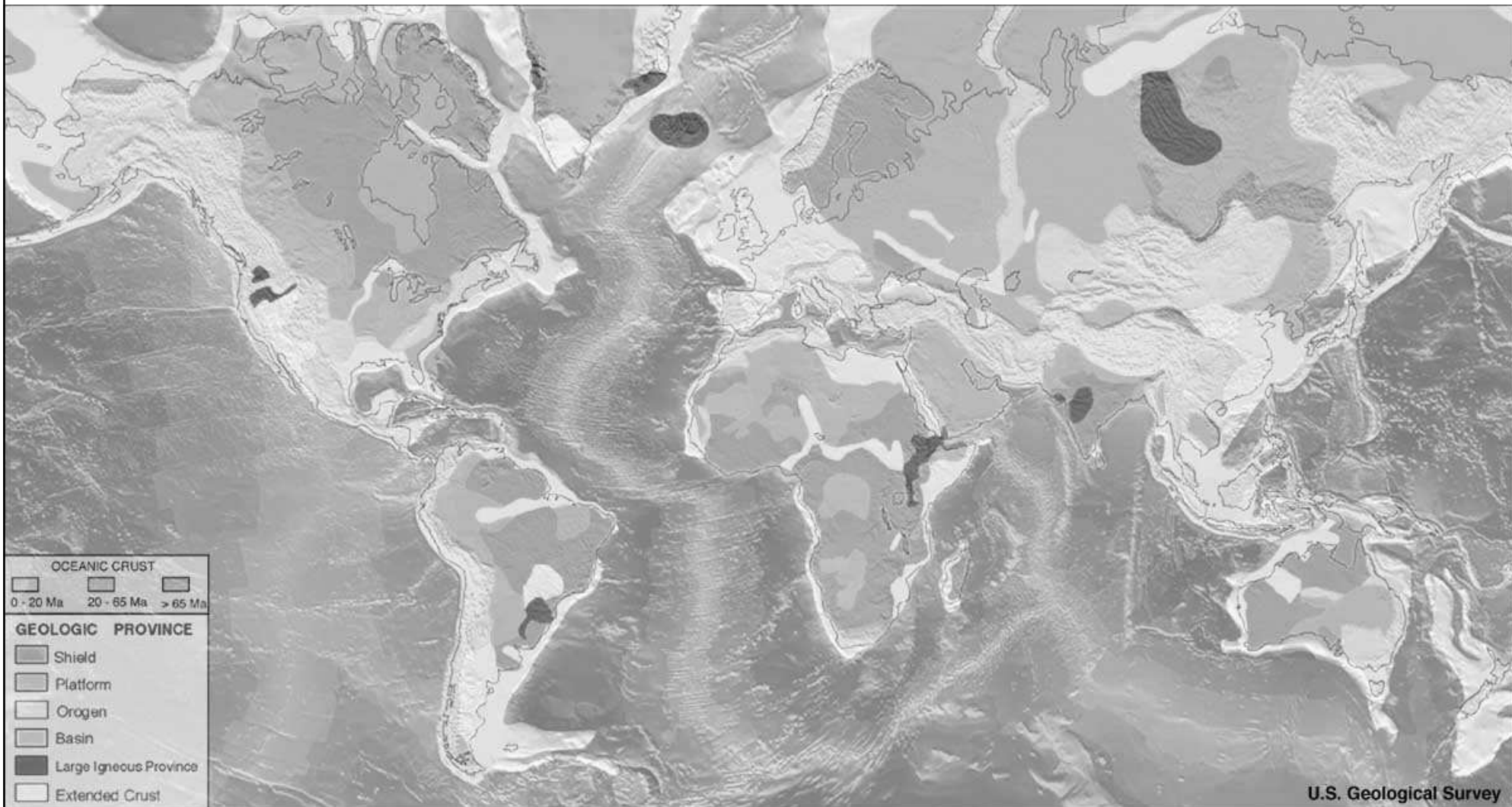


# Continental characteristics

- 30–70 km thick
- Granitic-andesitic composition
- 1/3 of Earth surface
- Complex structures
- Up to 4.0 Ga old

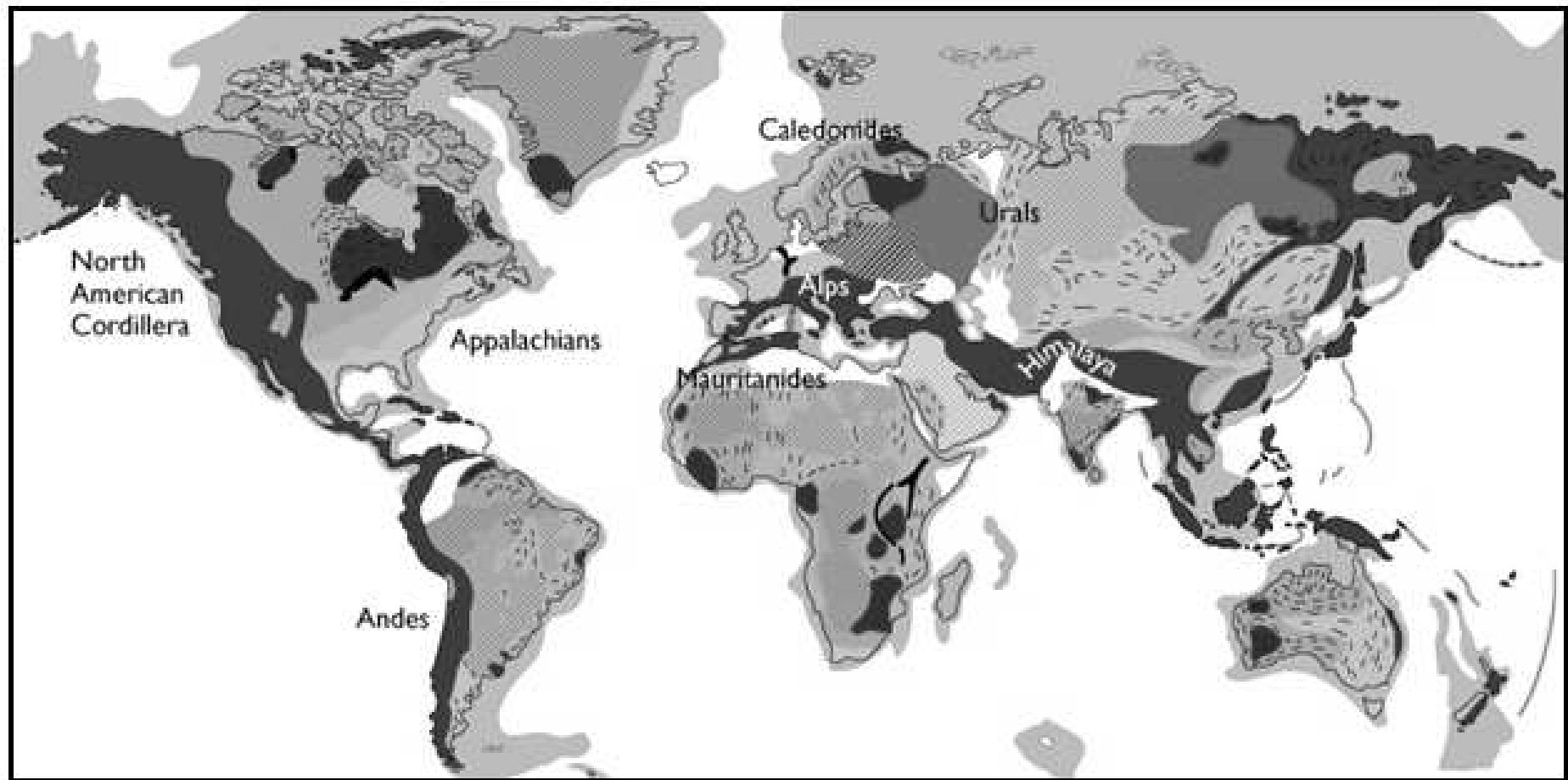
# Three basic structural components of continents

- Shields
- Stable platforms
- Folded mountain belts



U.S. Geological Survey

# Age of the Continental Crust



Time span (billions of years ago)



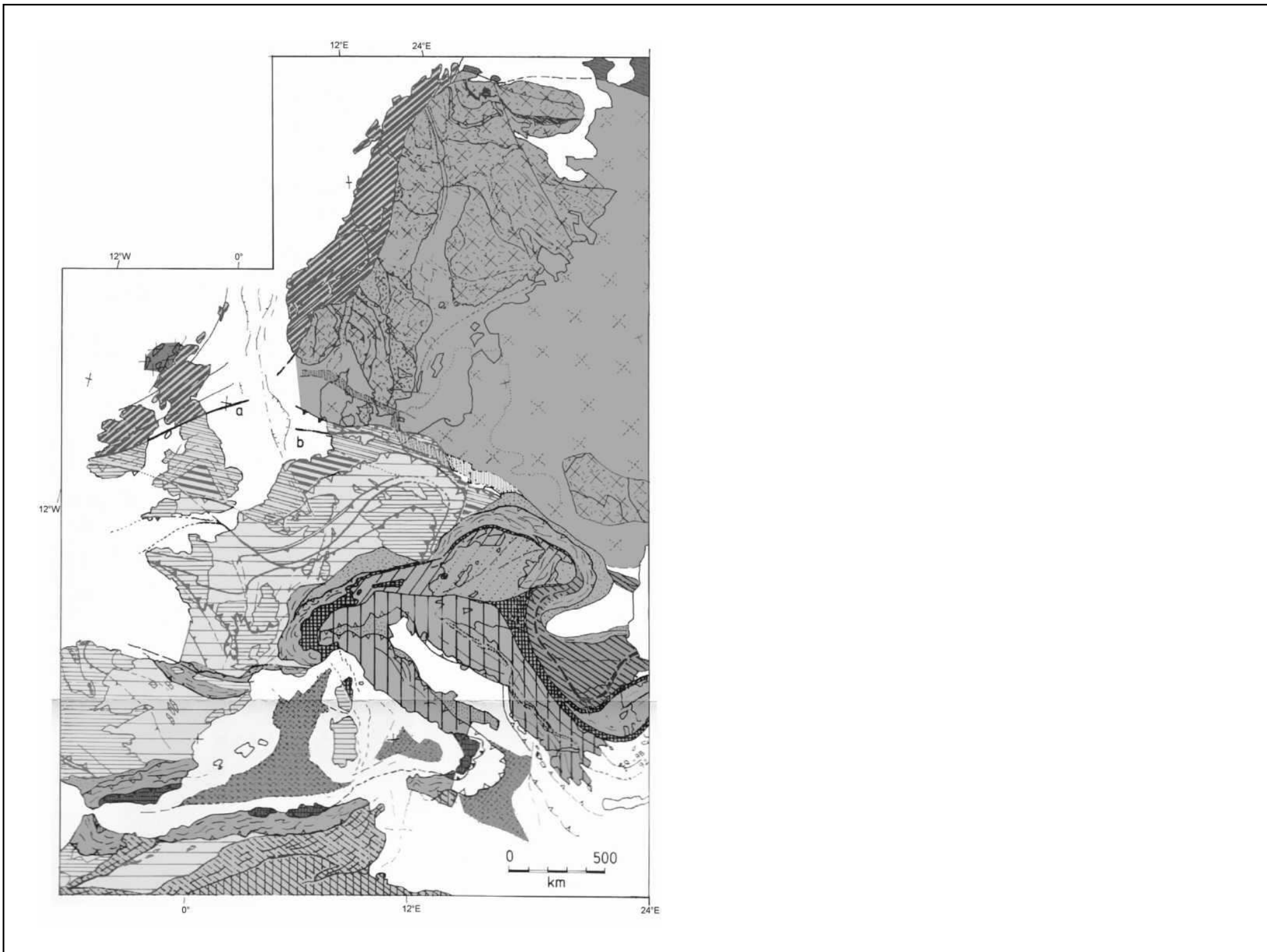
Blue areas mark continental crust  
beneath the ocean

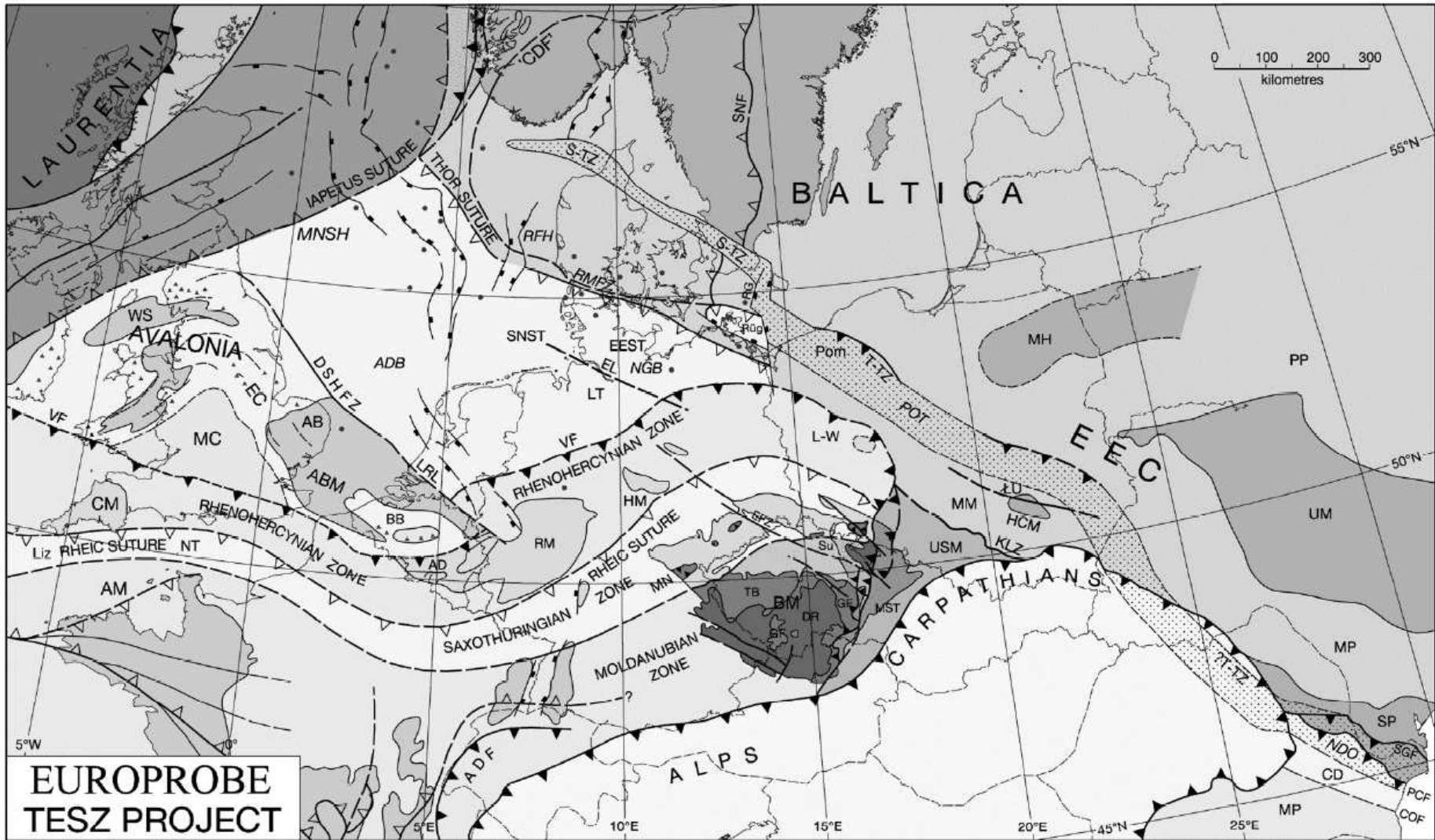
**Fig.21.2**



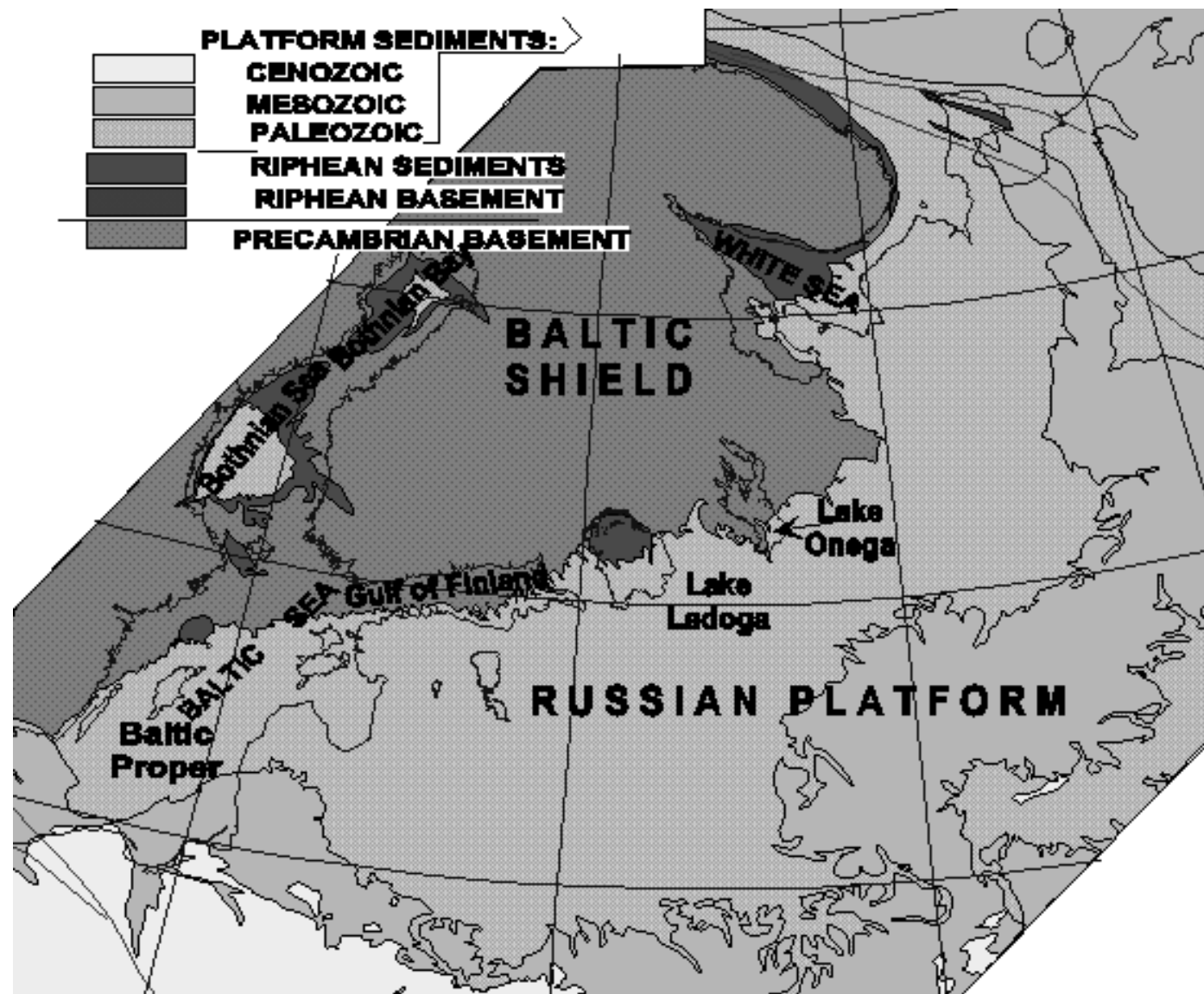
# SVEKALAPKO











## Východoevropský kraton se člení na

Fennoscandii – tvořena baltickým štítem a přilehlou platformou

Sarmatii

Volžsko.-uralskou oblast

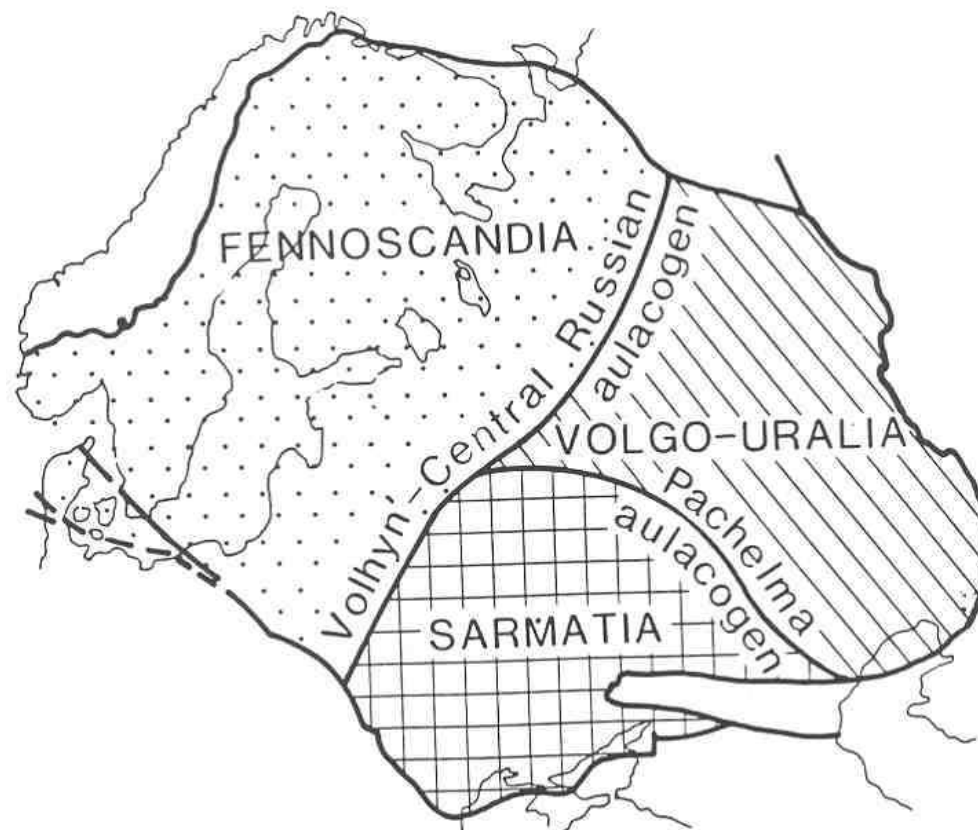


Fig. 2 Crustal segments of the East European Craton separated by Paleozoic rifts. Here, Fennoscandia applies to the Baltic Shield and its buried equivalent [Gorbatshev, 1993 #6].



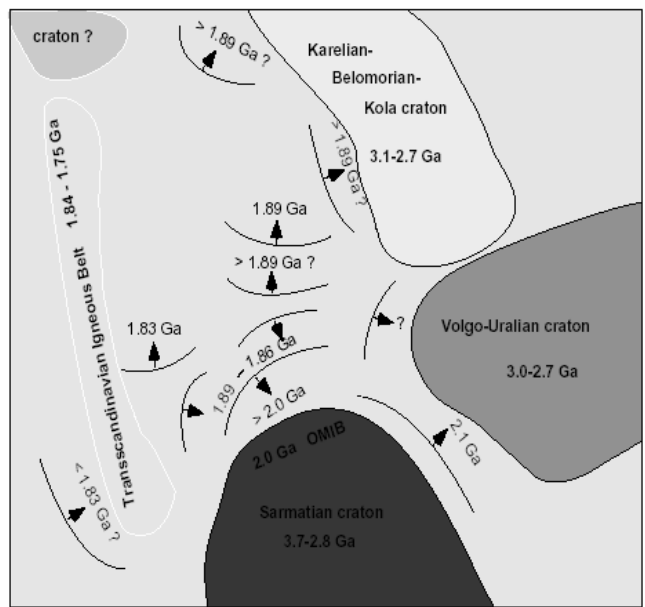
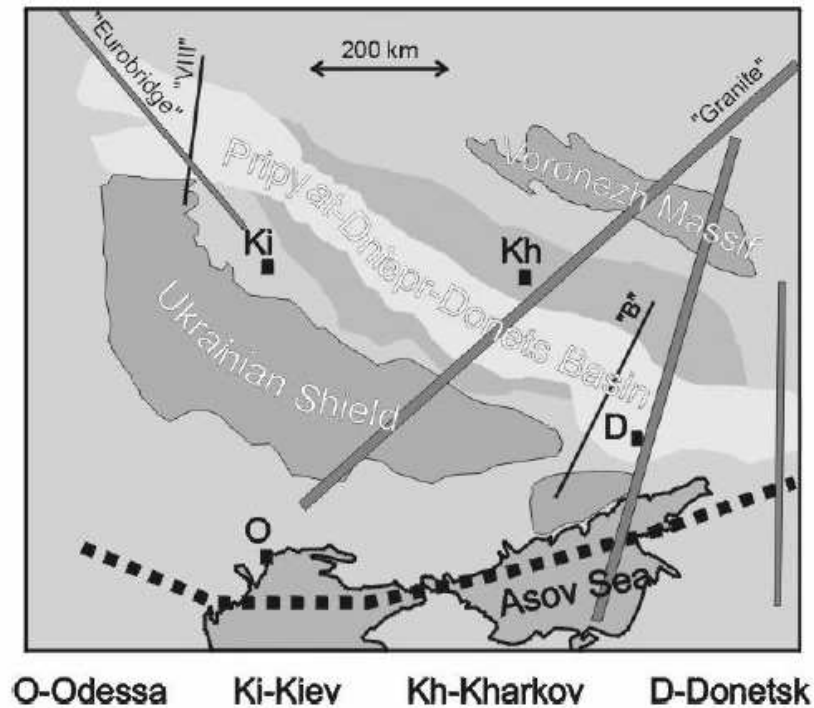


Figure 7.3: Sketch showing the axes of Svecofennian magmatic arcs and the times of Palaeoproterozoic accretion in the western part of the East-European Craton.

# Hlavní povrchové výchozy prekambria v Sarmatii



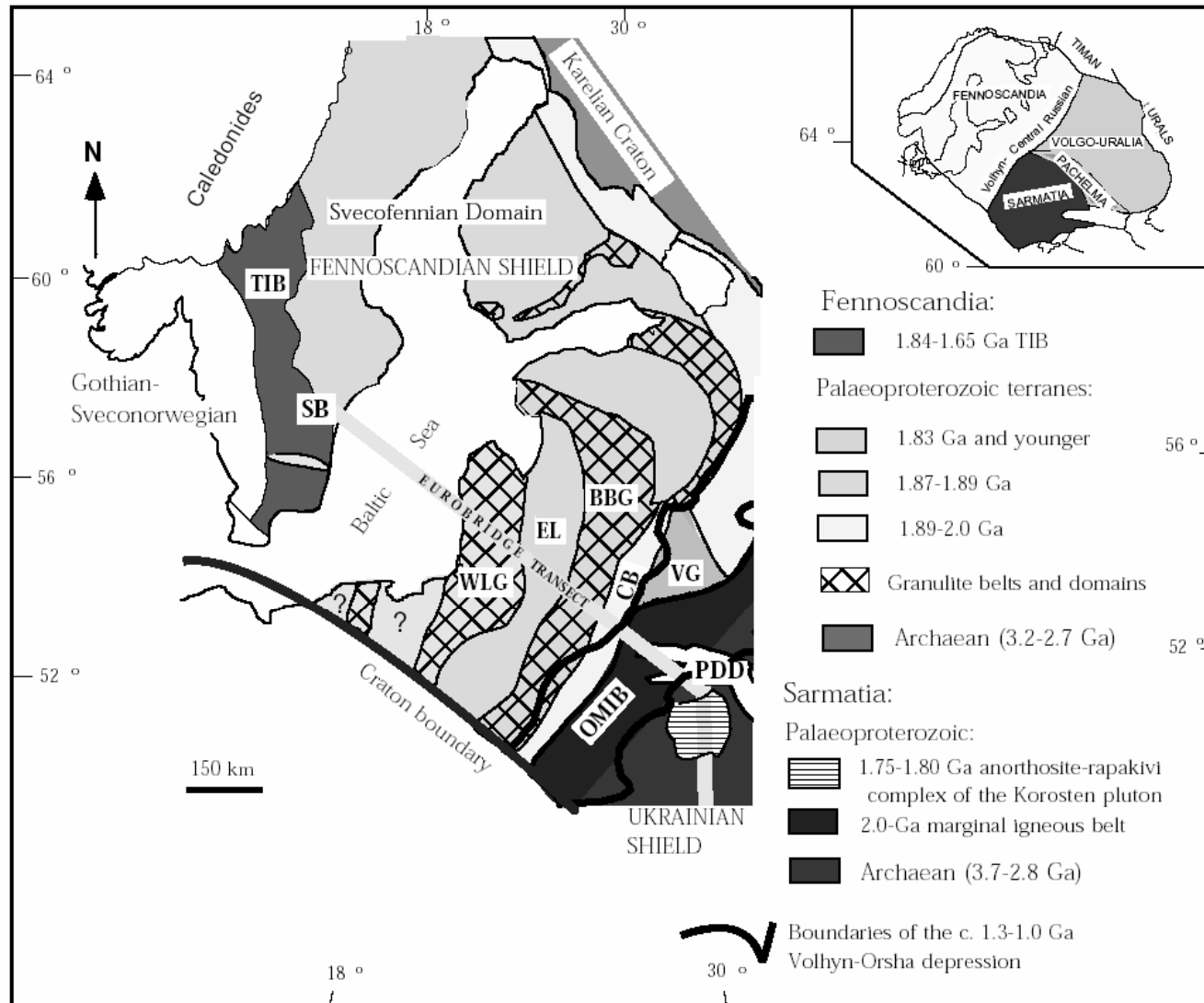


Figure 7.2a: Schematic map of the crustal structure in the EUROBRIDGE transect region (modified from Bogdanova et al., 1994, 1996). Letters are: BBG- Belarussian-Baltic Granulite Belt, CB- Central Belarussian Belt, EL- East Lithuanian-Latvian Belt, OMIB- Osnitsk-Mikashevichi Igneous Belt, PDD- Pripyat-Dniepr-Donets Palaeozoic Palaeozoic Aulacogen, SB- South Baltic Domain, TIB- Transscandinavian Igneous Belt, VG- Vitebsk Granulite domain, WLG- West Lithuanian Granulite domain. The three-segment subdivision of the East-European Craton (inset) is according to Bogdanova et al. (1996).

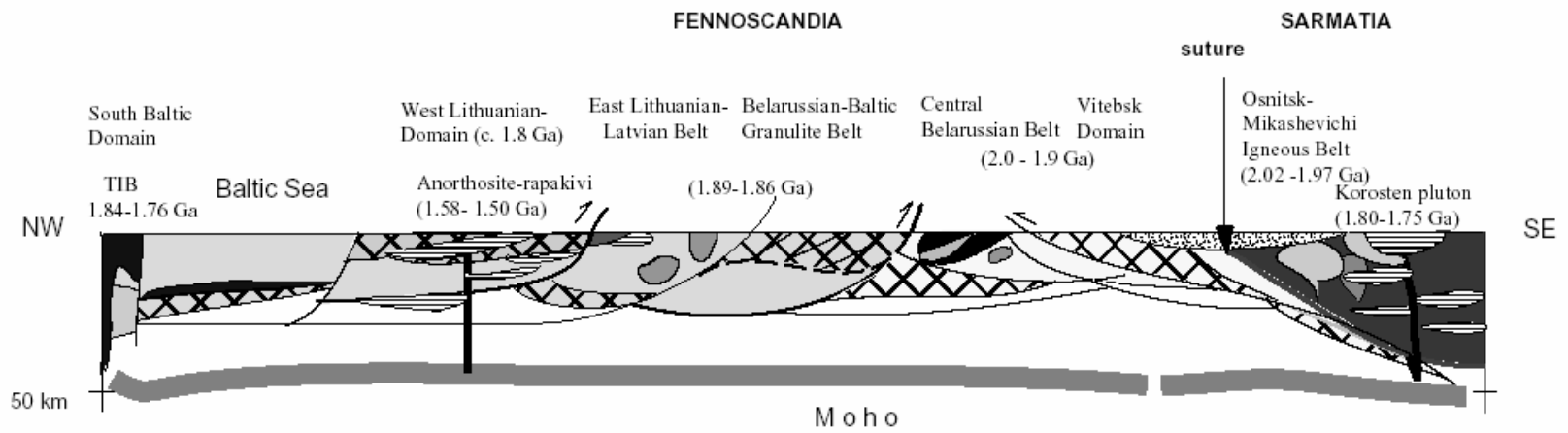


Figure 7.2b: Schematic profile of the crust along the EUROBRIDGE transect. The colours and symbols are the same as in Fig. 7.2a with some additions showing rapakivi-anorthositic intrusions in the western part of the transect (black-white stripes), intrusions of gabbro (light blue) in the East Lithuanian-Latvian Belt, the Okolovo volcanic unit in the Central Belarussian Belt (black), calc-alkaline intrusions in the Osnitsk-Mikashevichi Belt (green) and the sedimentary rocks of the Volhyn-Orsha depression (white dotted).

# Členění baltického štítu

Kolská provincie – **murmaňský blok a blok Sörvaranger - Kola**

Belomorská provincie – **belomorský blok a blok Inari**

Karelská provincie - **tvořena bloky Pudasjärvi, Iilsami a Kuhmo**

Sfekofenská provincie – **vulkanická severosfekofenská, centrální sfekofenská,  
vulkanická jihosfekofenská**

Sfekonorwegská provincie – **značně provrásněné a metamorfované horniny**



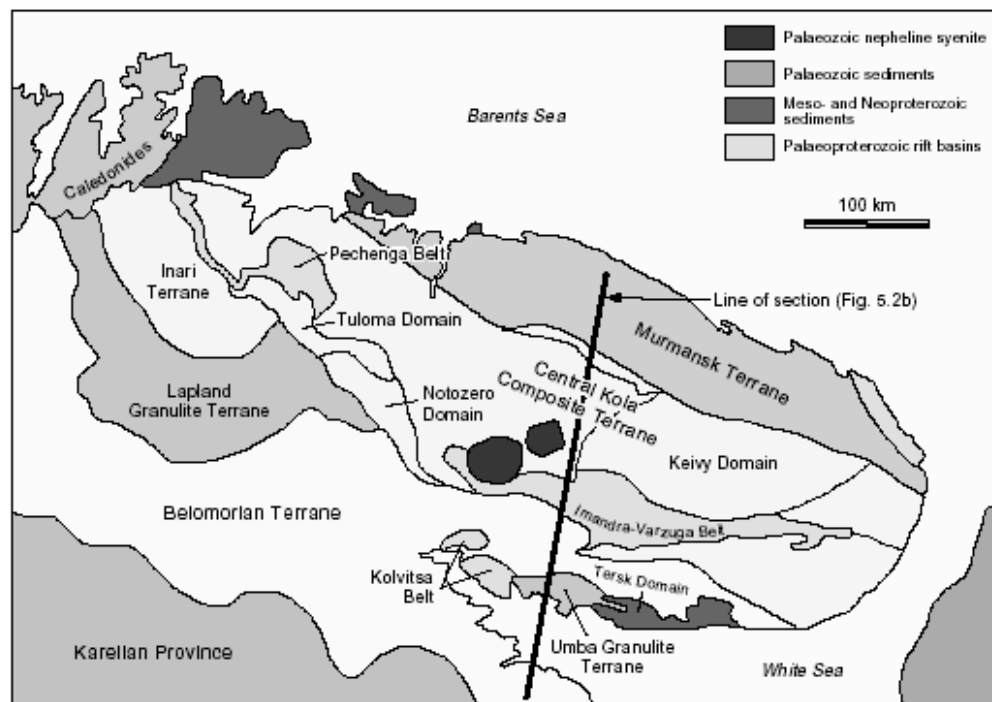


Figure 5.2a: Tectonostratigraphic terranes in the Lapland-Kola Orogen from Balagansky and Glaznev (pers. comm. 1994) and incorporating data from Marker (in Biundell et al., 1992).

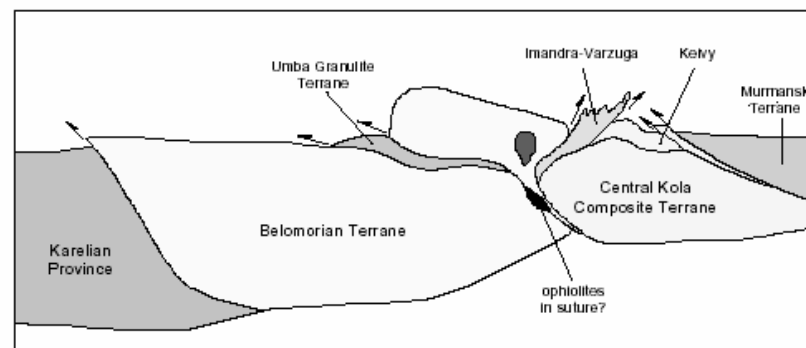


Figure 5.2b: Schematic cross-section along the line shown in Fig. 5.2a. Based on Marker (pers. comm., 1994) and Balagansky (pers. comm., 1994).

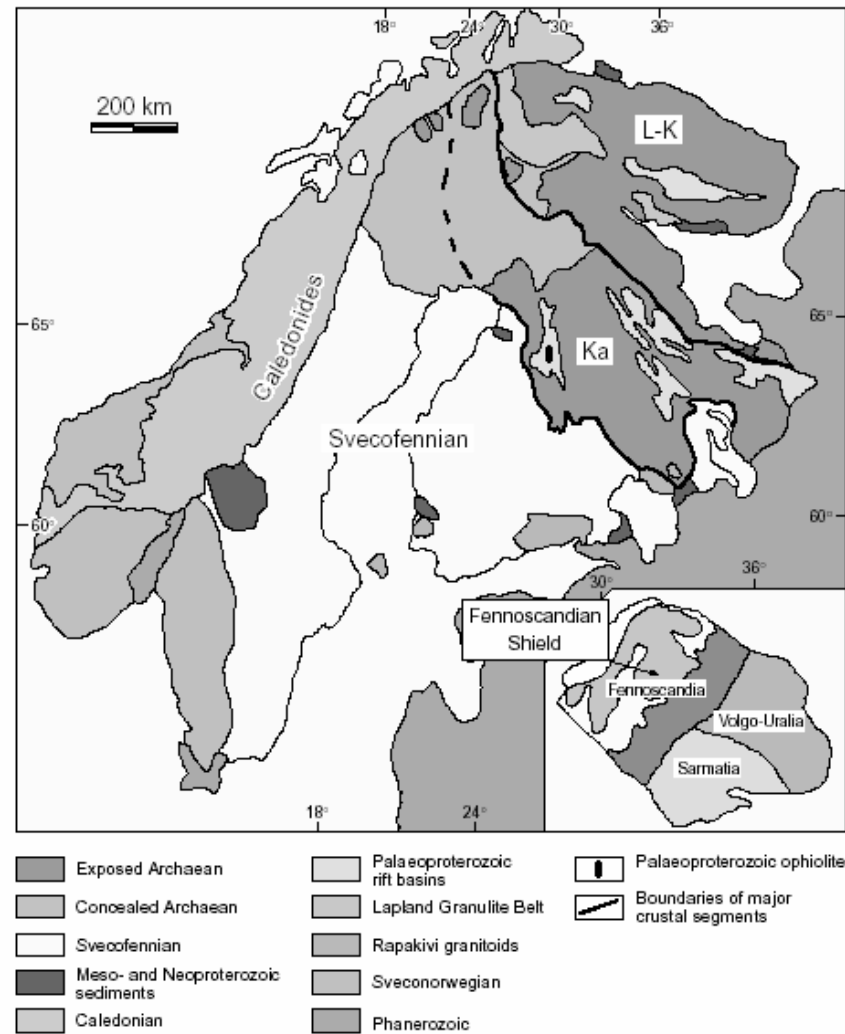


Figure 5.1: Simplified geological map of the Baltic Shield and surroundings (modified from Boyd et al., 1985 and Öhlander et al., in Gorbatshev, 1993; inset showing the subdivision of the East-European Craton from Gorbatshev and Bogdanova, in Gorbatshev, 1993). Generalized tectonic boundaries between the Lapland-Kola Orogen (L-K) and the Karelian Province (Ka) and between the latter and the Svecofennian Orogen are shown as heavy lines, dashed to indicate greater uncertainty. Proterozoic rift basins are omitted in the region labelled 'concealed Archaean'.

|                   |          |   |
|-------------------|----------|---|
| Saamská orogeneze | cca 3 Ga | kolize svekobaltského(SVK)<br>a karelského kontinentu(KK) |
|-------------------|----------|---|

|                            |        |                               |
|----------------------------|--------|-------------------------------|
| Kuhmo-belomorská orogeneze | 2,8 Ga | Wilsonův cyklus mezi SVK a KK |
|----------------------------|--------|-------------------------------|

|                        |        |                                     |
|------------------------|--------|-------------------------------------|
| Sfekobaltská orogeneze | 2,2 Ga | další Wilsonův cyklus mezi SVK a KK |
|------------------------|--------|-------------------------------------|

|                       |        |                                     |
|-----------------------|--------|-------------------------------------|
| Sfekofenská orogeneze | 2,0 Ga | další Wilsonův cyklus mezi SVK a KK |
|-----------------------|--------|-------------------------------------|

|                  |         |   |
|------------------|---------|---|
| Gotská orogeneze | 1,7-1,5 | ?? Akrece oblouků, mikrokontinentu,<br>Amazonie |
|------------------|---------|---|

|                          |     |                    |
|--------------------------|-----|--------------------|
| Sfekonorvegská orogeneze | 1,0 | kolize s Laurentii |
|--------------------------|-----|--------------------|

## Saamská orogeneze

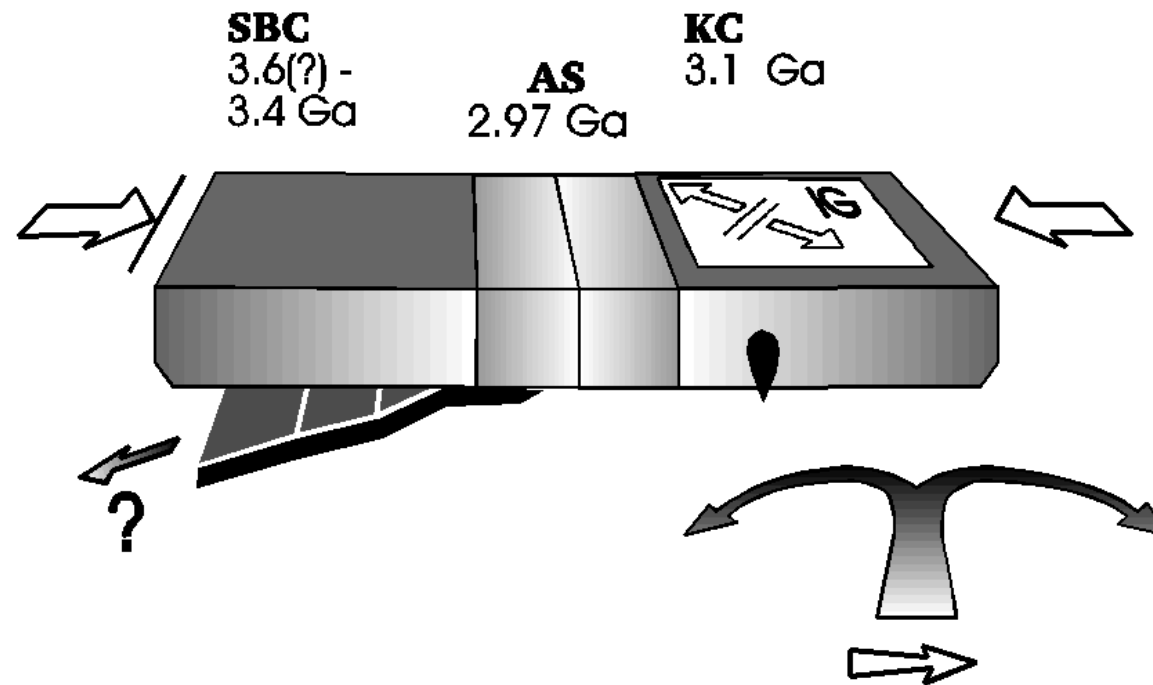


Fig. 2. Closing stage of the Archaean sea (AS; ca. 2.97 Ga). KC = Karelian continent and SBC = Svecobaltian continent. IG = intracontinental rifting and greenstone volcanism.

## Počáteční stadium kuhmo-belomorské orogenetického cyklu

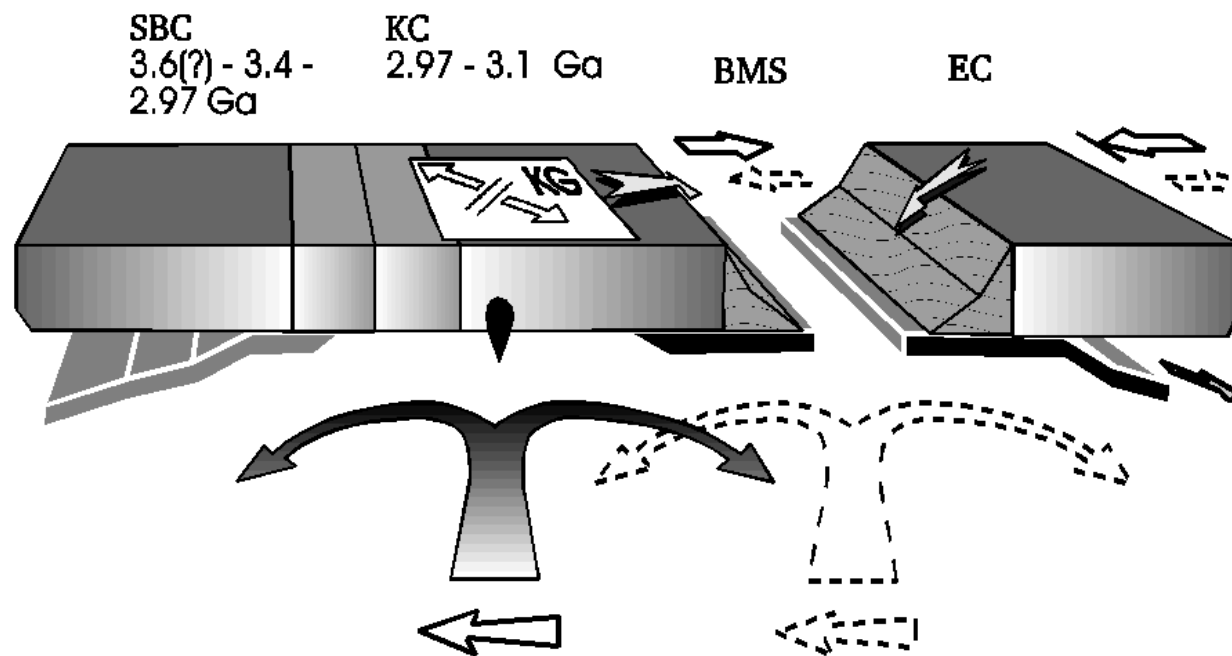


Fig. 3. Initial stage of Kuhmoan orogeny. Rifting of Karelian continent and intrusion of Kuhmo Greenstones (KG; ca. 2.79 Ga). The Belomorian sea (BMS) has begun to close, with convergence against the 'Eastern continent' (EC).

# Kuhmo-belomorská orogeneze

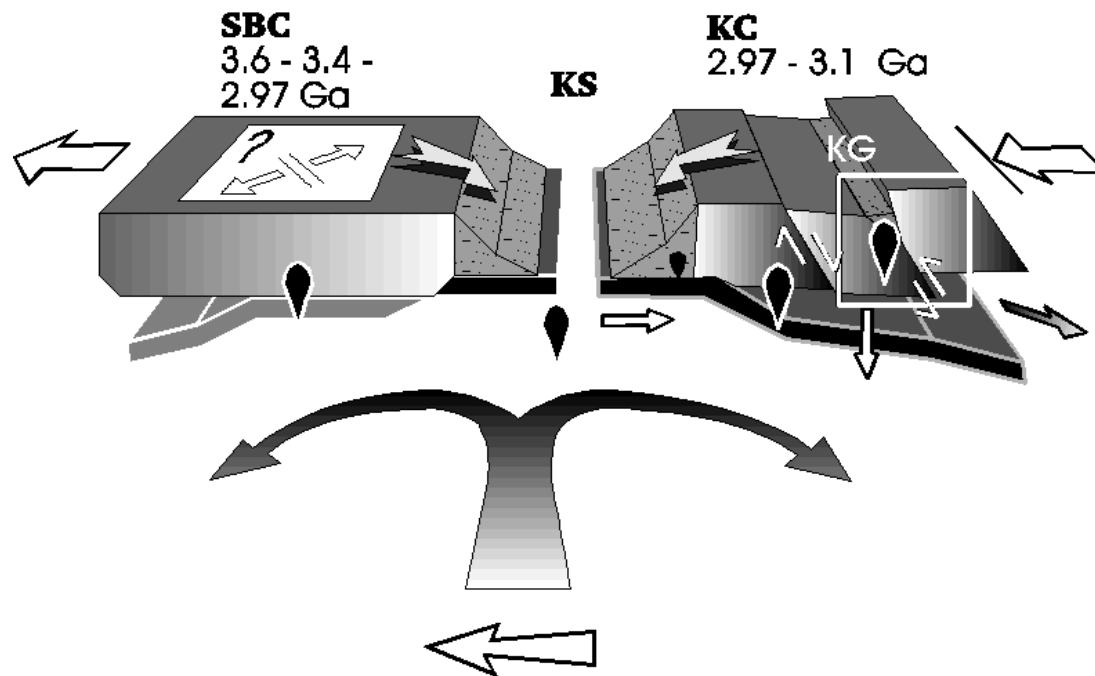


Fig. 4. Opening and subduction stage of the Karelian sea (KS), with compression and thrust faults in Karelian continent (ca. 2.74 - 2.7 Ga). The framed part of the figure has been adopted from Luukkonen (1992). The nearly simultaneous closing and collision stages of the Belomorian orogeny have been omitted from this figure.

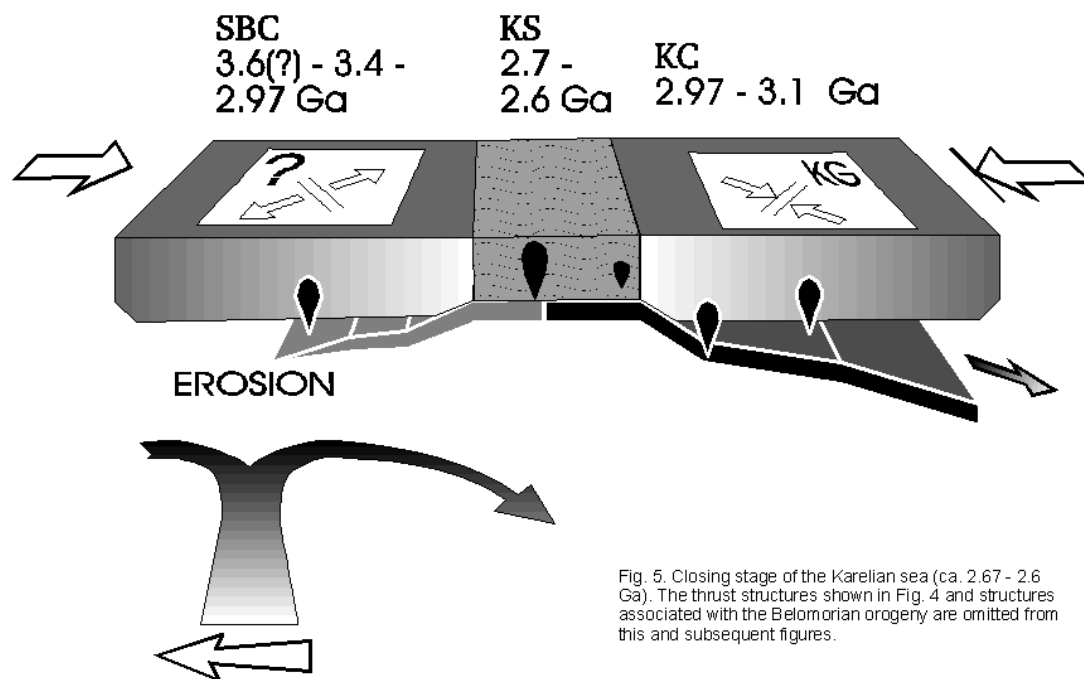


Fig. 5. Closing stage of the Karelian sea (ca. 2.67 - 2.6 Ga). The thrust structures shown in Fig. 4 and structures associated with the Belomorian orogeny are omitted from this and subsequent figures.

## Začátek svekobaltského orogenetického cyklu

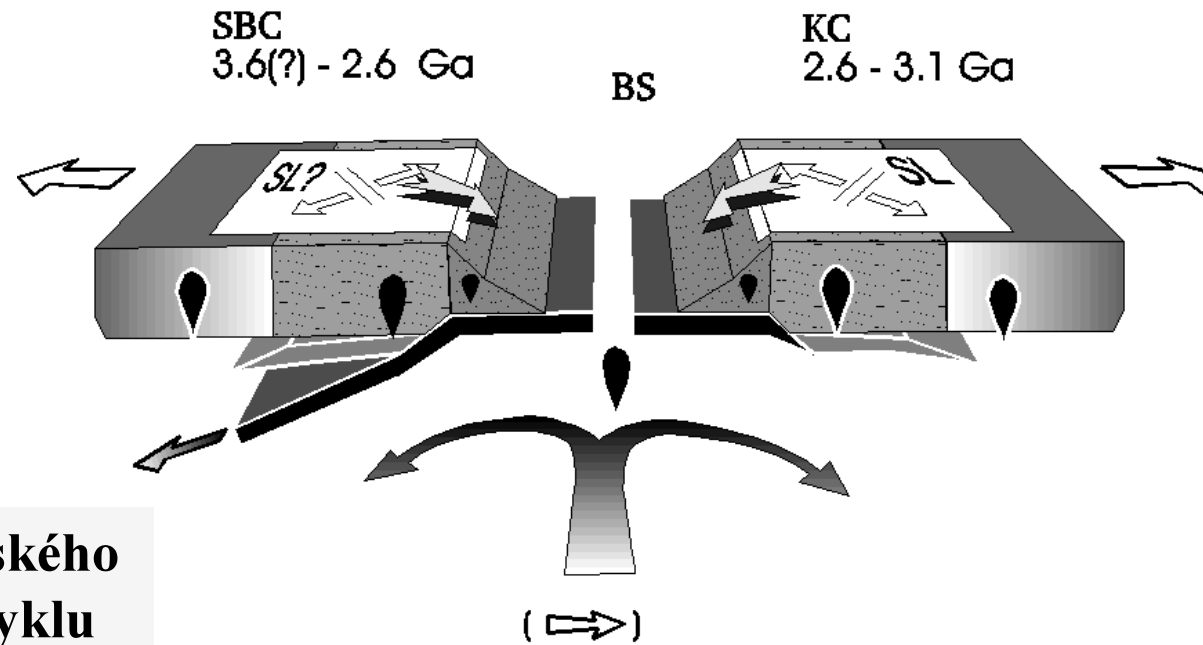


Fig. 6a. Opening stage of the Baltian sea (BS), intrusion of Karjalitic sills (SL), initiation of subduction (ca. 2.2 - 2.15 Ga).

ca. 2.2 Ga

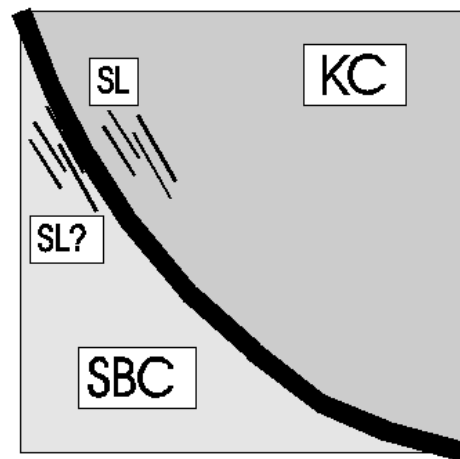


Fig. 6b. Plan view of the breakup of the Sveco-baltian - Karelian continent (SBC and KC). Intrusion of Karjalitic sills (SL). The thick line refers to the boundary between convection cells.

ca. 2.15 Ga

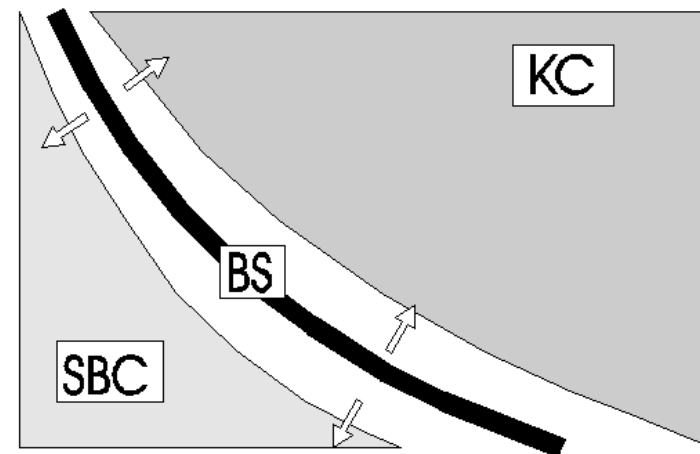
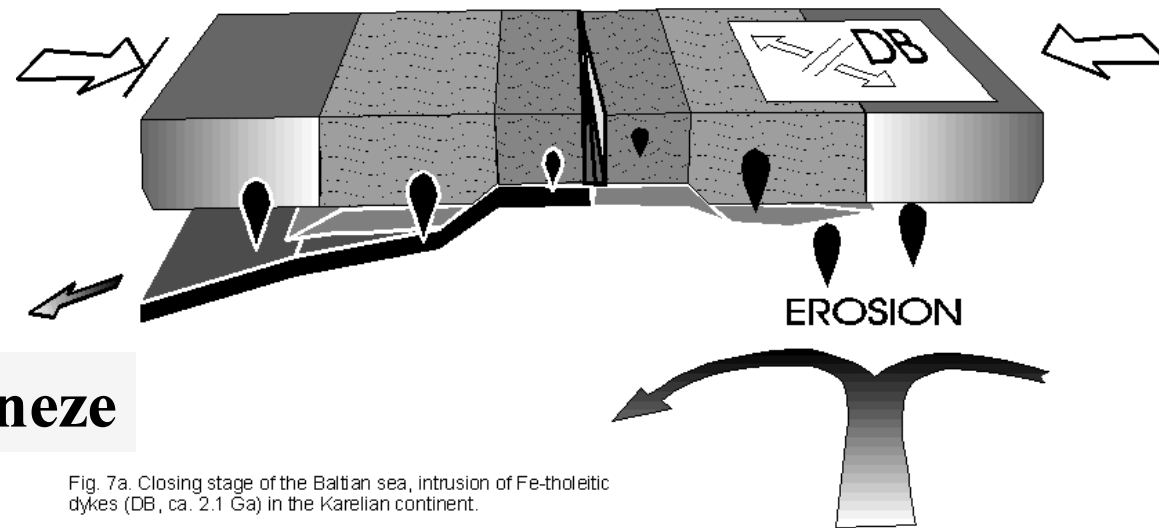


Fig. 6c. Plan view of the opening of the Baltian sea (BS).

SBC  
3.6(?) - 2.6 Ga

BS  
2.1 -  
2.0 Ga

KC  
2.6 - 3.1 Ga



## Svekobaltská orogeneze

Fig. 7a. Closing stage of the Baltian sea, intrusion of Fe-tholeiitic dykes (DB, ca. 2.1 Ga) in the Karelian continent.

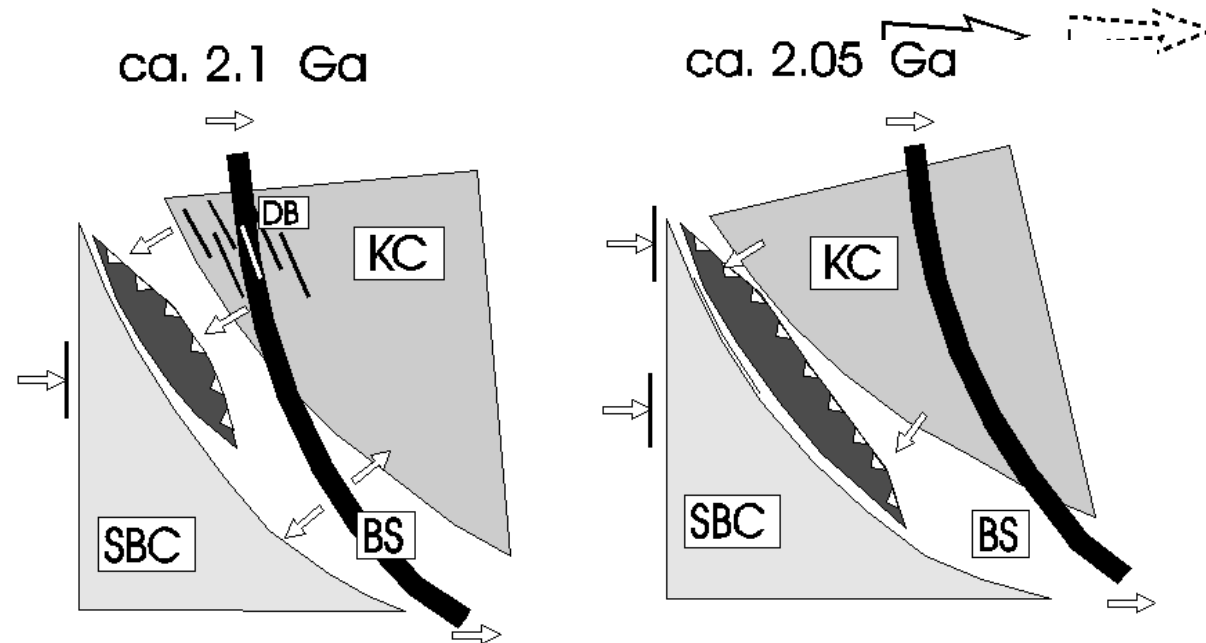


Fig. 7b-7c. Plan view of the closing stage of the Baltian sea. Intrusion of Fe-tholeiitic dykes (DB). Subduction under Svecobaltian continent. Convection cells move beneath and behind the Karelian continent.



SBC  
3.6(?) - 2.6 Ga

BS  
2.1 -  
2.0 Ga

KC  
2.6 - 3.1 Ga

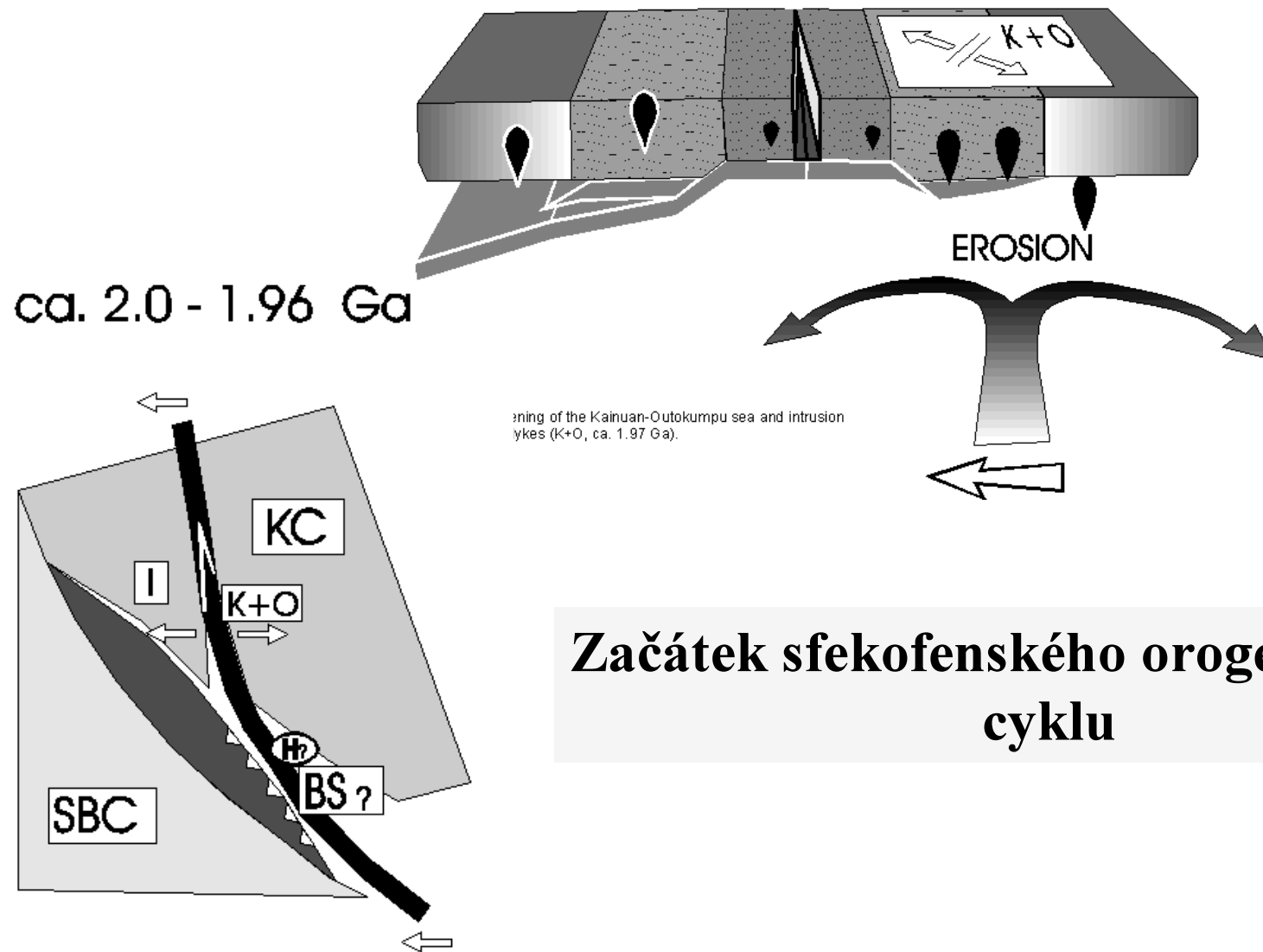


Fig. 8b. Divergent convection cells evolve or move beneath the Karelían continent. Intracontinental rifting and opening of the Kainuan-Outokumpu sea (K+O). Separation of Iisalmi block (I). Formation of the Haverí seamount (H).

# Otevírání Svekofenského moře

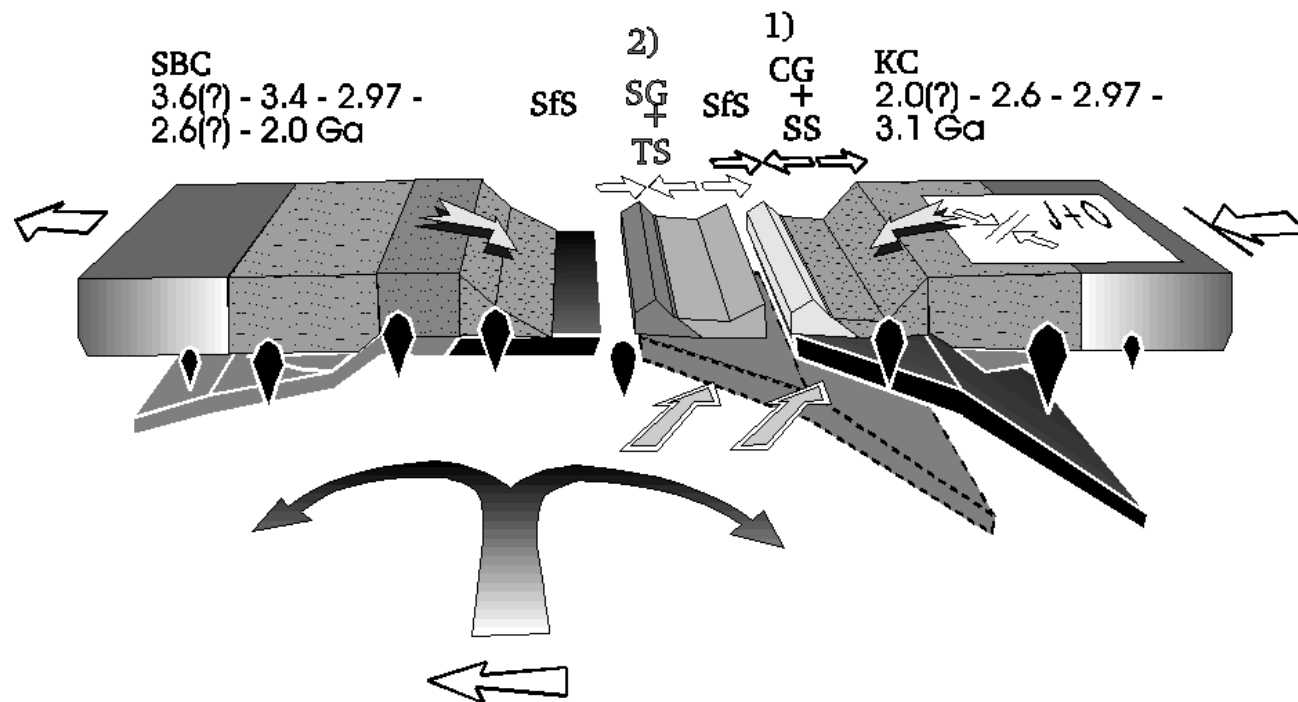
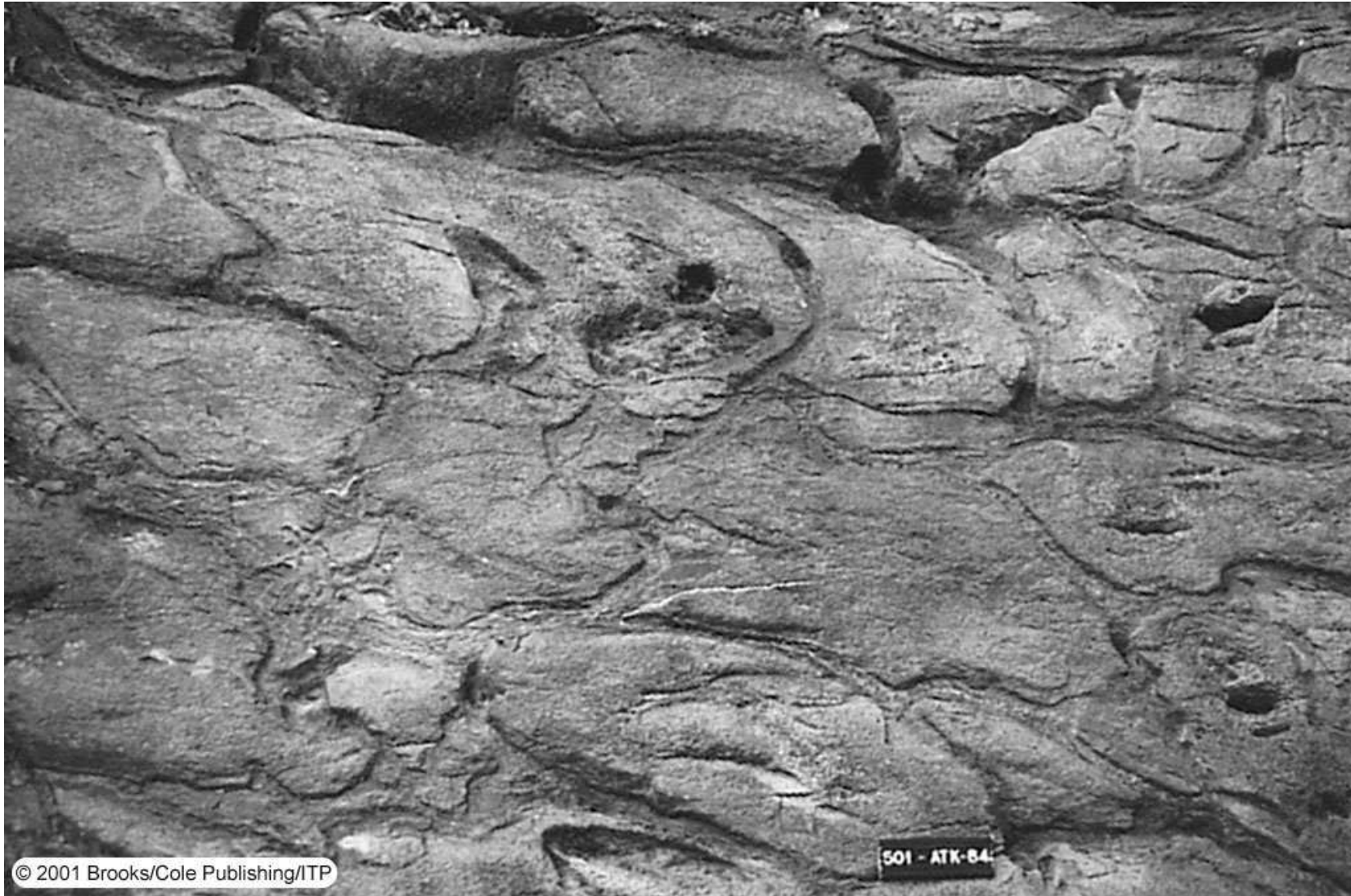


Fig. 10a. Opening of the Svecofennian sea (Sfs), subduction, evolution of central Finland island arc + Savo back arc basin (CG+SS) and of southern Finland island arc + Vaasa-Tampere back arc basin (SG+TS). Closing stage of the Kainuan sea and obduction of the Jormua and Outokumpu ophiolites (J+O; ca. 1.97 - ... Ga). The grey 'double arrows' represent the southern component of the compression.

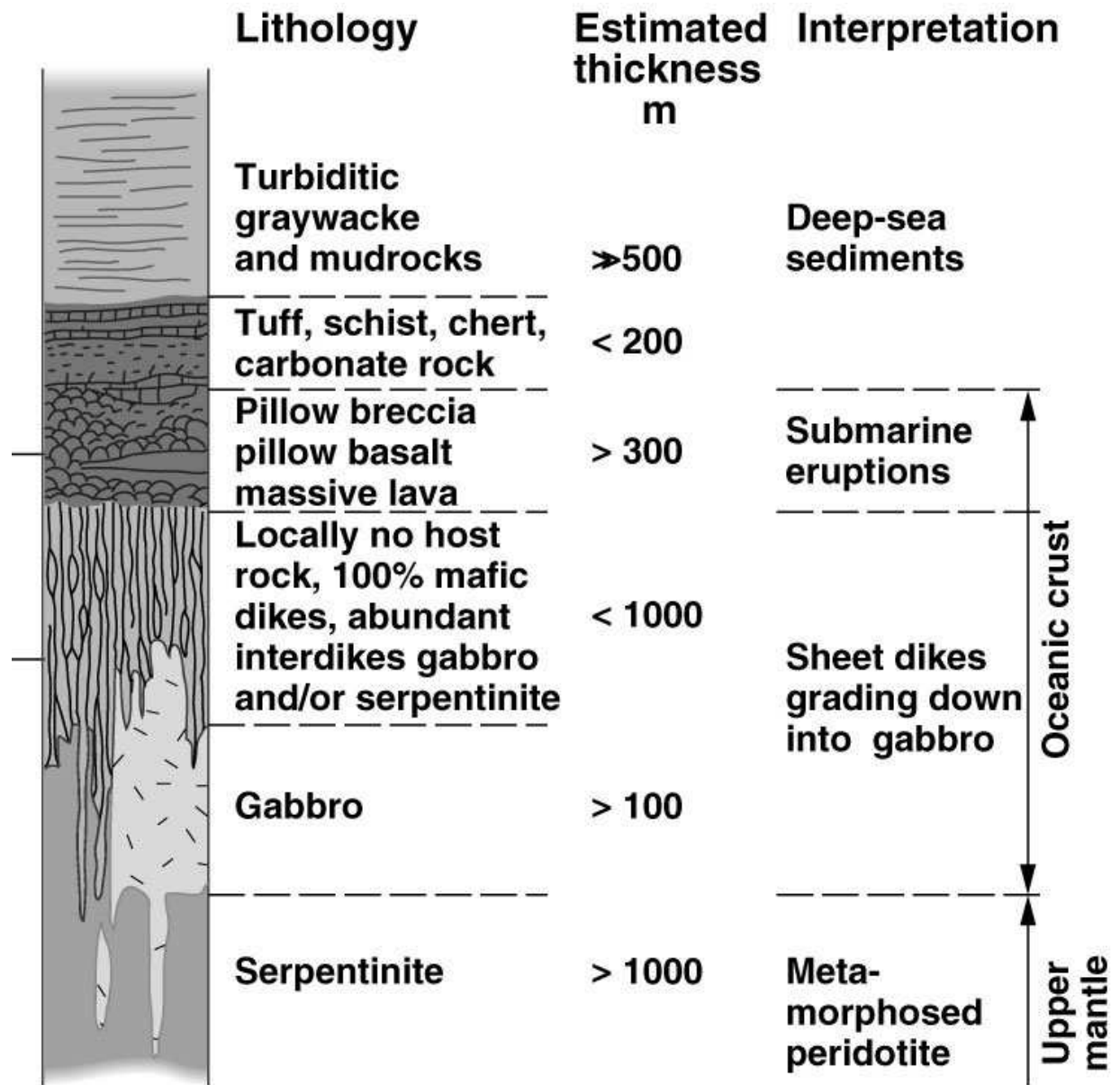
21

## Metamorphosed pillow basalts – Jormua, Finland.



**20 Ophiolite suites –oceanic crust preserved in areas of continental collision.**

**Jormua mafic-ultramafic complex in Finland, about 1.96 billion years old, compares closely in detail with younger well-documented ophiolites.**



(a)

# Vznik systému ostrovních a magmatických oblouků

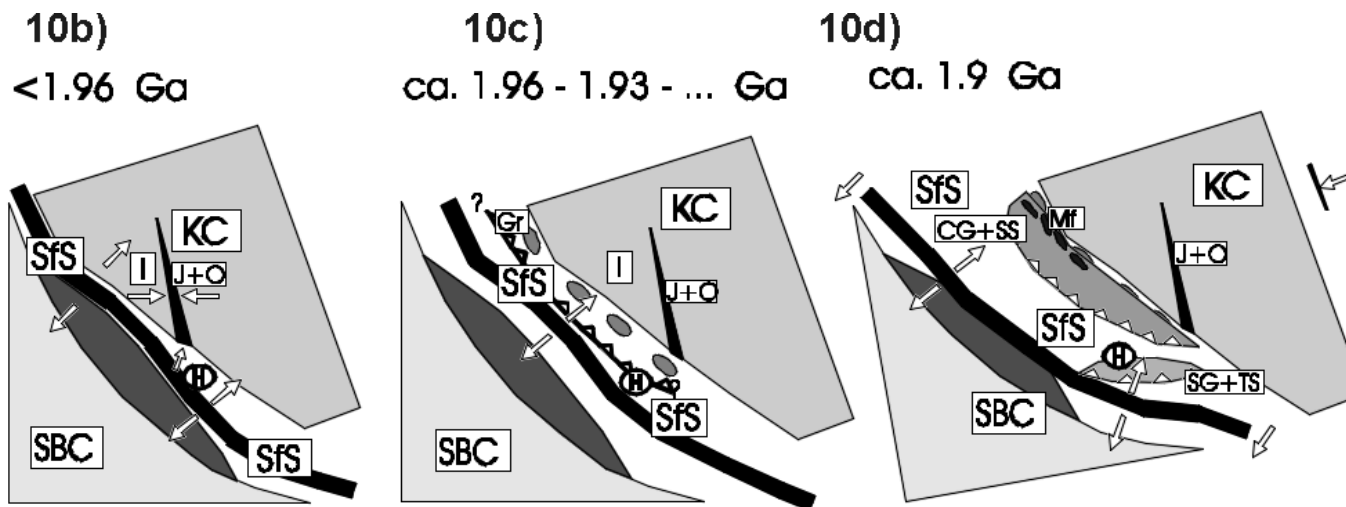


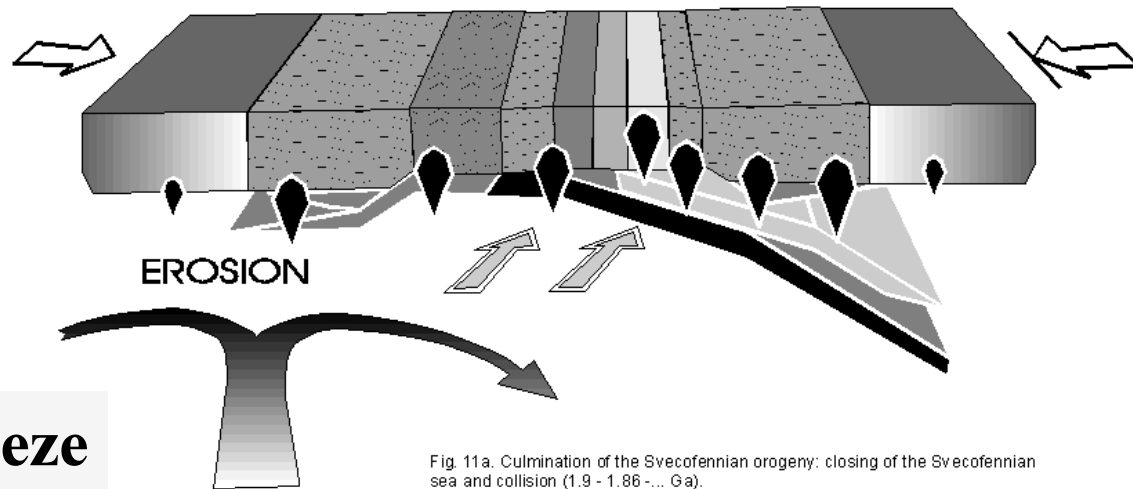
Fig. 10b. Plan view of rifting and opening of the Svecofennian sea (SfS) at the 2.1 - 2.0 Ga suture. Closing of the Kainuan-Outokumpu sea and obduction of the Jormua-Outokumpu ophiolites (J+O).

Fig. 10c. Plan view of the 'mature stage' of the Svecofennian sea. Intrusion of the 1.93 - 1.91 Ga granitoids (GR) (subduction related?).

Fig. 10d. Plan view of the evolution of the Svecofennian island arc systems. To the north is the central Finland granite island arc and Savo schist belt back-arc basin (CG+SS), while to the south is the southern Finland island arc and Vaasa-Tampere back arc basin (SG+TS). Intrusion of the Suonenjoki-Pyhäsalmi-Vihanti-Hailuoto mafic complexes (MF).

SBC  
3.6(?) - 3.4 - 2.97 -  
2.6(?) - 2.0 Ga

SG CG KC  
TS SS 2.0(?) - 2.6 - 2.97 -  
3.1 Ga



# Svekofenská orogeneze

Fig. 11a. Culmination of the Svecofennian orogeny: closing of the Svecofennian sea and collision (1.9 - 1.86 -... Ga).

ca. 1.885 Ma

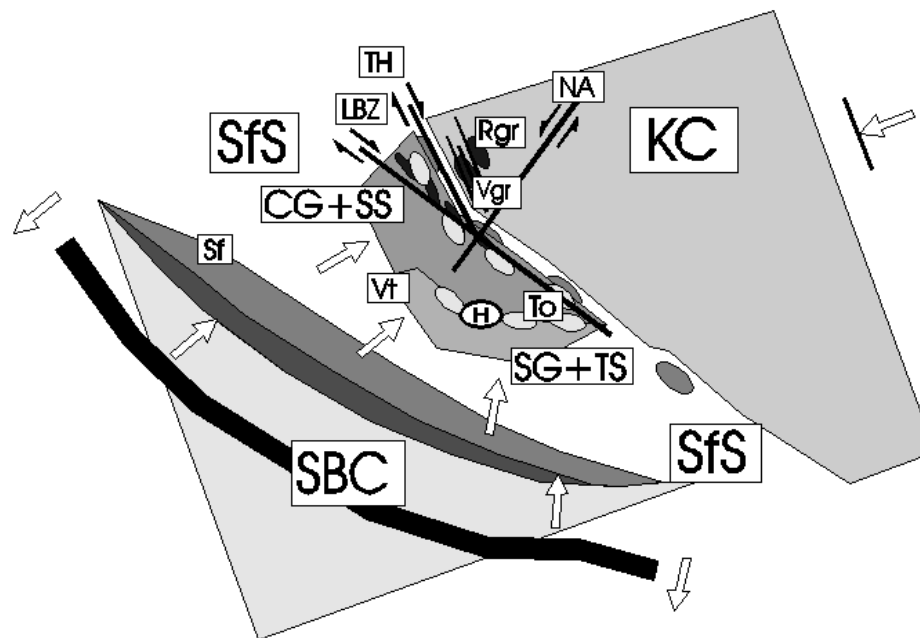


Fig. 11b. Plan view of the collision stage of the (CG+SS) and (SG+TS) island arc systems with Haveri volcanics in between. Overthrusting of the Vaasa block (Vt) and upthrusting of the Varpaisjärvi and Rautavaara granulates (Vgr and Rgr). Intrusion of tonalites (To). Evolution of the Ladoga-Bothnian Bay zone (LBZ) dextral faulting and its conjugate Näränkäväära-Auho faults (NA). Tervo-Haaparanta fracture zone (TH) represents the NE branch of LBZ. Later Svecofennian processes in Sweden and Estonia are denoted by (Sf).

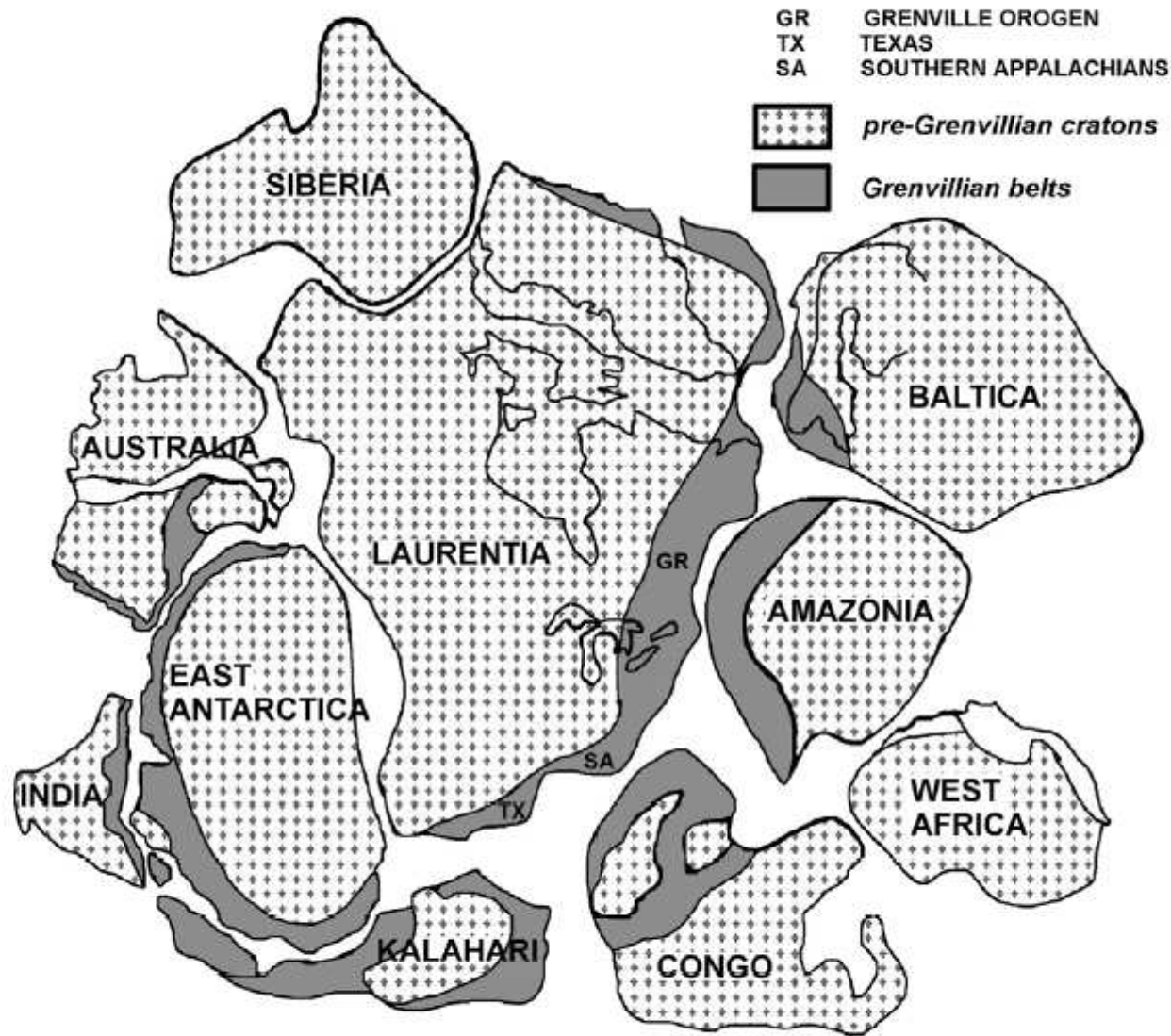


Fig. 1. One possible reconstruction of the late Mesoproterozoic supercontinent Rodinia. Archean cratons in light gray stipple, Grenvillian belts in dark gray. Modified from Hoffman (1991).

|                   |          |   |
|-------------------|----------|---|
| Saamská orogeneze | cca 3 Ga | kolize svekobaltského(SVK)<br>a karelského kontinentu(KK) |
|-------------------|----------|---|

|                            |        |                               |
|----------------------------|--------|-------------------------------|
| Kuhmo-belomorská orogeneze | 2,8 Ga | Wilsonův cyklus mezi SVK a KK |
|----------------------------|--------|-------------------------------|

|                        |        |                                     |
|------------------------|--------|-------------------------------------|
| Sfekobaltská orogeneze | 2,2 Ga | další Wilsonův cyklus mezi SVK a KK |
|------------------------|--------|-------------------------------------|

|                       |        |                                     |
|-----------------------|--------|-------------------------------------|
| Sfekofenská orogeneze | 2,0 Ga | další Wilsonův cyklus mezi SVK a KK |
|-----------------------|--------|-------------------------------------|

|                  |         |   |
|------------------|---------|---|
| Gotská orogeneze | 1,7-1,5 | ?? Akrece oblouků, mikrokontinentu,<br>Amazonie |
|------------------|---------|---|

|                          |     |                    |
|--------------------------|-----|--------------------|
| Sfekonorvegská orogeneze | 1,0 | kolize s Laurentii |
|--------------------------|-----|--------------------|



