# Exhumation of the Blanský Les Granulite Massif as a Result of Oblique Thrusting and Crustal-Scale Buckling

*Jan FRANĚK, Karel SCHULMANN, Ondrej LEXA and Stanislav ULRICH*

*Faculty of Science, Charles University, Albertov 6, 128 43 Prague 2, Czech Republic*

The Blanský les granulite body represents one of the largest and best studied granulitic complexes of the Bohemian Massif from structural, petrological and geochronological point of view. The complex consists mainly of felsic granulites in various degree of retrogression, serpentinites, eclogites, and small bodies of mafic granulites. The surrounding Varied unit to the E and S margin of the massif is composed of paragneisses with abundant intercalations of marbles, amphibolites, orthogneisses and calc-silicate rocks. Petrological data indicate HP granulitic stage at 16-20 kbar and 1100°C, and later retrogression under amphibolite facies conditions (ca 5-7 kbar at 700-800°C) (e.g., Svojtka et al.2002). The Blanský les granulite complex offers an excellent opportunity to study emplacement mechanisms of lower crustal segments into mid-crustal levels represented by Varied group using methods of structural analysis.

Most abundant rock type is the retrograde granulite gneiss, which exhibits strong mylonitic foliation marked by alignment of biotite. Mapping of this fabric on the scale of the whole granulite body (namely the SE half of the massif) revealed that this foliation forms a large-scale asymmetrical Z shaped fold reported already by Kodym (1972). This folding is also expressed in the Varied group where disharmonic folds of kilometre scale have developed. The degree of granulite retrogression increases to the east and south towards the boundary between the granulite complex and the Varied group. Here, the retrogression reaches conditions of partial anatexis, which is interpreted as a consequence of hydration due to high metamorphic fluid influx from underlying progressively metamorphosed sedimentary sequence. Structural analysis of the internal part of the granulite complex revealed a NW-SE trending elliptical domain of almost unretrogressed granulites, which exhibit internal fabrics discordant to the surrounding retrogressive foliations. The granulite facies fabric itself shows polyphase evolution marked by primary granulite layering extensively reworked by folding and mylonitization still under granulite facies conditions. The relics of original granulite layering are marked by alternations of perthitic feldspar layers with quartz aggregates and local trails of garnet. It is difficult at this stage of the research to propose any kinematic significance of granulite facies polyphase evolution in this large-scale boudin, because of its possible passive rotations and lack of knowledge of equivalent structural patterns in surrounding complexes.

Structures associated with amphibolite facies retrogression show contrasting pattern in the southern NW-SE trending limb versus N-S trending eastern limb of a megasyncline. To the north dipping southern limb retrograde granulites are affected by imbrications and development of duplexes bearing north plunging sillimanite lineations suggesting top to the S thrusting. However, to the north trending eastern limb does not show thrust-related structures. The question arises, whether these fabrics were only passively rotated during large-scale folding or originated during the buckling process. The geometrical construction of NE plunging syncline hinge and unfolding test of coupled rotation of planar and linear elements revealed that these structures are associated with that buckling process.

In conclusion, the structural pattern of the Blanský les granulite is interpreted in terms of thrusting and syntectonic retrogression of large-scale granulite sheet with preserved elliptical granulite facies domain in the internal part of the sheet. The presence of serpentinite stripes indicates that this body was already imbricated during the thrusting process. The exhumation was connected with cooling and increasing stiffness of the granulite sheet, which in mid-crustal levels became the strong layer with respect to adjacent mechanically weak Varied group. These rheological conditions favoured buckling mechanism to control final kinematic evolution of retrograded granulite sheet at this late stage. Kinematic data deduced from megafold geometry indicate dextral transpressive regime controlling the exhumation. The existing zircon age of 318±1 Ma from syntectonic granitoids at the eastern limb of the fold with Ar-Ar cooling ages of 316±1 and 310±1 Ma (Svojtka et al., 2002) indicate extremely fast buckling process in range of 10 to 5 mm/y which is compatible with data reported by other authors from the Himalayan syntaxes.

## References

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