THE RAABS SERIE, A VARISCAN OPHIOLITE IN THE SE-BOHEMIAN MASSIF: A KEY FOR THE TECTONIC INTERPRETATION

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Variscan orogeny in the SE-Bohemian Massif has been classically explained by collision of the Moldanubian continental block with the Moravo-Silesian foreland. Consequently, a possible suture including oceanic fragments should be located along this boundary. Based on new geochronological, petrological and structural arguments however, a different model for the Variscan tectonostratigraphy has been recently proposed by Fritz and Neubauer (1993). Two distinct crustal pieces are distinguished: (1) A Late Proterozoic terrane including the Moravian Nappe Complex and the Moldanubian Variegated and Monotonous Series and, (2) an Early Paleozoic terrane including Gföhl unit and granulite nappes (Gföhl terrane after Franke, 1989). The Raabs Serie is interpreted as an oceanic fragment seperating these crustal blocks.

The Raabs Serie is defined by a highly metamorphosed metasedimentary sequence including metapsammites, metapelites and, to a lesser extend calcsilicates, marbles and quartzites which are closely connected with various types of amphibolites and serpentinites. The serpentinites derived from harzburgites and are extremely uniform in petrology and chemical composition. Al_2O_3-CaO-MgO relations and petrology suggest metamorphic peridotites of oceanic or active margin origin.

Amphibolites differ in texture, mineral and chemical composition. Abundances of Rare Earth Elements (REE) normalized to average primitive mantle composition gave pattern subparallel to avarage E-type MOR-basalts for fine grained plagioclase and garnet amphibolites (Fig. 1a). HFS element pattern normalized to N-type MORB are close to the unity line. Very coarse plagioclase amphibolites with gabbroic texture gave similar REE pattern but lower absolute abundances (Fig. 1b) and strong depletion of incompatible trace elements. Another type is etremely rich in coarse amphiboles with plagioclase in an intercumulus phase. Element pattern are explained by fractionation processes in gabbro respectively cumulate rocks.

A kinematic and geodynamic models which explain this situation must consider: (1) The oceanic suture and hence the plate boundary is located within the Moldanubian Unit. (2) The Moldanubian Variegated Serie reflects an imbricated foreland unit and is comparable to the Moravo-Silesian Micaschist Complex.

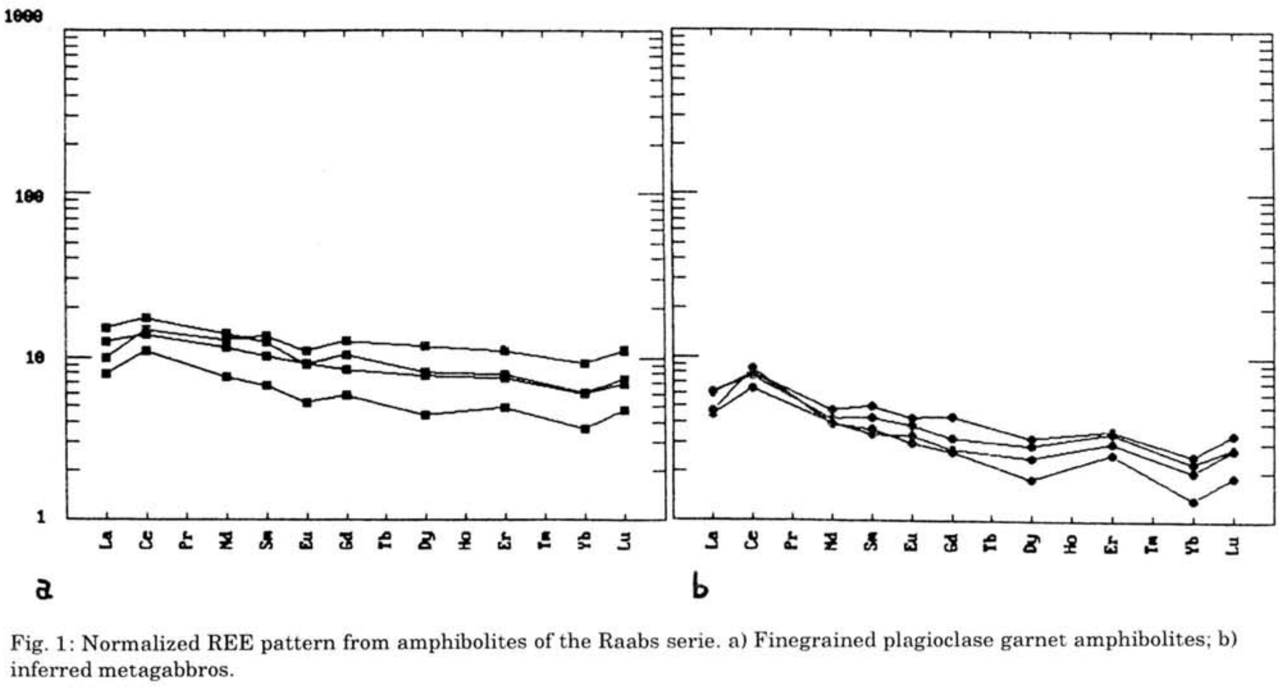

Fig. 1: Normalized REE pattern from amphibolites of the Raabs serie. a) Finegrained plagioclase garnet amphibolites; b) inferred metagabbros.

Overall kinematic is explained by foreward propagation of thrusts. Major decollement developed at the base of the Early Paleozoic Gföhl and granulite terrane seperating two crustal blocks. Remnants of the suture are preserved in the Raabs and Letovice ophiolite bodies (Mísař et al, 1984). During thrust propagation the Moldanubian/Moravian boundary developed as a deep crustal decollement as effect of continental underplating. Rapid uplift and exhumation of deep crustal rocks together with a steep temperature gradient is explained by thrusting in a thick skinned tectonic style.

References
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THICK-SKINNED VERSUS THIN-SKINNED THRUSTING: MECHANISMS OR THE FORMATION OF INVERTED METAMORPHIC SECTIONS IN THE SE BOHEMIAN MASSIF.

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Variscan orogeny in Central Europe resulted from continental collision between the Devonian and Early Carboniferous. The Bohemian Massif is interpreted as a root zone characterized by "deep" crustal nappe assembly within an overall transpressive regime. Typical features of the Bohemian Massif include: 1) many crystalline nappes which record large-scale assembly during granulite to amphibolite facies conditions in internal orogenic zones; and, 2) nappe assembly which occured under very low to low-grade metamorphic conditions in external parts.

Structural characteristics indicate a deformation path which initiated close to peak metamorphic conditions and progressed during decreasing temperatures. These correspond with a clockwise tectonic displacement path with orogen-parallel HT displacement. This was followed by orogen-perpendicular LT displacements. In later stage of trans-pression, extensional structures developed. Extension in the hinterland is contemporanous with compression in the foreland. Displacement partitioning effected distribution of extensional structures associated with both orogen-parallel and orogen-perpendicular displacements. Foreland units were overthrust by HT-metamorphosed nappes during oblique collision. Structural investigations indicate an inverted metamorphic zonation with HT fabrics (related to nappe assembly) in the hangingwall units and LT-fabrics in the footwall units.

$^{40}Ar/^{39}Ar$ muscovite and hornblende ages reflect complete resetting of Cadomian Ar isotopic system during late Variscan thrusting tectonics (Figure 1). White mica and hornblende within hangingwall units record plateau ages between 331 Ma and 325 Ma. This contrasts with c. 580-560 Ma $^{40}Ar/^{39}Ar$ hornblende and muscovite ages from igneous suites in footwall units immediately below the Variscan HT thrust plane. These ages date post-magmatic cooling of the Cadomian plutons.

Kinematic and geodynamic models which explain this situation must consider a deep crustal decollement which did not effect the temperature regimes maintained in footwall units. This situation may have developed during rapid uplift associated with formation of ramp anticlines during forward nappe propagation. HT nappe assembly initiated in deep crustal levels in a thick-skinned tectonic style, and was approximately coeval to maximum subsidence of a narrow and deep foreland basin. Maximum basin subsidence occurred in Visean. Uplift and exhumation of deep crustal nappes changed the rheological behaviour; subsequent thrusts progressively developed under LT conditions and thin-skinned tectonic style. Rapid uplift with a steep temperature gradient together with the narrow, deep and rapidly subsiding foreland basin suggests collision with a hot and weak lithospere plate.