Development of S–C fabric is marked by break–down of rigid feldspar skelet while weaker phase starts to be interconnected. Strain rate and stress are concentrated to quartz/mica weak layers shielding isolated pockets of rigid feldspar aggregates. Final stage of banded mylonite is marked by decreasing ratio of viscous contrast between both hard and weak phases. Power law creep mechanisms (dislocation creep) operate in both quartz and feldspar monomineral aggregates which are equally rheologically active.

This progressive microstructural development of deformed granite help to understand 1) a rheological behaviour of continental rocks in mid–crustal levels and 2) steady state flow microstructure of polyphase quartz/feldspar material under amphibolite facies conditions.

CHARACTERIZATION, 3–DIMENSIONAL ORIENTATION AND DECOMPRESSION OF THE ZEV MINERAL ZONES (NE–BAVARIA)

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In the main part of the ZEV (Zone of Erbendorf Vohenstrauß), three mineral zones of NNW–SSE extension were mapped (from W to E): a Staurolite zone with staurolite+garnet (+kyanite/sillimanite) + biotite + muscovite + quartz, a Garnet–Aluminiumsilicate zone with garnet + kyanite/sillimanite + biotite + muscovite + quartz and a Cordierite zone with cordierite + andalusite + biotite. The Cordierite zone extends along the late Variscan Leuchtenberg Granite, but is also found, in small "isles", far away off the granite.

In the KTB drill hole the first 7800 m represent the Garnet–Aluminiumsilicate zone with some migmatitic portions and a segment of Cordierite zone at 470 m. Below 7800 m in cuttings the assemblage staurolite + garnet + kyanite + sillimanite + biotite + muscovite + quartz and others with andalusite + biotite + quartz are recovered, the latter which eventually represents the Cordierite Zone.

Garnet of the Staurolite zone show bell–shaped Mn–profiles, but is nearly homogenized in the Garnet–Aluminiumsilicate zone except for a retrograde rim. In the latter mineral zone e decompressive reaction garnet + muscovite > biotite + sillimanite + quartz is observed. Wherever both aluminiumsilicates occur, sillimanite often seems to be the younger polymorph.

Calculated temperatures with garnet–rim / contact biotite pairs range from 568 °C–616 °C at pressures below 5–6 kbar as given by the stability of sillimanite. Cordierite zone is characterized by the reaction garnet + aluminiumsilicate + quartz > cordierite, indicative of a second decompression reaction.

TECTONOMETAMORPHIC EVOLUTION OF THE INTERNAL VARISCAN BELT – EXAMPLES FROM EASTERN/WESTERN ALPS, BOHEMIAN MASSIF, MASSIF CENTRAL AND SOUTHERN BRITTANY

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Pressure–temperature–time–deformation (P–T–t–d) paths from metamorphic rocks provide considerable insight to the tectonothermal history of single crystalline segments in an orogenic belt. Most precise information about the P–T–t–d–space evolution of a terrain can be obtained from single metapelite and metabasite samples by relating mineral zonations and successive mineral equilibria to linear and planar (L–S) structures of progressive deformation. When continuous reactions are considered in such rocks, each step of garnet or amphibole growth zonations represents a finite temporal and spatial domain of equilibration within the assemblages and allows to evaluate P and T or P–T changes for each deformational step by geothermobarometry based on cation exchange and amphibole end member equilibria (Triboulet & Audren 1985; Triboulet 1992; Schulz 1993). This microstructural-petrological approach has been applied to several segments of the internal Variscan belt. The characteristic shapes of the P–T–t–d paths from each segment allowed a thermotectonic interpretation by comparison with numerically modelled P–T paths.

In the Austroalpine basement to the south of the Tauern Window (Eastern Alps), high-pressure conditions were passed by clockwise P–T paths with P variations at increasing T. Furthermore, nearly isobaric heating paths and anticlockwise paths occur. The array of P–T paths signalizes burial and partial uplift of different lithological units in course of an early Variscan overstacking process with formation of the main foliation (Schulz 1993).

Basement sequences in the Aiguilles Rouges Massif of the Helvetic Zone (Western Alps) display a metamorphic zonation with a high T gradient. The decompressional paths of the high-pressure rocks are related to the formation of subvertical planar structures. This can be explained by an early-Variscan rapid tectonic uplift in a general strike-slip regime and final late-Variscan telescoping of the pre-existent metamorphic zonation (Schulz & von Raumer 1993).

A prograde-retrograde Variscan P–T path from a garnet-sillimanite-biotite mica schist of the Moldanubian diaphthorite zone (Bohemian Massif, NE Bavaria) passes early HT–LP and later high-pressure conditions with an anticlockwise shape, and then displays nearly isothermal decompression to a final HT–LP stage. This signalizes a rapid tectonic burial and uplift process of a crustal segment with initial high heat flow rates (Schulz 1992).

Several flat-lying lithological units are stacked in the La Sioule and Haut Allier regions of the French Massif Central and show syndeformational Variscan P–T paths with different shapes. Different Tmax in the units confirm an inverse metamorphic zonation. The prograde anticlockwise and post-Pmax clockwise paths are associated with formation of the main foliation by pervasive top-to-W shearing parallel to the regional stretching lineation. The major parts of prograde and retrograde metamorphism of each unit are independent of the thermal history of the other units, however, particular P–T paths geometries may be explained through successive stacking and uplift stages (Audren et al. 1987).

Different early-Variscan P–T histories are as well found in the units of Southern Brittany. Anticlockwise prograde and clockwise retrograde paths of Ile de Groix blueschists are associated with formation of sheath folds (Audren & Triboulet 1993a). Mica schists and amphibolites of the Ia Vilaine unit display similar P–T paths with marked late isobaric cooling, which can be interpreted by understacking of crustal nappes (Triboulet & Audren 1985;1988). Macro- and mesoscopic structures in the mica schists and underlying migmatitic gneisses suggest the existence of an unexposed diapir. A multistage clockwise P–T evolution in high-grade aluminous gneisses (kinzigites) gives evidence of progressive diapirism. These vertical movements pertube the general lineation-parallel top-to-W shearing in the region (Audren & Triboulet 1993b).

To sum up, the general process of Variscan crustal thickening and thinning led to individual tectonometamorphic histories associated with comparable structural evolutions in each crustal segment of the internal Variscan belt. The time calibrations of these tectonometamorphic histories remain as a crucial problem.

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