

# Metamorphic and Structural Evolution of the Moldanubian Lower Crust – An Example of the Strážek Moldanubicum

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The major objective of our research was to study the relationship between lower crust of the orogenic root and the juxtaposed middle-crustal rocks. We used both field structural investigations and petrological analysis of main lithologies to decipher the exhumation history of the lower crust. The studied area is situated at the eastern limit of the internal orogenic domain of the Bohemian Massif. Here, two crystalline complexes with different grade of metamorphism meet along the major tectonic boundary. The Strážek Moldanubicum (SM) is represented by acid granulites and granitic gneisses associated with the migmatized Gföhl gneisses, amphibolites, ultramafic rocks and durbachitic intrusions. This unit is thrust over metasediments, orthogneisses and migmatites of the Svatka Crystalline Complex (SCC).

Two dominant sets of structures can be observed in the area. The early  $S_1$  foliation in granulites is represented by flattened quartz ribbons and partly also by preferred orientation of biotite. The  $S_1$  foliation is subvertical and strikes mostly in N-S direction. The  $L_1$  stretching lineation is represented by elongate quartz and quartz-feldspar aggregates it plunges to the S-SE under moderate angles. Sills of durbachites parallel to the  $S_1$  fabric were observed at several localities. The  $D_1$  fabric is overprinted by  $S_2$  planar system which is either penetrative or developed as discrete ductile shear zones. It crosscuts the  $S_1$  at high angles. The  $S_2$  fabric is generally oriented to the SW and becomes progressively steep close to the contact with the underlying SCC. As in the case of the  $S_1$  foliation, we have also observed durbachites within the  $S_2$  shear zones.

So far, we have studied metamorphic conditions of granulites from two distinct localities in the Strážek Moldanubicum – the Loučka–Bobruvka river valley and the Libochovka river valley. These are typical acid granulites with mineral parageneses consisting of Grt-Ky-Sill-Bt-Hc-Plg-Kf-Qtz. We have observed succession of stable mineral assemblages, which can be defined as follows. 1) The stable mineralogy in several samples from granulites with subvertical fabric (interpreted as  $S_1$ ) is represented by Grt-Ky-Bt-Plg-Kf-Qtz. 2) More often, the granulite samples show extensive conversion of kyanite to sillimanite, thus suggesting stabilization of the assemblage Grt-Sill-Bt-Plg-Kf-Qtz. 3) In a few samples we observe crystallization of hercynite suggesting discontinuous reaction Grt + Sill = Hc + Bt. 4) A complete retrogression of Grt-bearing mineral assemblages can be observed in samples from the  $S_2$  shear zone. The resulting mineralogy comprises only Bt-Plg-Kf-Qtz.

These preliminary structural and petrological data can be interpreted as a polyphase exhumation of lower-crustal rocks. As the  $D_1$  fabric is developed exclusively in the SM, we suppose that this event reflects compressional event deep in the lower crust. The observed  $D_2$  fabric reflects transition from vertical extrusion into thrusting of lower-crustal rocks over middle crust of the SCC. This flat thrusting occurred in middle to shallow level of the crust but under high temperature conditions. We assume that durbachite magma exploited the early  $D_1$  fabric for vertical ascent parallel to the main anisotropy. It is likely but not satisfactorily proved that durbachites also intruded late  $S_2$  surfaces.

## Rare-Element Nb-Ta-W Mineralization of the Tin-Bearing Spiš-Gemer Granites, Eastern Slovakia

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The Spiš-Gemer granites, SGG (Uher and Broska 1996) represent several small intrusions outcropping in western and south-eastern part of the Gemericum Superunit, one of the principal Paleozoic-Mesozoic units of the Central Western Carpathians. They gained an increased attention due to their clearly different composition if compared to the other West-Carpathian granites as well as their potential genetic relationship with numerous hydrothermal siderite-sulphide and stibnite deposits of the Gemericum Superunit (Grecula Ed. 1995 and references therein). Moreover, SGG showed features of tin-bearing intrusions, locally with zonal structure containing (from bottom to the roof) two-mica, tourmaline, albite-Li-mica-topaz (Li-F) granites (or

muscovite-topaz leucogranites), albitites and greisens in granite cupolas, with disseminated rare-element Nb-Ta-W mineralization in Dlhá Valley, Hnilec and Poproč localities (Malachovský et al. 1983; 1992a,b – in Grecula Ed. 1995).

Ferrocolumbite to manganocolumbite are the most widespread Nb-Ta phases of SGG, they form euhedral to anhedral, up to 0.4 mm large crystals in rock-forming minerals, often with cassiterite and Nb-Ta rutile. Ferrocolumbite occurs predominantly in various granite types, manganocolumbite is typical mainly of greisens (Dlhá Valley). Ferrocolumbite and manganocolumbite show oscillatory zoning often corroded by younger irregular zones along the margins of crystals. Generally,