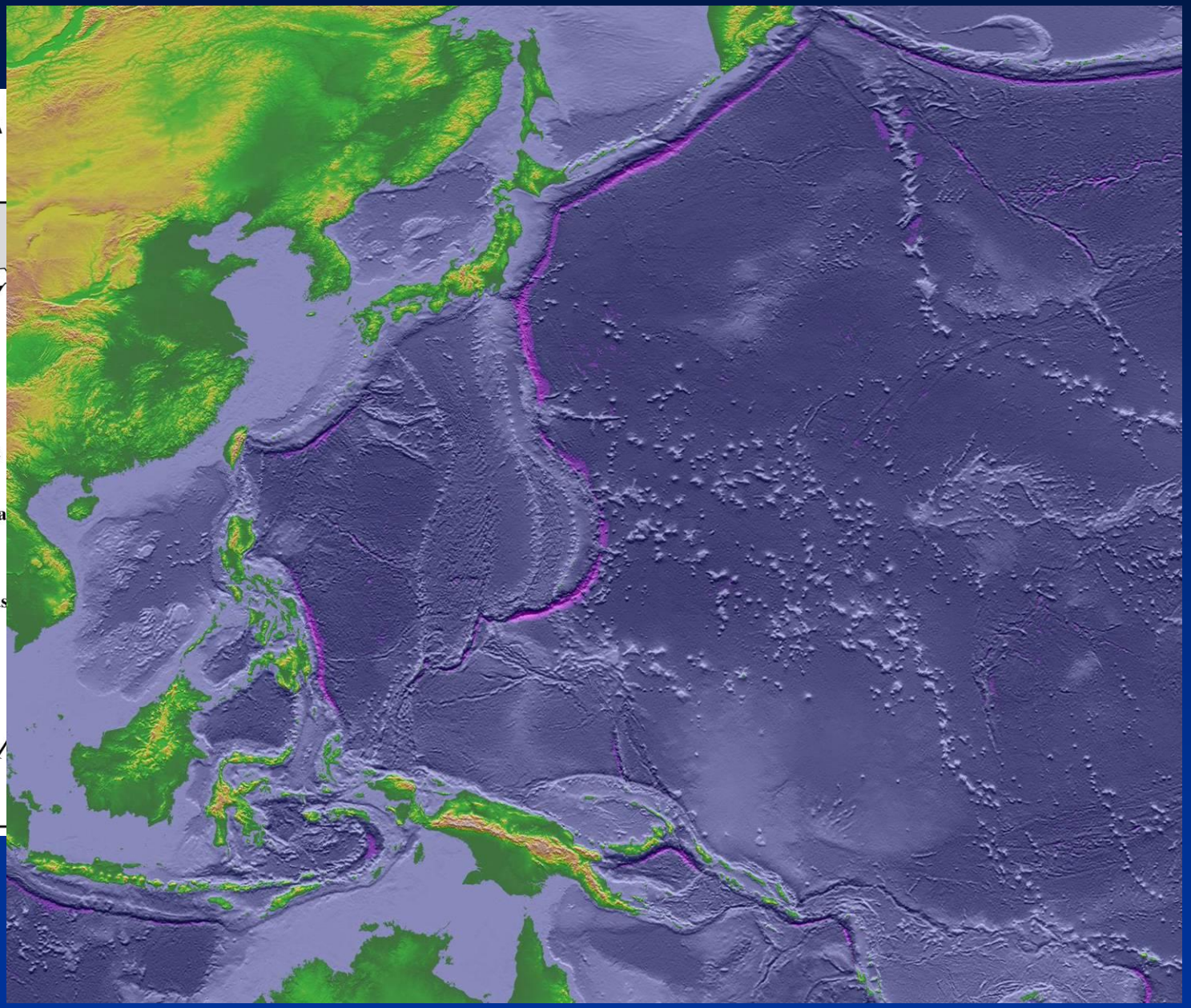
3) associazioni estensionali dovute ad ambienti geodinamici convergenti:

Estesi bacini di retroarco



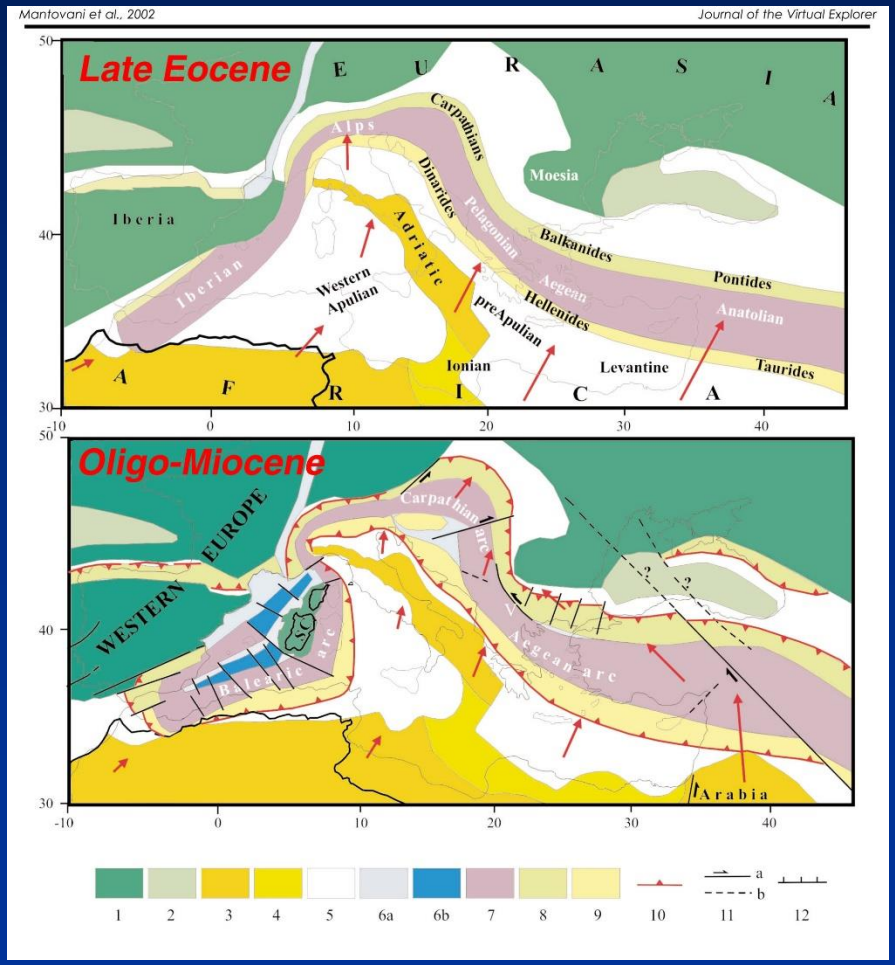
Shaded reliefs e batimetria da NOAA National Centers for Environmental Information (NCEI)

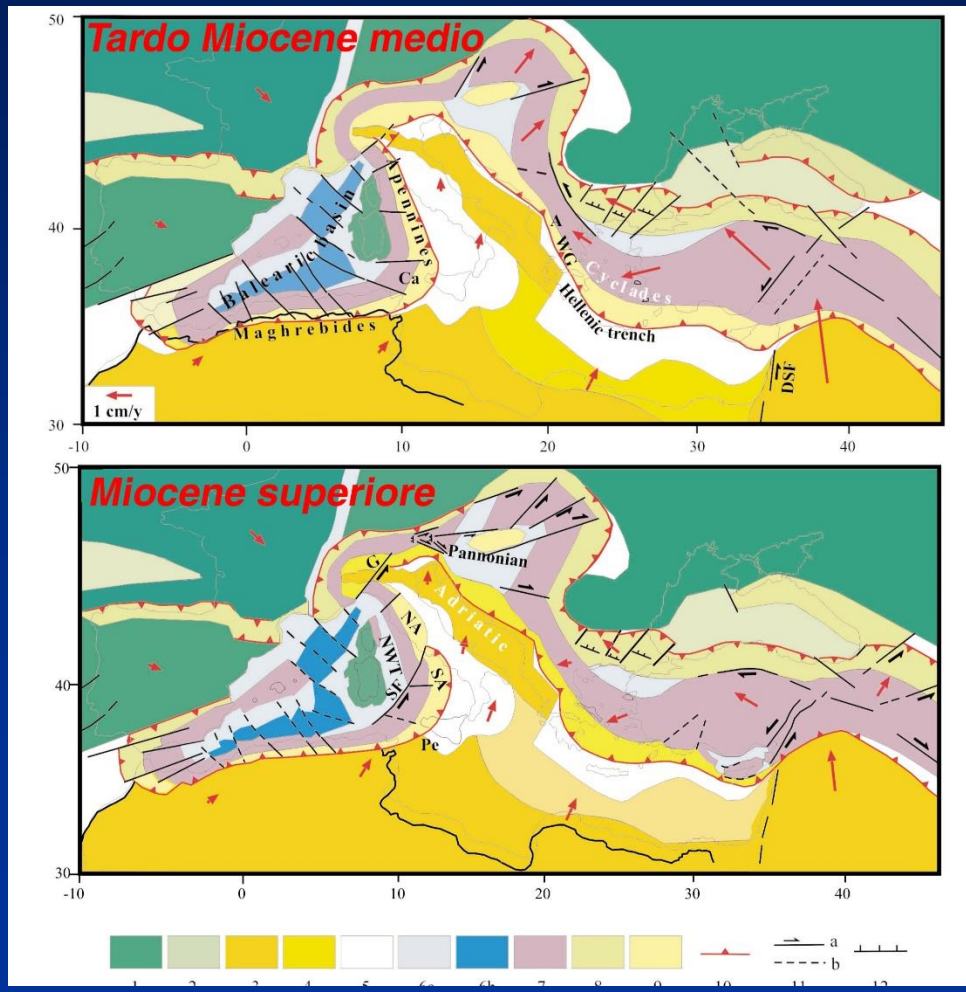

k-Arc Basins (BA
120°E
180°
Aleutians
Kurile
BAB
Japan
Izu-Bonin
Ryukyu
Mariana Trough BAB
Manus Basin BAB
New Britain
North Fiji Ba
Fiji
Solomons
Tonga
New Hebrides
Lau Bas
Kermadec
Hikurangi
(New Zealand)



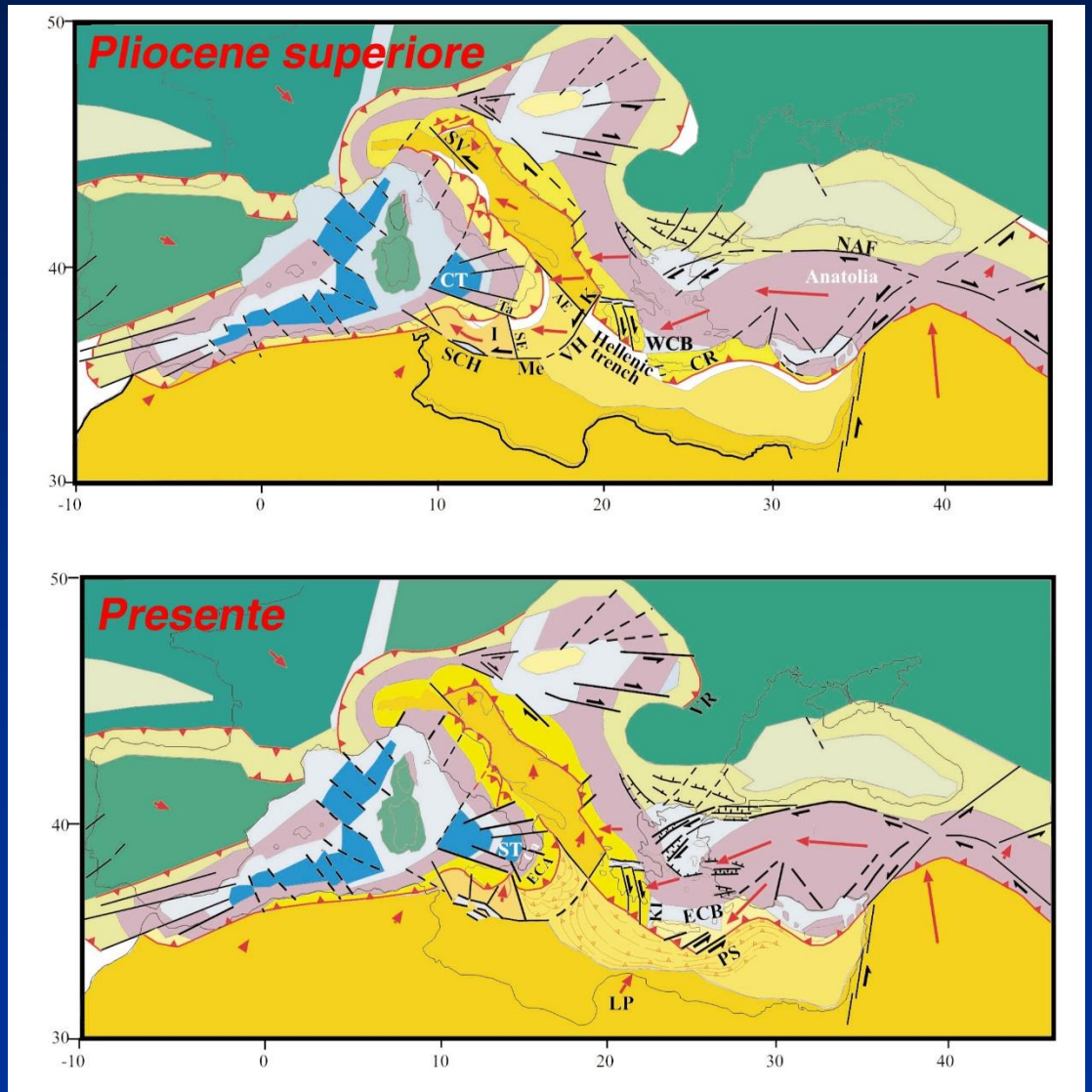
associazioni estensionali dovute ad ambienti geodinamici convergenti: evoluzione oligo-miocenica sino all'Attuale dell'Appennino

Da Mantovani et al., 2002

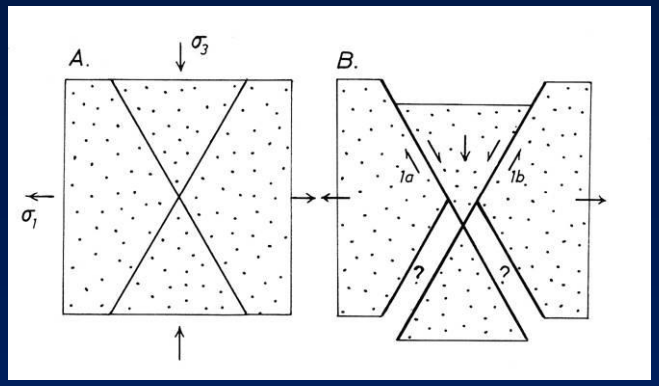




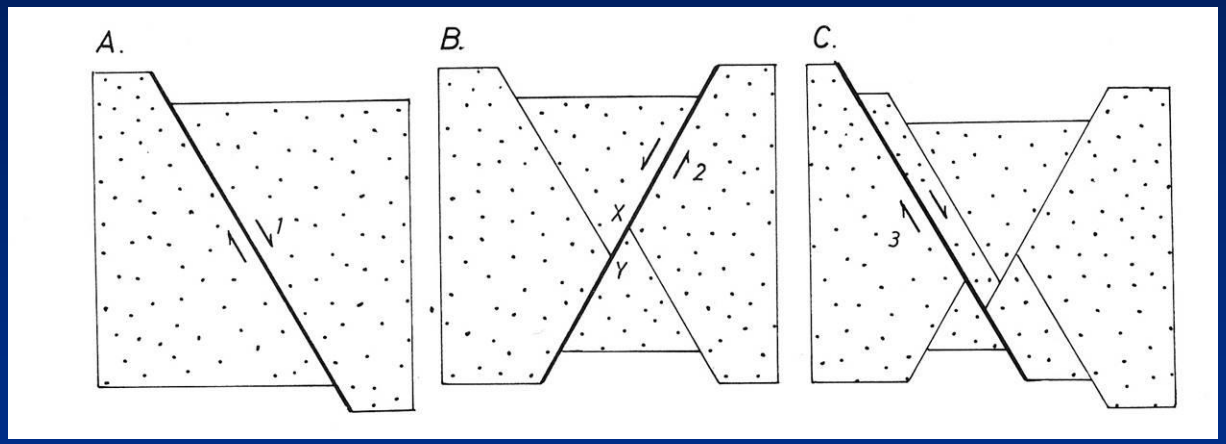
associazioni estensionali dovute ad ambienti geodinamici convergenti: evoluzione oligo-miocenica sino all'Attuale dell'Appennino



Da Mantovani et al., 2002

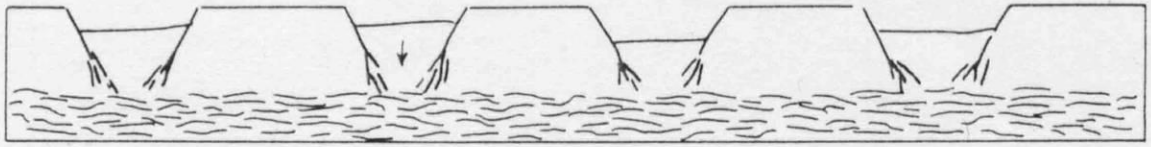


Da Ramsay and Huber, 1987



Solo le associazioni di faglie (coniugate) lavorano!!

FAGLIE NORMALI DIRITTE

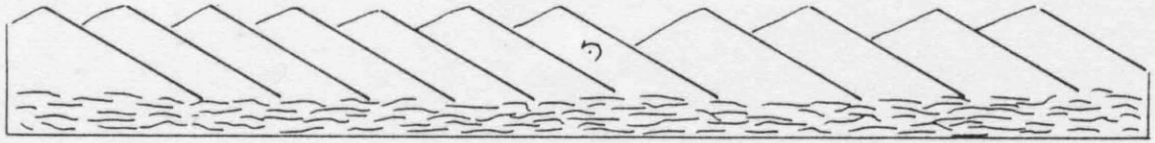


a)

FAGLIE NORMALI LISTRICHE

b)

FAGLIE A "DOMINO"

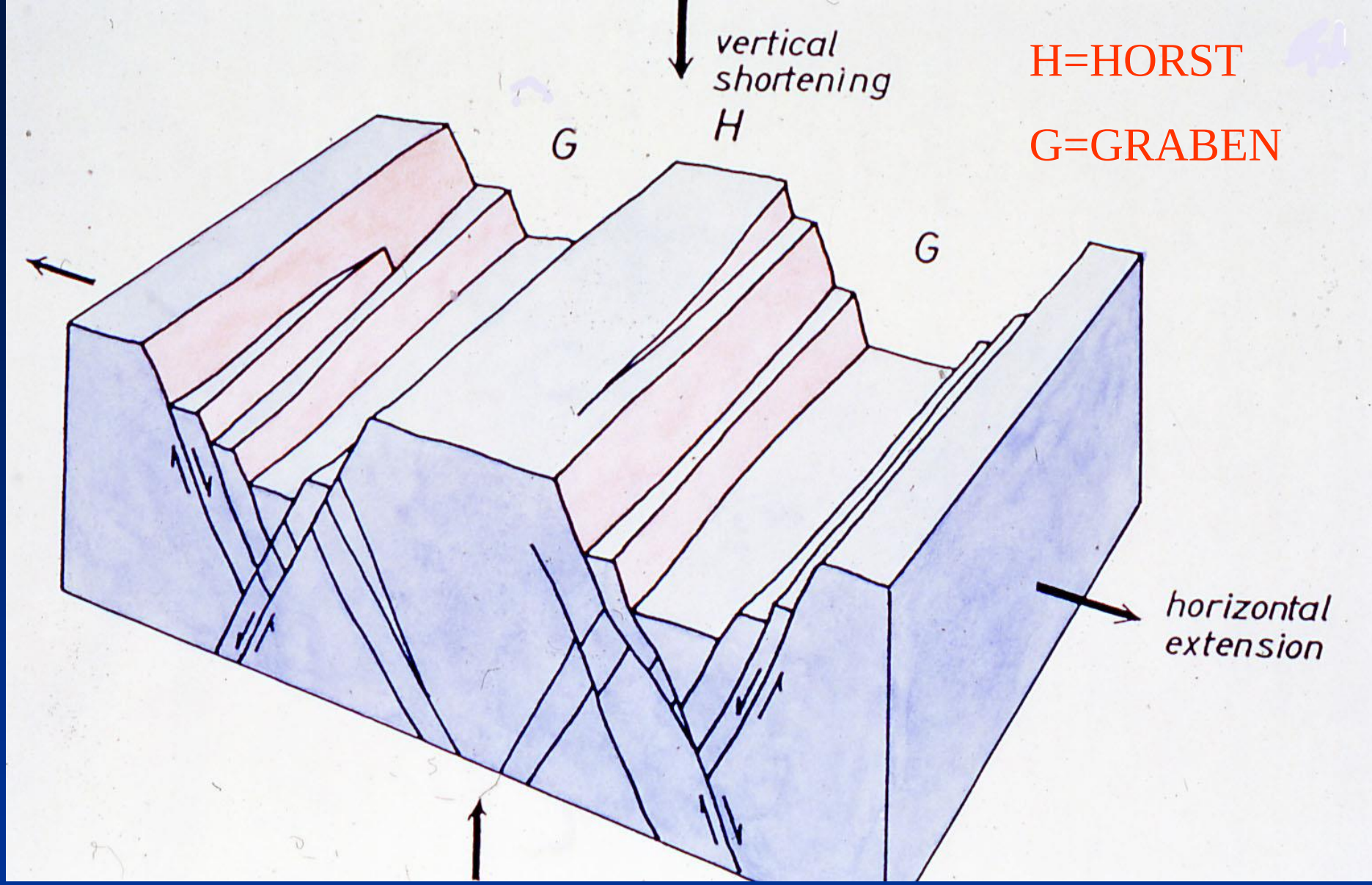


c)

FAGLIE DI DISTACCO (DETACHMENT) A BASSO ANGOLO

d)

Sistemi di faglie normali: il problema della continuazione in profondità. Diverse geometrie in superficie e diversi modelli concettuali



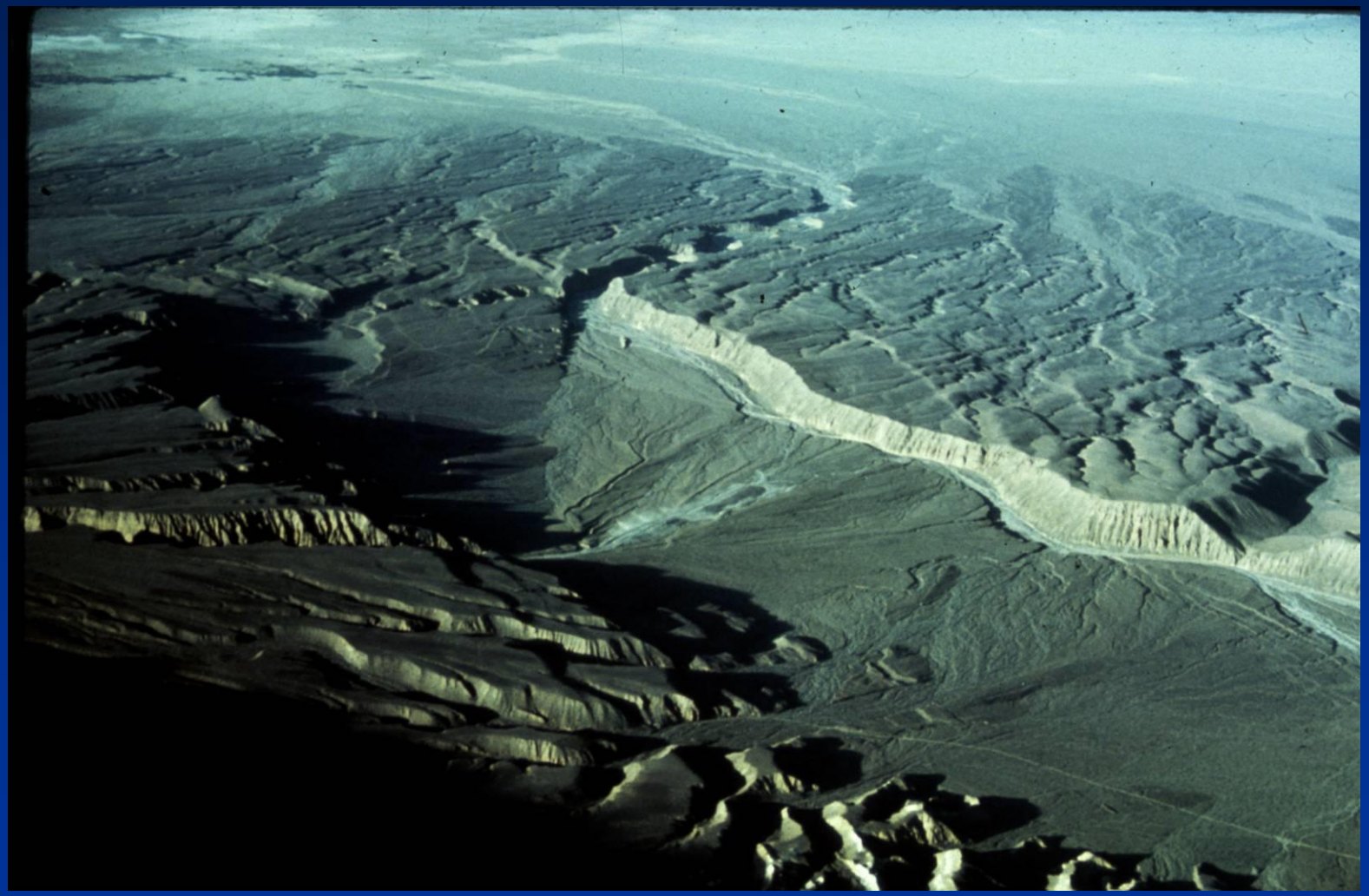
H=HORST

G=GRABEN

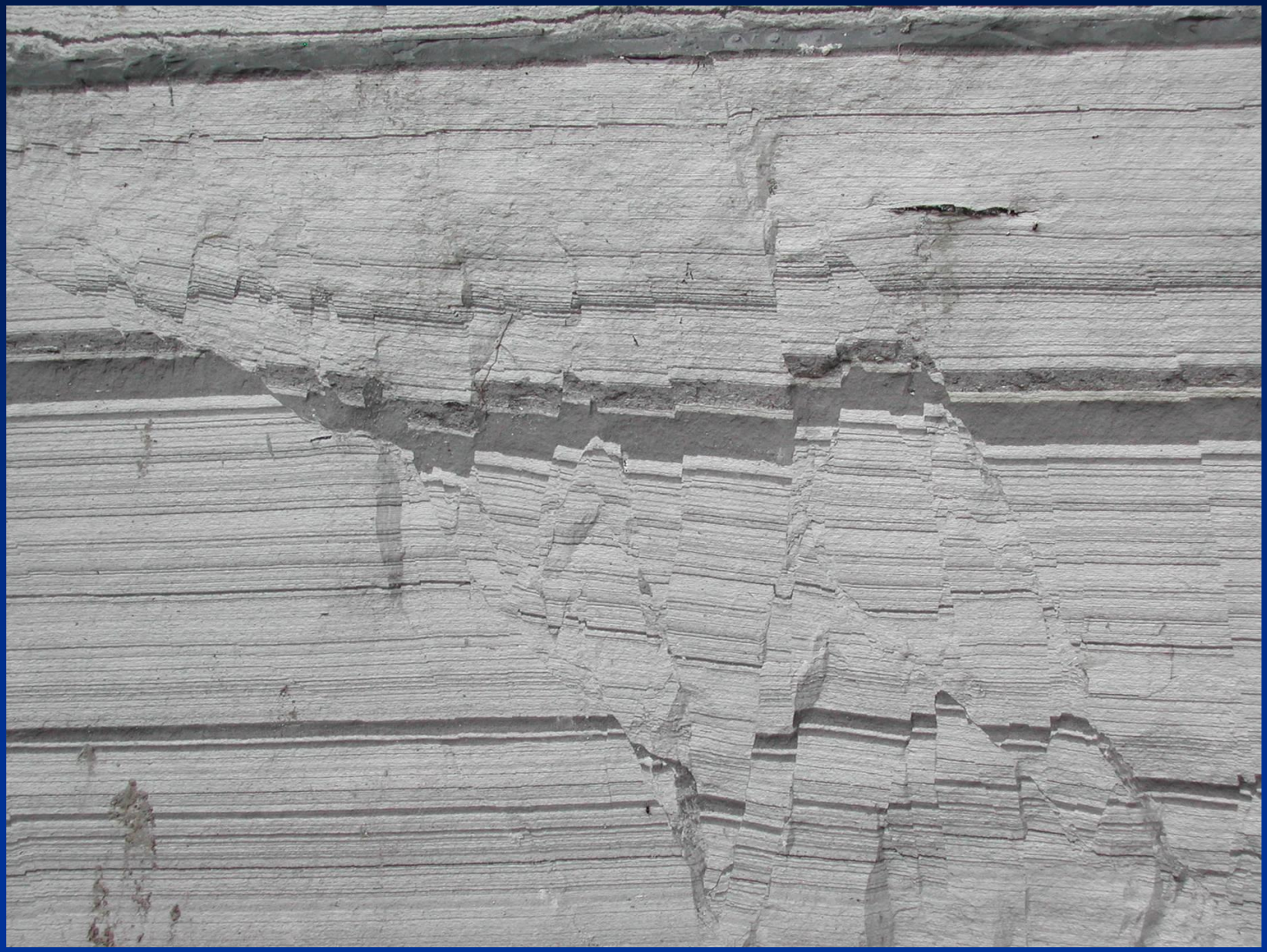
Da Ramsay and Huber, 1987

FAGLIE PIANE

Esempio di grabe (singola fossa) recentissimo e, presumibilmente, attivo



Sistemi di faglie normali: coniugate, faglia principale (master fault) e faglie curve!



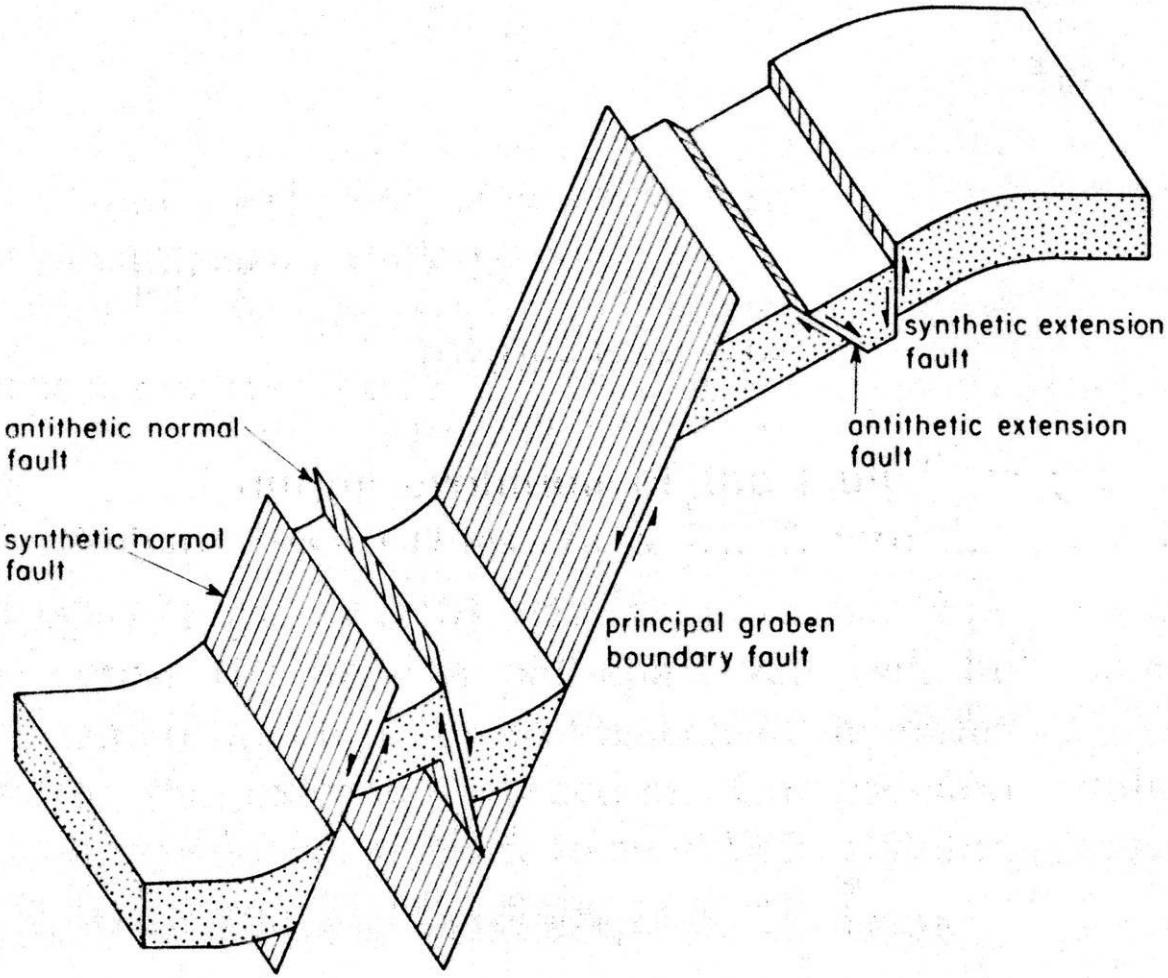


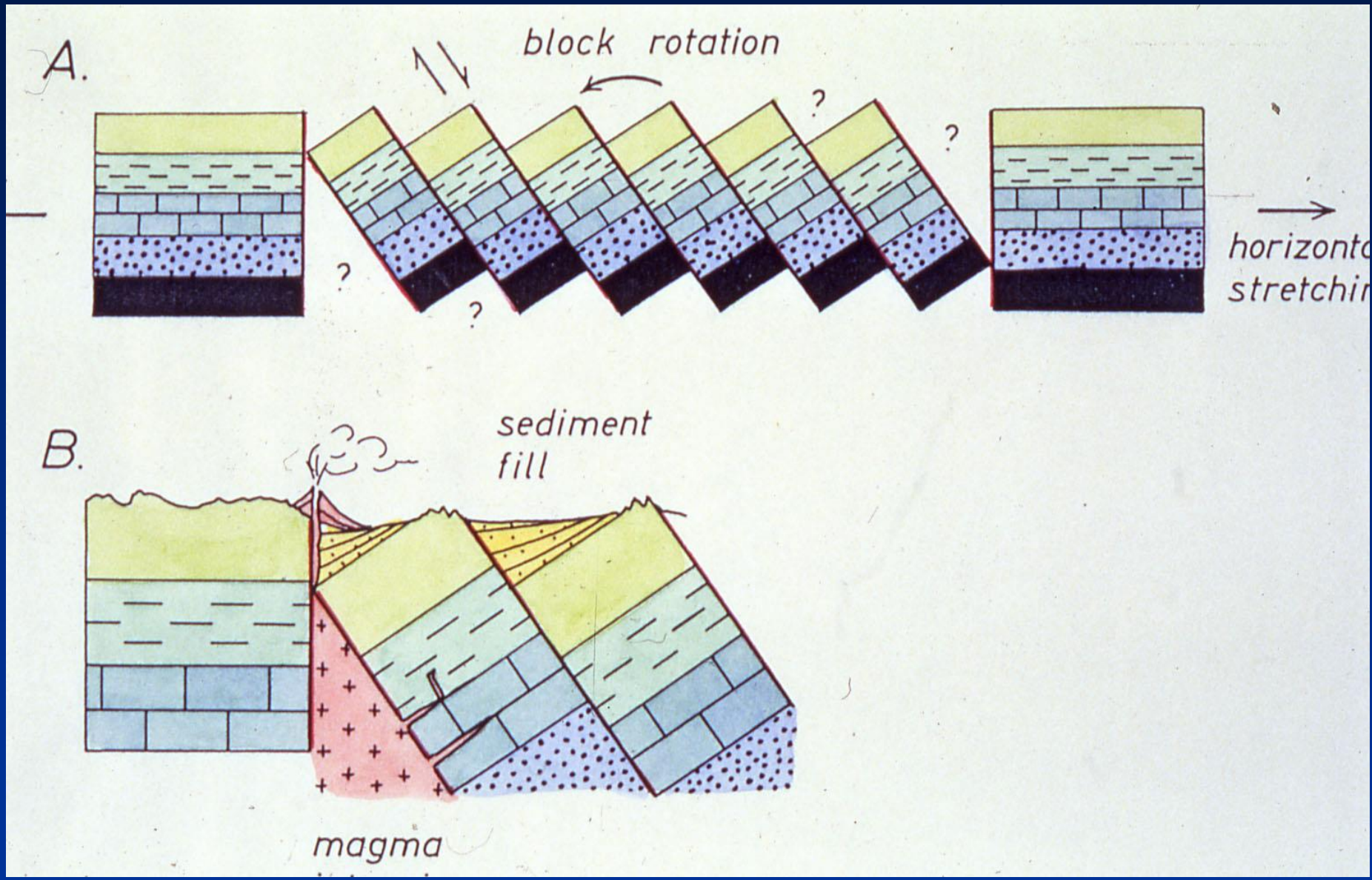
Fig. 6. Structures characteristic of planar high-angle normal fault zones such as those bounding grabens in terrains that have been inhomogeneously extended by a small percentage. After Al Kadhi & Hancock (1980, fig. 6).

Sistemi di faglie normali coniugate: faglia principale, faglie antitetiche e sintetiche

Da Hancock, 1985

Come si vede in affioramento una faglia normale?
(foto L. Selli)

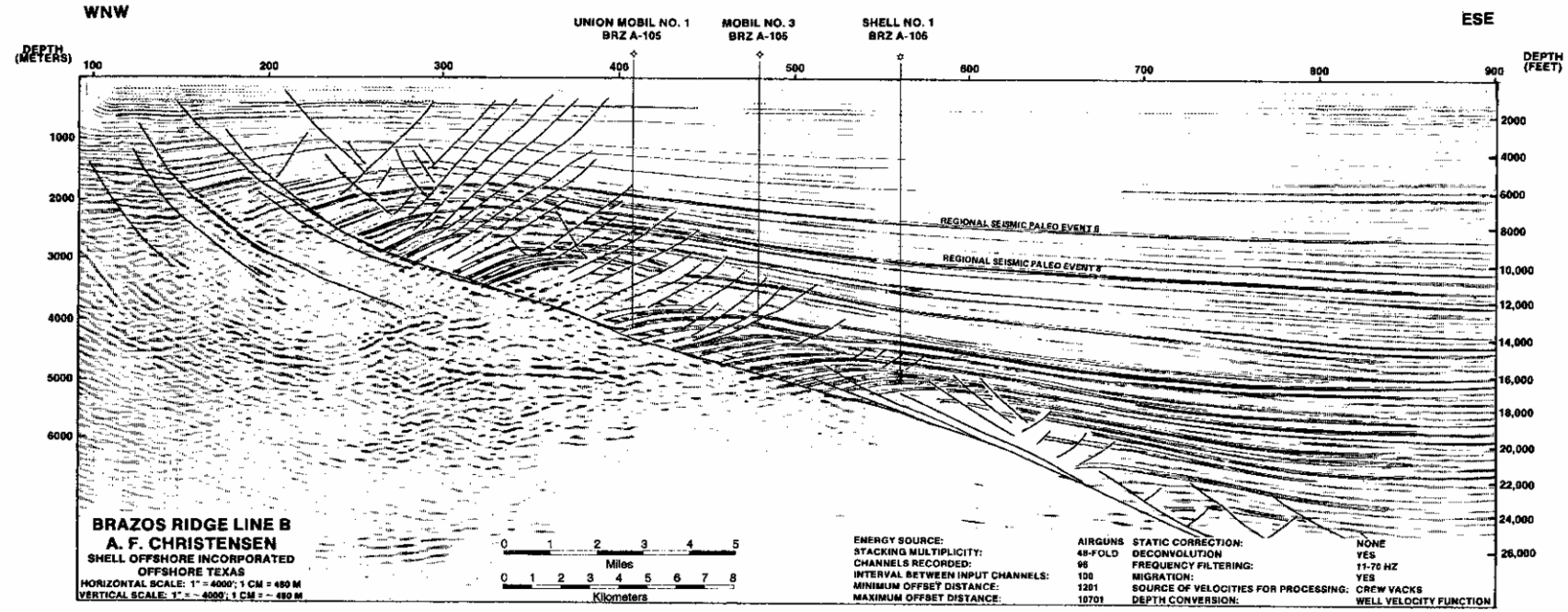
Sistemi di faglie normali coniugate sintetiche; sistema a domino!



Da Ramsay and Huber, 1987

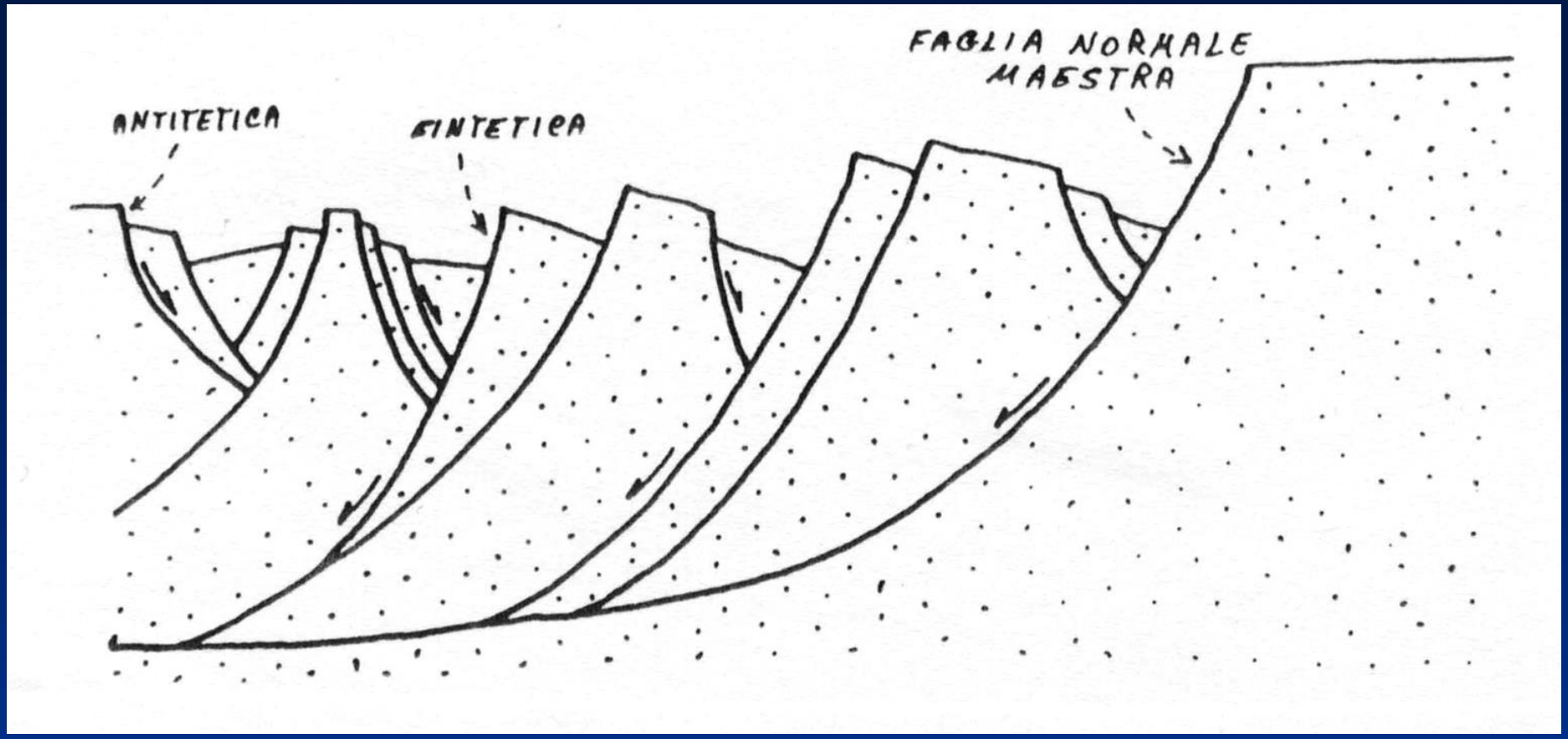
Sistemi di faglie normali coniugate sintetiche; sistema a domino!


Da Ramsay and Huber, 1987

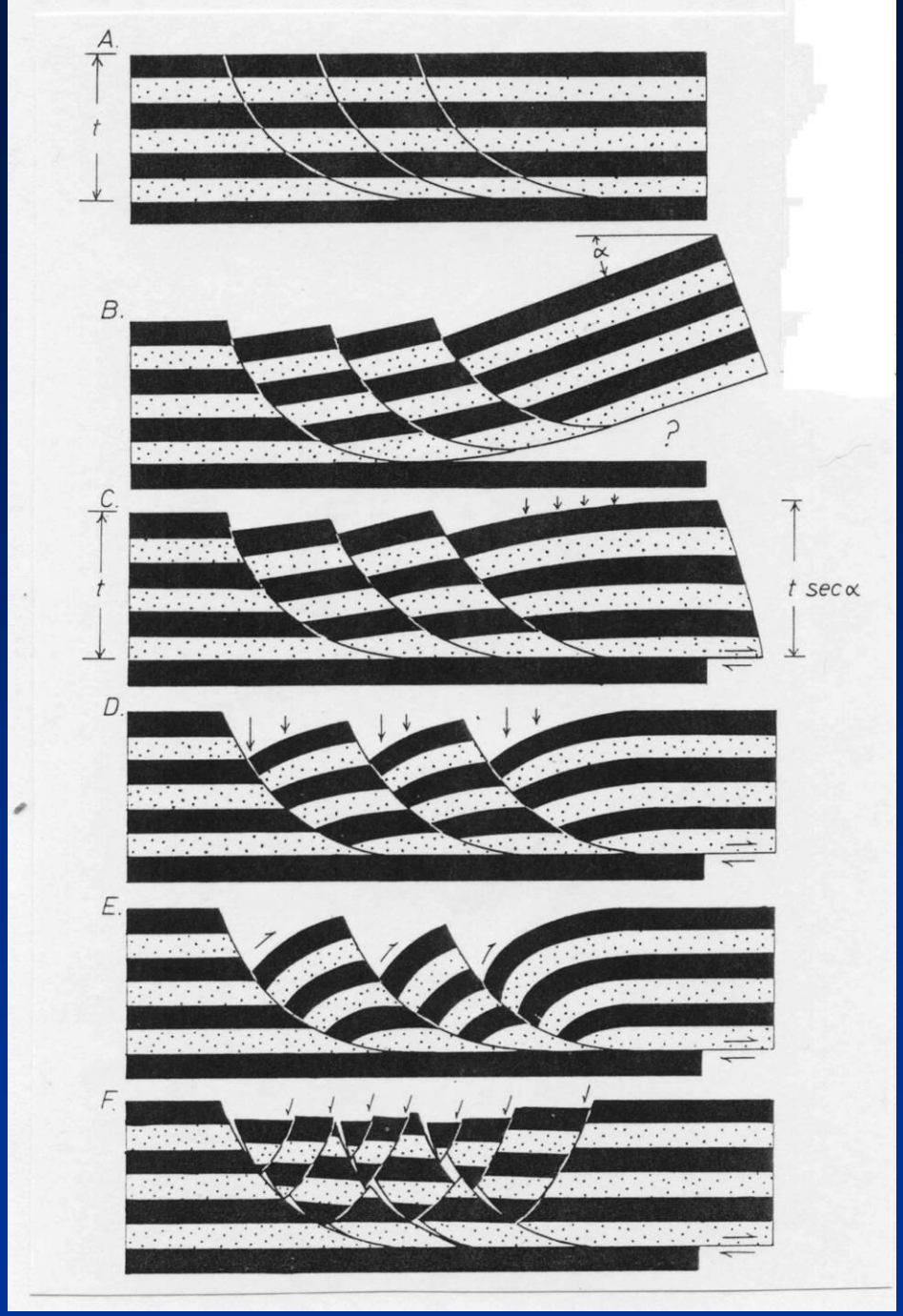


(b)

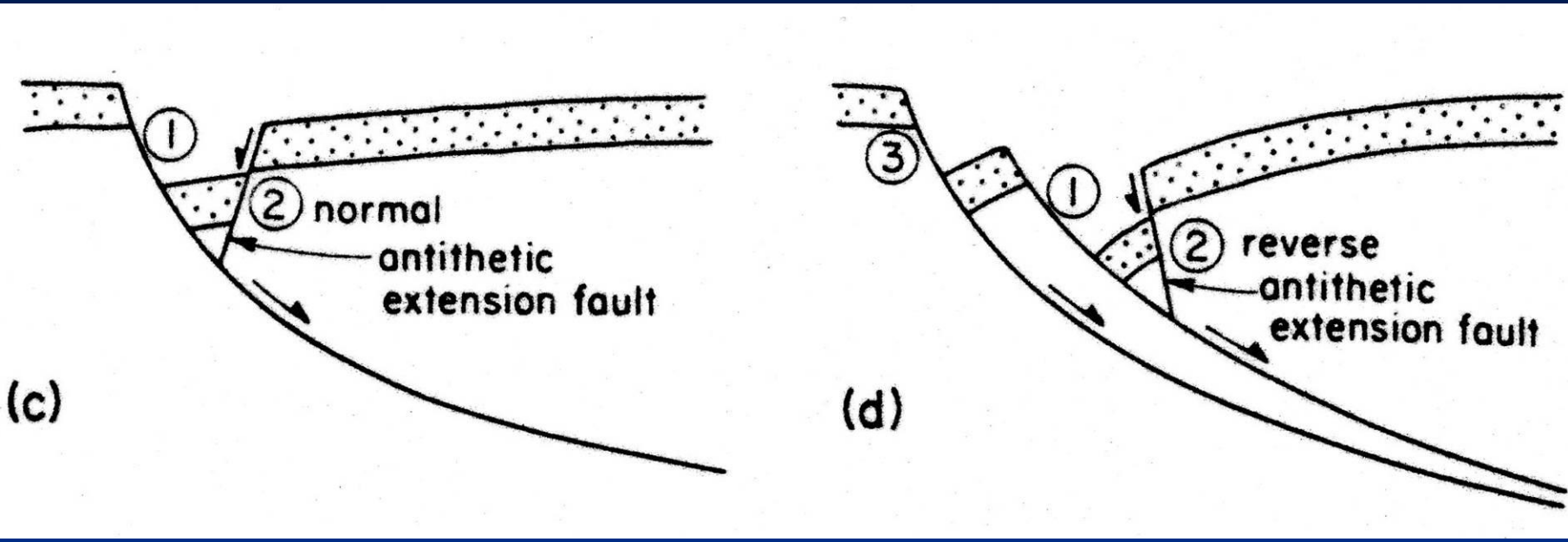
Da Hatcher, 1995



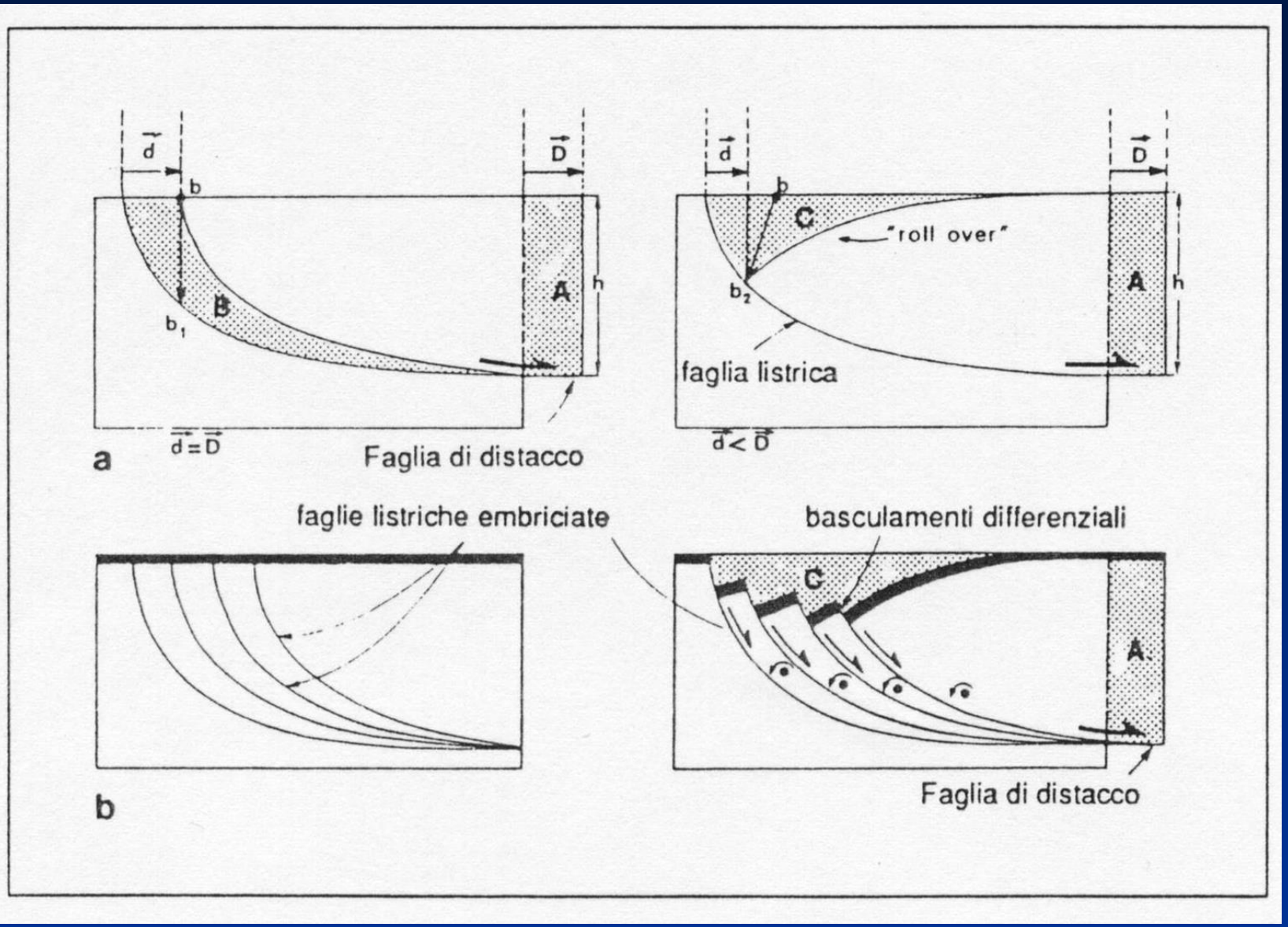
Faglia listrica



Da Ramsay and Huber, 1987

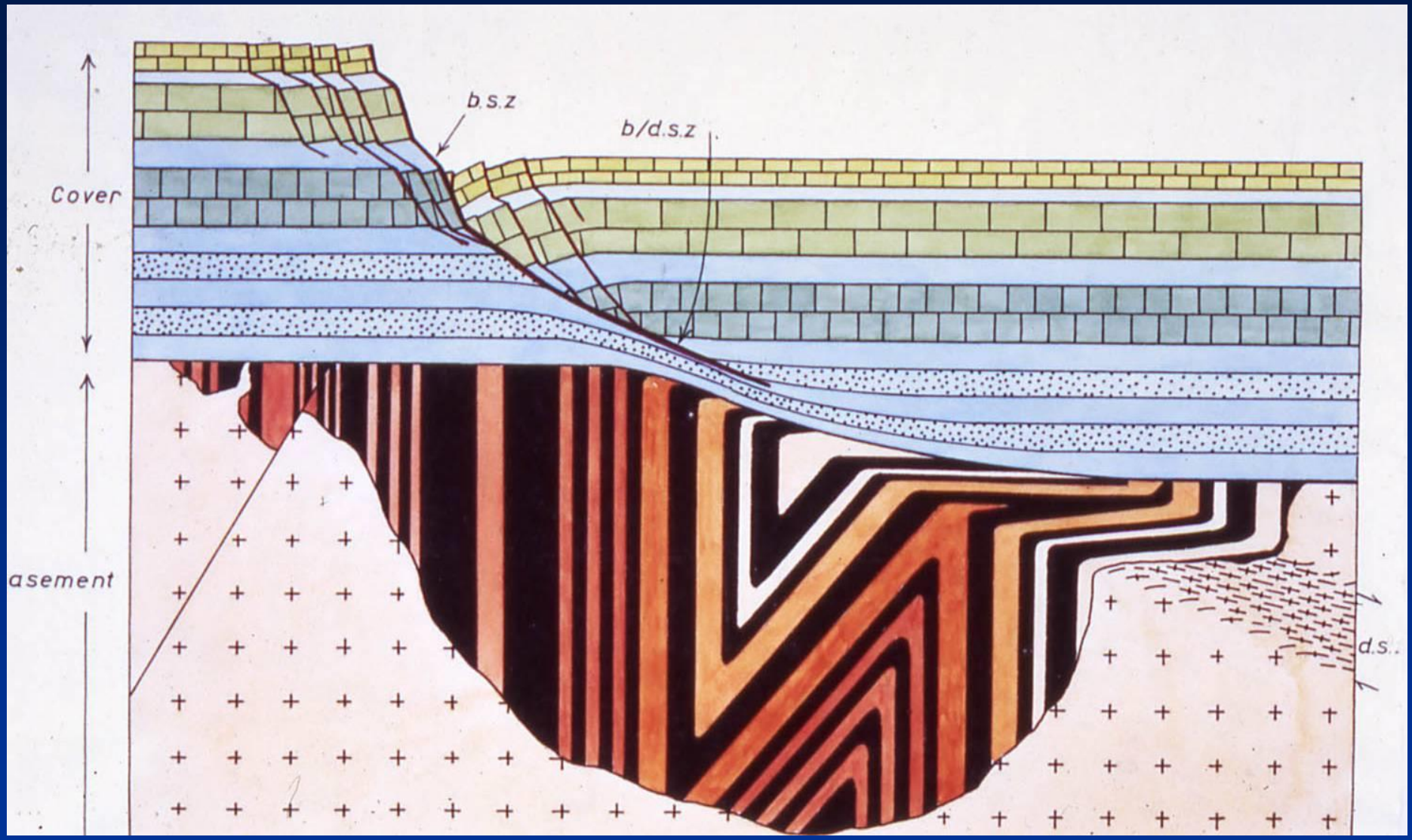


Da Hancock, 1985

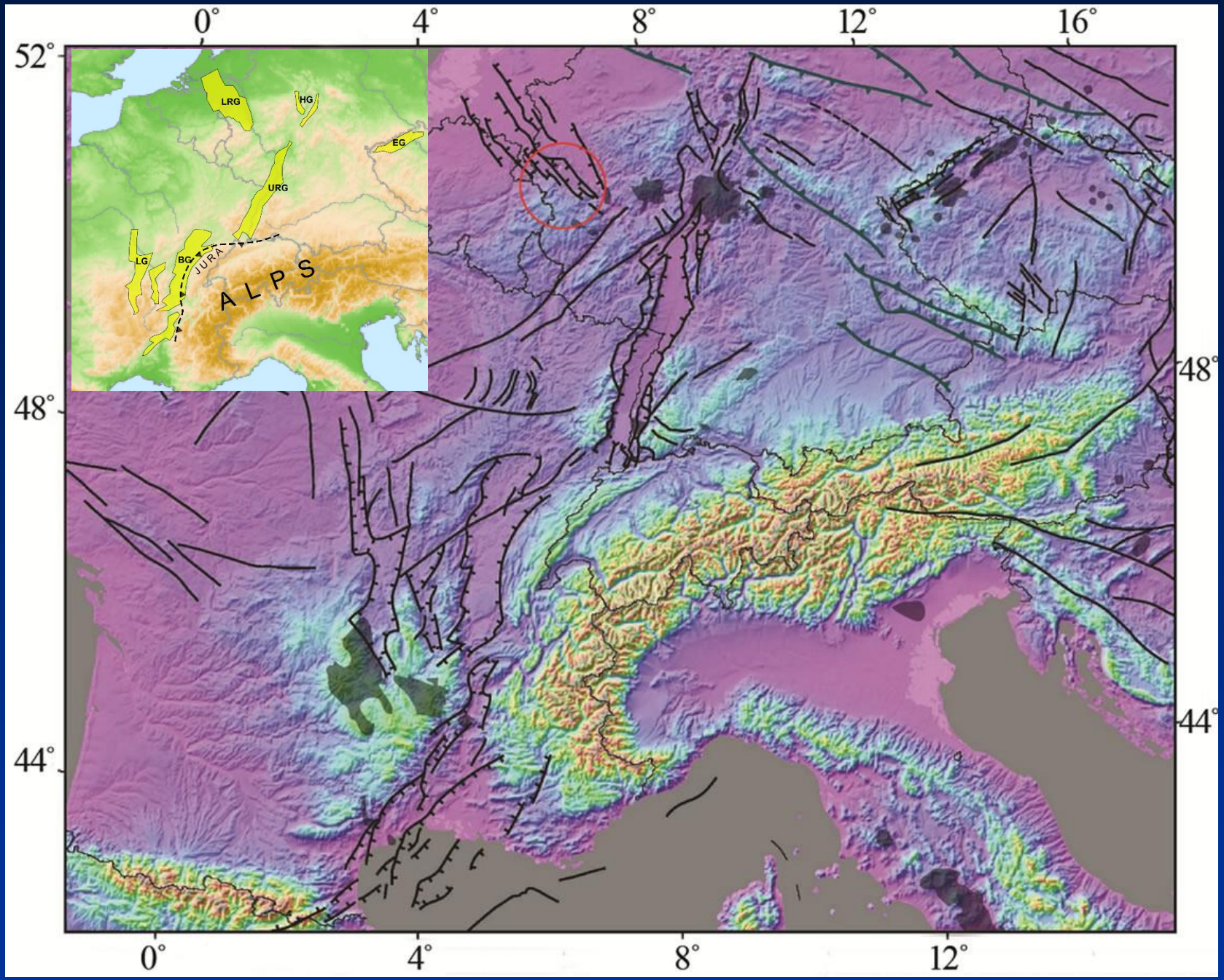


Da Mercier & Vergely, 1996

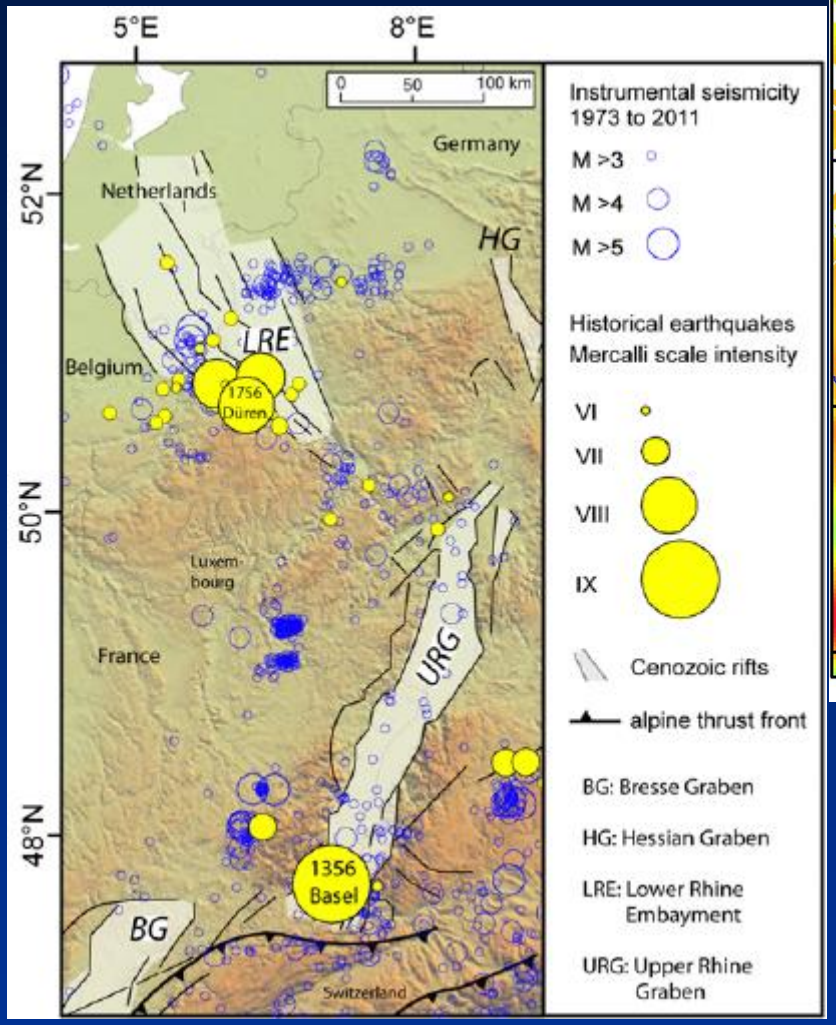
Estensione crostale

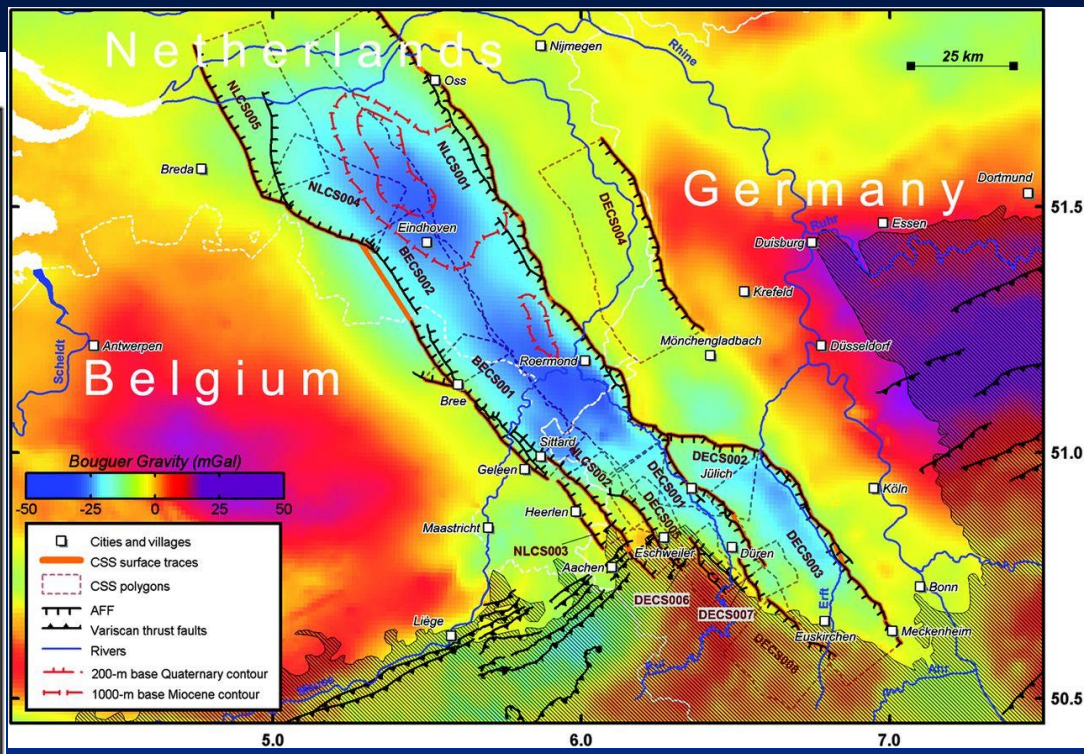


Da Ramsay and Huber, 1987



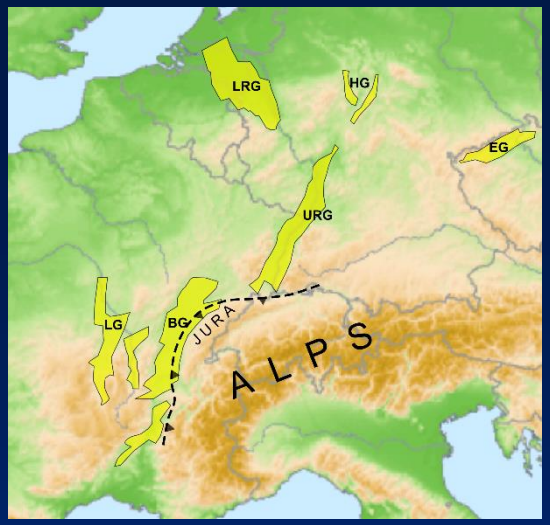
Dijkshoorn L, Clauser C., 2013

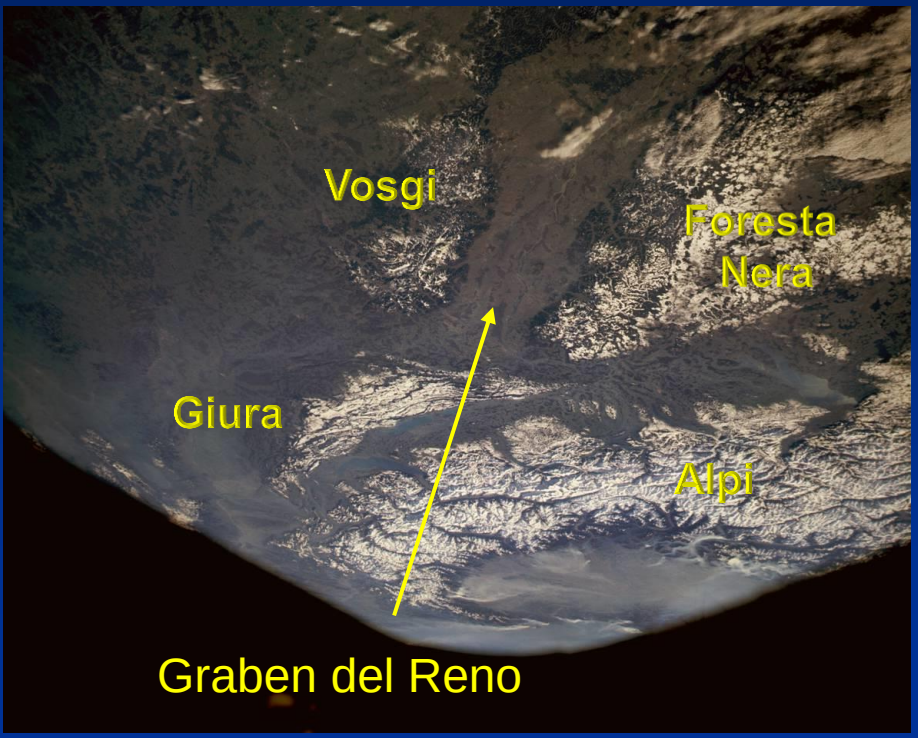


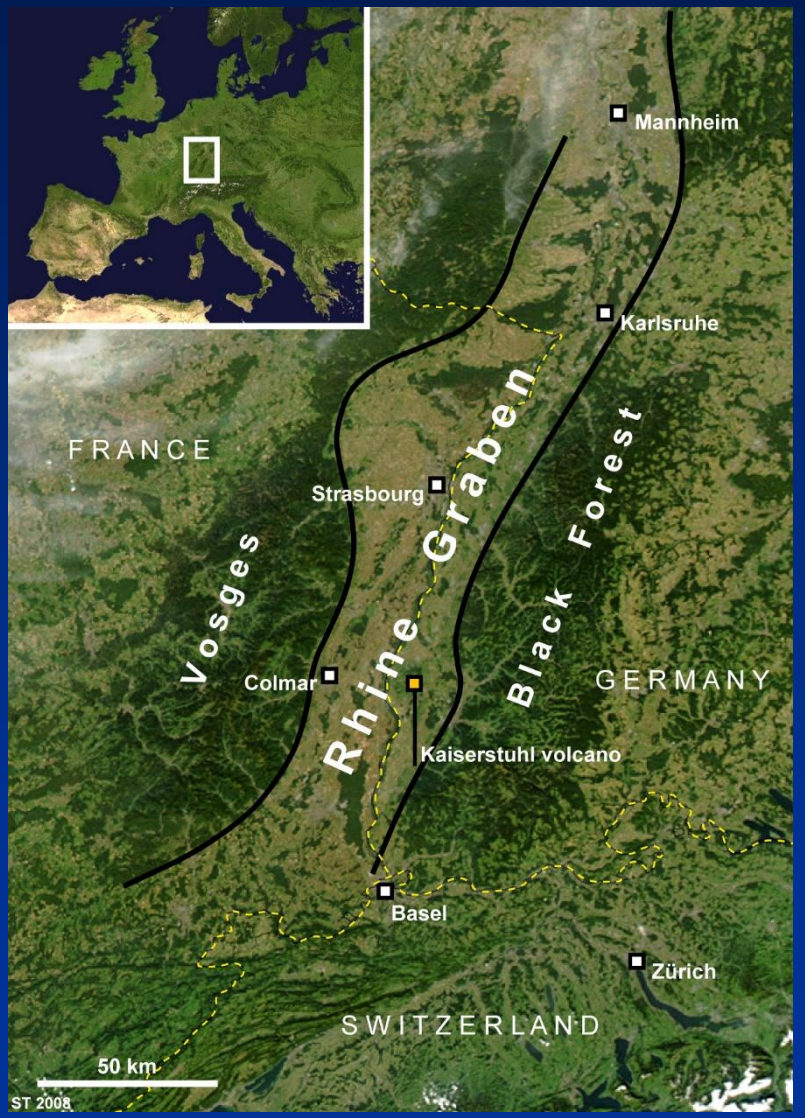


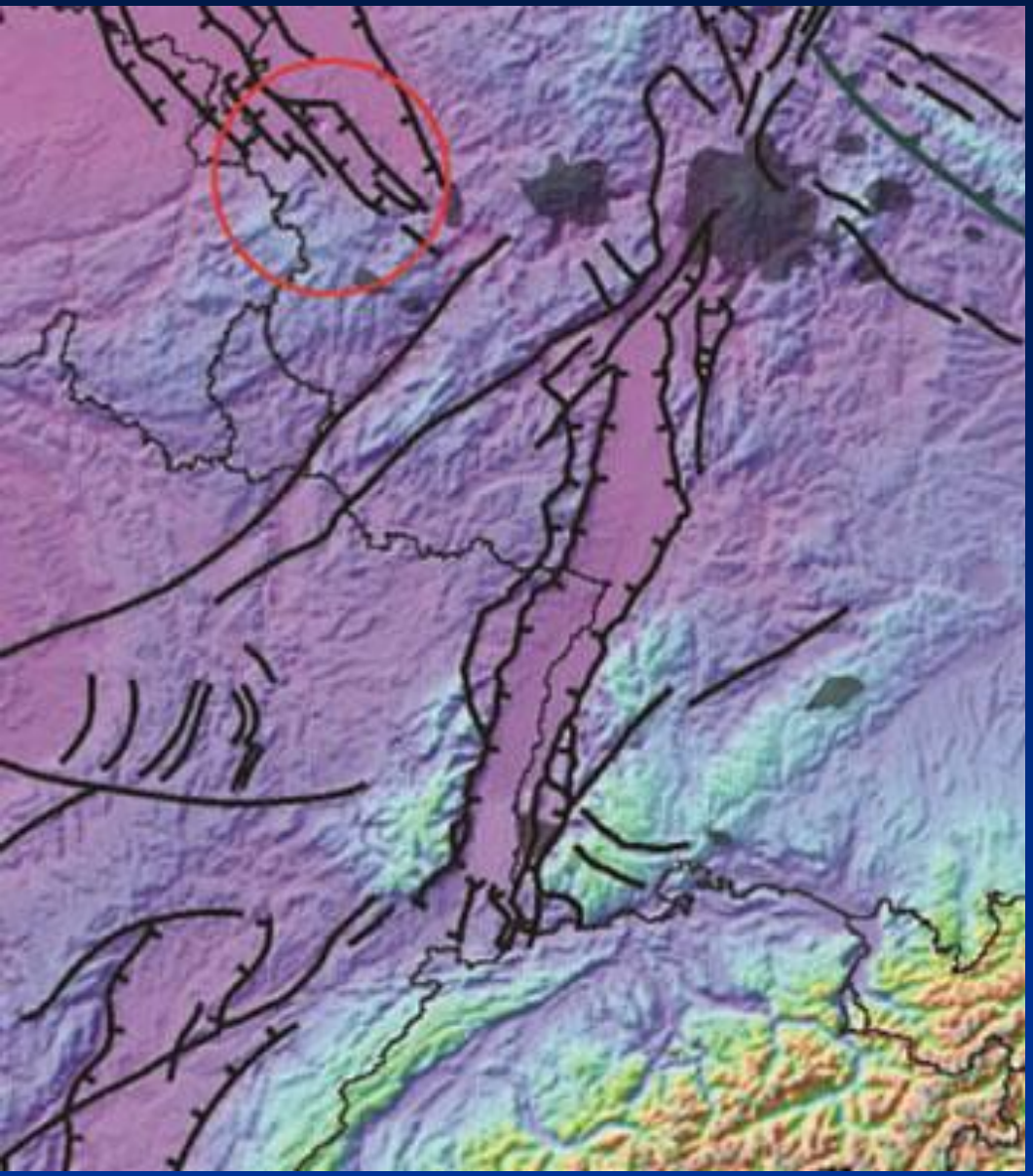
Da Kuebler, 2012

Graben del Reno

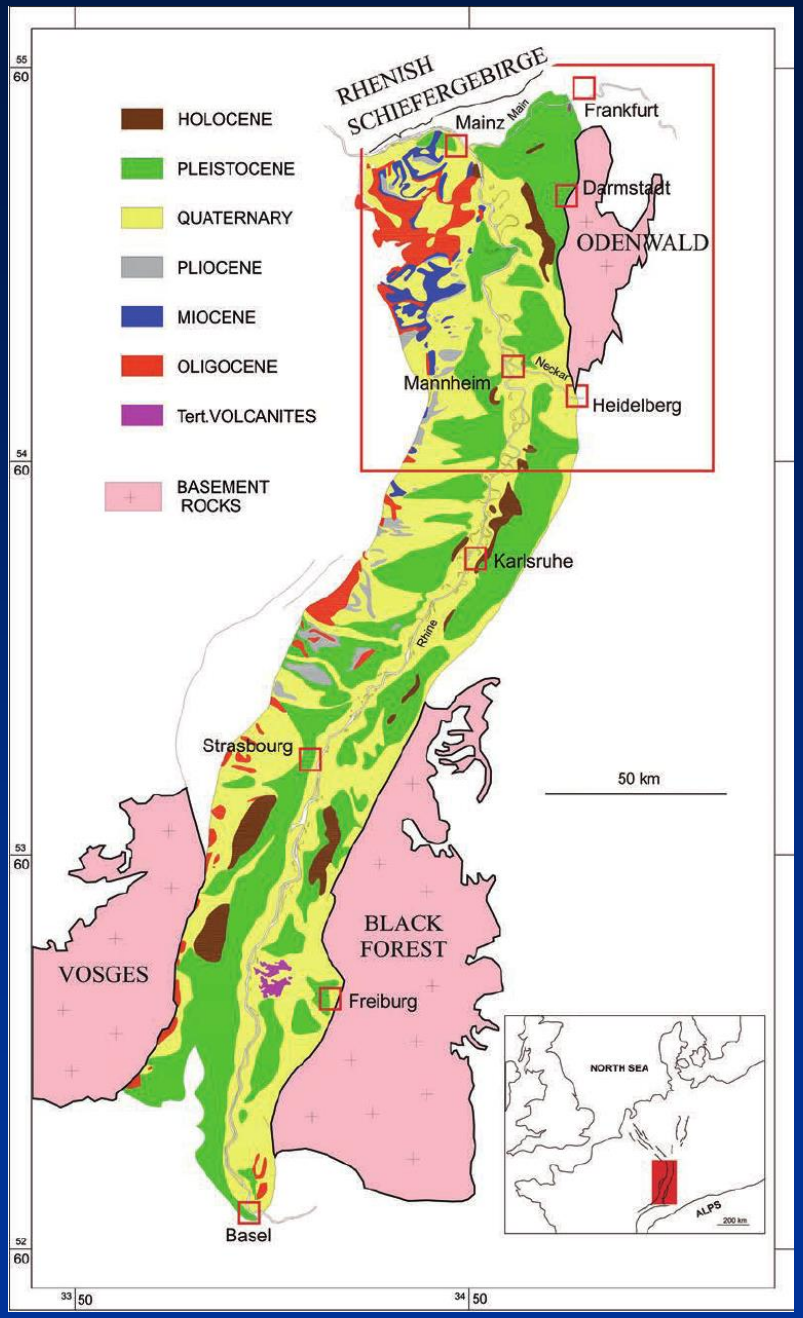






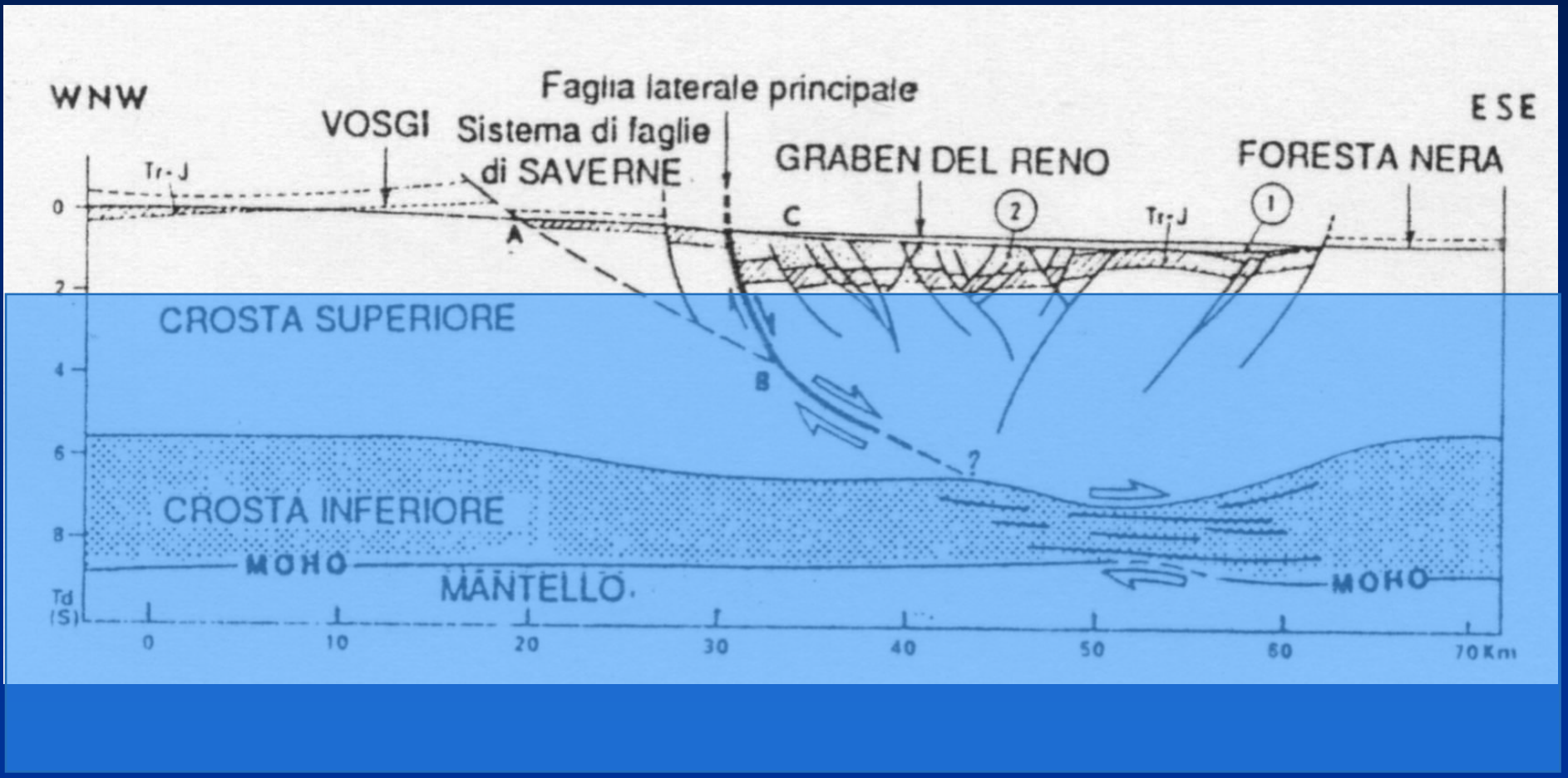


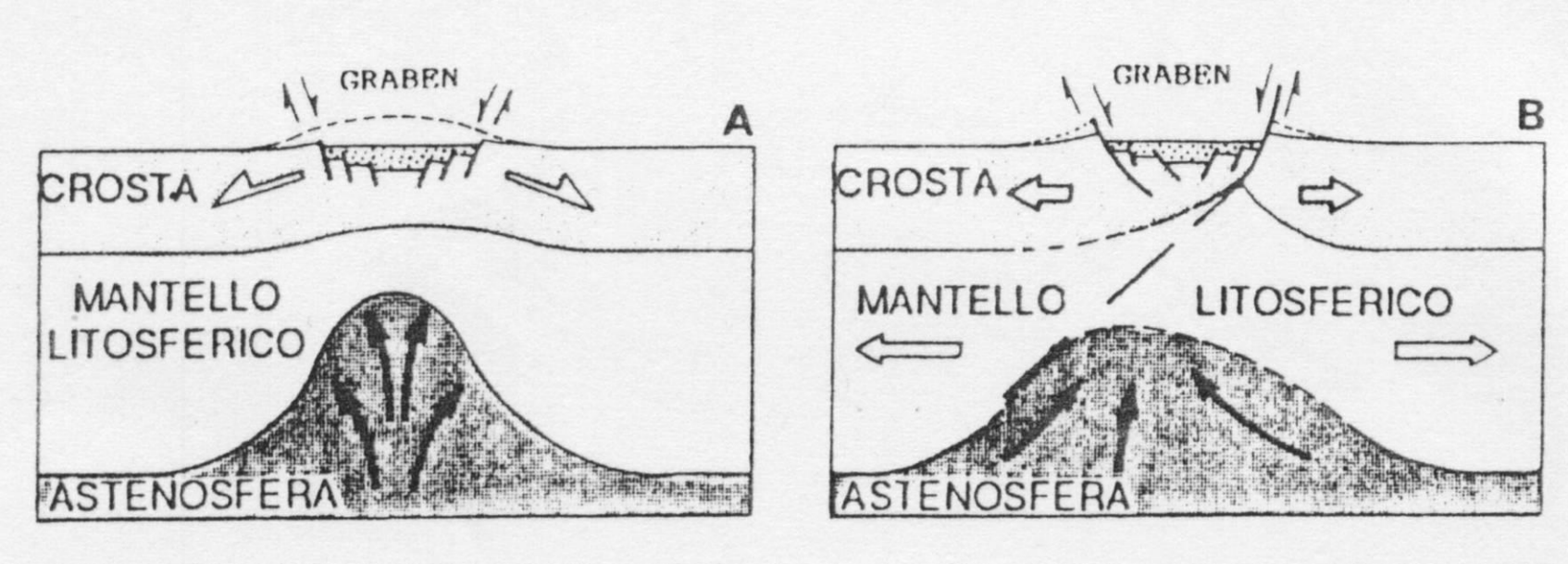
Da Dijkshoorn & Clauser, 2013



Przyrowski & Schäfer, 2015

Da Mercier & Vergely, 1996





Da Mercier & Vergely, 1996

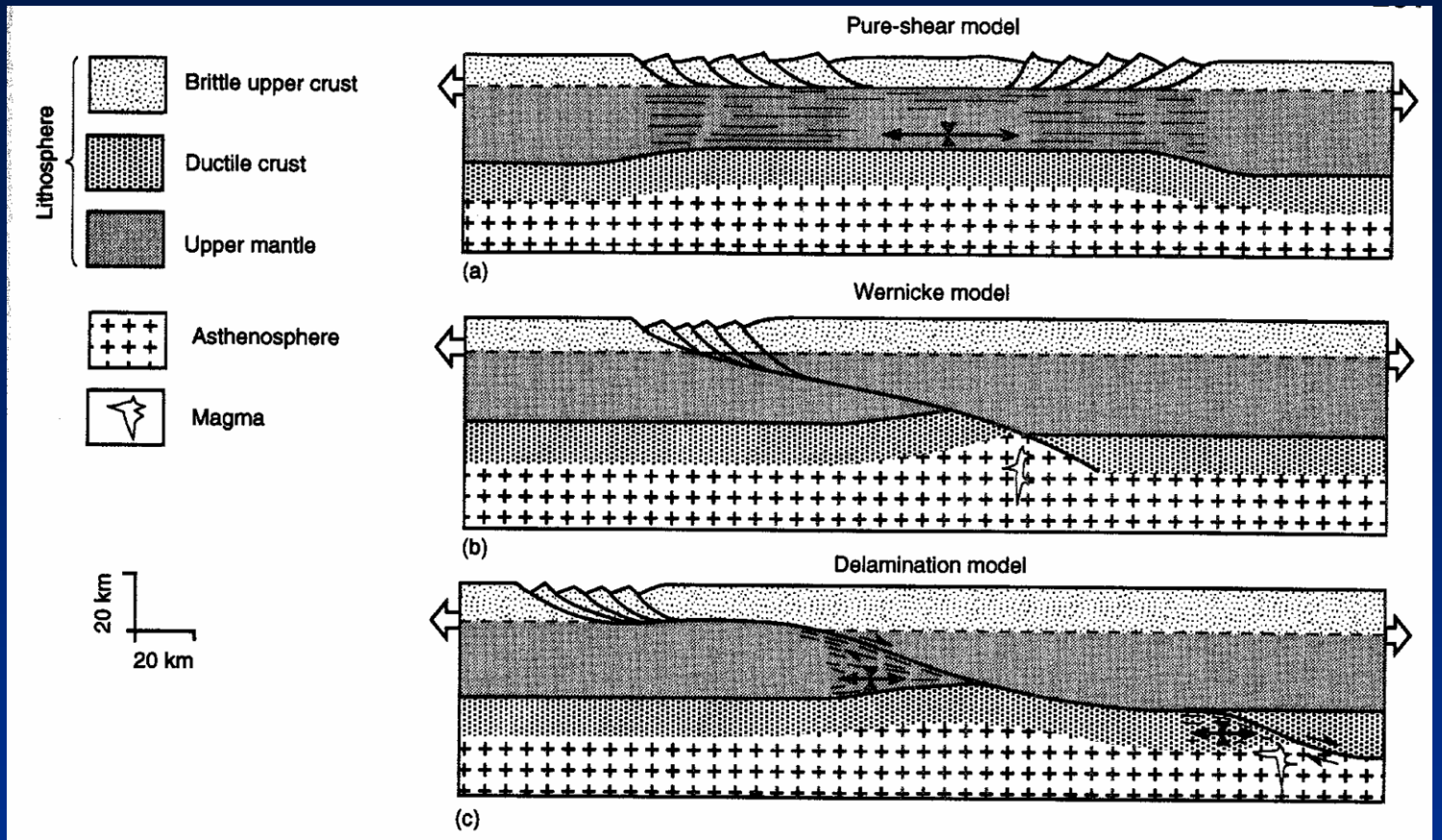
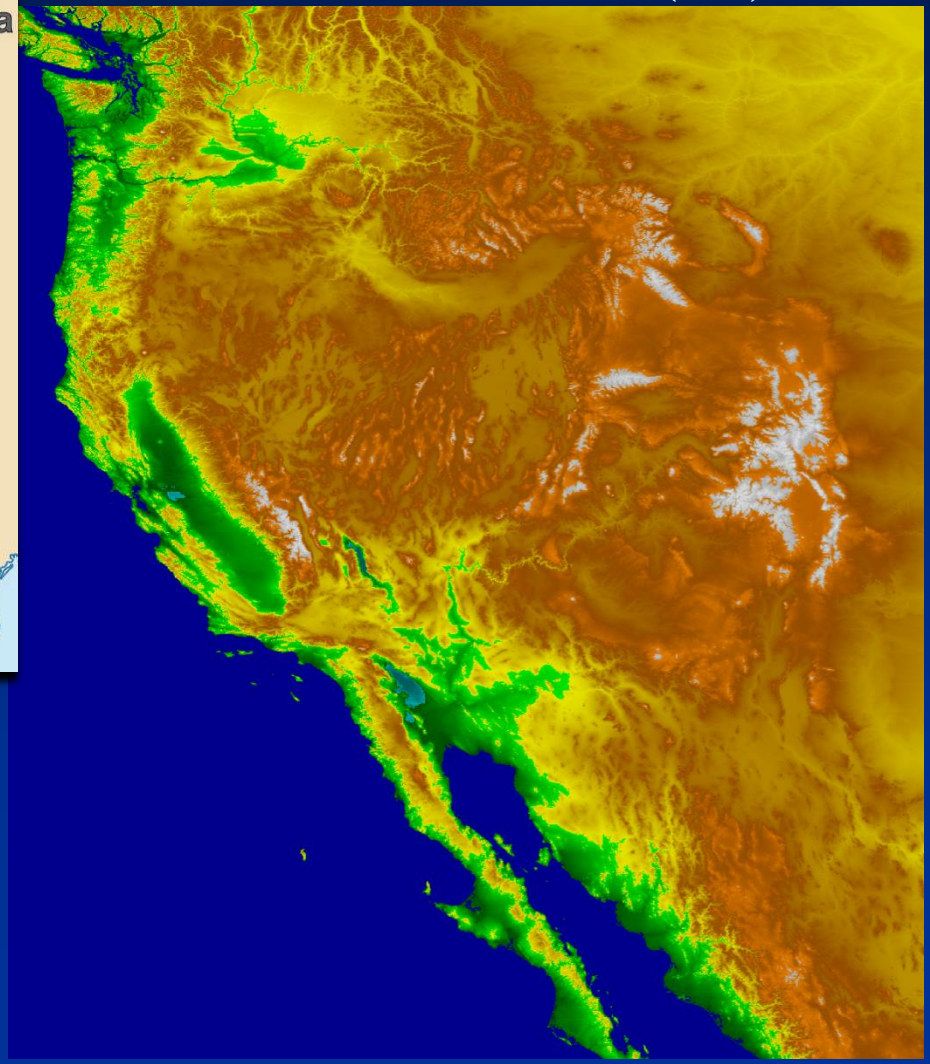


FIGURE 13–15
Three models of extension of continental crust. (a) McKenzie "pure-shear" model: symmetrical rifting and pure shear. b) Wernicke model: asymmetric rifting with simple shear. (c) Delamination model: asymmetric rifting with simple shear and delamination. (From G. S. Lister, M. A. Etheridge, and P. A. Symonds, *Geology,* v. 14, 1986.)

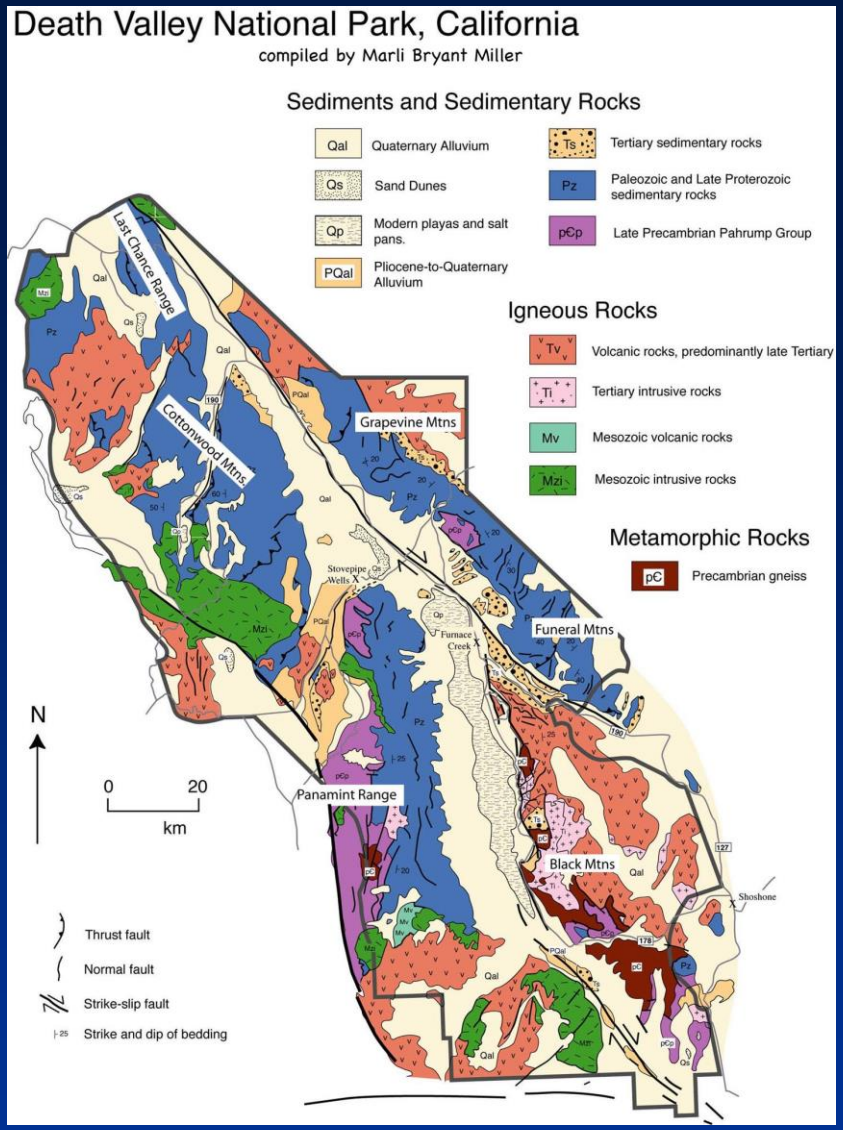
Da Hatcher , 1995

https://commons.wikimedia.org/wiki/File:Tectonic_plates_boundaries_detailed-en.svg

Shaded reliefs e batimetria da NOAA National Centers for Environmental Information (NCEI)

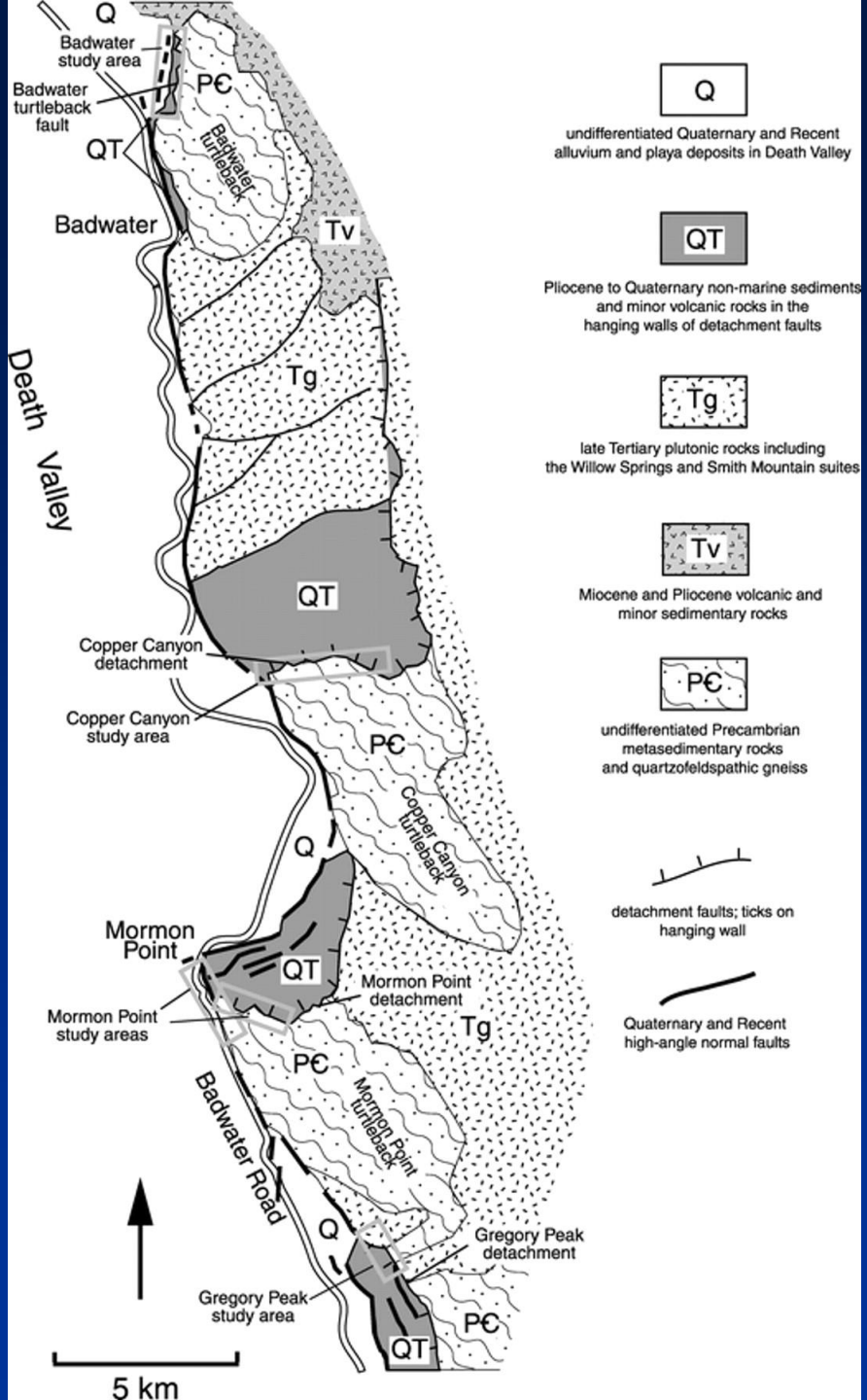


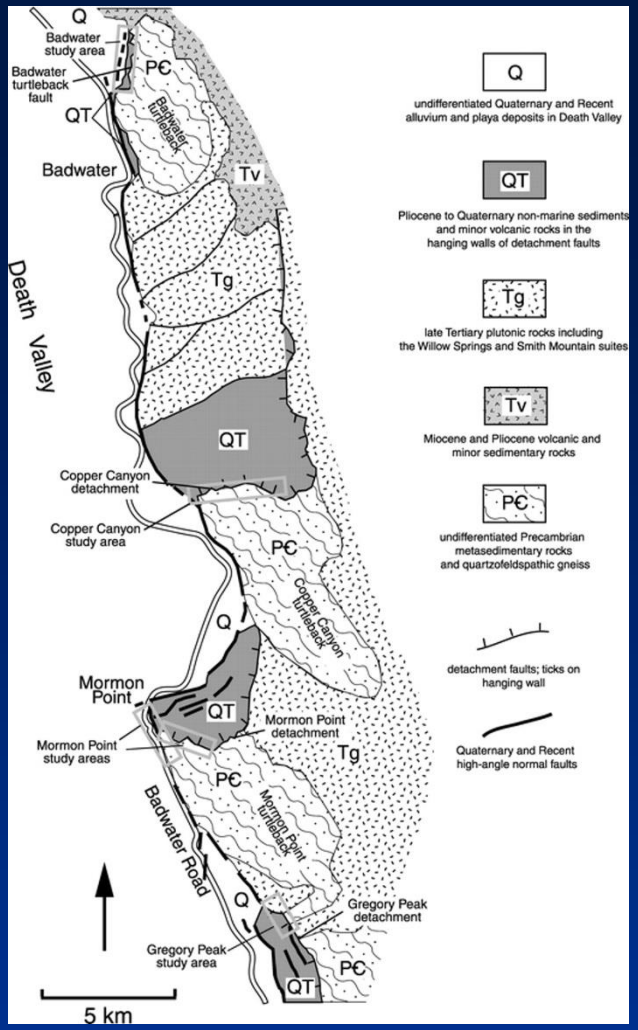
Basin & Range, estensione intra-continentale



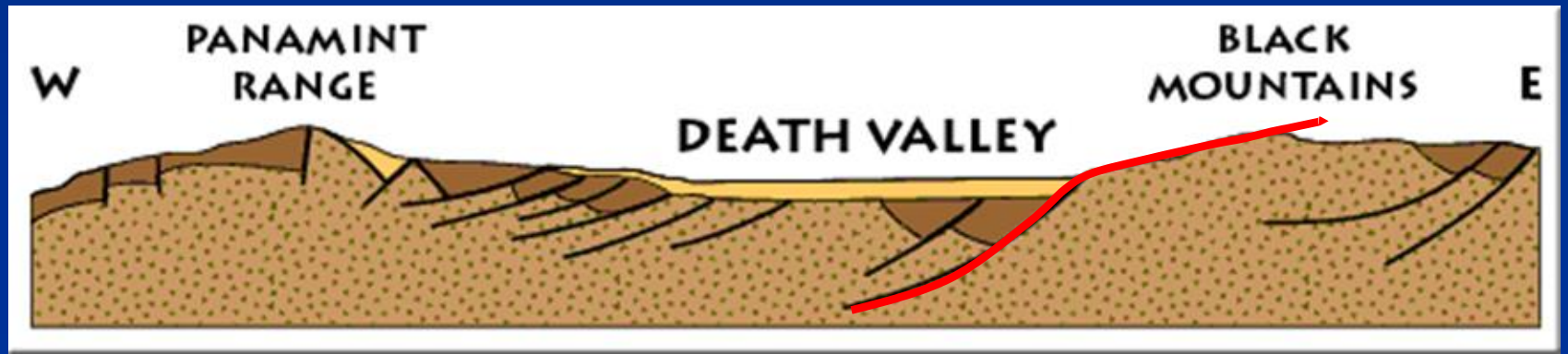
Da Bryant Miller M.

Valle della morte (Basin & Range)

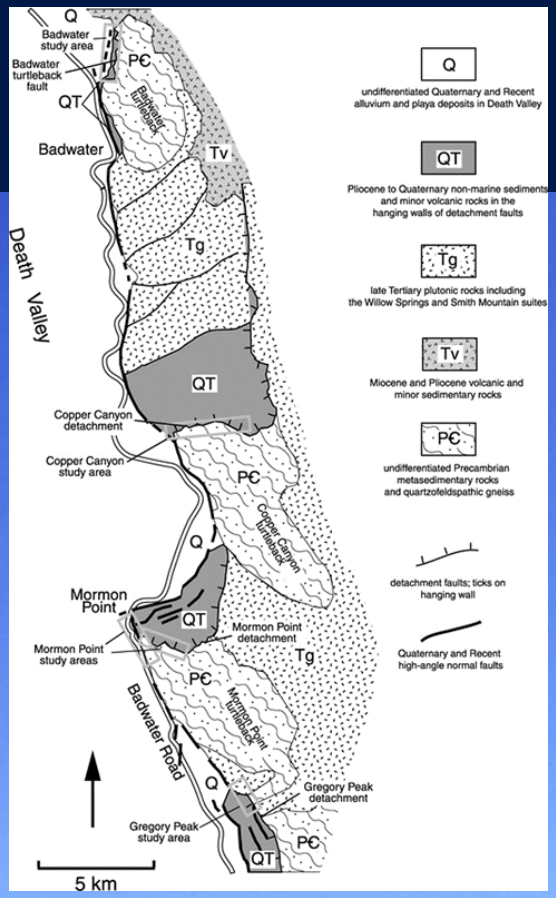


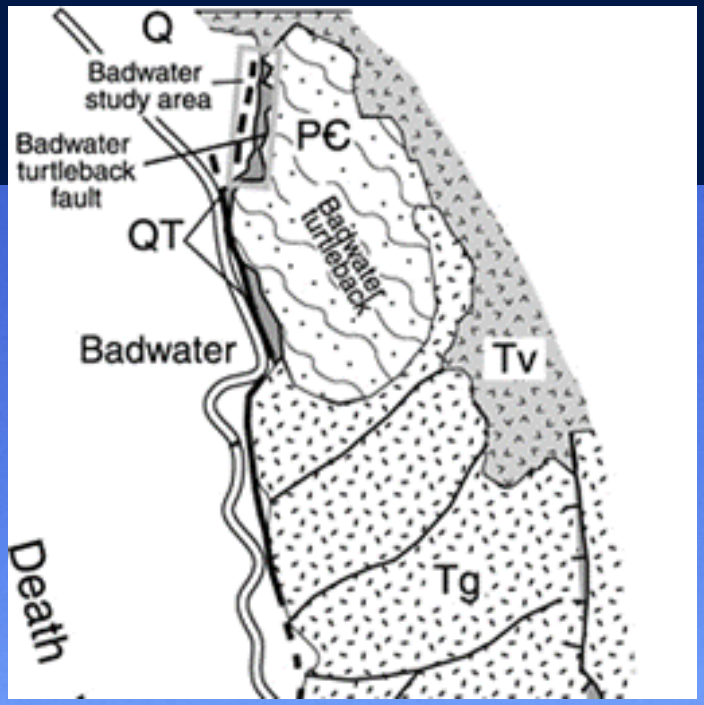


USGS Geology of Death Valley National Park

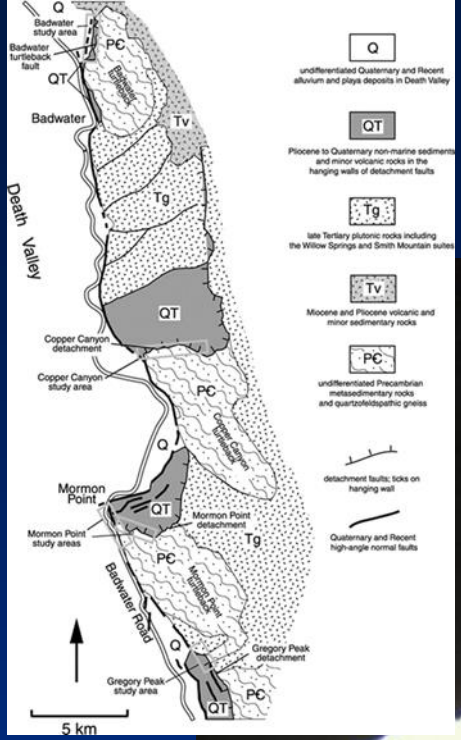


Badwater Turtleback normal fault

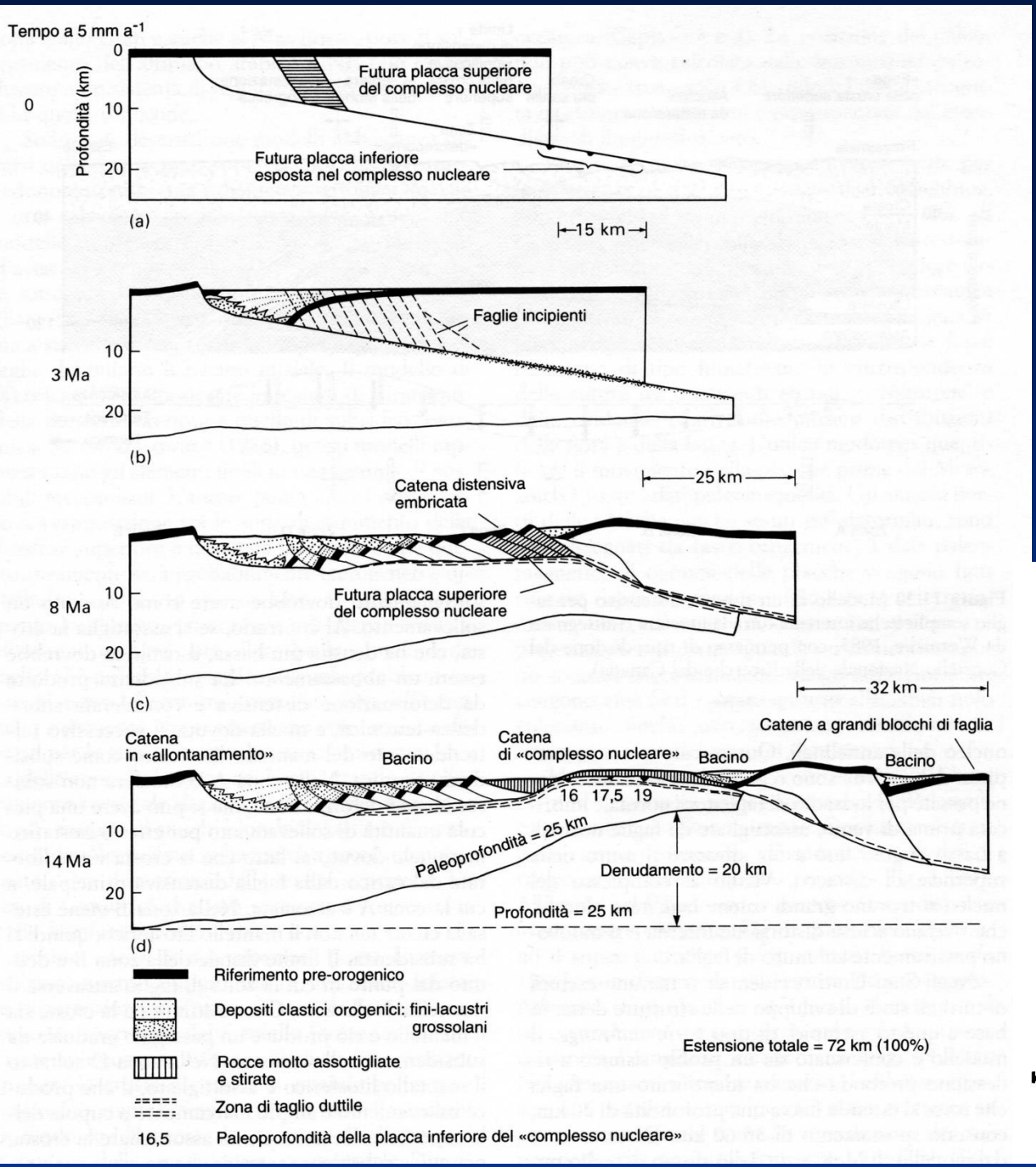


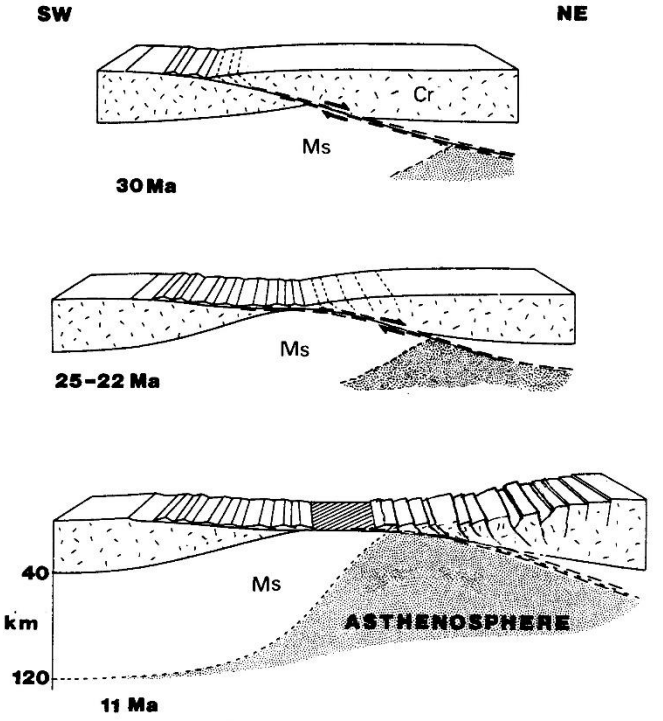


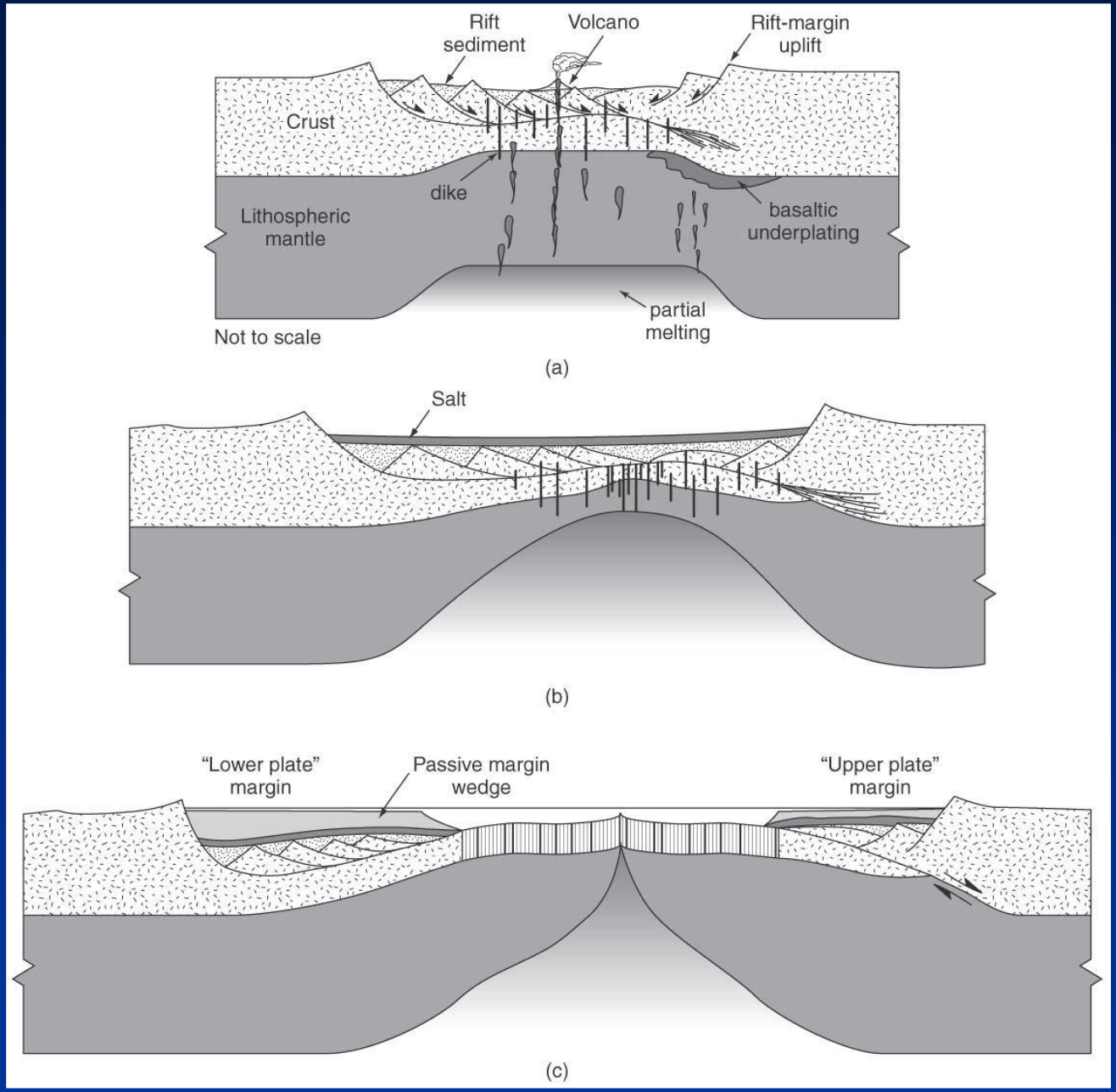
Badwater Turtleback normal fault: Copper Canyon fault zone



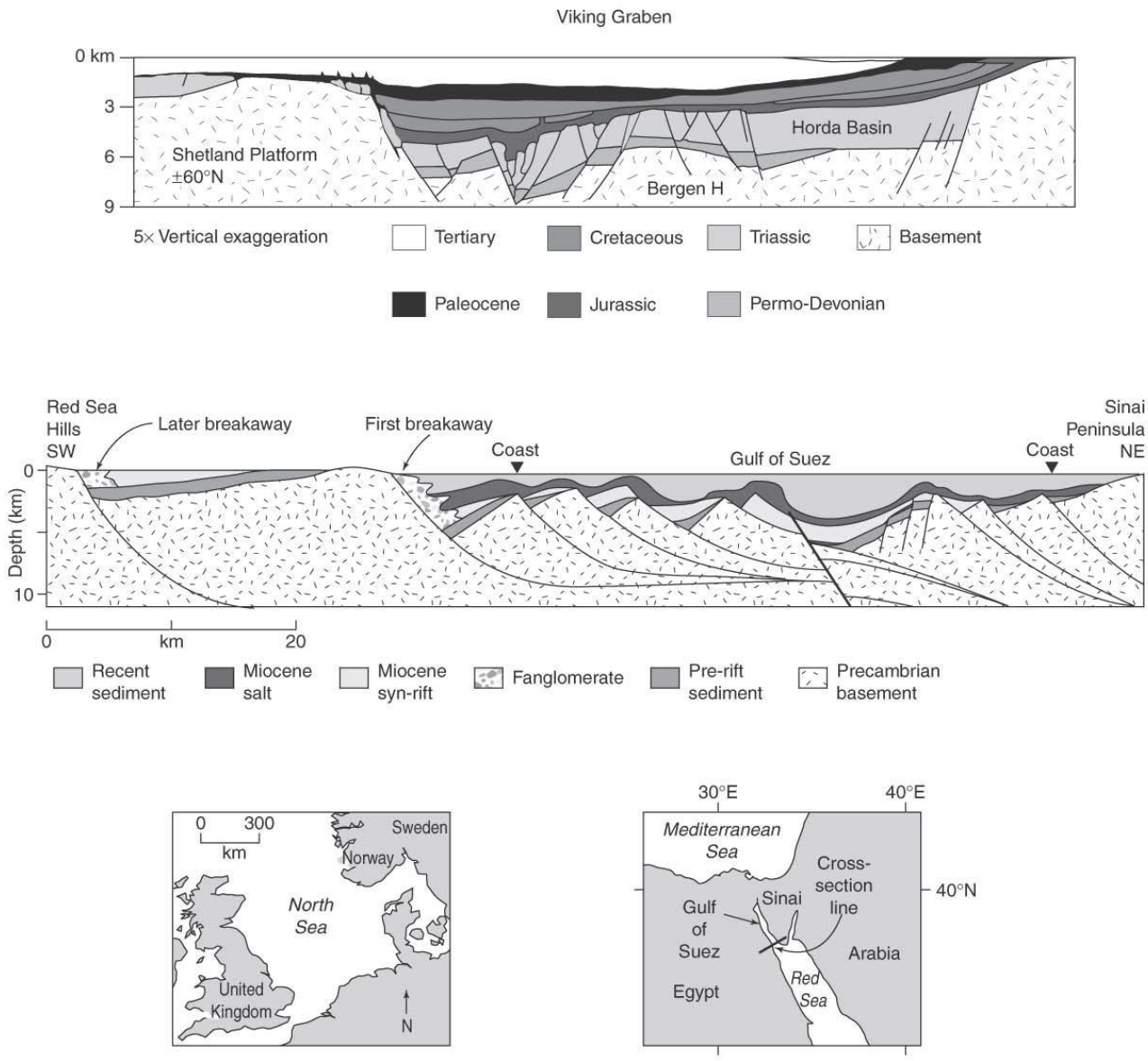
GA Pini


Tempo a 5 mm a^{-1}
Profondità (km)
0
10
20
Futura placca superiore del complesso nucleare
Futura placca inferiore esposta nel complesso nucleare
(a)
15 km
3 Ma
Faglie incipienti
(b)
25 km
Catena distensiva embricata
8 Ma
Futura placca superiore del complesso nucleare
(c)
32 km
Catena in «allontanamento»
Bacino
Catena di «complesso nucleare»
Bacino
Catene a grandi blocchi di faglia
Bacino
16 17,5 19
14 Ma
Paleoprofondità = 25 km
Denudamento = 20 km
Profondità = 25 km
(d)
Riferimento pre-orogenico
Depositi clastici orogenici: fini-lacustri grossolani
Rocce molto assottigliate e stirate
Zona di taglio duttile
16,5
Paleoprofondità della placca inferiore del «complesso nucleare»
Estensione totale = 72 km (100%)

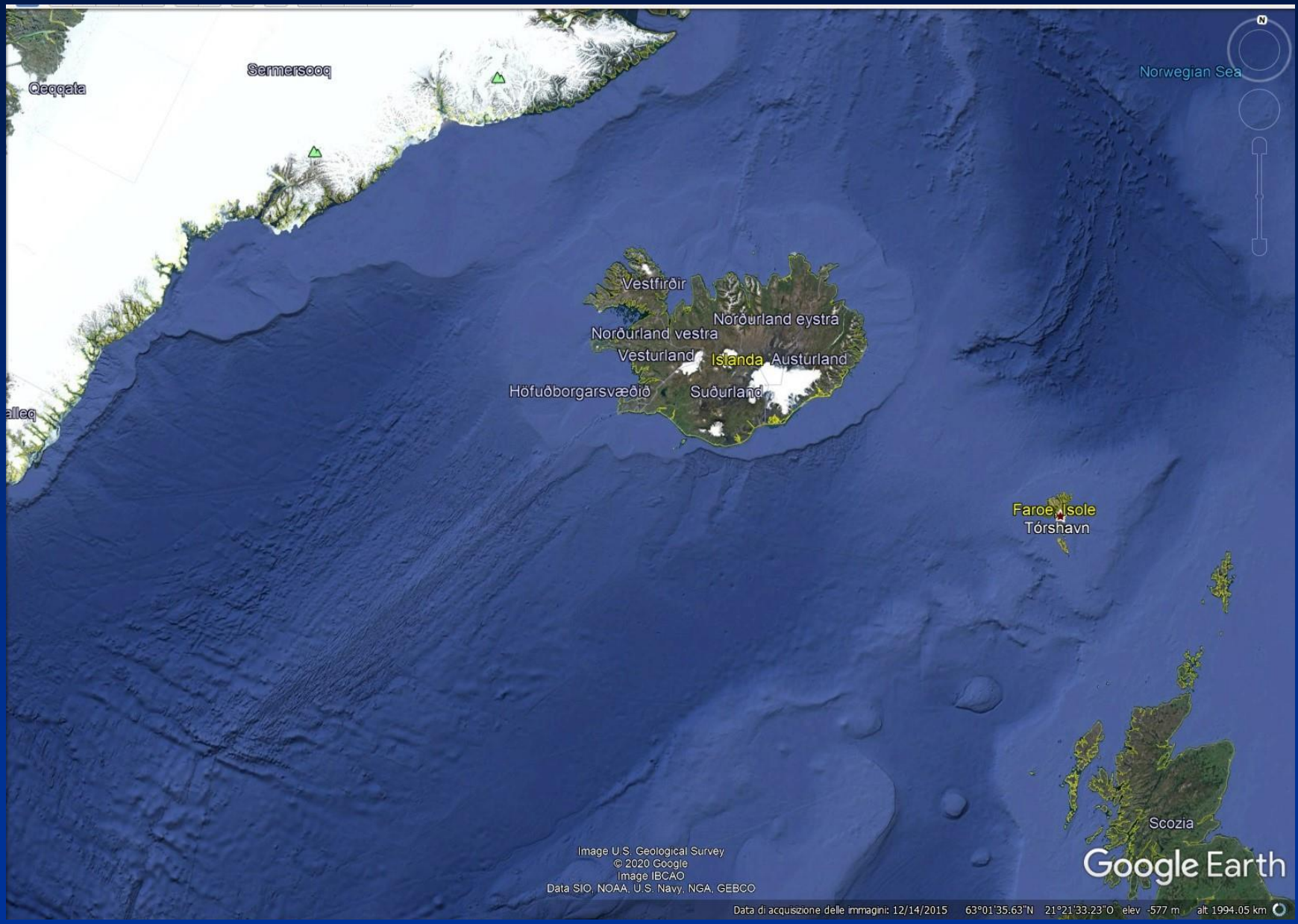

SW
NE
Cr
Ms
30 Ma
Ms
25–22 Ma
40
km
120
Ms
ASTHENOSPHERE
11 Ma

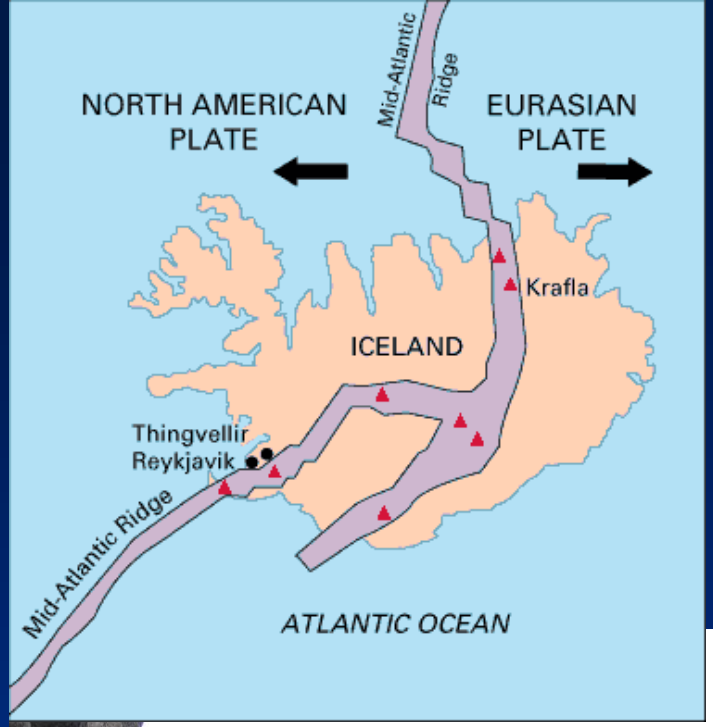


Da van der Pluijm & Marshak, 2004

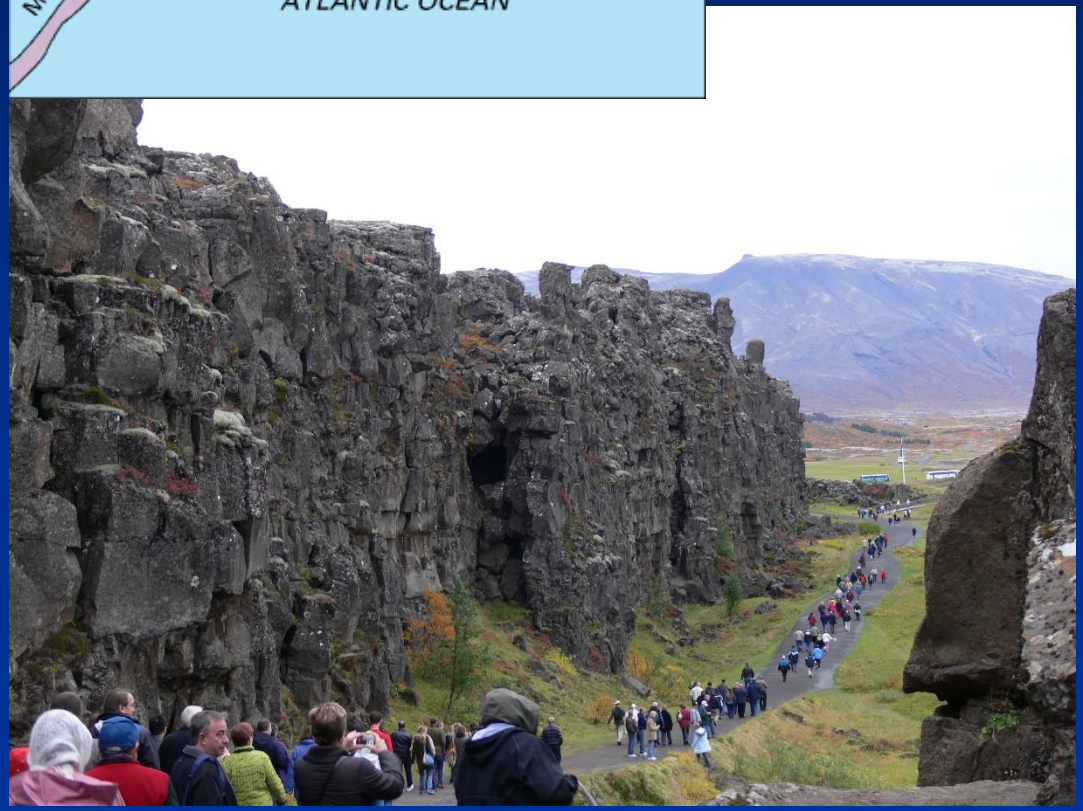


Da van der Pluijm & Marshak, 2004


Qeqqata
Sermersooq
Norwegian Sea
Vestfirðir
Norðurland eystra
Norðurland vestra
Vesturland
Ísland
Austurland
Höfuðborgarsvæðið
Suðurland
Faroe Isole
Tórshavn
Scozia
Image U.S. Geological Survey
© 2020 Google
Image IBCAO
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth
Data di acquisizione delle immagini: 12/14/2015 63°01'35.63"N 21°21'33.23"O elev -577 m alt 1994.05 km

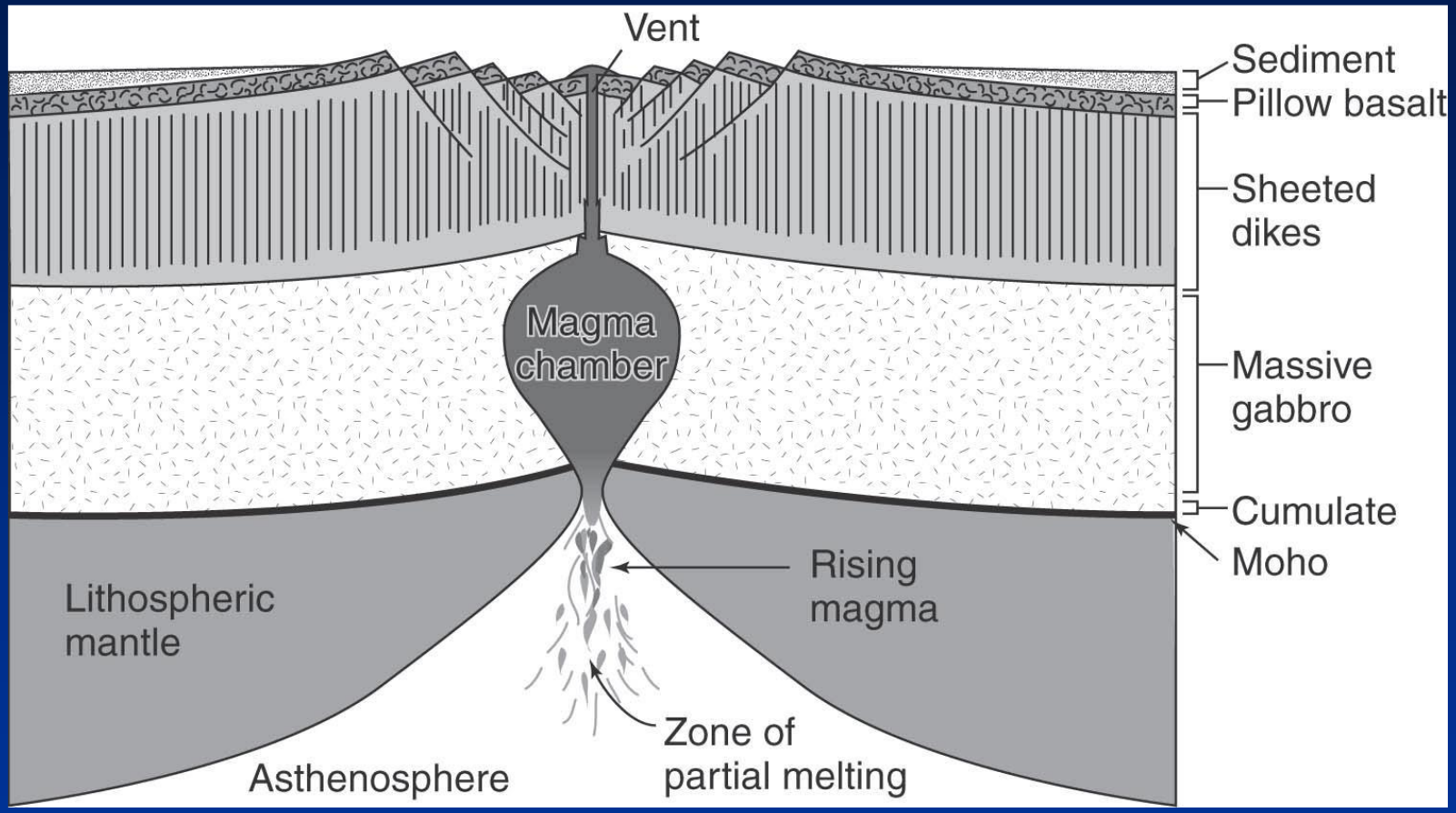


USGS: https://pubs.usgs.gov/gip/dynamic/understanding.html

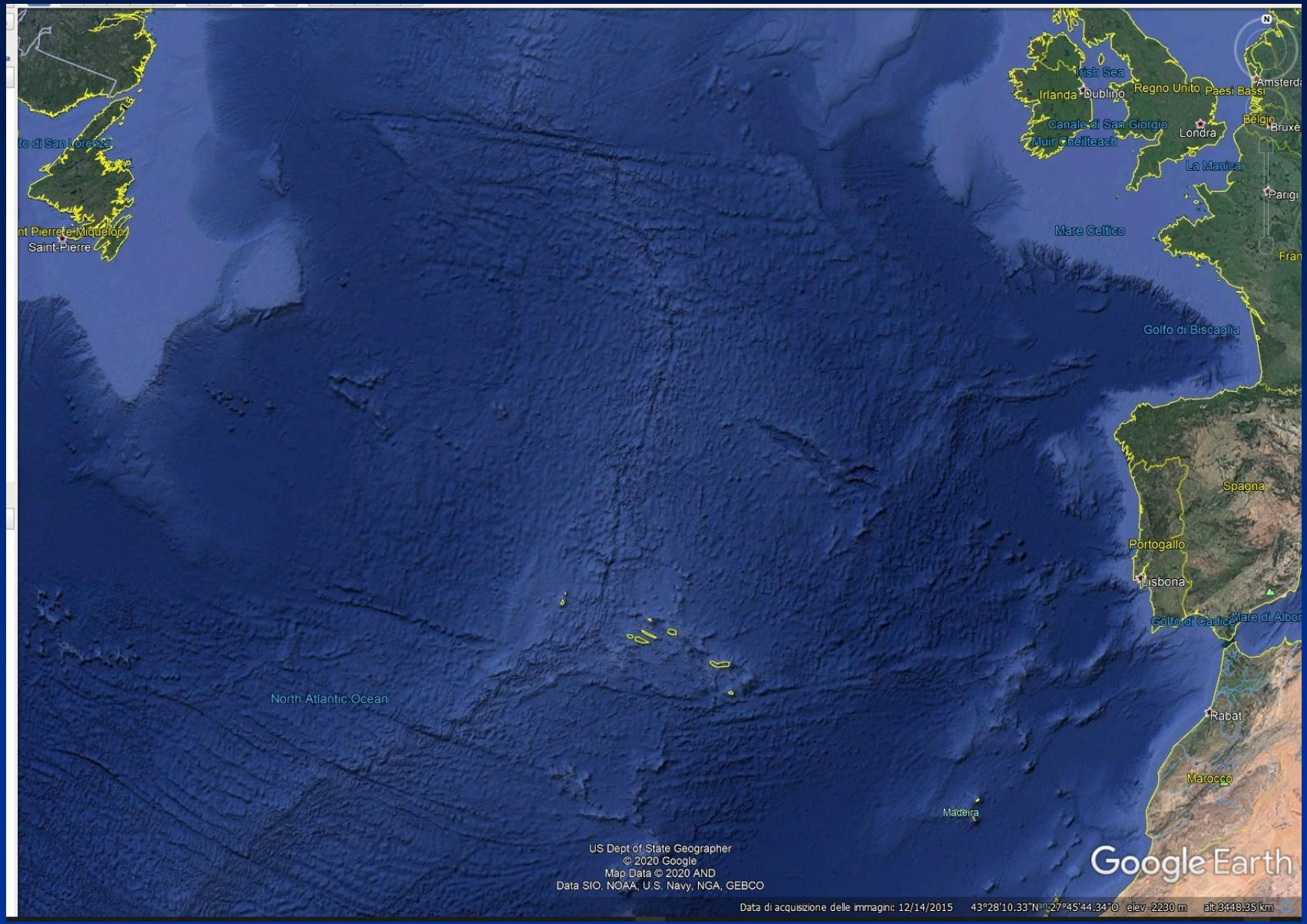


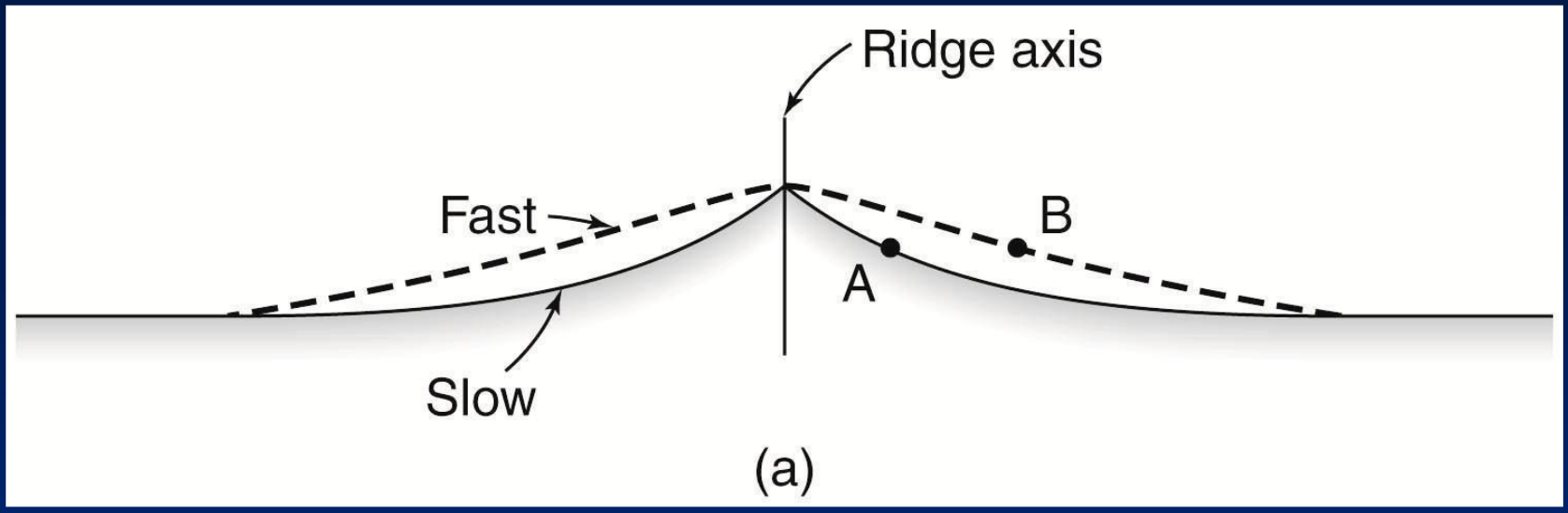
Thingvellir National Park, Iceland

https://commons.wikimedia.org/wiki/File:Iceland_mid_atlantic_ridge.JPG

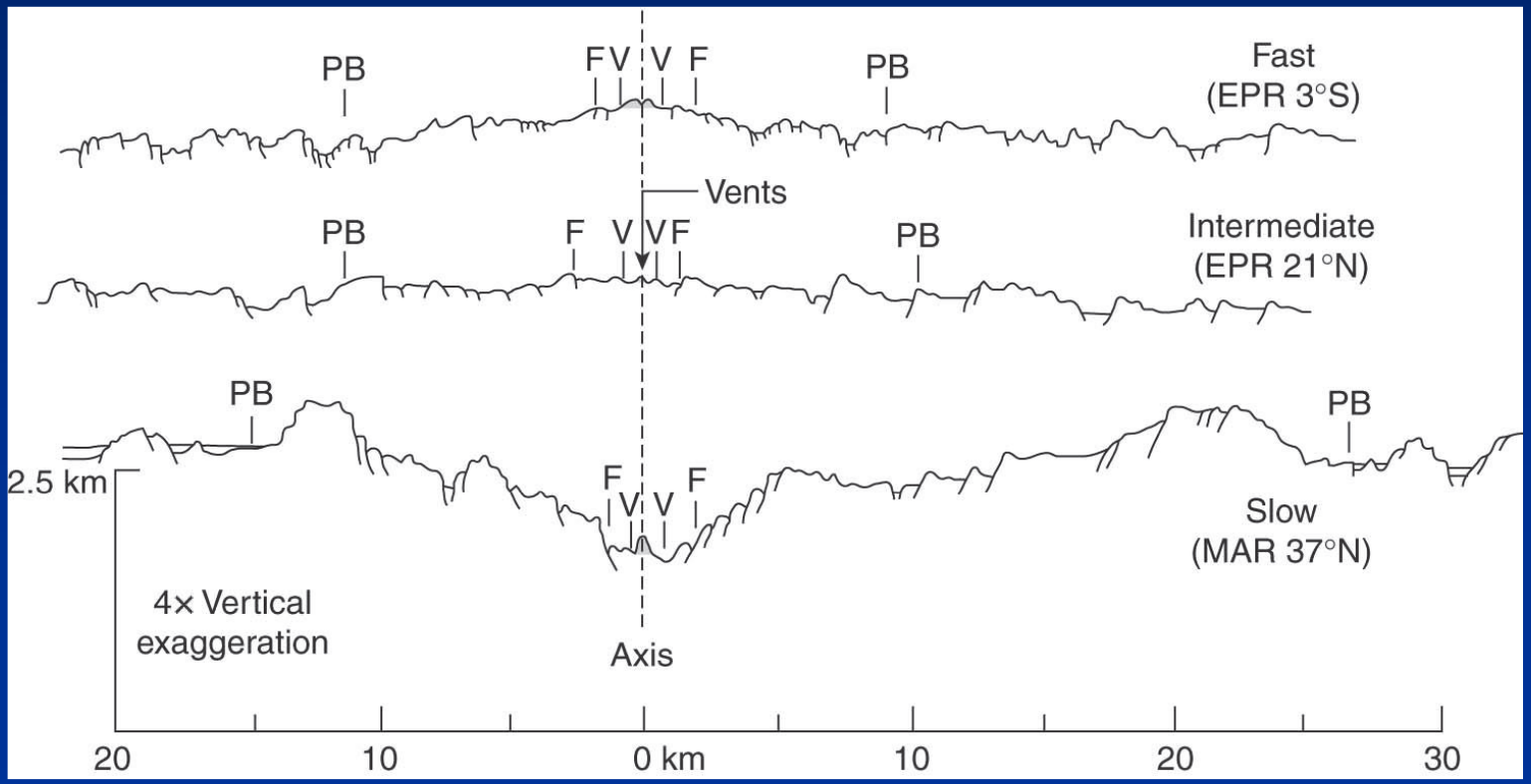


Da van der Pluijm & Marshak, 2004

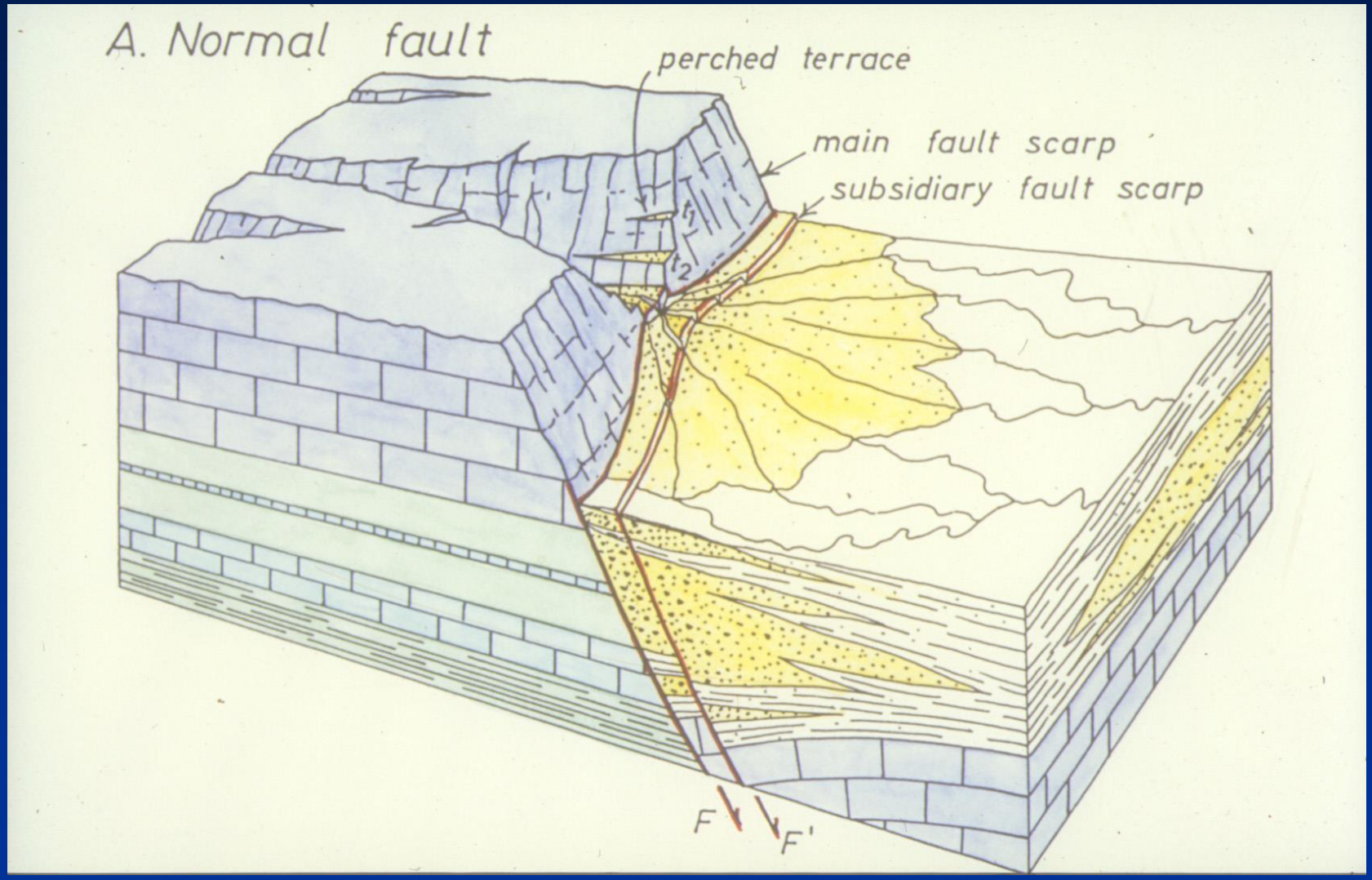

Irish Sea
Irlanda
Dublino
Regno Unito
Paesi Bassi
Amsterda
Canale di San Giorgio
Muir nEilleach
Londra
Belgio
Bruxe
La Manica
Parigi
Mare Celtico
Saint-Pierre
Golfo di Biscaglia
Spagna
Portogallo
Lisbona
Golfo di Cadice
North Atlantic Ocean
Rabat
Marocco
Madeira
US Dept of State Geographer
© 2020 Google
Map Data © 2020 AND
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth
Data di acquisizione delle immagini: 12/14/2015
43°28'10.33"N 27°45'44.34"O elev -2230 m alt 3448.35 km



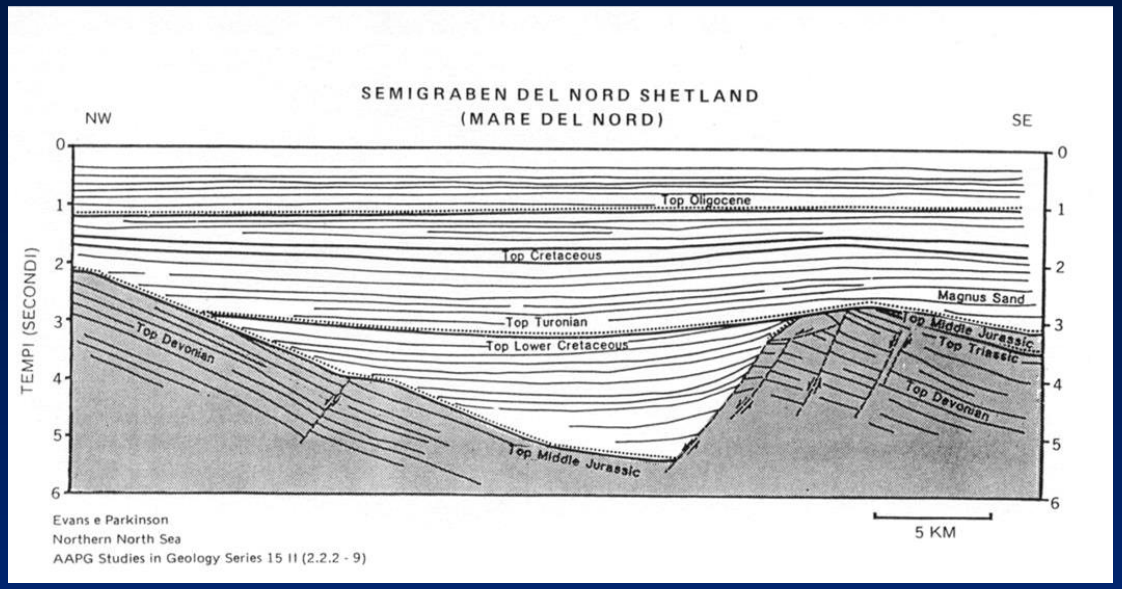
Da van der Pluijm & Marshak, 2004



Faglia normale associata ad erosione (letto) e deposizione (sul lembo di tetto). La forma del bacino sedimentario e la stratigrafia dei depositi è controllata dalla attività della faglia



Da Ramsay and Huber, 1987

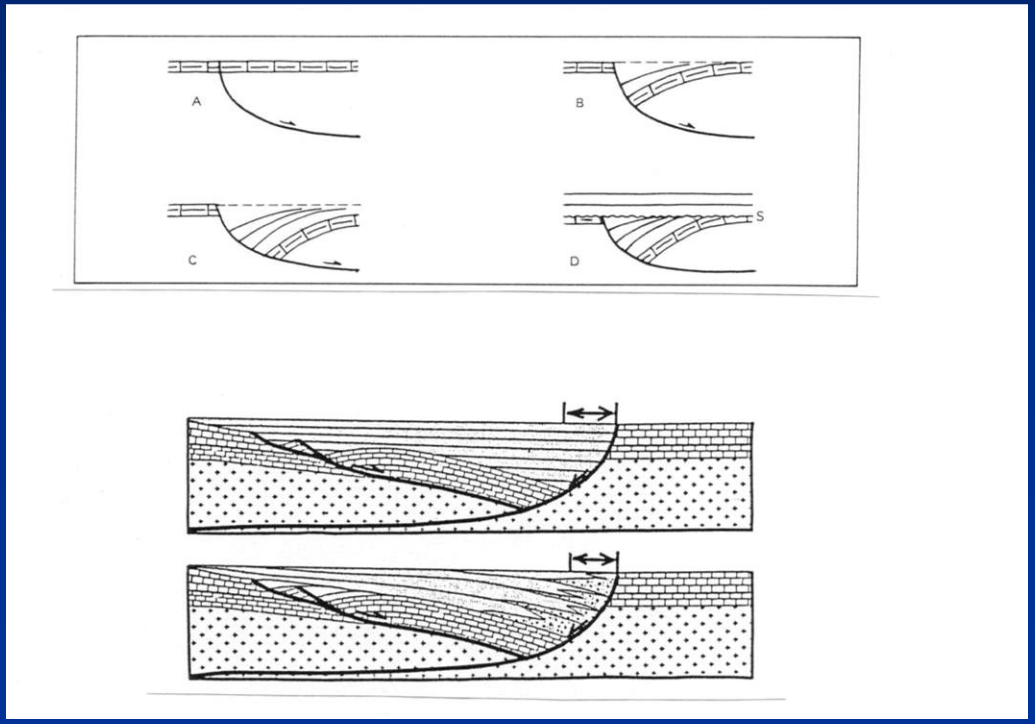


Da Bally et al., 1985

Velocità di attivazione della faglia elevata, basso tasso di sedimentazione

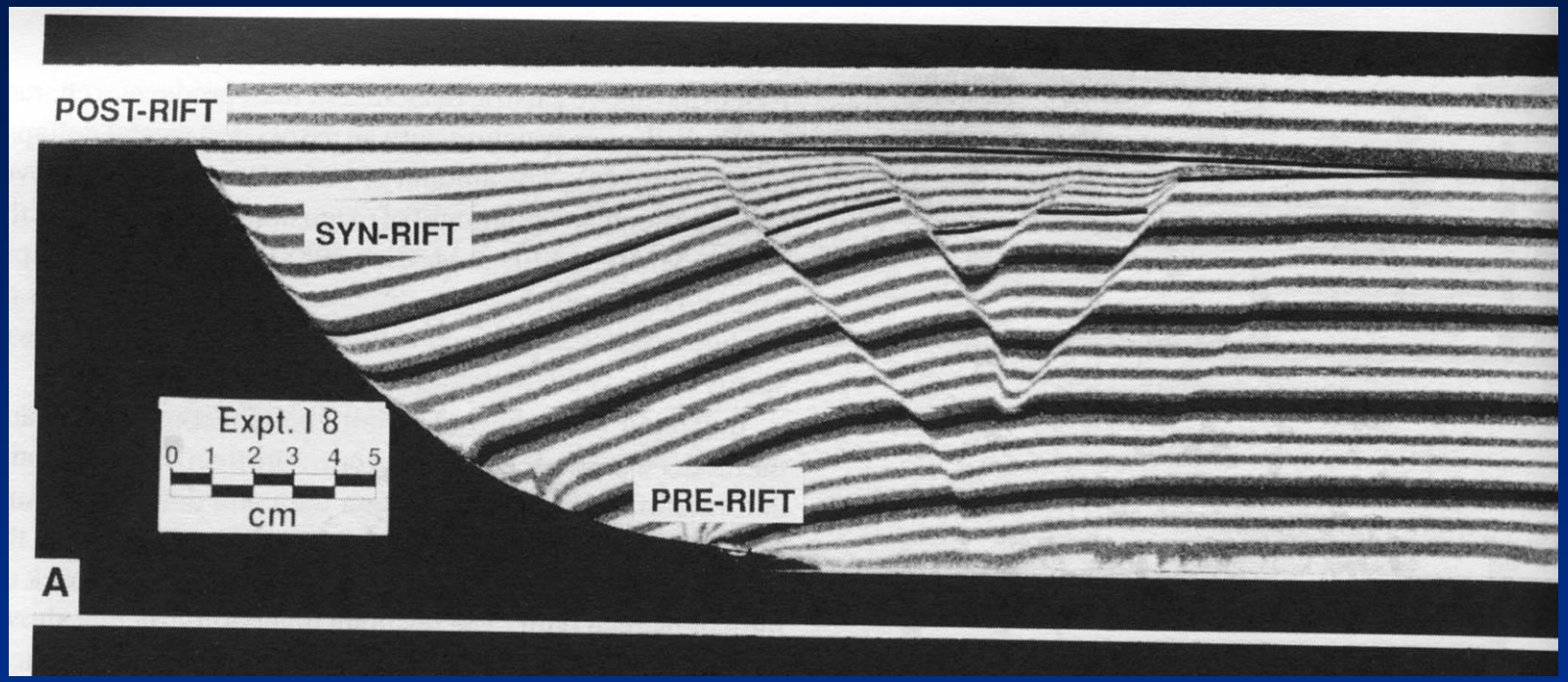
Tasso di sedimentazione elevato, movimento della faglia protratto nel tempo.

I due casi precedenti a confronto



Da Bally et al., 1985

Depositi di pre-, sin- e post-rift.



Da Buchanan & McClay, 1991