sedimentary Stronie series which extends from the Javorník town at the NE towards the Polish border at the SW.

The investigated belt is composed of paragneisses and micaschists with intercalations of amphibolites, amphibole-bearing gneisses, marbles and quartzites and is surrounded by the augen to fine-grained orthogneisses. The first recognized structure in the area is a rarely preserved subvertical NE-SW trending foliation S_1 defined by metamorphic and lithological layering without an apparent lineation. The S_1 foliation is folded by open to isoclinal F_2 folds which led in some areas to a complete transposition into the S_2 foliation. The centimetre- to several metre-scale F_2 folds are asymmetrical to subhorizontal NE-SW trending axes and axial planes dipping to the NW under shallow to intermediate angles. In the areas of the complete transposition, the S_2 foliation dips under shallow to intermediate angles to the NW or to the SE and bears a NE-SW trending intersection lineation L_2 parallel to the fold axes. Isoclinal centimetre-scale rootless F_2 folds composed of quartz and feldspar exudations are often preserved within the transposed S_2 foliation. The degree of transposition is most advanced in the soft micaschists and paragneisses, whereas in the areas with higher amount of stronger amphibolite and marble layers the folds are more open, and locally vertical S_1 foliation is preserved. In the surrounding orthogneisses, the dominant structure is the S_2 flat lying foliation with rarely preserved isoclinally folded ribbons of recrystallized feldspars and quartz.

The peak mineral assemblage in the micaschists comprises st-grt-bt-ms-pl-qtz or ky-st-grt-bt-ms-pl-qtz and in the amphibolites amp-ep-pl-qtz ± grt. Secondary growth of sillimanite and andalusite was observed. in the micaschists The microstructure in micaschists is characterized by crenulation foliation S_1-S_2 often completely transposed into the S_2 foliation. The kyanite and staurolite grew during the D_1 deformational phase and are often entirely reoriented into the S_2 foliation. Usually straight quartz and ilmenite inclusion trails in garnet are oriented at a high angle to the matrix S_2 foliation which indicates that the growth of the garnet occurred during the D_1 deformational phase. However, the inclusion trails in the andalusite porfyroblasts are curved, evidencing the later growth synchronous or even post-dating the F_2 crenulation. Inferred minimum PT conditions based on the peak metamorphic assemblages in metapelites and published petrogenetic grids are ~600 °C and ~8 kbar. The growth of sillimanite and andalusite indicates the decompression at still high temperature.

Our structural and metamorphic investigations show that the Stronie series in the studied area was buried at a depth corresponding to ~8 kbar at ~600 °C and that the development of the peak metamorphic assemblages was contemporaneous with the development of the S_1 foliation. The F_2 folding occurred at decreasing pressure conditions at still high temperature as indicated by the later local growth of sillimanite and subsequent andalusite overgrowths of the S_2 crenulation. The first deformational and metamorphic stage is interpreted to be a result of burial associated with the thickening of the orogenic root during the Variscan convergence, whereas the second deformational stage and growth of the later mineral phases in metapelites is connected with the subsequent exhumation.

Mid-Crustal Emplacement of the Třebíč Durbachite: a Result of Interplay between Compressional and Wrench Tectonics due to Block Rotations

Karel SCHULMANN, František HORUDA, Ondrej LEXA, František MLEJNECKÝ, Stanislav ULRICH and Jiří KONOPÁSEK

Institute of Petrology and Structural Geology, Charles University, Albertov 6, 12843, Prague, Czech Republic,

We have examined emplacement mechanisms of durbachite magma of one of the largest plutons within the Moldanubian orogenic root system. The structural study of magmatic and subsolidus fabrics was carried out by means of standard methods of field structural geology, systematic measurements of fabrics of large feldspar phenocrysts using reflection goniometry and regional AMS study. These investigations were supported by detailed structural investigations of the country rocks.

Tectonics of the eastern Variscan orogenic root is controlled by 350–340 Ma successive westward thrusting of the lower crustal Gfohl unit (15 kbar/800 °C peak) over the middle crustal Varied group to the east (7–9 kbar/700 °C peak), and eastward thrusting over the easterly middle crustal Svratka crystalline complex (6–9 kbar/650 °C). This extrusion of lower crustal segment was controlled by originally NNE-SSW trending continental margin of the easterly lying Brunovistulian basement and was terminated at ca 340 Ma ago. This compressional structural fabric was modified by a dextral lithospheric NW-SE Elbe fault zone at ca 330–325 Ma. This fault zone is responsible for dextral rotation of the adjacent crustal blocks into parallelism with major sense of shearing.

This tectonic template created complex polyphase geometrical boundary conditions controlling emplacement of mantle – – derived (ultra Mg-K) syenite of triangular shape (500 km^2) along tectonic contact of lower crust and middle crustal units. The boundaries of the pluton are steep to the east (parallel to continental margin) and north (parallel to one of lithospheric faults), whereas western margin is flat and parallel to regional mid-crustal fabrics. Structural and petrological study of country rocks, regional AMS study (800 sites) and reflection goniometry of feldspar phenocrysts show dextral flow along the eastern margin, sinistral along the northern edge and flat flow pattern parallel to the western margin. The magmatic flow is polyphase which is reflected by steep and NNE-SSW trending early magmatic fabrics in the core of the vast majority of the pluton. These fabrics are overprinted by flat submagmatic to solid state shear zones which are locally dominant.

This pattern reflects an early E-W shortening of orogenic root associated with extrusion of the lower crust lubricated by sills of mantle – derived melts. The magma ascended vertically along pre-existing vertical anisotropies and major thrust boundaries forming positive flower structure. Subsequent large – scale wrenching is responsible for sinistral rotation of the Variscan fabric. In the studied area, the differential rotation is responsible for progressive movement and rotation of the original eastern margin to the north creating final triangular shape of the pluton. These movements are responsible for magma flow parallel to the western flat dipping margin of the pluton and for partial or complete reworking of the early steep fabrics. This work demonstrates the role of changing boundary conditions for emplacement of a large pluton in a time span of 15 Ma.

Hydrothermal Mineralization Beneath the Upper Silesian Basin, Czech Republic: The Record of a Possible Tectonic Driving Fluid Flow

Marek SLOBODNÍK[1] and Zdeněk DOLNÍČEK[2]

[1] Department of Geology and Palaeontology, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic
[2] Department of Geology, Palacký University, tř. Svobody 26, 771 46 Olomouc, Czech Republic

A sulphide mineralization (including sphalerite, galena, chalcopyrite, pyrite and marcasite) has been encountered in several deep boreholes drilled through the front zone of the Carpathian nappes and the Carboniferous rocks to the south of Ostrava in the Czech Republic (Fig. 1). An uncertain age of this mineralising event within a time period from the Permian to the Late Tertiary has been reported (Češková 1978, Bernard 1991, Vaněček et al. 1985, Slobodník et al. 1999).

Underlying the eastern part of the Upper Silesian Basin (Kotas 1982) a stable basement is formed by the Brunovistulicum unit of the Upper Silesian Block. Deposited on the stable basement are a thick sequence of Devonian and Lower Carboniferous carbonates (often massive reef limestones) and clastics at the top succeeding basal conglomerates. The overlying coal-bearing sequences are of Late Carboniferous age. Early Badenian siliciclastics transgressed over and rest unconformably on the eroded Palaeozoic surface, and later the Carpathian nappes moved over these siliciclastics during the Styrian tectonic phase (Carpathian-Badenian). Important faults, namely Frýdek-Místek – Považská Bystrica F. (NNW-SSE, Buday and Ďurica 1994), Bludovice F. and Orlov F. trending W-E and NNE-SSW, respectively (Dopita et al. 1997), cut through the mineralized area.

The hydrothermal sulphide mineralization occurs in Early Carboniferous carbonate rocks and to a lesser extent in the overlying siliciclastics. The present depth of the mineralization from surface is some 1000 and 1200 m and the mineralization extends over a vertical borehole interval some tens of meters thick. All the main sulphides succeed the earliest quartz having been precipitated within the first mineralizing stage. Sphalerite is the most common ore mineral but chalcopyrite, galena, pyrite and marcasite occur less frequently. Calcite is the most important gangue mineral. Two generations of calcite (I, II) with minor pyrite and marcasite succeed the Zn-Pb-Cu sulphide phase. The third calcite generation (III) forms the second mineralizing stage cementing fragments of earlier mineral phases.

A microthermometric study revealed Th values between 81 and 118 °C, 70 and 130 °C, 56 and 155 °C for quartz, sphalerite and calcite generations, respectively. Salinities of fluids in inclusions of the same mineral phases range between 17.8 and

Fig. 1. The geological sketch map of the Ostrava area and position of boreholes with hydrothermal Mineralization. 1–Palaeozoic sediments (siliciclastics prevail), 2–Upper Tertiary sediments (the Carpathian Foredeep), 3 – Carpathian nappes (Cretaceous and Lower Tertiary sediments prevail), 4 – boreholes with hydrothermal Mineralization. Faults under the Tertiary units: Ŕ – Frýdek-Místek– Považská Bystrica fault, Á– Orlov fault, Â – Bludovice fault.