

**Variscidy**

TESZ



# Severní křídlo variscid - charakteristika

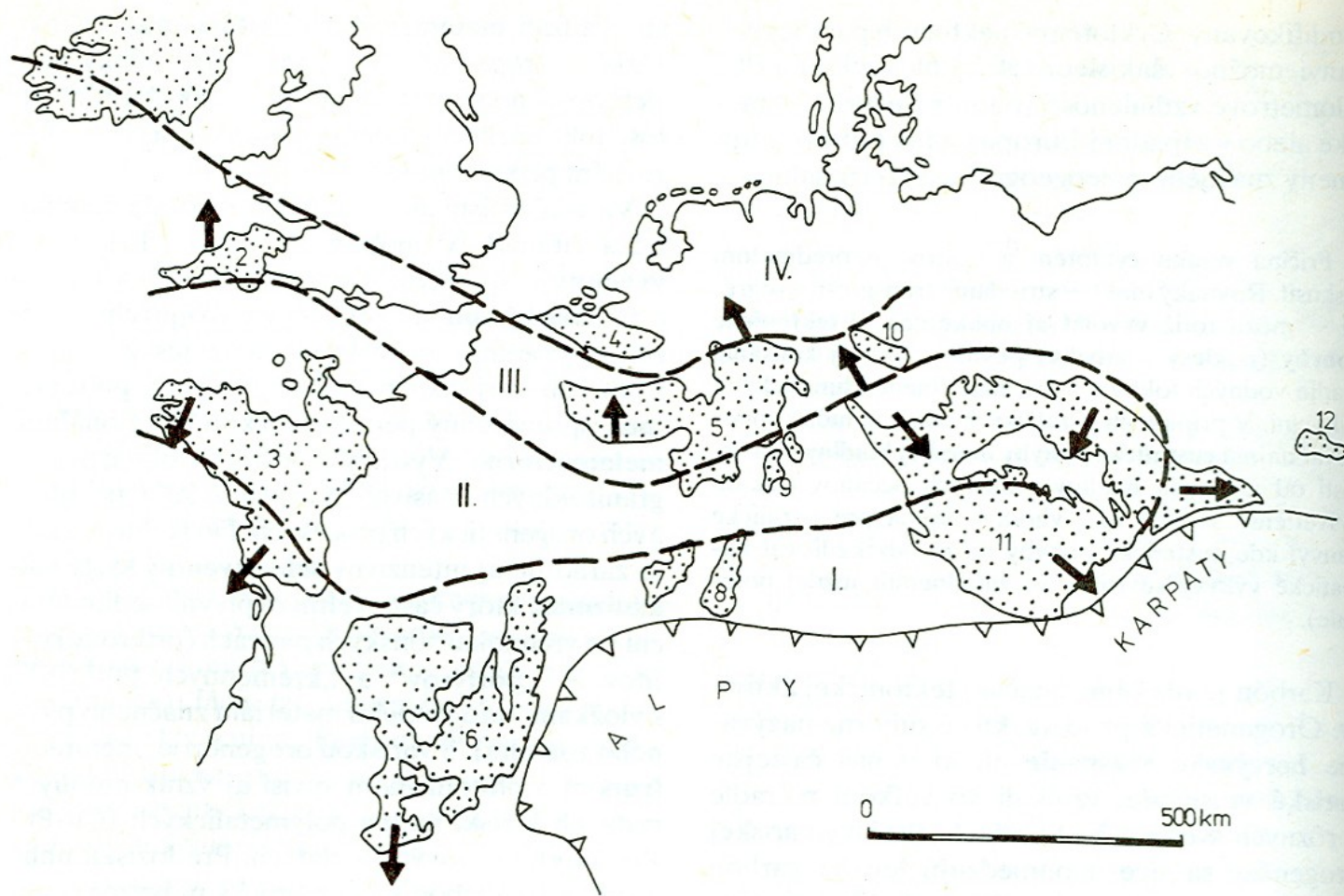
**Subvariská zóna** – dozvuky variského vrásnění – slabě zvrásněné nebo nezvrásněné sedimenty.  
Molasové paralické uhelné pánve

**Renohercynské-jihoportugalská zóna** – extenzní zóna variské kolize (devon-spod. karbon),  
Okraj Avalonie, brunovistulika, příkrovová stavba, bimodální vulkanismus, slabá  
nebo žádná metamorfóza, typický flyš (kulm)

**Středoněmecký krystalinický práh** – metamorfované svrchnoproterozoické-ordovické  
sedimenty a vulkanity, původně okraj terány saxothuringika. Od renohercynské  
zóny oddělen fylitovou zónou

**Sasko-durynská zóna** – značná metamorfóza a grantizace slábnoucí k severu, postorogenní  
plutonismus. Počátek vrásnění v spodním devonu, hlavní fáze spodní karbon.  
Divolý flyš – sv. devon-sp, karbon. Terán saxothuringika oddělen od moldanubika  
ebersdorfskou linií (litoměřický zlom), marianskolázeňský ultrabazický komplex

**Moldanubická zóna** – intenzivní metamorfóza, grantizace a plutonismus. Hlavně devonské fáze  
vrásnění. Moldanubický terán (Perunica). Na západě a severu tekton. Kontakt s  
saxothuringikem, na jihu s perimediterránním teránem a na východě s brunovistulikem



Obr. 278. Zjednodušená schéma variscíd strednej a západnej Európy (upravené podľa F. PATOČKU, 1980, s použitím dát M. G. RUTTENA, 1969, C. F. BURRETTA a J. GRIFFITHSA, 1977 a W. KREBSA, 1975).

I moldanubická zóna a jej ekvivalenty, II sasko-durýnska zóna a jej ekvivalenty, III rhenohercýnska zóna a jej ekvivalenty, IV subvariská zóna a predpolie variského orogénu. Na povrch vystupujúce časti variscíd (vybodkované): 1 južné Írsko, 2 Cornwall, 3 armorický masív, 4 brabantský masív, 5 Ardeny a Porýnska bridličnatá vrchovina, 6 Massif Central, 7 Vogézy, 8 Schwarzwald, 9 Odenwald a Spessart, 10 Harz, 11 český masív, 12 Svätokrižske hory. Šípky znázorňujú prevládajúcu vergenciu vrás



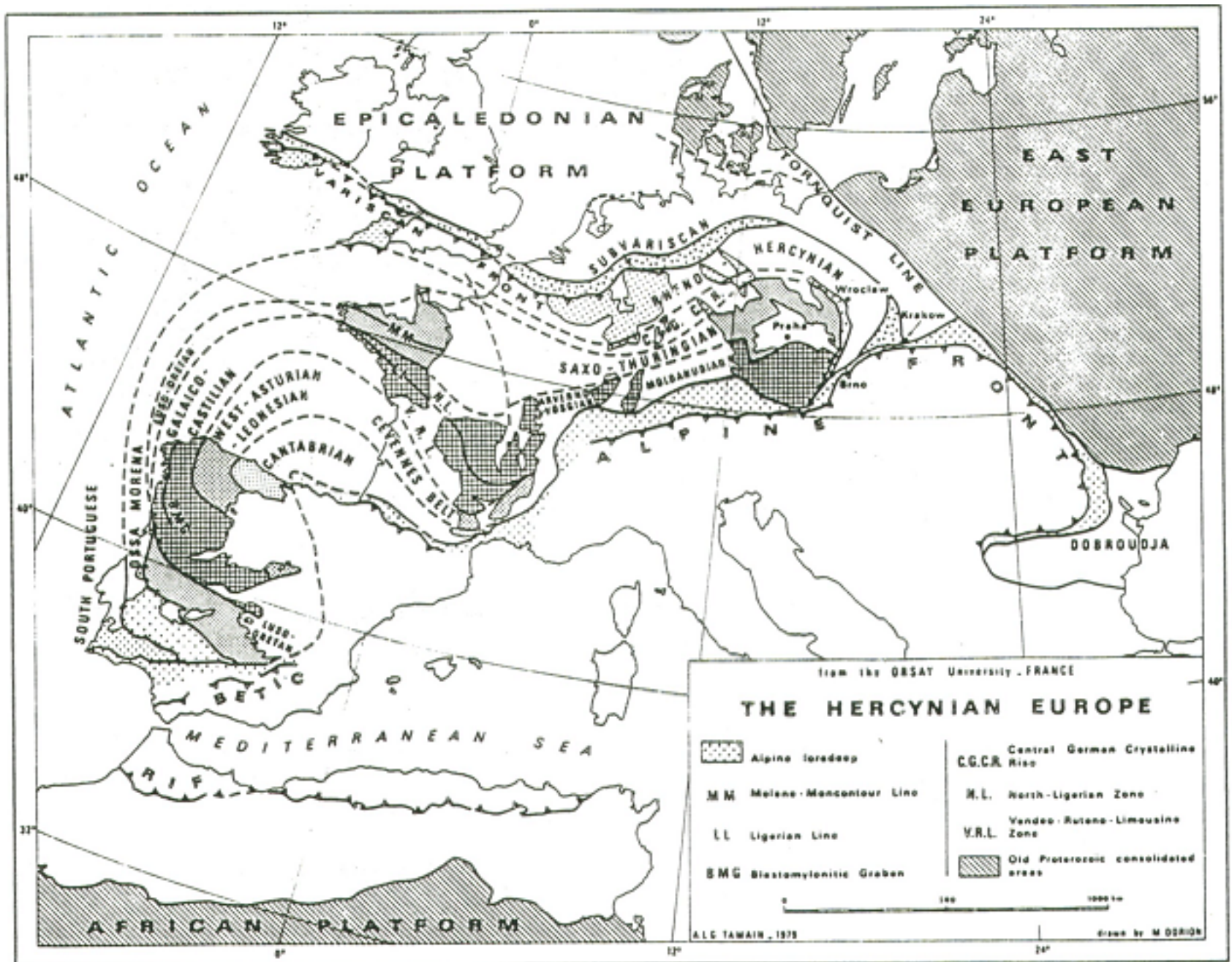


Figure 1. Map showing major zones of the Hercynian in Europe.

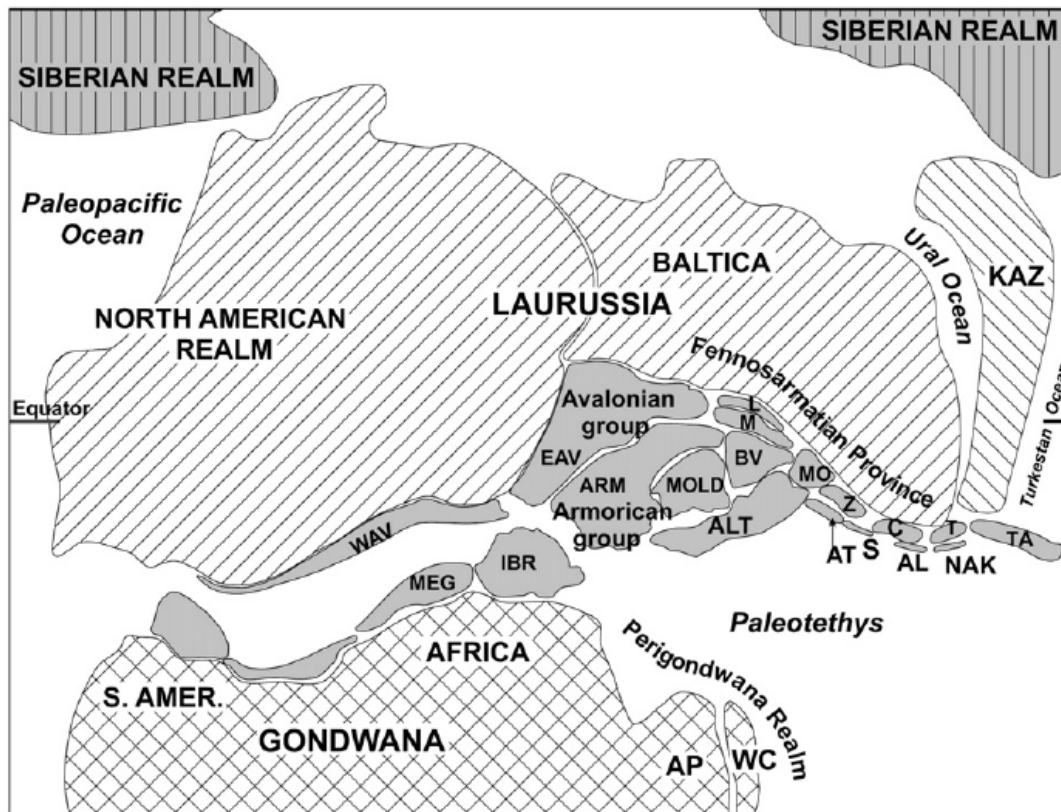
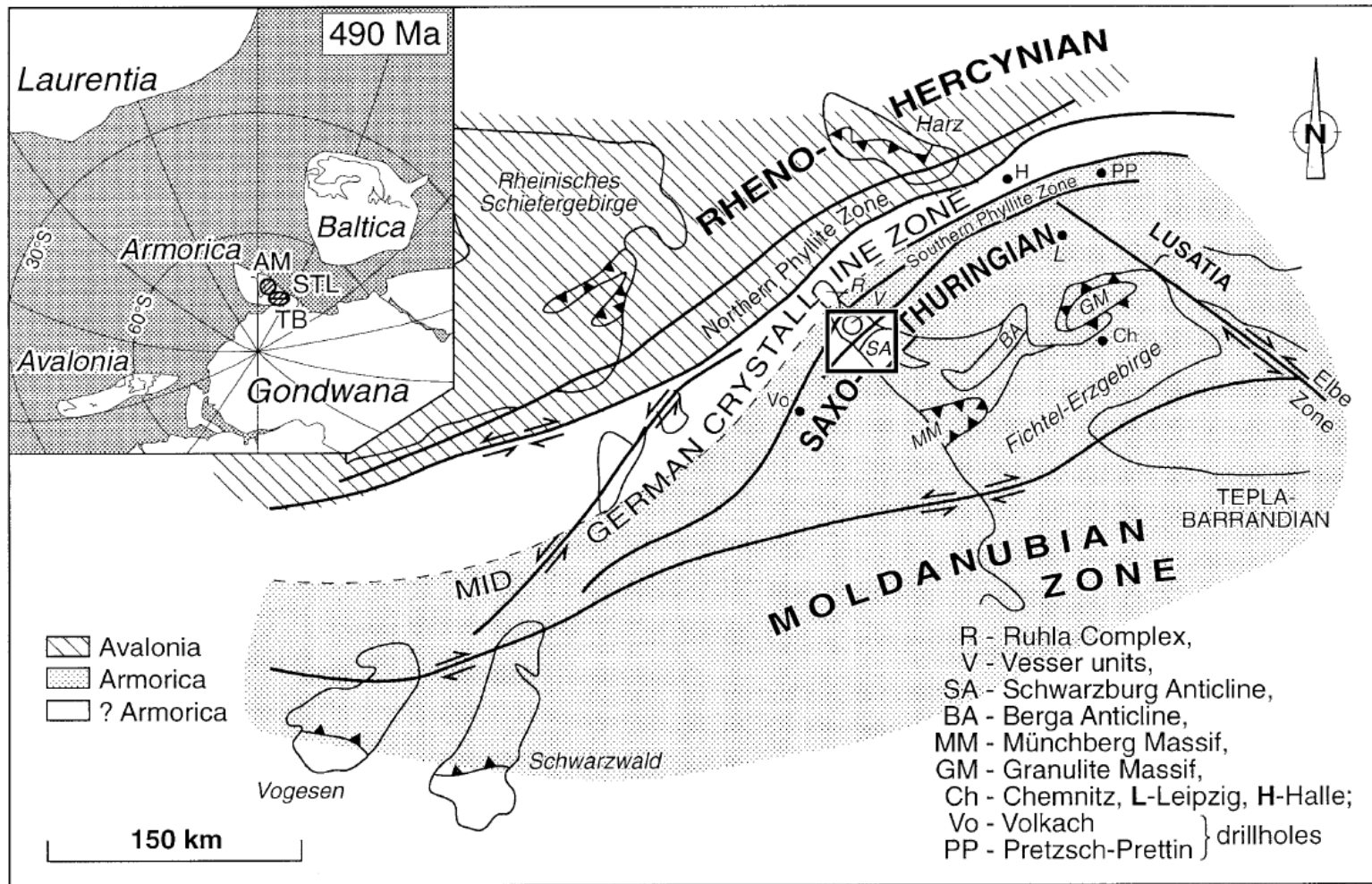


Fig. 2. Early Carboniferous paleogeographic reconstruction. Abbreviations: ALT — group of Alpine terranes including the Getic and Balkan Terrane, AL — Alborz, AP — Arabian Plate, ARM — Armorica, AT — Anatolide–Tauride terrane, BV — Brunovistulian terrane, EAV — Eastern Avalonia, IBR — Iberia, IZ — Istanbul–Zonguldak terrane, KAZ — Kazakh microcontinent, L — Lysogory terrane, M — Malopolska terrane, MEG — Meguma, MO — Moesia, MOLD — Moldanubian terrane, NAK — North Afghan–Karakum terrane, S — Sakarya terrane, T — Turan peri-Gondwana terranes, TA — Tarim microcontinent, WAV — Western Avalonia, WC — Western Cimmeria. Modified after Kalvoda (2002).



# Severní křídlo variscid v Německu



# MID-EUROPEAN VARISCIDES

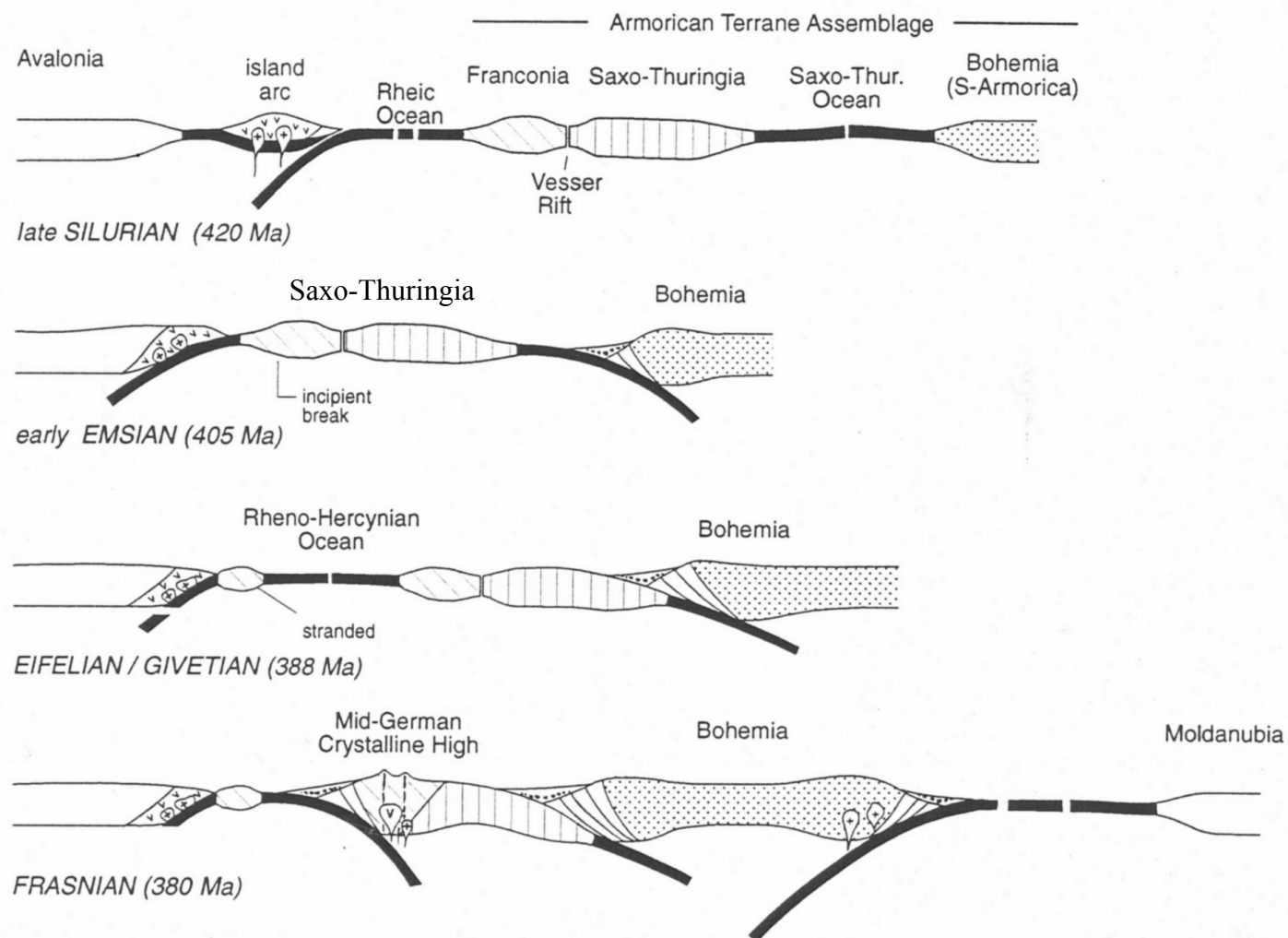


Fig. 8. Plate kinematic evolution of the mid-European Variscides.



# Středoevropské variscidy

Lysogorský terán

Malopolský terán

Subvariská zóna

Brunovistulikum

Severní křídlo

Renohercynsko-jihoportugalská  
zóna

Dorzální pásmo

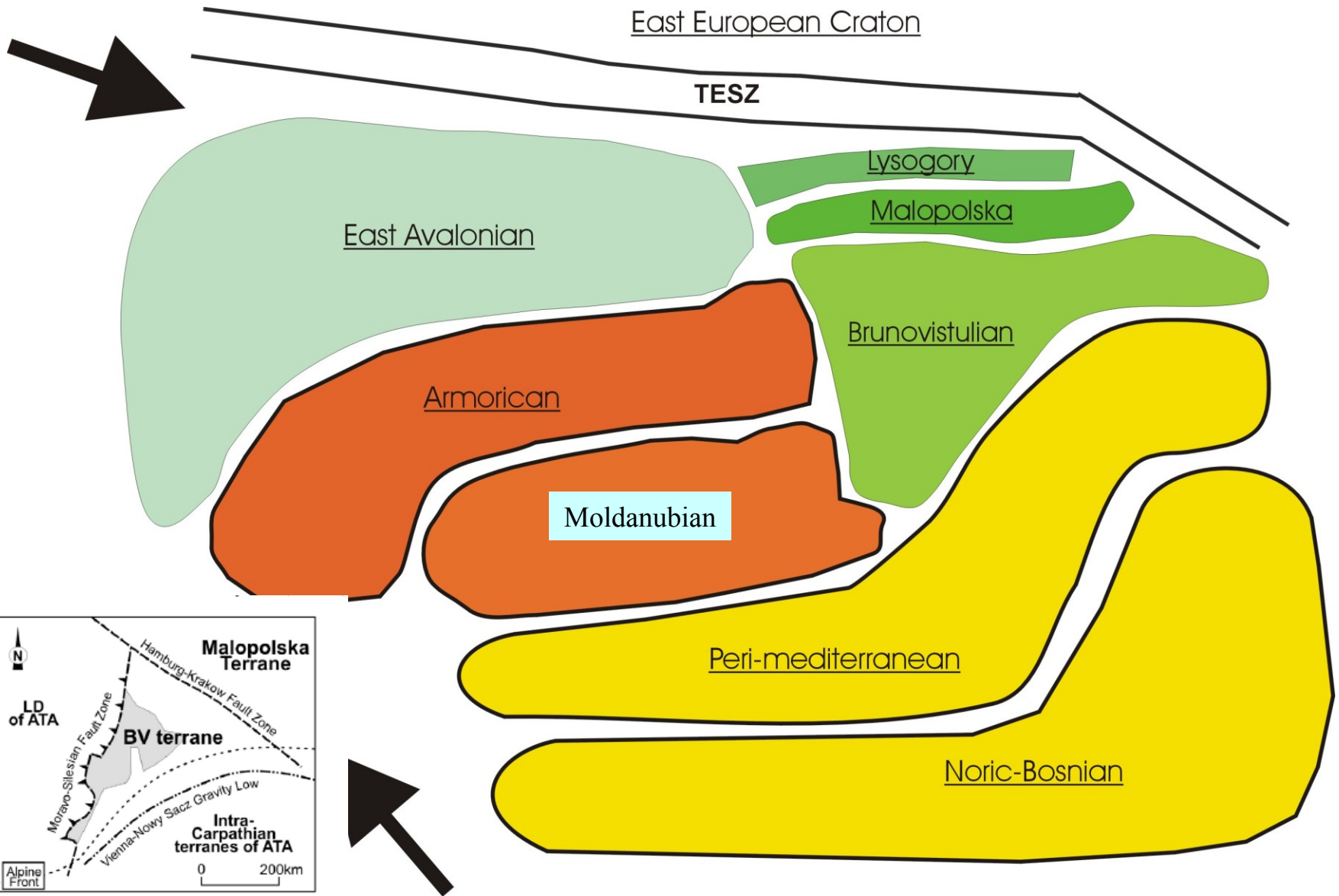
Sasko-durynská zóna  
Moldanubická zóna

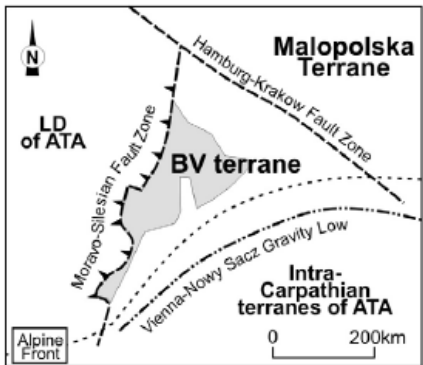
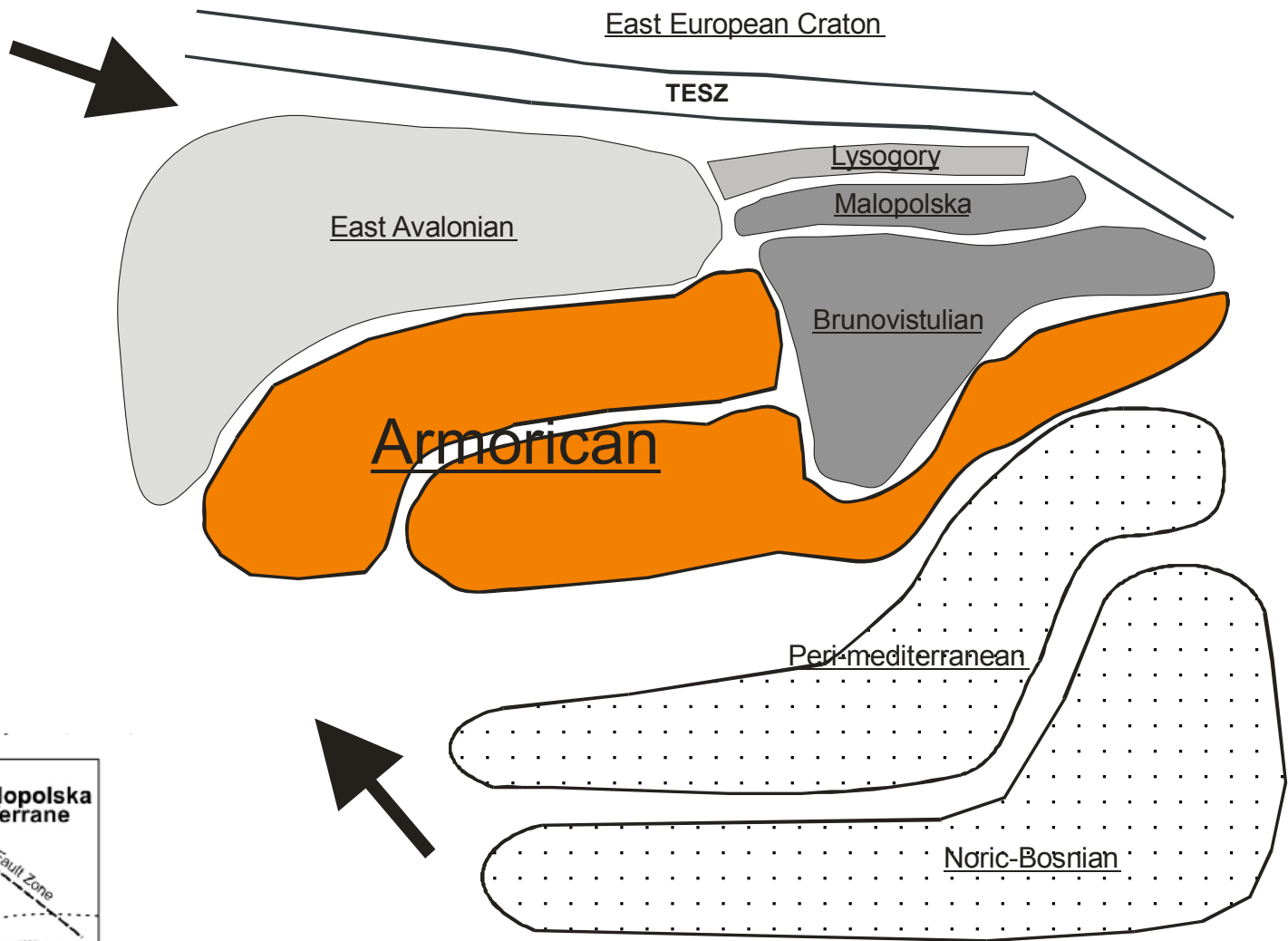
Armorické společenstvo  
teránů

Jižní křídlo

Perimediterranní terán

Noricko bosenský terán





**Brunovistulický terán**

Armorický terán

**Perimediterranní terán**

**Bosensko-norický terán**

**Jižní křídlo**

**Paleotethys**

Gondwana



# Západní Evropa

## Symetrické uspořádání

Severní křídlo

Subvariská zóna

Avalonie

Renohercynsko-jihoportugalská zóna

Dorzální pásmo

Sasko-durynská zóna  
Moldanubická zóna

Armorické společenstvo teránů

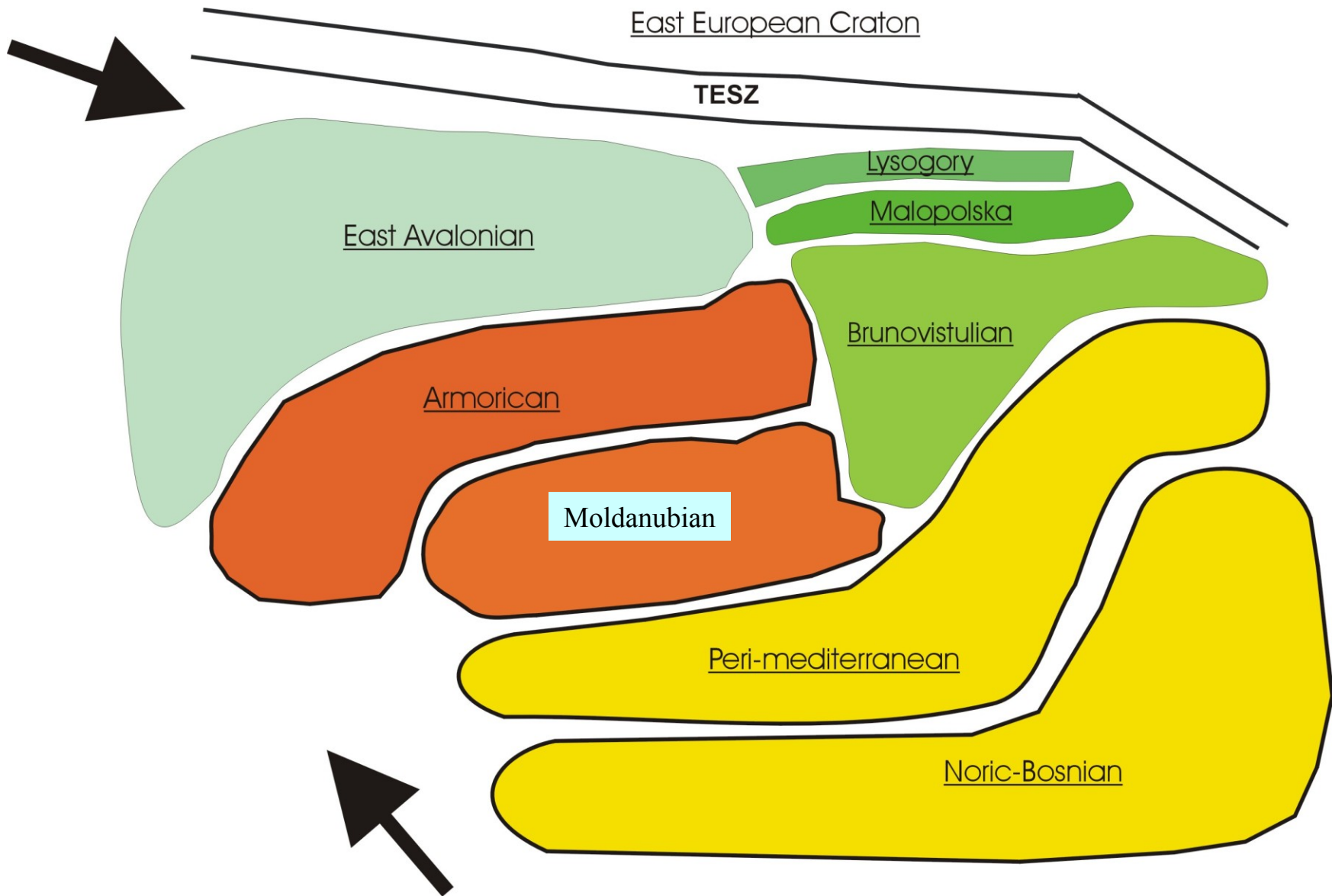
Jižní křídlo

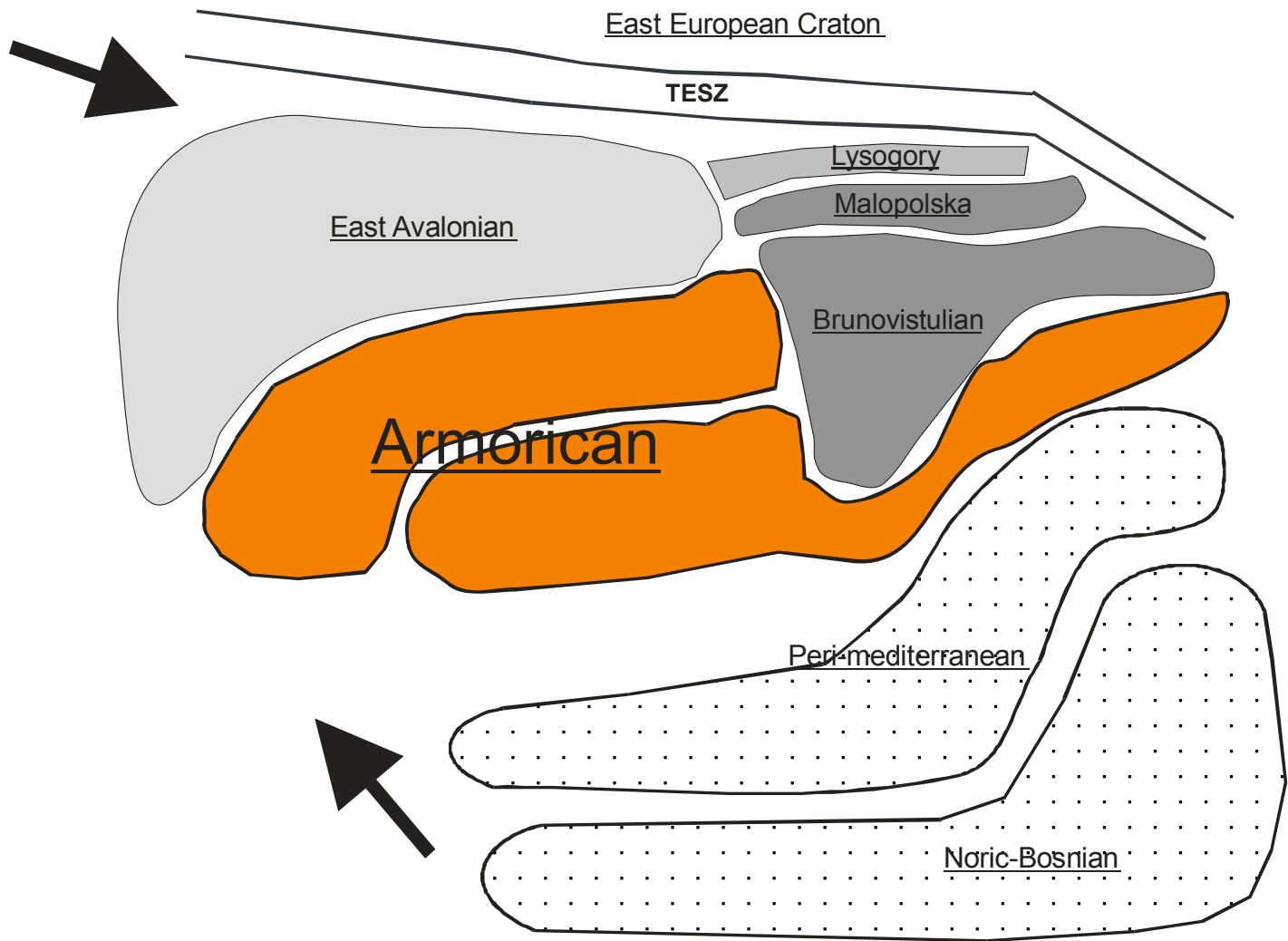
Vendésko-limousinská zóna

Iberie

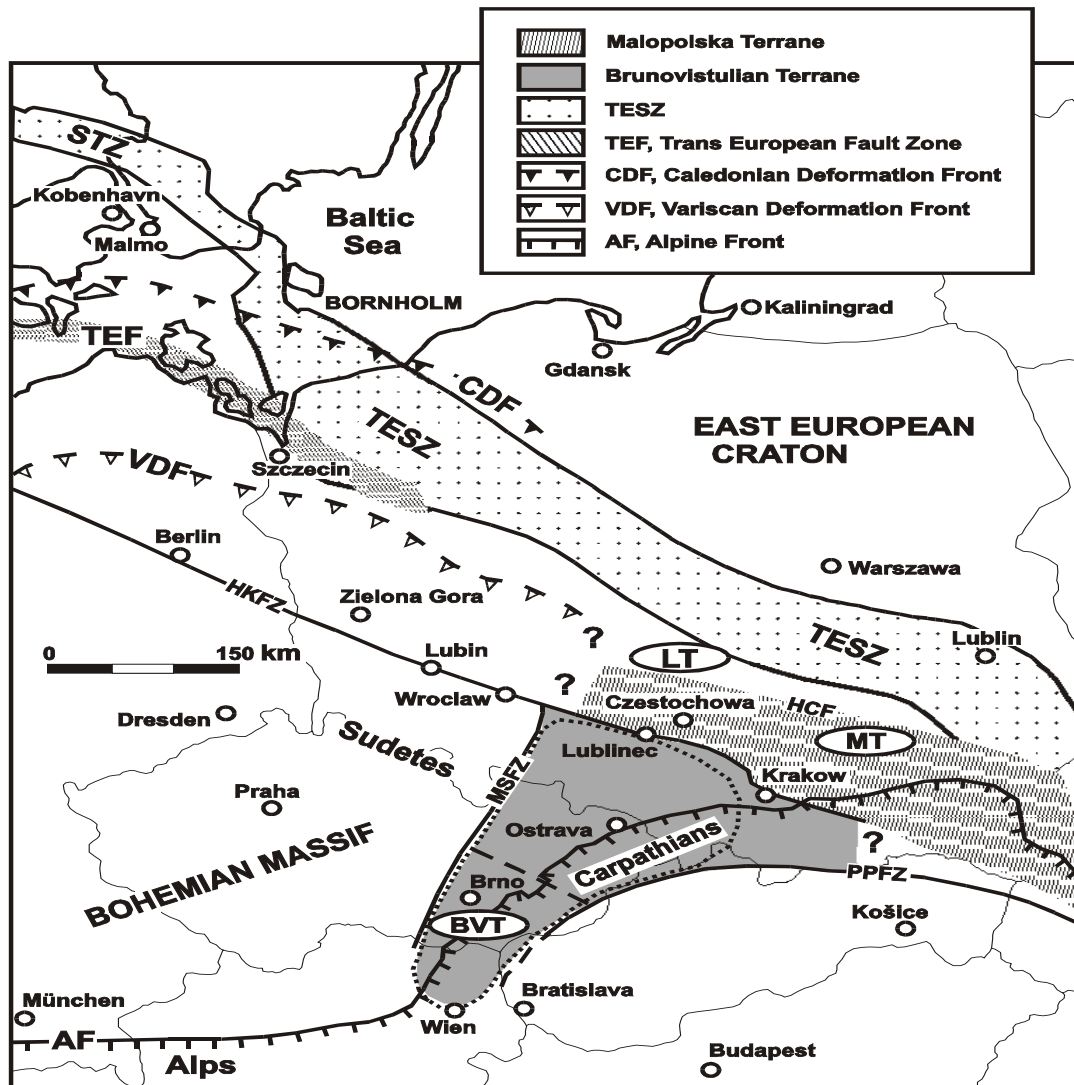
Cevenská zóna (Iberia)

# Český masiv









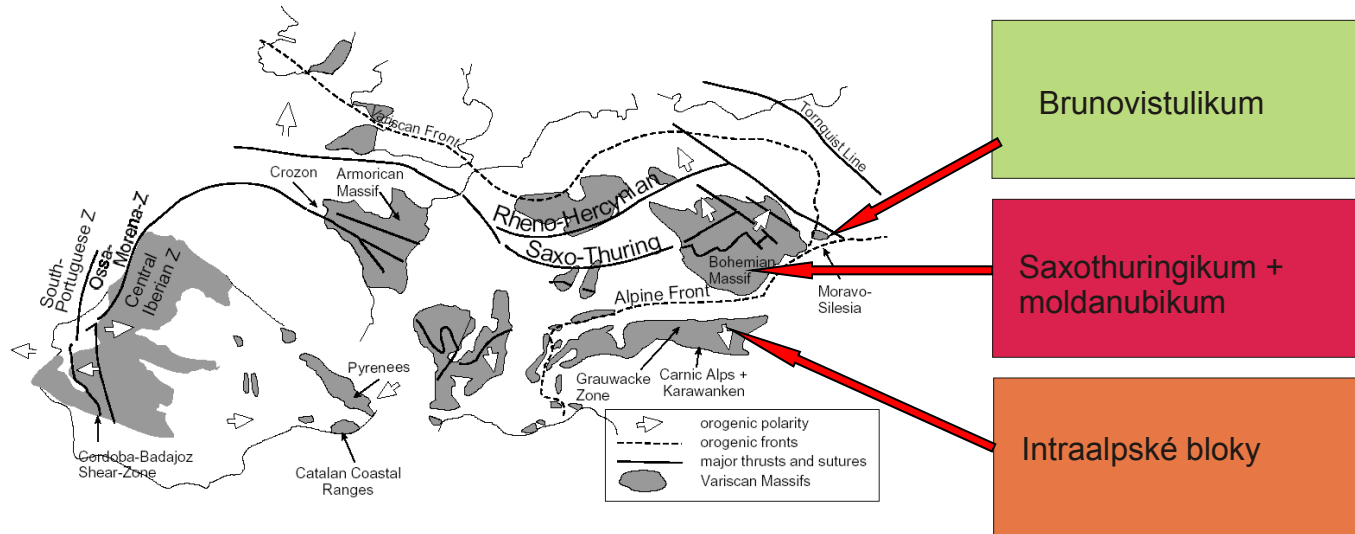
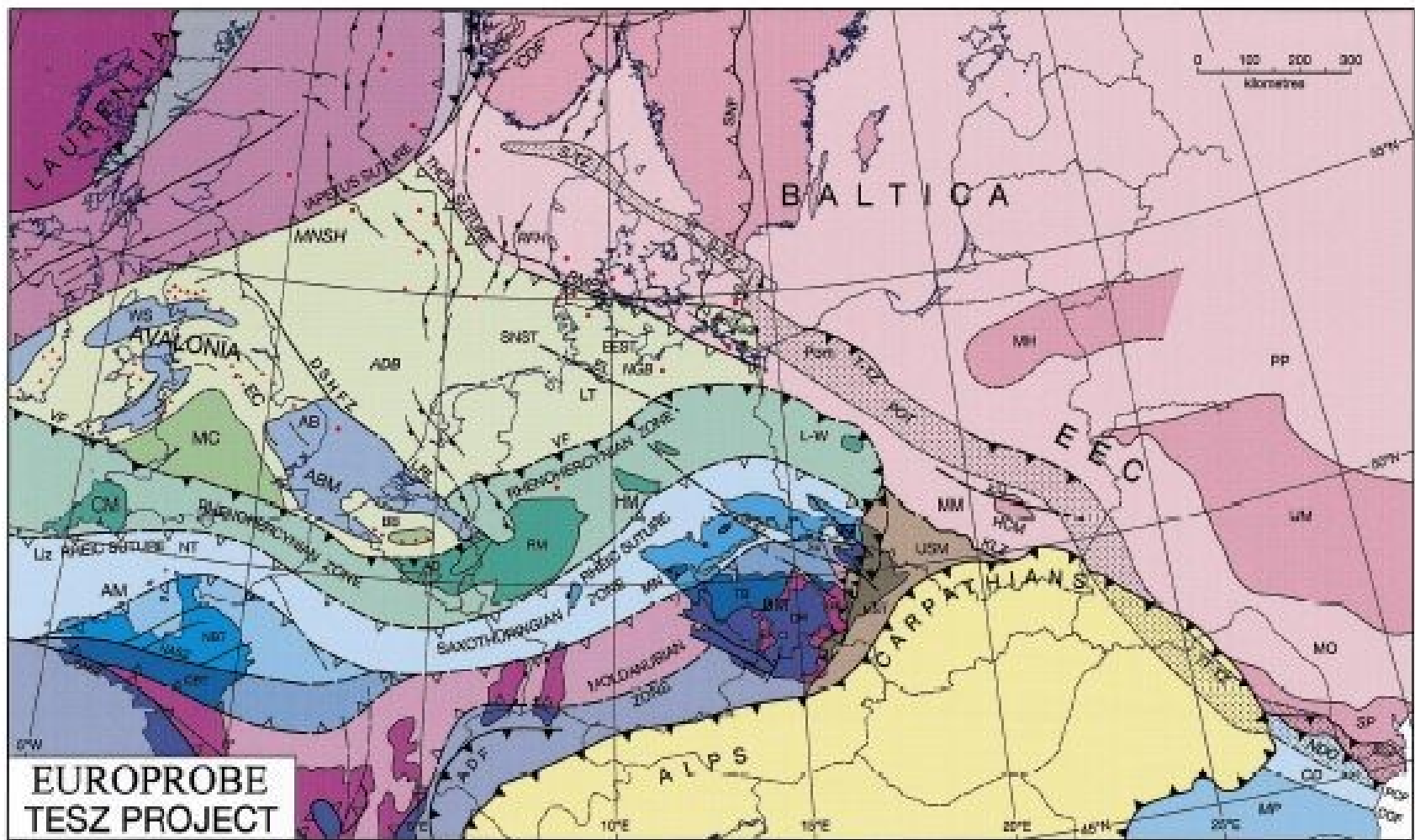
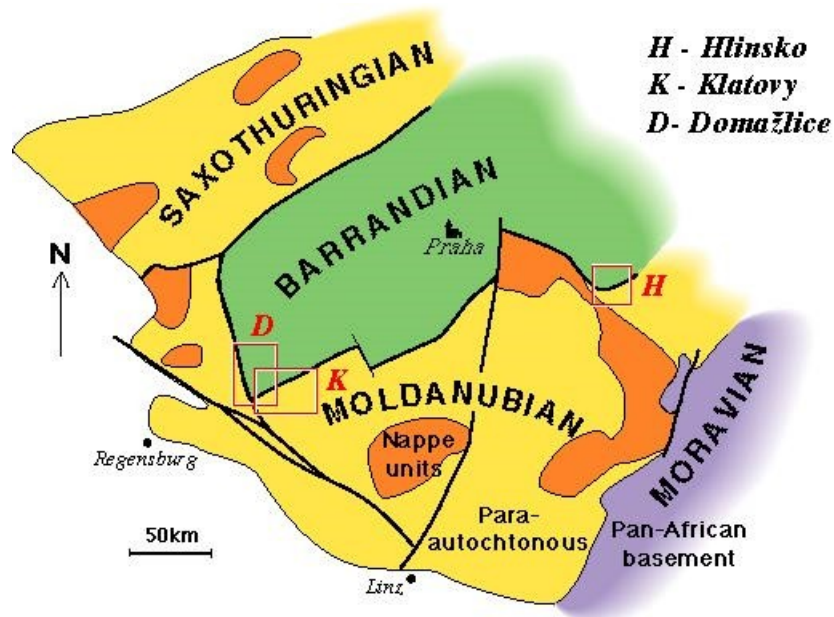
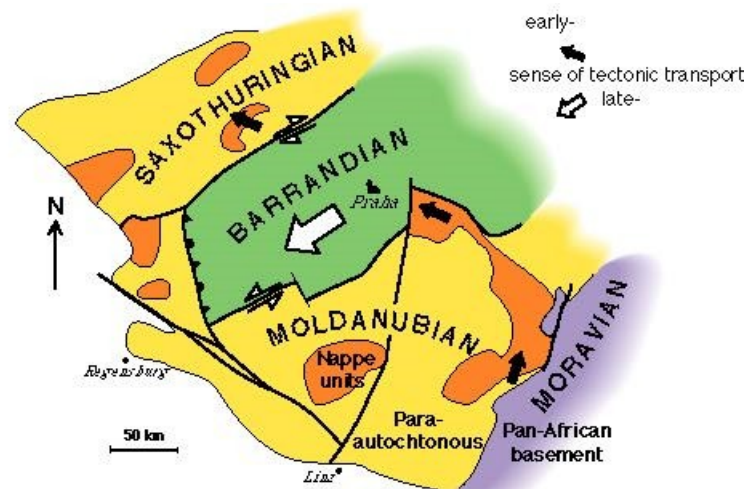


Figure 2: Main structural elements of the European Variscan fold belt.





Sketch of the Bohemian Massif



Tectonic evolution of the Bohemian Massif  
 and the juxtaposition of the Barrandian & Moldanubian blocks



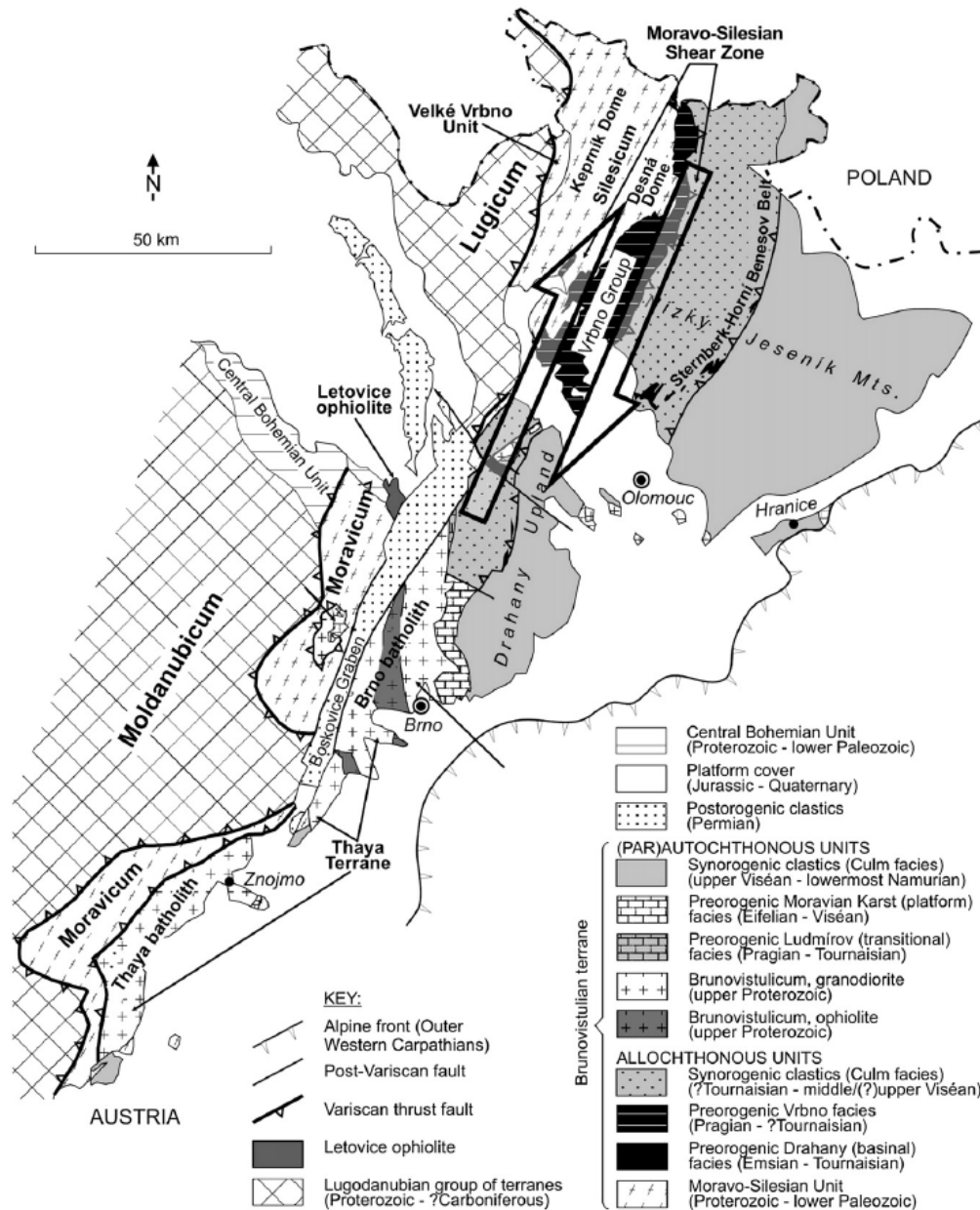


Fig. 3. Simplified geological map showing subdivision of the Brunovistulian terrane and its position at the eastern margin of the Bohemian massif. Modified after Kalvoda et al. (2008).

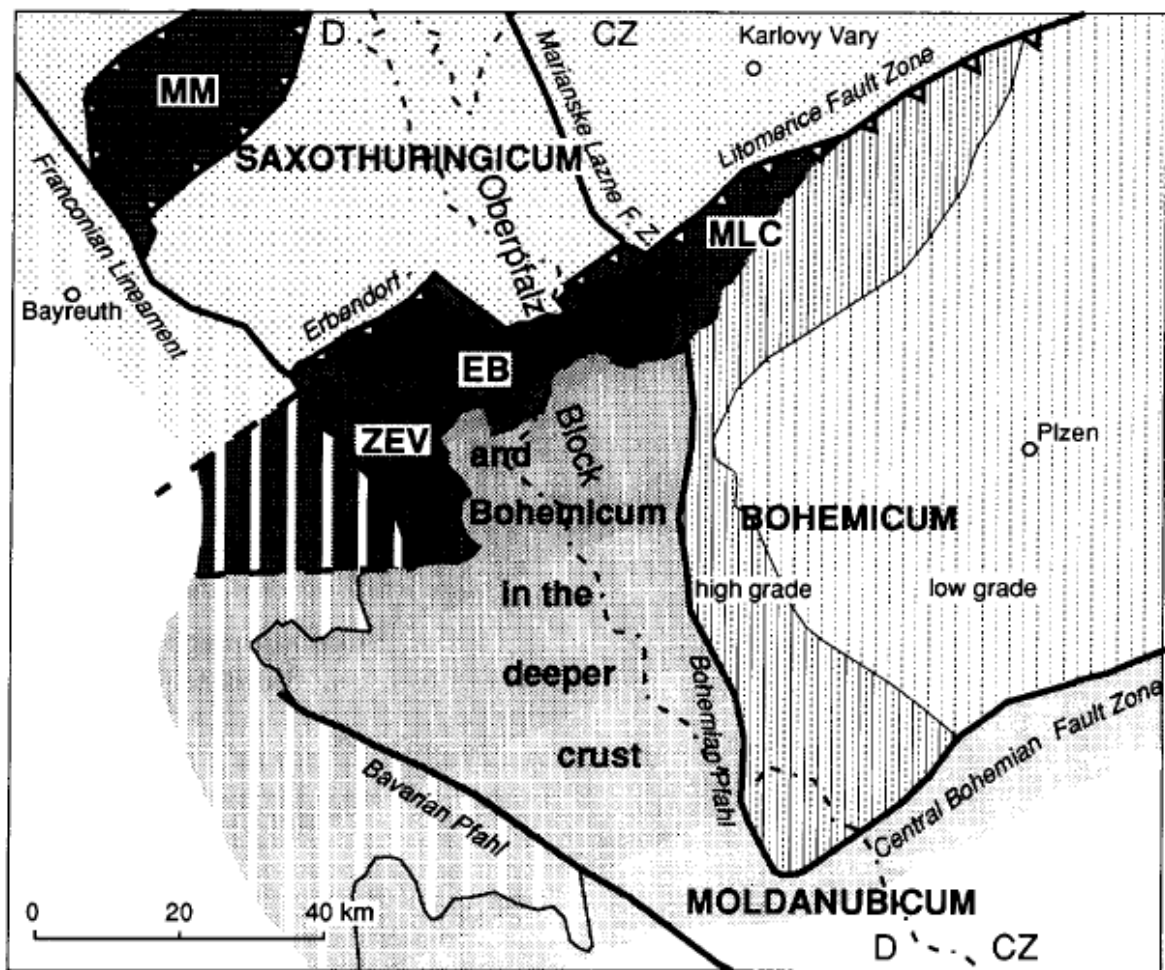


Fig. 7. Configuration of terranes at the NW edge of the Bohemian Massif (West Bohemia-Northeast Bavaria). The NW-thrusting Erbendorf-Litoměřice Fault Zone represents the terrane boundary (suture) between the Moldanubicum and Bohemicum/Mariánské Lázně Complex (MLC) in the south and the Saxothuringicum in the north. It is assumed that parts of the high-grade metamorphic MLC/Bohemicum complexes are buried in the deeper crust beneath the Moldanubicum of the Oberpfalz Block (Behr, 1992) west of the Bohemian Pfahls/Mariánské Lázně Fault Zone (West Bohemian Fault Zone). The highly reflective zone of the Erbendorf Body (EB) possibly represents the concealed continuation of the Mariánské Lázně Complex. MLC and ZEV are regarded as suture complexes which were exhumed from the deeper crust and which are tied up to the junction of the ENE-WSW terrane boundary with the NNW-SSE Oberpfalz Block.

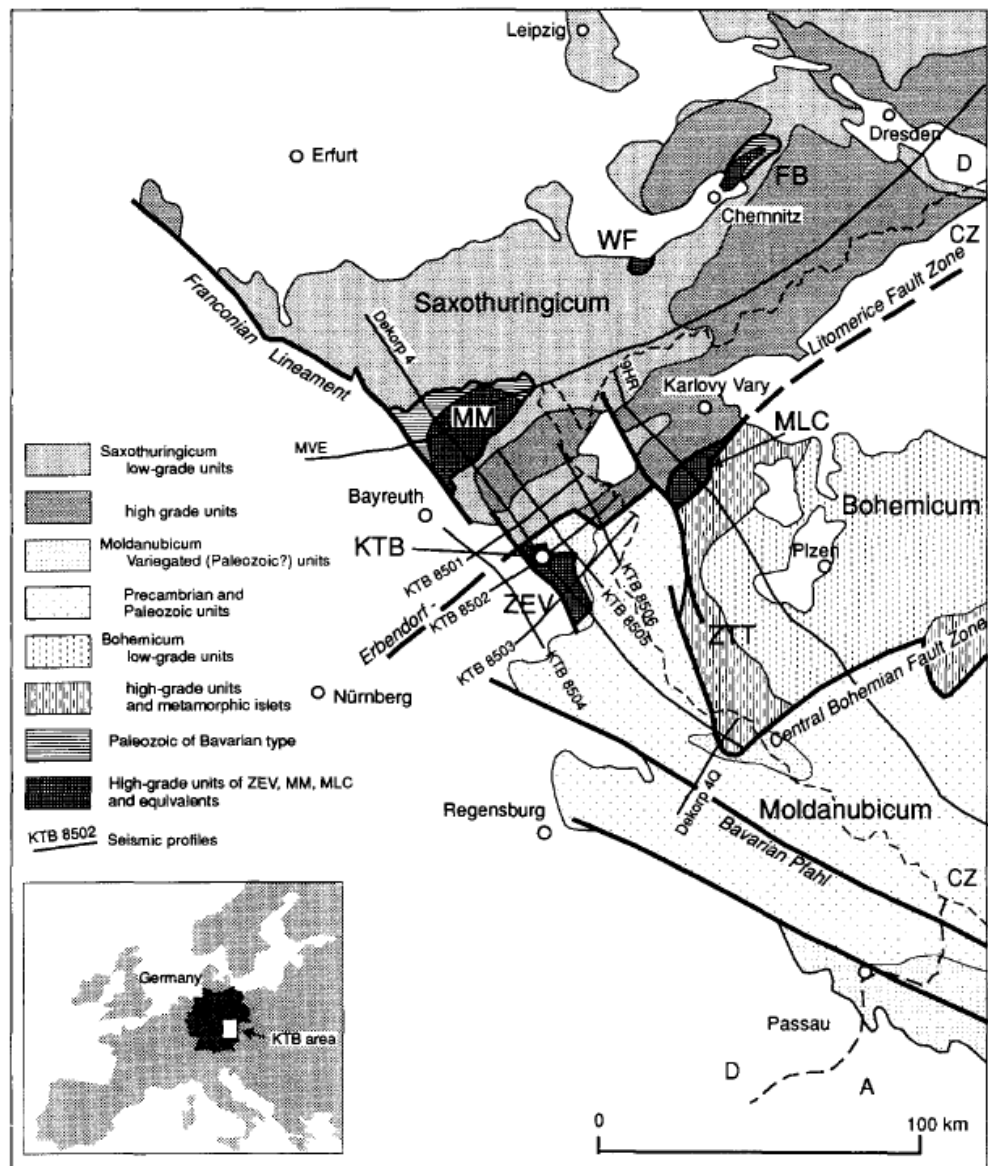
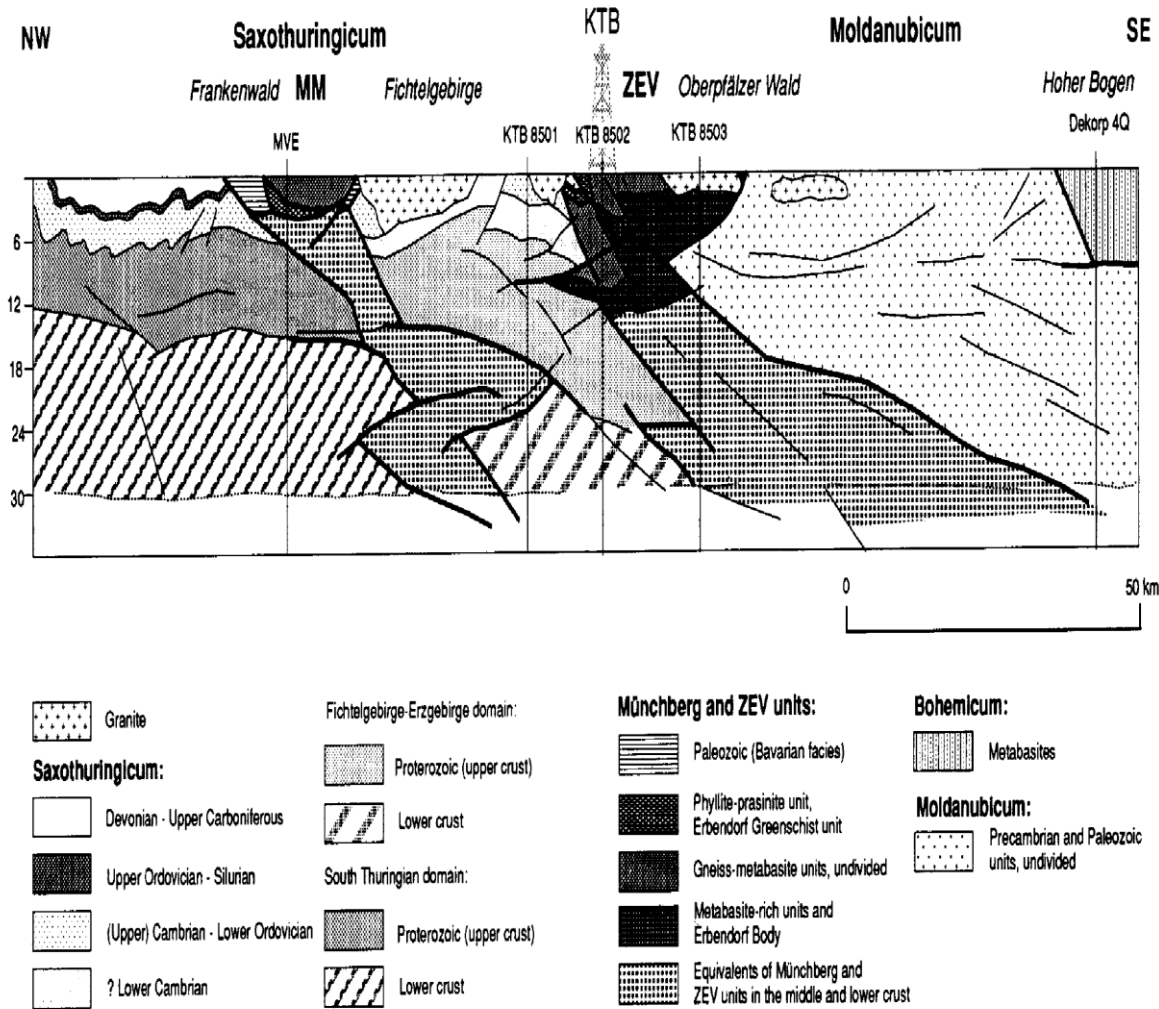


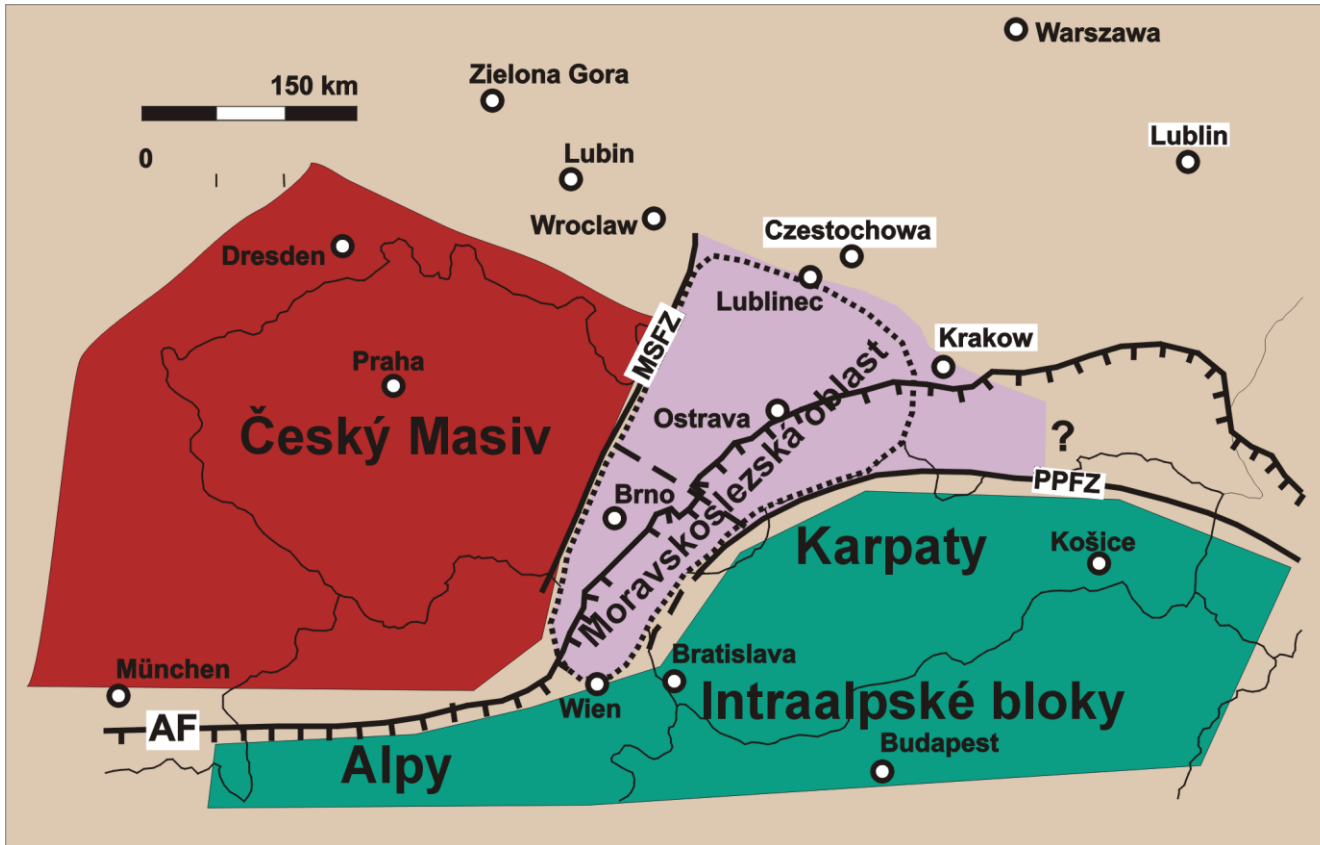
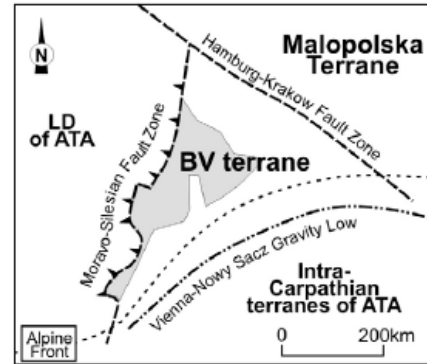
Fig. 1. Tectonometamorphic units (terranes) in the western part of the Bohemian Massif (Germany and Czech Republic) and the position of deep seismic profiles. *FB* = Frankenberg unit, *KTB* = KTB-location, *MLC* = Mariánské Lázně Complex, *MM* = Münchberg Massif, *WF* = Wildenfels unit, *ZEV* = Zone Erbendorf-Vohenstrausz, *ZIT* = Zone Teplá-Domažlice (Tepl-Taus). Bold lines represent Variscan and post-Variscan fault zones of regional importance (without distinction).



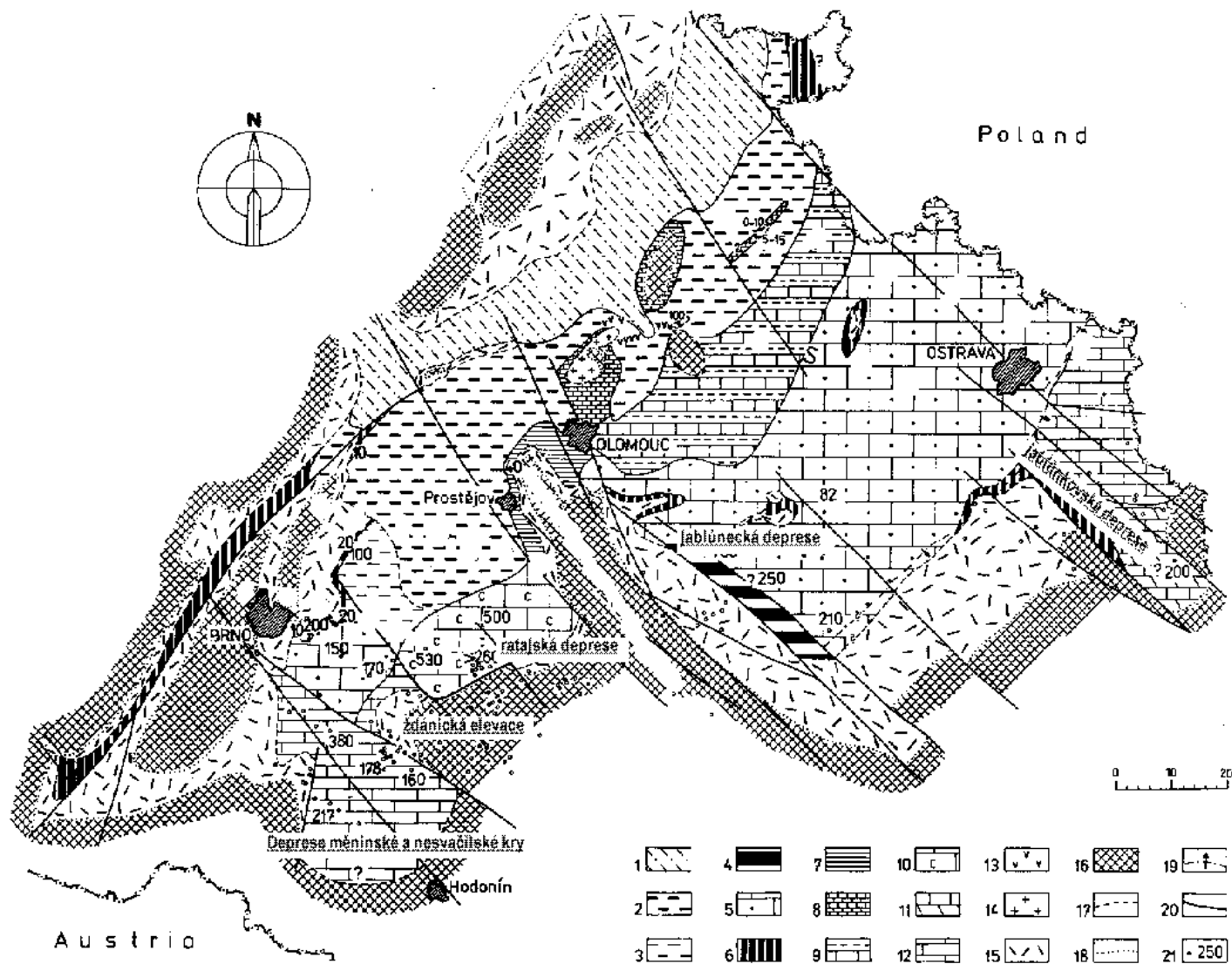
G. Hirschmann / *Tectonophysics* 264 (1996) 327–339

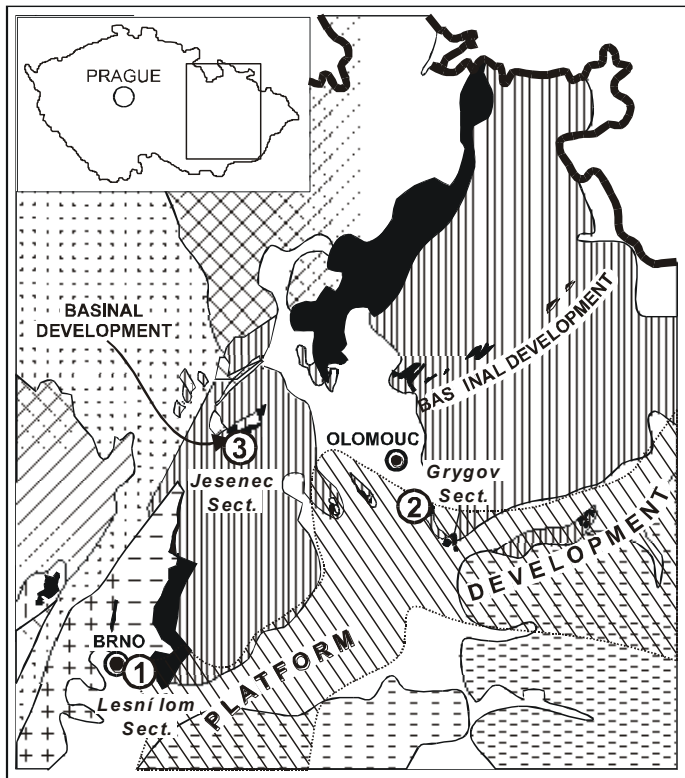
Fig. 8. Tentative geological cross-section following the seismic profile DEKORP 4. The presented interpretation assumes the existence of two sutures: a suture separating the Moldanubicum (and Bohemium) from the Saxothuringicum, with equivalents of the Mariánské Lázně Complex (Erbendorf Body) and Bohemium in the deeper crust, and with the ZEV on top of it, and an intra-Saxothuringian suture between the Fichtelgebirge-Erzgebirge domain and the South Thuringian domain, with the shallow nappe-structure of the Münchberg Massif (MM) on top of it. For further explanation see text and Fig. 7

# **Variscidy na Moravě**













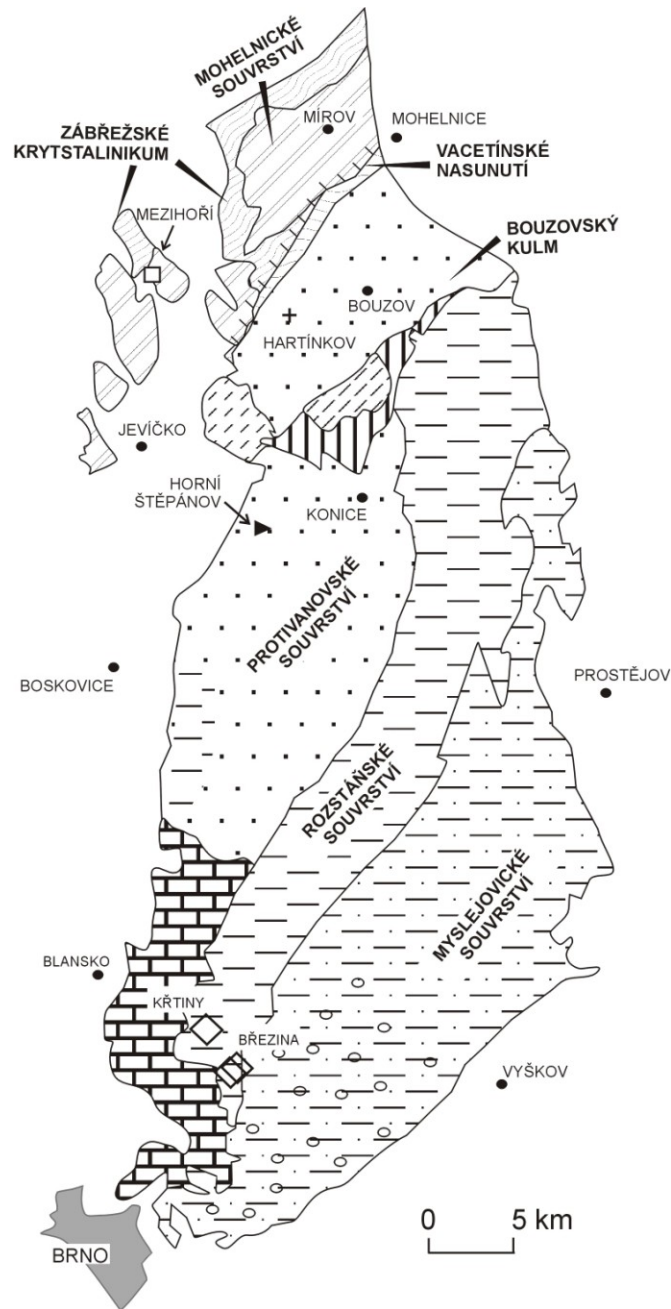


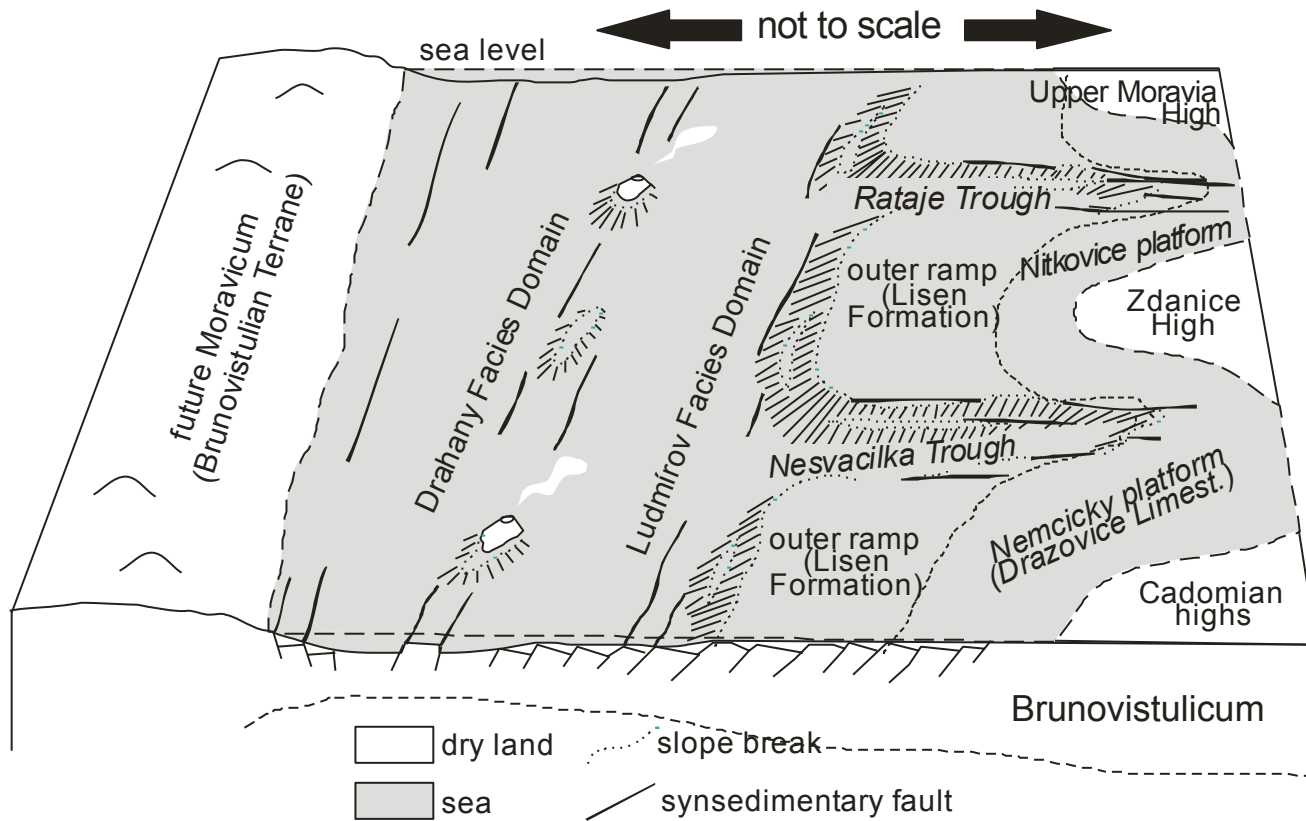




LEGEND:

- |   |   |   |   |
|---|---|---|---|
|    | Brunovistulian terrane (Laurussian basement)    |    | Western Carpathians flysch                            |
|   | Variscan crystalline rocks                      |   | Neogene - Quaternary cover                            |
|  | Devonian - Lower Carboniferous pre-flysch rocks |  | Hypothetical subsurface limit of Platform Development |
|  | Lower Carboniferous flysch (Culm facies)        |  | Section locations                                     |
|  | Permian - Cretaceous sedimentary cover          |  | Major city  |





Middle Devonian

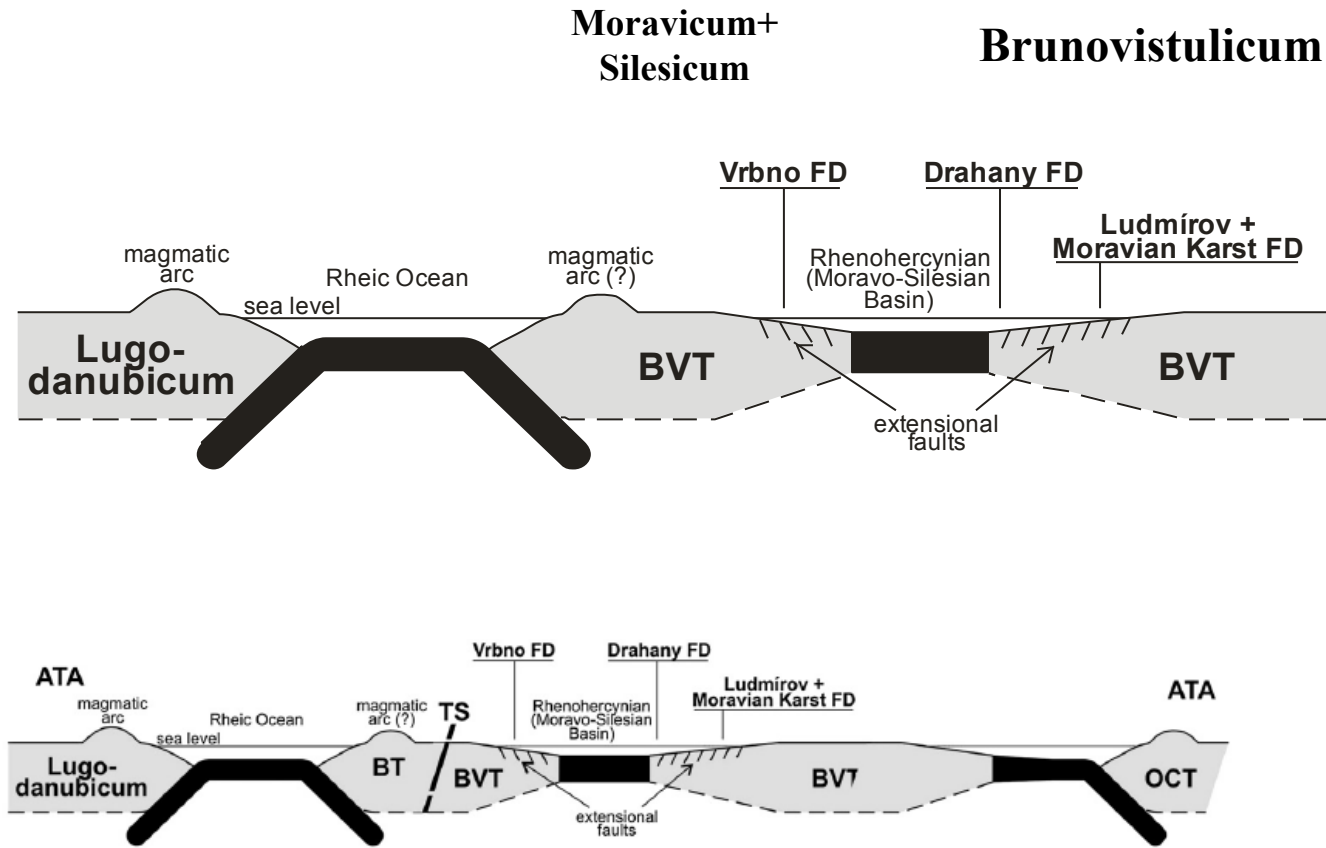
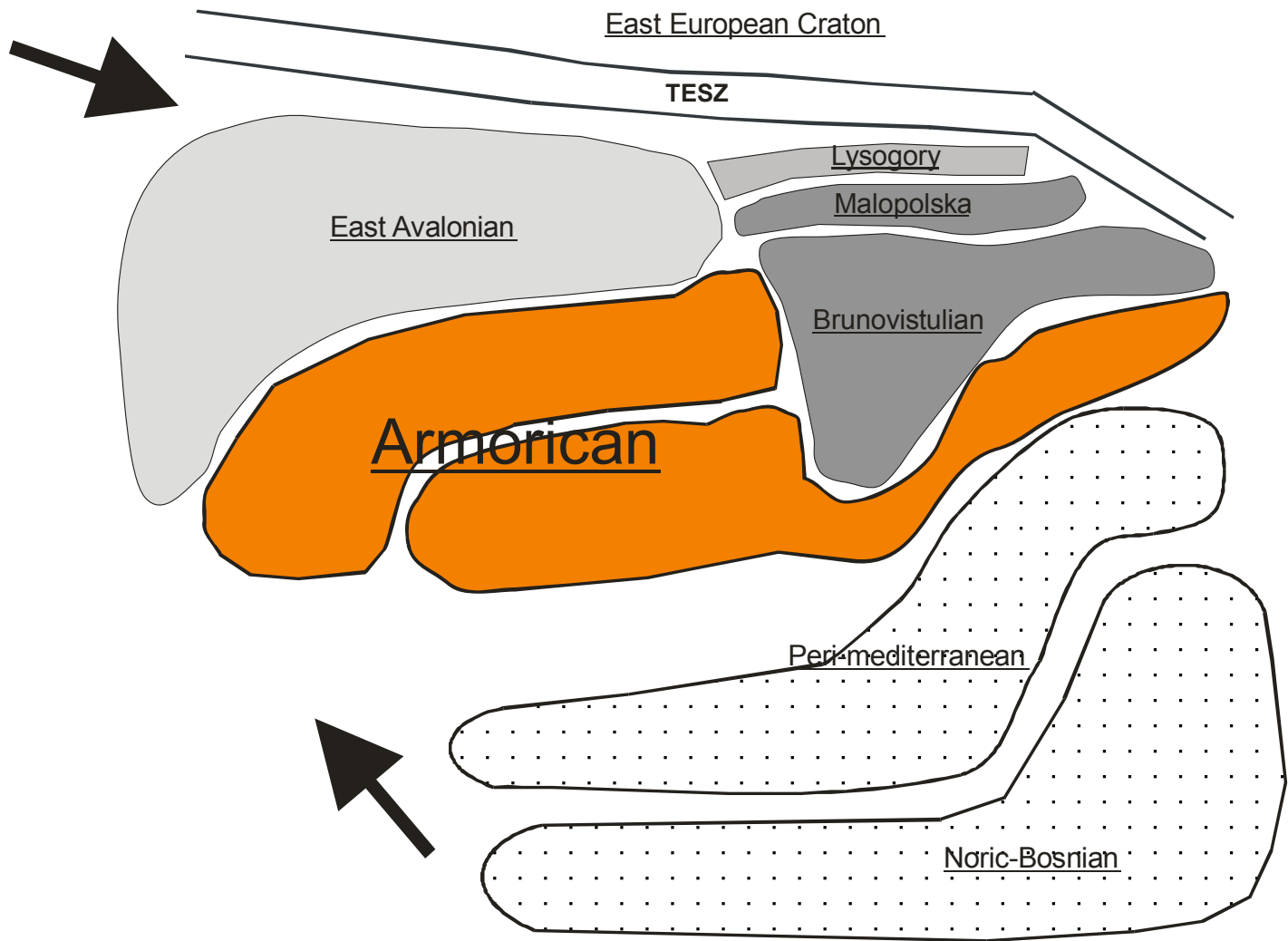
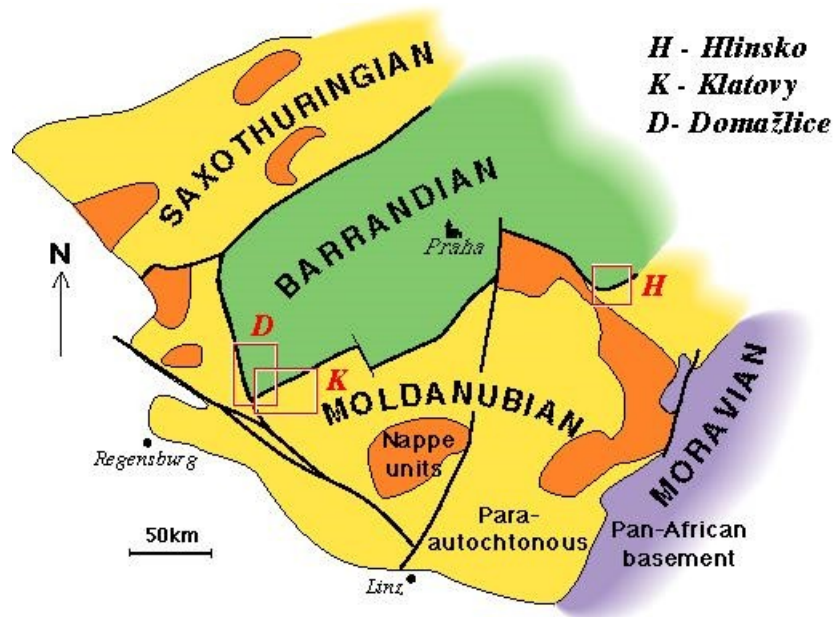
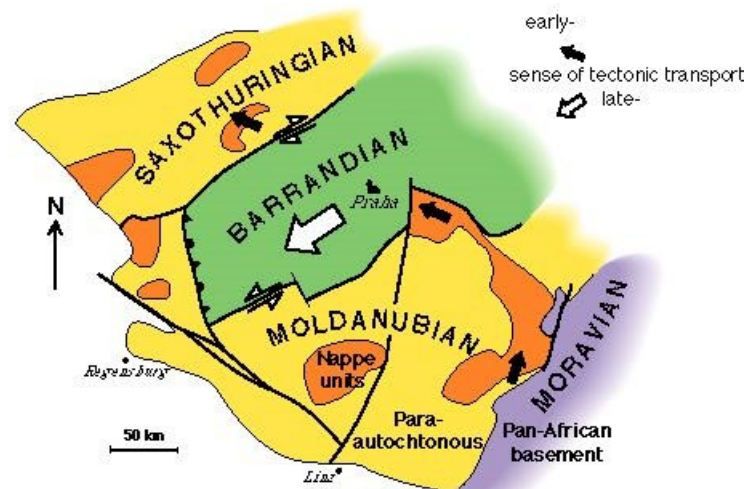


Fig. 4. Plate tectonic cartoon showing the closure of the Rheic Ocean at the eastern margin of the Bohemian massif in the Devonian (modified from Kalvoda et al., 2008). ATA — Armorican terrane assemblage, FD — facies domain, BT — Bíteš terrane, BVT — Brunovistulian terrane, TS — Tornquist suture, OCT — Outer Carpathian terrane. Modified from Kalvoda et al. (2008).



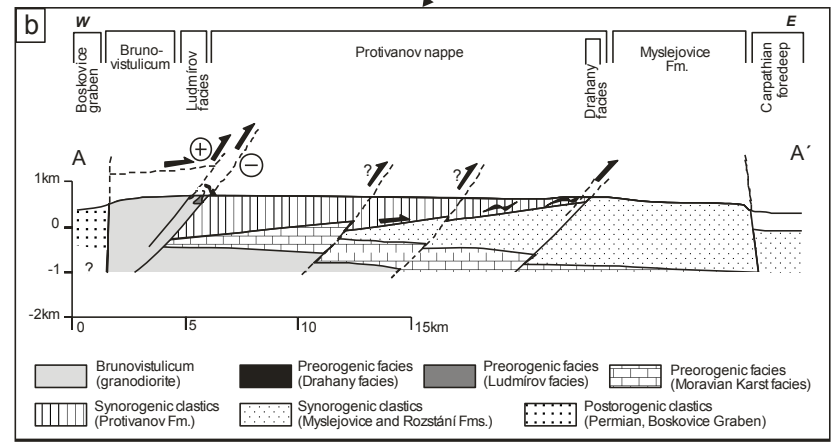
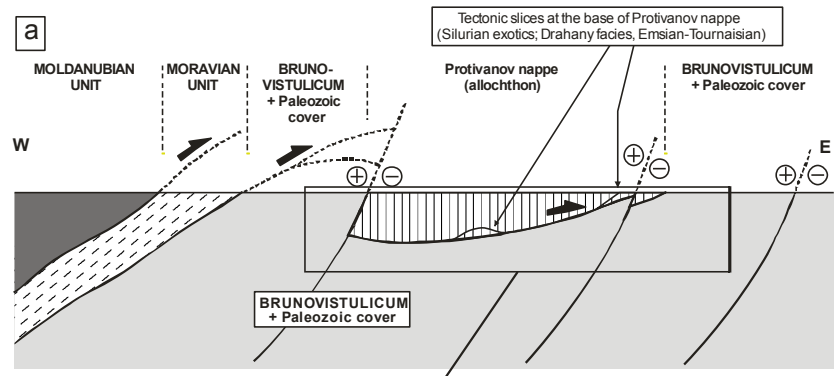


Sketch of the Bohemian Massif



Tectonic evolution of the Bohemian Massif  
 and the juxtaposition of the Barrandian & Moldanubian blocks





## Jižní křídlo variscid – západní Evropa (jižní Francie)

Deformace a metamorfóza - polarita od severu k jihu

**Vendéesko-limousinská zóna** – jižní okraj dorzálního pásma. Různě metamorfované sedimentární a vulkanosedimentární komplexy (proter.-devon) eohercynská migmatizace a anatexe, vysokotlaké metamorfity,

**Cevenská zóna** – centrální krystalinikum (Iberie), slabě metamorfovaný až nemetamorfovaný sedimentární pokryv (proterozoikum-spodní paleozoikum), spodnokarbonský flyš

Armorický mikrokontinent

Iberský mikrokontinent

Gondwana

## Jižní křídlo variscid – střední Evropa

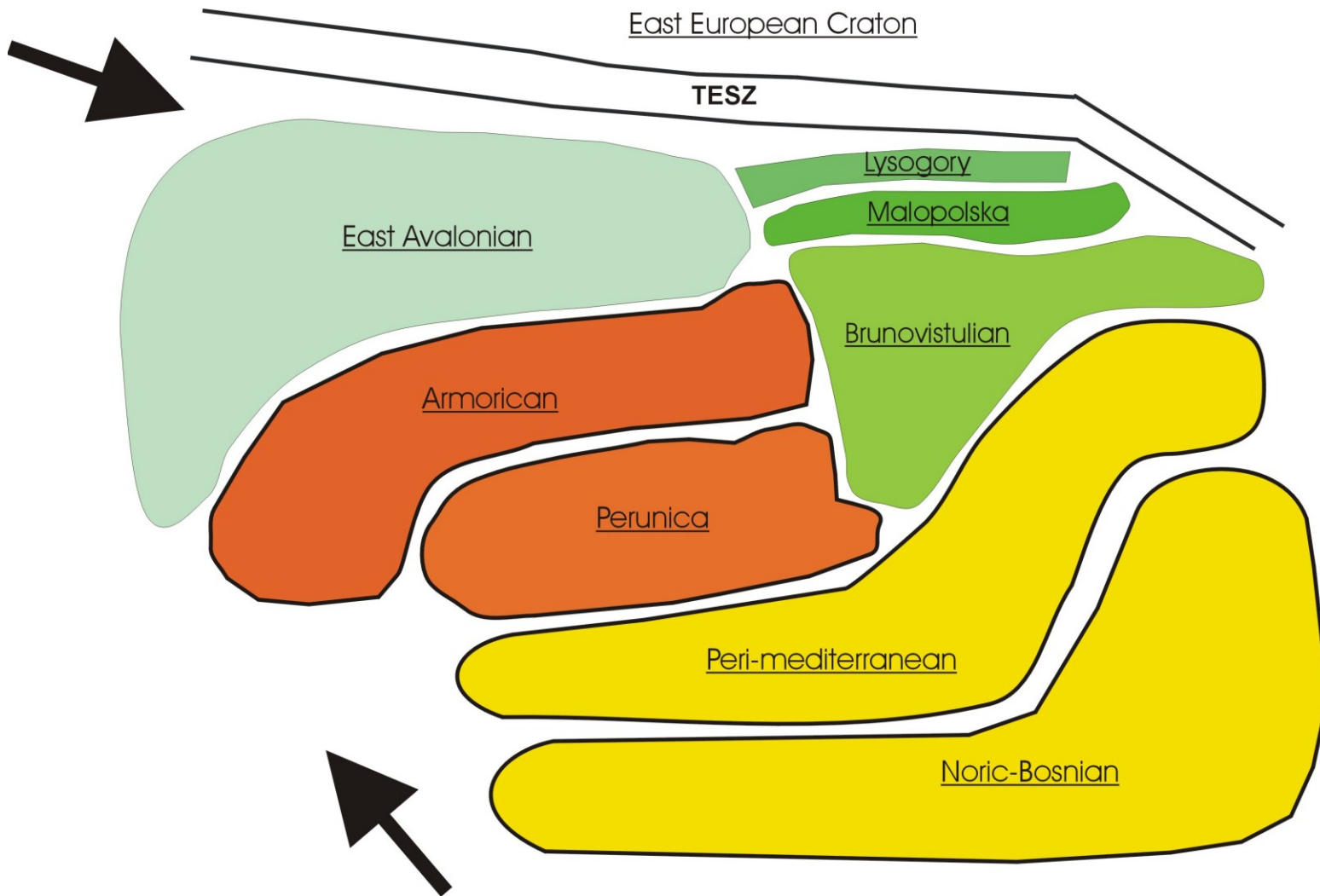
**Moldanubický terán**

**Brunovistulický terán**

Armorický terán

**Perimediterranní terán** – zahrnuje podloží helvetika a část peninika. Aktivní kont. okraj – magmatický oblouk.

**Bosensko-norický terán** – zahrnuje paleozoické jednotky vystupující v příkrovech austroalpinu a suedalpinu. Pasivní kontinentální okraj.



### Discussion

The data from both BM and ACD belts reveal that in both sectors of the Variscides similar processes occurred at the same time, but affected different continental units. Furthermore, the general direction of tectonic transport is basically N-directed in the BM and S- to SW-directed in Alpine basement units (Figs. 9, 10). These relationships suggest that BM and ACD represent different sectors of a double-vergent orogen, which formed between two different continental foreland blocks during the course of the Carboniferous. The Cetic massif, as well as Penninic units with Devonian to Early Carboniferous subduction-related plutonic suites, may have been located along southern, distal margins of the BM block and argue for the presence of a major subduction zone there separating BM and Alpine basement units.

The southeastern BM massif records Carboniferous tectonic consumption of the oceanic lithosphere and the subsequent collision of the (Cadomian) Moravo-Silesian block (Brunovistulian microplate) with the Gföhl terrane. Mantle rocks were exhumed along the suture zone, together with subducted portions of the overlying rocks. In this sense, the entire Gföhl terrane (upper Moldanubian units), as it is exposed now, may represent part of the subduction zone which partially remelted due to entrainment of hot lithospheric mantle slabs into the subduction zone (BRUECKNER, 1998; BRUECKNER and MEDARIS, 1998; MEDARIS et al., 1998). The Moldanubian orogenic wedge was thermomechanically extremely weak, deformed within migmatite-grade metamorphic conditions and allowed rotation of the stiff foreland crust. The thermal imprint on Moravo-Silesian foreland units came from Moldanubian units (Höck, 1995). All the Group III granitoids may record the same melt event (FINGER

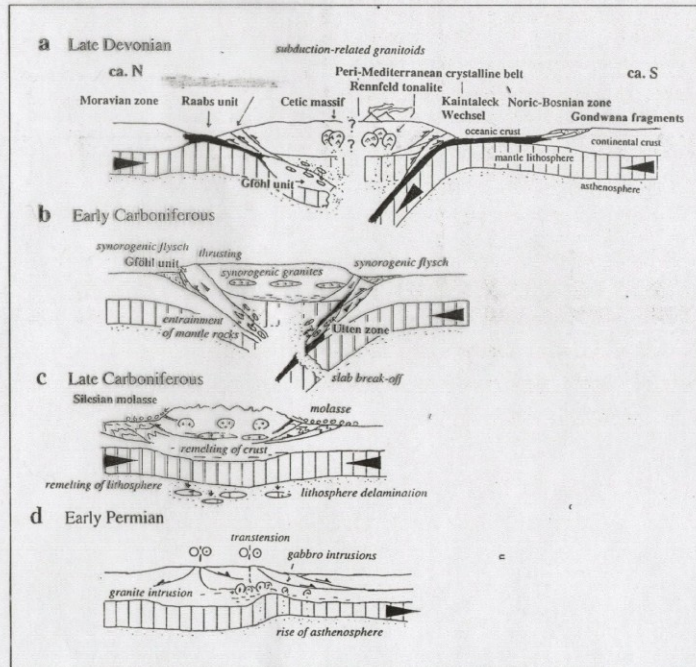
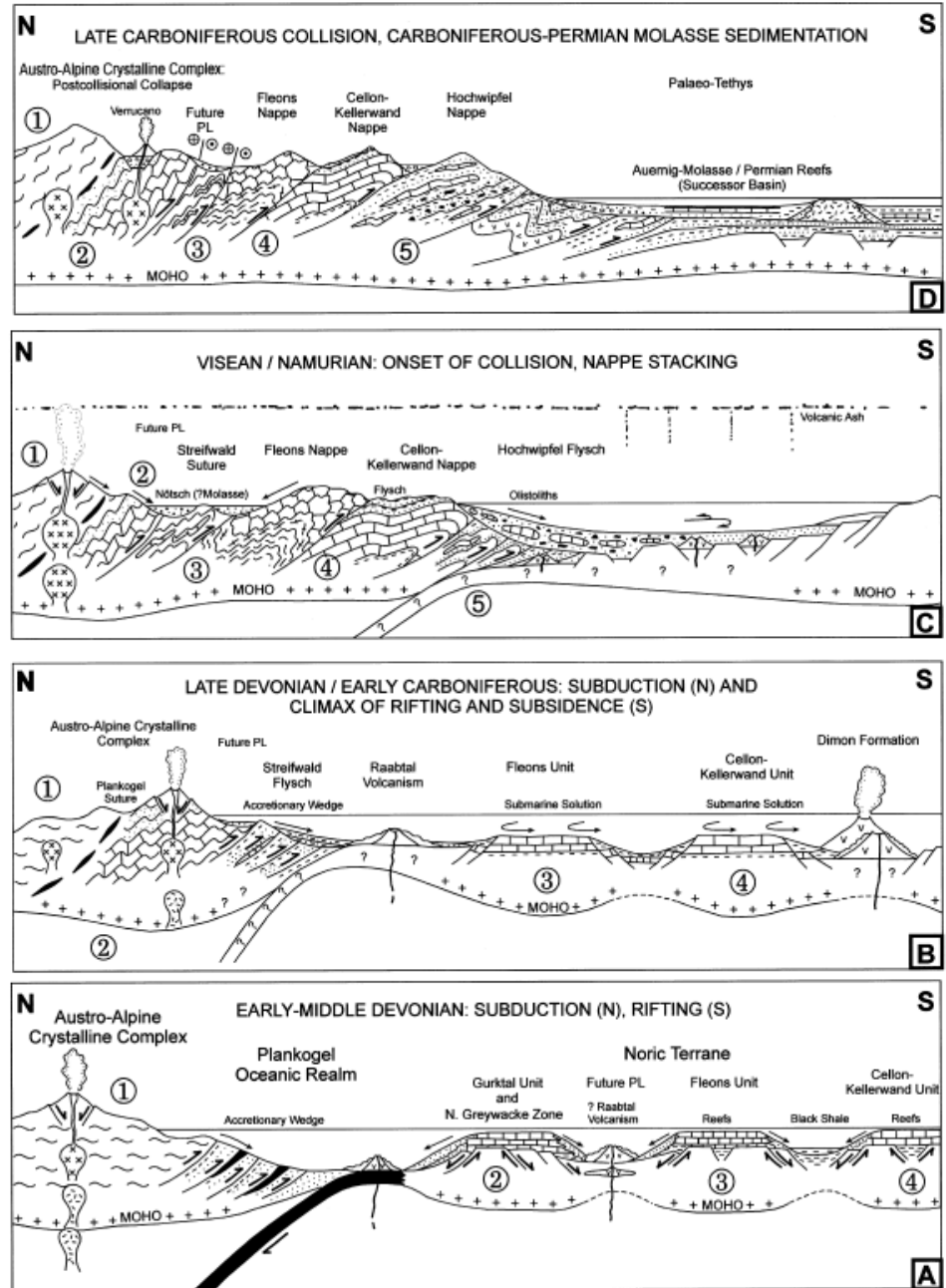


Fig. 9 Stages of tectonic evolution of Central Europe. a - Late Devonian; b - Visean; c - Late Carboniferous; d - Early Permian.



**Brunovistulický terán**

Armorický terán

**Perimediterranní terán**

**Bosensko-norický terán**

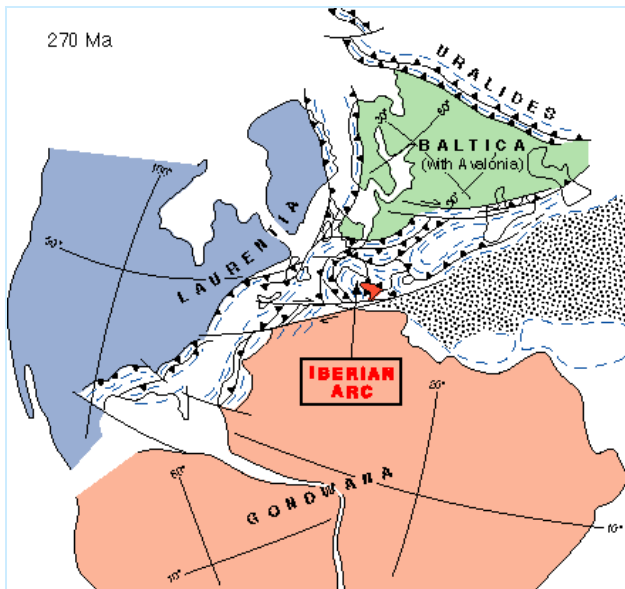
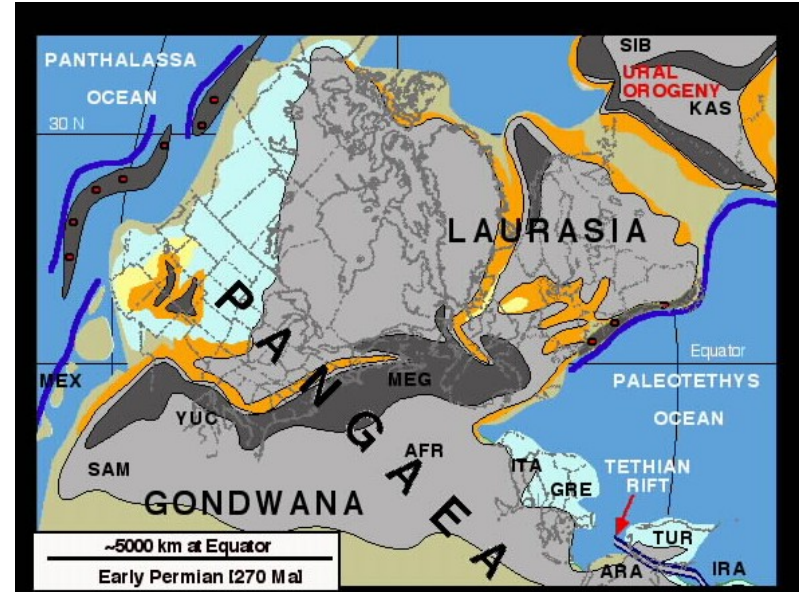
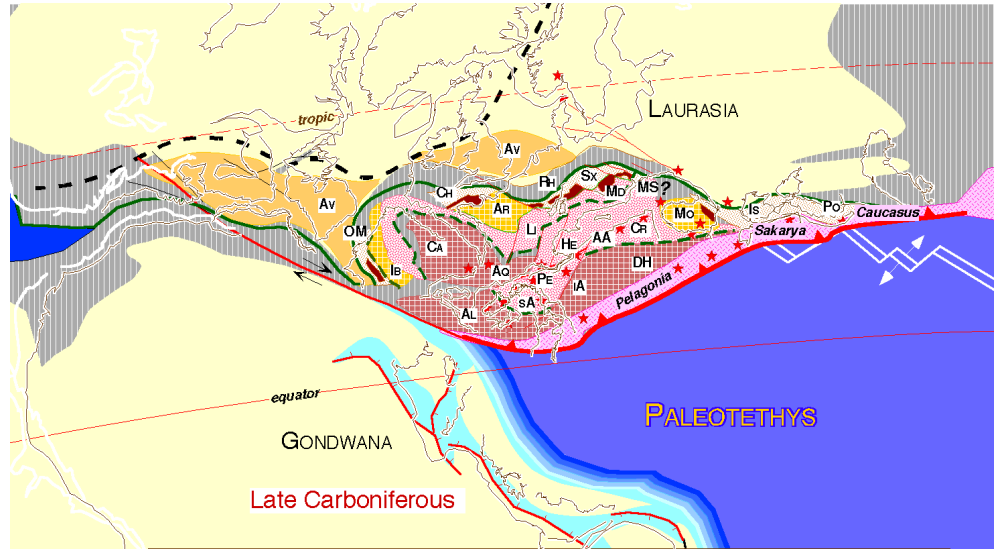
**Jižní křídlo**

**Paleotethys**

Gondwana



# Geologický vývoj variských perigondwanských teránů ve svrchním karbonu a permu

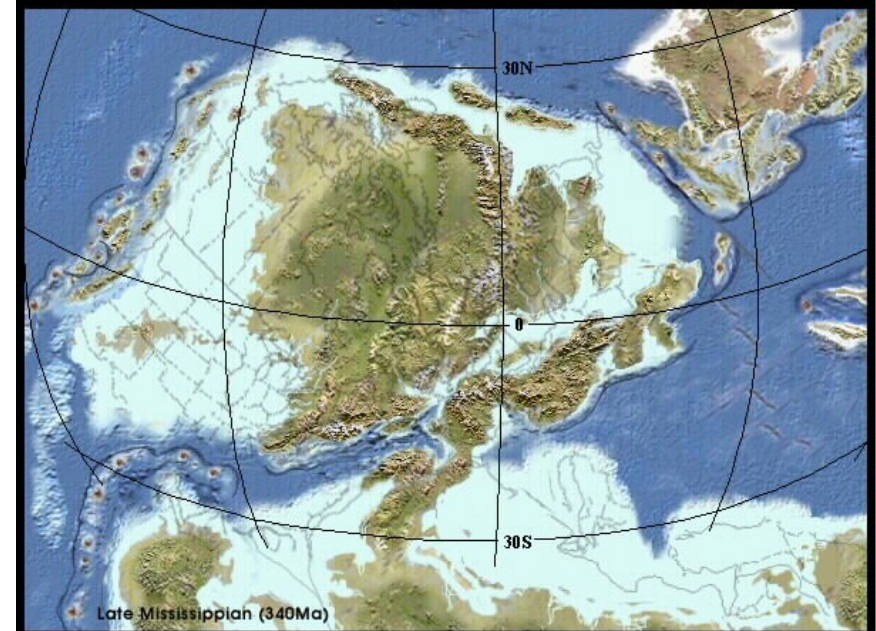
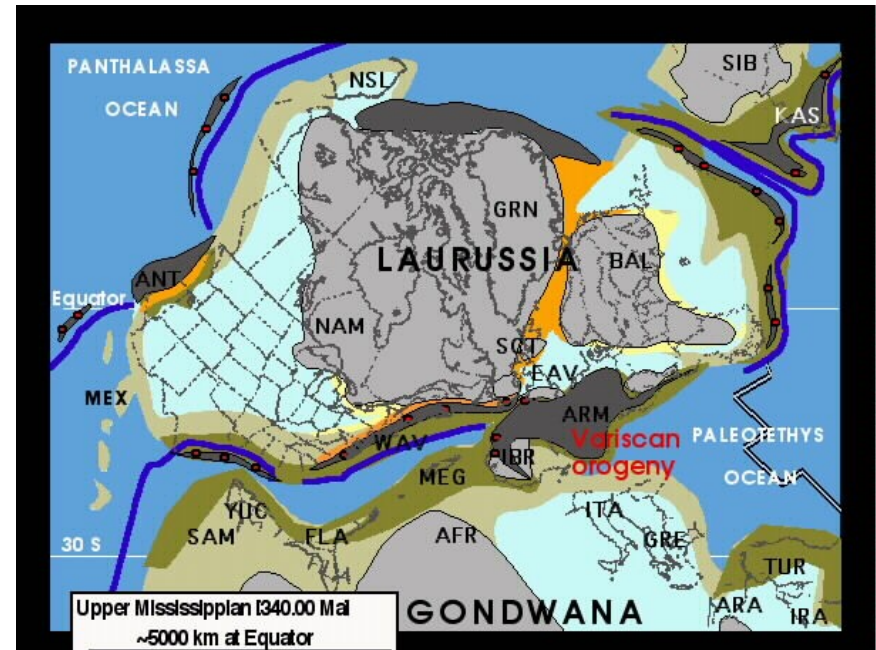
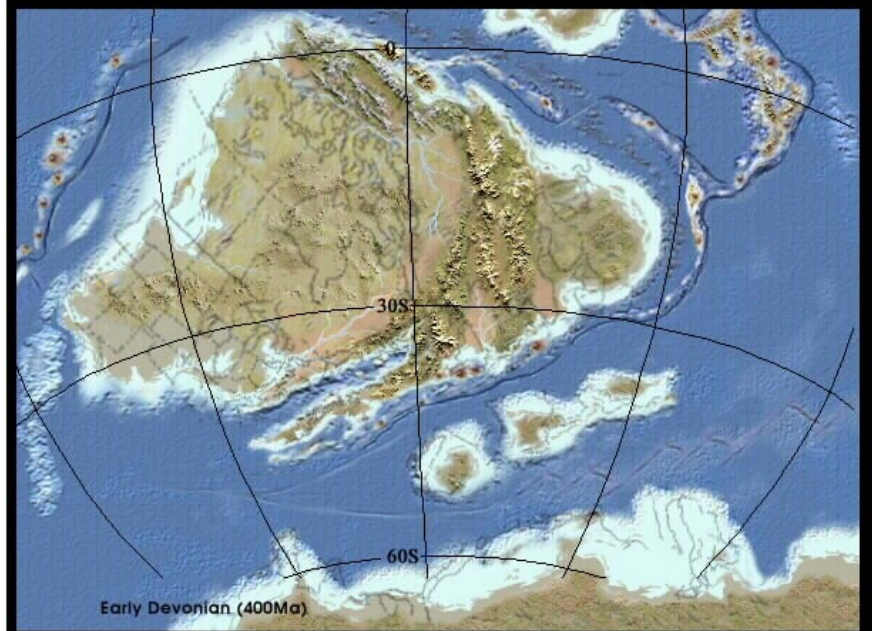


420 Ma





# Vývoj variského orogenu v devonu a spodním karbonu













# Geologický vývoj jižního Uralu

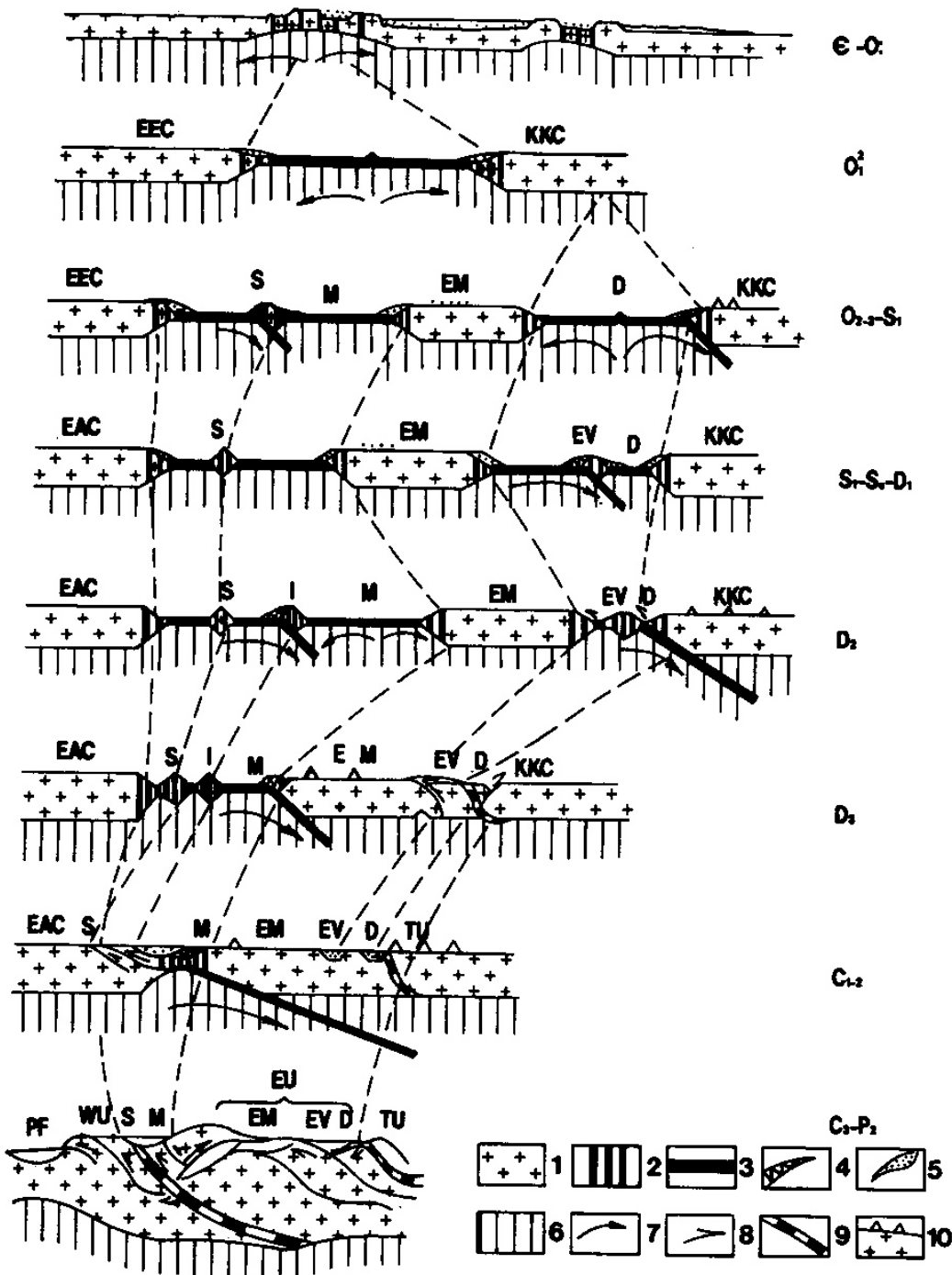
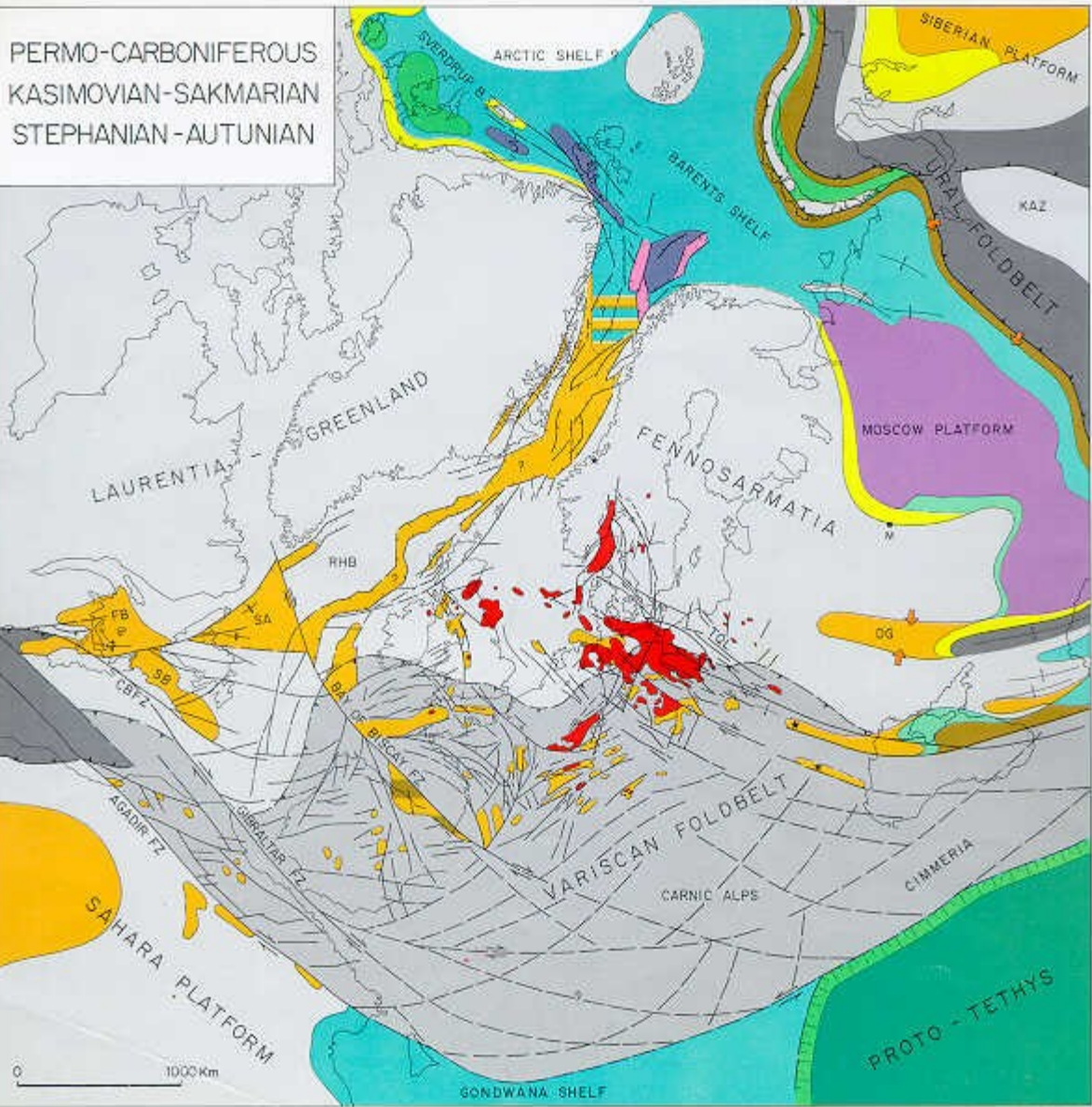


Fig. 5. Palinspastic profiles across the Southern Urals during various stages of the Paleozoic.

Plates: *EEC* = East European continent; *KKC* = Kazakhstano-Kirghizian continent (from beginning of Silurian).

Zones: *S* = Sakmara; *M* = Magnitogorsk; *EM* = East Mugodjary; *D* = Denisovka; *EV* = Eastern volcanic zone; *I* = Irendyk island arc (Magnitogorsk zone); *TU* = Transuralian; *PF* = Pre-Uralian Foredeep; *EU* = East Uralian megazone.



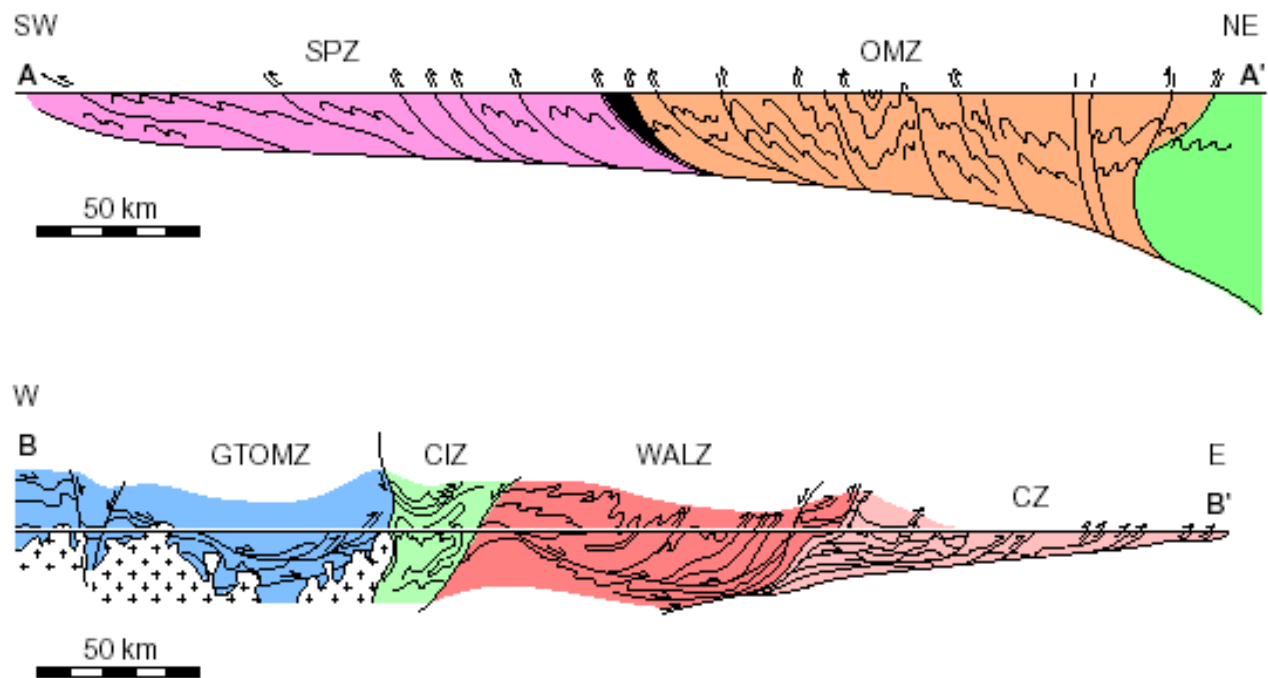


Figure 8.3: Simplified cross-sections of the Iberian Variscide Belt (ophiolites black). A-A': southwestern profile (redrawn from Ribeiro et al., 1995), B-B': northwestern profile (redrawn from Pérez-Estaún et al., 1991). Positions and abbreviations see Fig. 8.2.

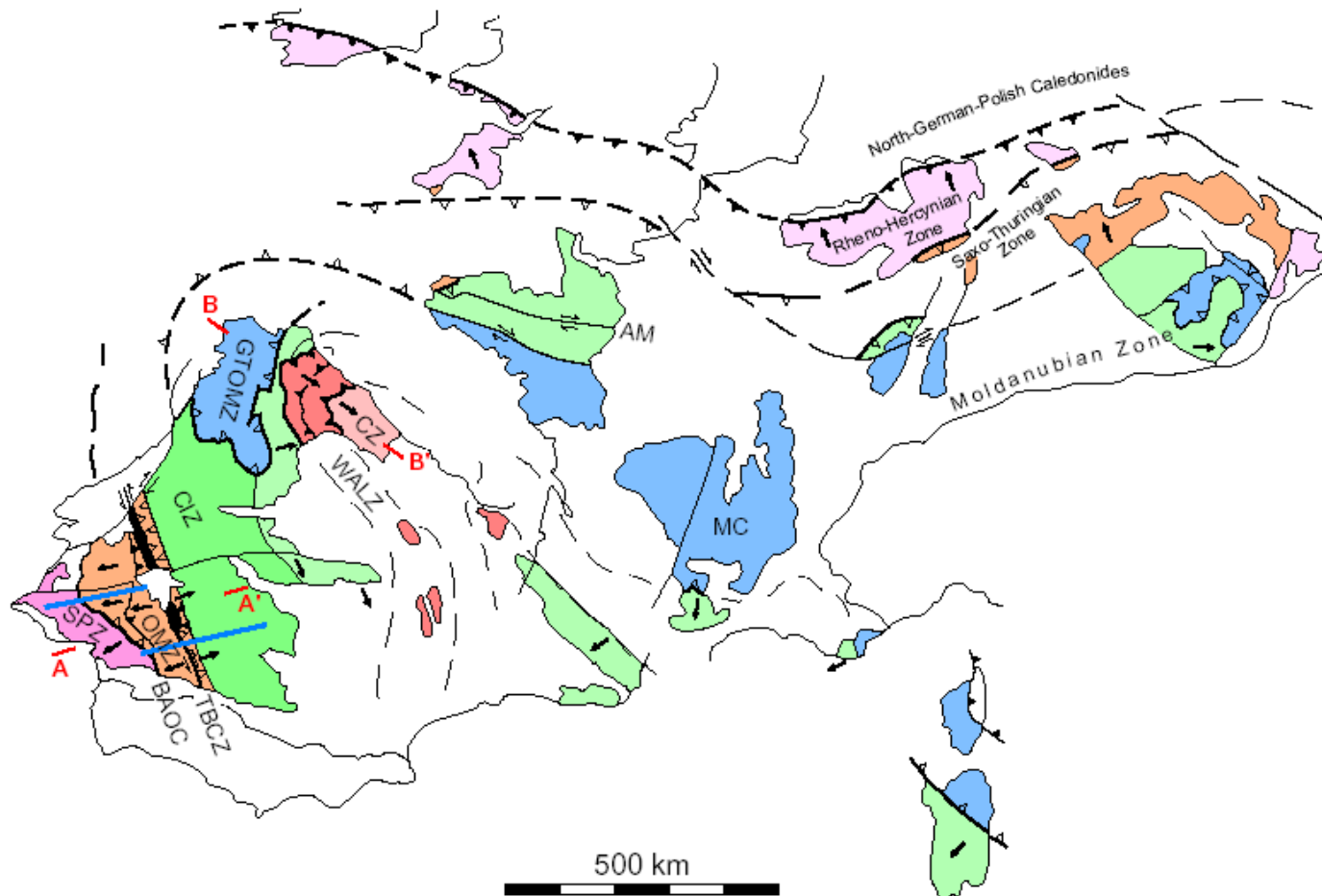
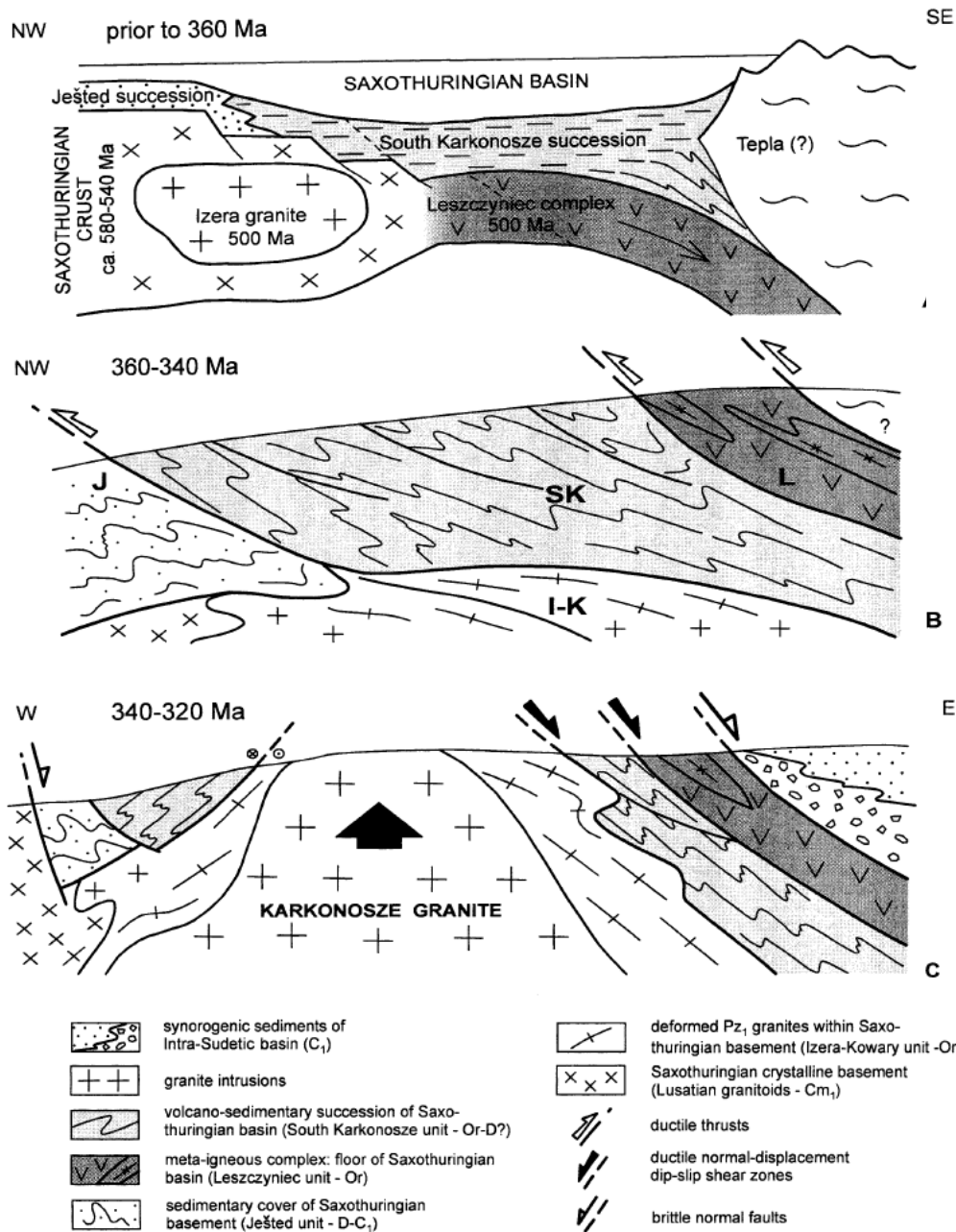


Figure 8.2: Main structural elements of the Variscides during the early Carboniferous (after Franke, 1989). Blue lines in southwestern Iberia mark the planned seismic profiles. Red marks indicate the positions of the cross-sections represented in figure 8.3. AM, Armorican Massif; BAOC, Southern Ophiolite Terrane; CIZ, Central Iberian Zone; CZ, Cantabrian Zone; GTOMZ, Galicia-Tras-Os-Montes Zone; MC, Massif Central; OMZ, Ossa Morena Zone; SPZ, South Portuguese Zone; TBCZ, Tomar-Badajoz-Cordoba Shear Zone; WALZ, West-Asturian Leonese Zone.



**Fig. 9** Late Devonian to Carboniferous structural evolution of the Karkonosze-Izera massif leading to formation of a suture zone and inverted metamorphic nappe pile (vertically exaggerated schematic model). **A** Schematic palinspastic restoration of the Karkonosze-Izera nappe units prior to the main overthrusting event (Middle Devonian) inspired by Wolfgang Franke's

reconstructions of the Saxothuringian belt. **B** Late Devonian to early Visean NW-ward overthrusting event. **C** Top-to-ESE extensional collapse followed by intrusion of the Karkonosze granite during the Visean. **I-K** Izera-Kowary unit; **J** Ještěd unit; **SK** South Karkonosze unit; **L** Leszczyńiec unit. Age assignments as in Fig. 1

**Fig. 11** Evolution of the Kłodzko Metamorphic Complex in Devonian. 1 Mały Bożków Unit; 2 Łączna Unit; 3 Bierkowice Unit; 4 Ścinawka Unit; 5 Orła-Gołogłowy Unit; 6 Kłodzko Fortress Unit; 7 Nowa Ruda Ophiolite. **A** Pre-collisional stage: protoliths of the Mały Bożków, Łączna and Bierkowice units are comprised in the volcano-sedimentary succession of the passive continental margin; **B** collisional stage: obduction of the ophiolite and subsequent nappe stacking are induced by uplift of the earlier subducted continental crust

