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Kinematics of Fold-Thrust and Nappe Deformations in Variscan Accretion Wedge – Moravosilesian Zone, Bohemian Massif

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The Variscan orogenic belt of central Europe represents a complex of crustal blocks accreted to the Laurussian foreland during closure of oceanic domains between Laurussia and Gondwana. The general kinematics of accretion in Saxothuringian and Moldanubian/Lugian zone of the Variscan belt was towards the northwest up to NNE, however presence of Brunovistulian terrane (microcontinent) on the east resulted in more complex and anomalous kinematics and transpressional character of thrusting, especially inside of Variscan sedimentary accretion wedge of Moravosilesian zone. In this presentation we discuss both eastern apical domain of the Moravosilesian zone in flysh foredeep including coal-bearing foreland basin (Upper Silesian Coal Basin) and most inner domains of Silesicum and Lugicum (Orlice-Sněžník Dome), based on comparative complex kinematics and paleostress analysis. One of a fundamental imaginary discrepancies in area under study concerns relation between direction of thrusting inside of most inner Variscan orogeny root zone (Orlice-Sněžník Dome), where top-to-N thrusting is dominant and top-to-E up to SE thrust kinematics, which is evident for all outer domain (Carboniferous flysh and coal-bearing foreland basin) of Variscan sedimentary accretion wedge.

The Variscan metamorphic and deformation evolution of the Orlice-Sněžník Dome indicates significant thickening at ~340 Ma (Steltenpohl et al. 1993), producing especially in the eastern flank of the dome subvertical transpressional shear bands (deformation D_2) indicating dextral transpression (Grygar and Vavro 1995, Štípská et al. 2001), which follow previous early Variscan top-to-NNW shearing (deformation D_1) along subhorizontal shear bands, well preserved in western Orlice flank of the dome. The same D_1 kinematics is well known from the most northern outcrops of Polish part of the Silesian domain (Obertz-Diedicz and Sziepański 1995) and especially also from the norther part of Silesicum.

Transpressional thickening of the inner Lugo-Moldanubian domain of Variscan orogeny initiates and was contemporaneous with grow and sedimentary filling of synorogenic Moravosilesian flysh foredeep. Final crust thickening of internal Variscan orogeny domains resulted in consequent top-to-SE up to E thrusting (deformation phase D_3) inside of sedimentary accretion wedge of Moravosilesian foredeep and foreland basins. Underplated Brunovistulian foreland carried out essential role in character, development and space distribution of regional deformation. A final stage of this deformation phase is related to widely extend dextral transpression along WNW-ESE and NW-SE striking shears zones.

The geometry and direction of thrusting especially along eastern-most apical domain of sedimentary accretion wedge was significantly conditioned by topography and inherited tectonic ramps of underplated Brunovistulian basement. This fact is well demonstrated on the case of Upper Silesian Coal Basin, especially on the Karviná Central Thrust Zone (Grygar et al. 1989, 2003). Progressive development of the prograde deformation inside accretion wedge was conditioned by layer parallel slip and detachment thrusting promoted by high bedding anisotropy of cyclic sediments. The similar role belongs to lithological inhomogeneities (carbonate versus flysh facies, sandstones layers versus coal seams etc.). Slickensides on the bedding planes and intrafoliation fault indicate WNW-ESE up-to NW-SE compression. Recently known easternmost limit of thrust front reaches today post-erosional eastern limit of the Karviná subbasin (part of Upper Silesian Coal Basin – Grygar et al. 1989, 1998, Koníček and Ptáček 1999 etc.). Next progressive stage was represented by tectonic ramping and fault-bend folds structures. Main fold-thrust system is rather uniform from strike point of view (striking NNE-SSW). Dominant asymmetry (vergency) of folding and direction of thrusting is E up to SE-ward. In the whole accretion wedge so as inside Upper Silesian Coal Basin this thrusts display statistically conjugated (bi-vergent) geometry and kinematics. Corresponding back-thrusting is primarily limited along the western domain of flysh foredeep and partially also in the western part of Upper Silesian coal basin.

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Early Palaeozoic Syntectonic Migmatization Preceded Variscan Metamorphism in the Orlica-Śnieżnik Dome, Sudetes: U-Pb SHRIMP Evidence

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The Międzygórze structure is one of informal tectonic units in the eastern part of the Orlica-Śnieżnik Dome (OSD), West Sudetes, Poland. Within coarse-grained, augen orthogneisses (~Śnieżnik type), there is a ca. 6 km long and 1.7 km wide inlier composed of fine-grained, light to dark, banded or streaky, often migmatitic gneisses (~Gierałtów type), accompanied by isolated bodies of amphibolites (mainly retrograded eclogites) and eclogites. U-Pb and Pb-Pb datings of zircons from the OSD gneisses repeatedly yielded ages between 515–480 Ma interpreted as time of intrusion of their granitic precursors (Van Breemen et al. 1982, Oliver et al. 1993, Borkowska and Dörr 1998, Turniak et al. 2000, Kröner et al. 2001). All rocks in the OSD rocks underwent synmetamorphic shearing and mylonitization during Variscan orogeny at ca. 340–320 Ma (Borkowska et al. 1990, Brueckner et al.1991, Turniak et al. 2000, Lange et al. 2002, Marheine et al. 2002), which resulted in overall secondary parallelism of almost all lithological contacts and often imparted similar outlook to originally different gneiss variants. Combined with superposed foldings and geochemical similarities, all these have caused serious confusions and misidentification of gneiss variants, and provoked still open debate on their original relationships and timing of deformation, i.e. pre-Variscan and Variscan (Don 1977, 2001, Borkowska et al. 1990, Přikryl et al. 1996, Kröner et al. 2001), or exclusively Variscan (Turniak et al. 2000, Štipska et al. 2004). Kröner et al. (2001) were able to show that in the western part of the OSD an undeformed microgranodiorite vein dated at 492±35 Ma (Pb-Pb zircon) intruded the already gneissified granite (~514 Ma protolith age). This data needs to be verified, however, an early Palaeozoic tectonothermal event in the OSD cannot be viewed upon as a merely magmatic one. Similar conclusion, based on data from the eastern OSD, has recently been reached by Lange et al. (in prep.).

Our studies revealed that although augen gneisses and migmatitic gneisses outcropped in the Międzygórze structure display little differences in geochemistry, they differ systematically in modes and mineral phase (feldspar, garnet, mica) compositions, and differ significantly in fabrics and deformational histories (Grześkowiak and Żelaźniewicz 2002, Grześkowiak 2003, 2004). From the presence of (1) the isolated enclaves of migmatitic gneisses enclosed in the once porphyrytic granite (now augen gneiss), (2) the preserved intrusive contacts of the two rocks and (3) much simpler phase composition of feldspars in the porphyrytic granite, it has been inferred that the latter developed at the expense of a migmatitic suite via partial melting of the older crust. This requires migmatization coeval with the granite formation. An alternative view which assigns granite intrusion to the Cambro-Ordovician and migmatization to the Carboniferous (Turniak et al. 2000) is not substantiated by our field and textural evidence. To solve the problem a set of 5 zircon