Fig. 1. Diagram of PbvsTh*plot.

Metabasites (metagabbros) have partly well-preserved their primary cumulate texture and minerals: olivine, clinopyroxene, orthopyroxene, Cr-spinel and An-rich plagioclase (Méres et al., 1996). Metamorphic parageneses in the metabasites include garnet, clinopyroxene, amphibole, rutile, plagioclase and quartz. Calculated pressure and temperature from the inferred peak assemblage garnet + clinopyroxene (diopside with a low-jadeite componente) + plagioclase (andesine) + quartz ± hornblende are 750–850 °C and 12–14 kbar. Symplectic intergrowths of slightly more jadeitic clinopyroxene with more sodic plagioclase indicate the pseudomorphs after omphacite. This suggests an earlier eclogite facies stage followed by a re-equilibration at high-pressure granulite P-T conditions in the metabasites. Several generations of amphibole and formation of epidote (clinozoisite), biotite and titanite are evidence of a widespread retrograde overprint at amphibolite facies conditions.

The method of chemical Th-U-Pb dating of monazite by means of the electron microprobe has been applied to two samples of metagranitoids. The preliminary results can be taken from the total-Pb vs Th* diagram in Fig.1. Two generations of monazite can be clearly distinguished. An older- Ordovician (c. 470 Ma) monazite is interpreted to be magmatic. A younger- Carboniferous (c. 340 Ma) one forms new independent grains as well as overgrowth rims on older monazite and is obviously related to the high-grade metamorphic recrystallization and growth phase.

These new petrological and geochronological data suggest:

1. An important pre-Variscan phase of granitoid magmatism in the Western Carpathians during the Ordovician time.
2. High-pressure/high-temperature recrystallization of these Ordovician magmatic rocks during Variscan orogeny in the Carboniferous time.
3. Lower-temperature Alpine metamorphic overprint, not effective for recrystallization and growth of monazite in the investigated metagranitoids.

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Petrology, Geochemistry and Petrogenesis of a Post-Orogenic Variscan Granite: Ševětín Massif, Moldanubian Batholith

Vojtěch JANOUŠEK, Stanislav VRÁNA and Vojtěch ERBAN

Czech Geological Survey, Klárov 3, 118 21 Prague 1, Czech Republic

In the Central Europe are widespread volumetrically rather small post-orogenic calc-alkaline metaluminous and, more rarely, peraluminous granitoid plutons whose emplacement was connected with brittle tectonics (strike-slip and extensional faulting) developing at the twilight of the Variscan orogeny. Granitoids of this type (c. 310–290 Ma old group 4 of Finger et al., 1997) are relatively abundant in the Alpine-Carpathian realm, effectively rimming the southern flank of the orogen. In Bohemian Massif they occur within the Sudetes (e.g., the Liberec granite) and as members of the Mauthausen Group in the Austrian part of the Moldanubian Batholith (Finger et al., 1997 and references therein); analogous petrographic and geochemical character has been also ascribed to the Pavlov and Ševětín granites (e.g., Klečka and Matějka, 1996; Matějka and Janoušek, 1998; René et al., 1999).

In the composite Ševětín Massif (20 km N of České Budějovice) three main granite pulses can be distinguished: (1) the oldest, two-mica Deštná granite with cordierite ± andalusite (SE part of the massif), (2) biotite-muscovite Ševětín granite (BMG), constituting most of the granite pluton, and (3) fine-grained biotite Ševětín granite (BtG) forming only minor bodies. While the two-mica Deštná granite is likely to be a member of the older, Eisgarn clan (~ 327–318 Ma: see review in Gerdes, 1997) with petrologic and whole-rock geochemical character compatible with dehydratation melting of mature Moldanubian metasediments, the Ševetín granites are probably fairly late, with indirect evidence suggesting their age comparable with Mauthausen Group in Austria (~300 Ma?: see review in Gerdes, 1997). This is in line with occurrence of Ševětín granites next to late Drahotěšice fault forming a part of the late Variscan Blanice Graben. Moreover, the shallow intrusion level and rapid cooling are indicated also by the morphology of minute, long-prismatic zircon and apatite crystals as well as the Ab-Qz-Or normative plot.

The Ševětín granites (BtG and BMG) have transitional I/S type character. The whole-rock geochemical signature of the BtG is less evolved than that of the BMG. The former shows lower SiO_2, Na_2O, K_2O and A/CNK accompanied by higher TiO_2, FeO^t, MgO, Al_2O_3 and CaO. The BtG is also characterized by higher contents of Rb, Sr, Cr, Ni, La, LREE, Eu and Zr than the BMG. The initial Sr isotopic ratios for four of the samples of Ševětín granites are nearly uniform regardless their petrology, disclosing fairly evolved character of the parental magmas ($^{87}Sr/^{86}Sr_{300}$ = 0.70922 – 0.70950) but BR484 is even more radiogenic ($^{87}Sr/^{86}Sr_{300}$ = 0.71290). The initial ϵNd values are highly negative (ϵ^{300}_{Nd} = −7.4 to −8.0; BR 484:

−9.2) and this is reflected by high two-stage Nd model ages (T^{DM}_{Nd} = 1.60–1.75 Ga).

Both the Ševětín granites are coeval; their Sr-Nd isotopic compositions and whole-rock geochemistry correspond to a quartz-feldspathic (?metapsammitic) parentage (Sylvester, 1998) or, more likely, may reflect a mixing between: (1) a relatively primitive component (having low time-integrated Rb/Sr and Sm/Nd ratios, with $^{87}Sr/^{86}S_{ri} \leq 0.705$ and eiNd Nd > −7: e.g., undepleted or slightly enriched mantle-derived melts or metabasic rocks) and (2) a material geochemically matching the mature Moldanubian metasedimentary rocks or their melts ($^{87}Sr/^{86}Sri > 0.713$ and eiNd < −9.5). Both BtG and BMG can be linked by up to c. 10% of (nearly) closed system biotite-plagioclase fractional crystallization (Janoušek et al., in print). The observed minor Nd isotopic heterogeneity could be explained by an influx of slightly isotopically and geochemically different melt batch(es) into periodically tapped and replenished magma chamber (RTF – O'Hara, 1977).

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Tectonometamorphic Evolution of the Krzyżnik Mt. Region, the Lądek-Śnieżnik Metamorphic Unit, West Sudetes

Mirosław JASTRZĘBSKI

Institute of Geological Sciences, Polish Academy of Sciences, Podwale 75, 50-449 Wrocław, Poland

The Lądek-Śnieżnik Metamorphic Unit (LSMU), the Sudetes, is composed of the varied Stronie series of Late Proterozoic – Middle Cambrian age and Cambro-Ordovican gneisses, of which some contain UHP eclogite and granulite bodies (Don at al., 1990; Bakun-Czubarow, 2001). The supracrustal Stronie series is composed of MP mica schists intercalations of marbles, quartzites, and acid and basic metavolcanogenic rocks. Published data suggest differences in metamorphic and deformation history of the LSMU rocks and it is unknown which of them have undergone P-T-d path(s) similar to that of eclogites and granulites. These uncertainties demand testing of the various views and further studies. The Krzyżnik fold area is a suitable subject within the Stronie series, because of relatively well – exposed interlayers of marbles and mica schists with well-preserved deformation structures focusing detailed structural and petrologic investigations (Oberc, 1966; Don, 1976; Grzechnik, 1989). However, the earlier studies did not consider relations between metamorphism and deformation. This work relates meso- and microstructures to polyphase metamorphic evolution inferred from changing mineral assemblages and thermobarometric calculations.

The earliest deformation structures can be observed as small--scale isoclinal intrafolial folds F1. During D1, the first metamorphic axial plane foliation S1 was produced, mostly parallel to the bedding. The stage D2 is characterized by development of similar, tight, non-cylindrical plane folds F2 in foliation S1. F2 fold axes exhibit orientation from 330/15 to 40 /40 with maximum of 345/20. Several centimetres to several meters large, asymmetric, parasitic folds occur in limbs of the major structure, the Krzyżnik synform. Its tight geometry and the well--defined new axial planar foliation S2, shallowly dipping toward the NE, are the result of an intense E-W shortening and flattening taking place in ductile synmetamorphic conditions. During that stage the oldest recognizable and weakly visible lineation L2f, produced by the flexural slip on the S1, surface was developed. Parallel to the F2 fold axes a well – preserved lineation L2 is defined by the intersection of S1 and S2 foliations. During the uplift and progressive subvertical flattening, rodding lineation L3 marked by elongate quartz and carbonate clasts was formed. Lineation L3 plunging toward the NNE at moderate angles was developed on the S2(S1) surface. S-C fabric, s and d type structures indicating top-to-the-N shear sense have been found in thin sections. A rare occurrence of L3 structures in the study area suggests that the D3 strain was zonally localized. The D4 gave open, vertical, concentric or kink folds F4. Their axes and a crenulation lineation L4 plunge toward NE at moderate angles. The axial planes of F4 folds are developed as complementary surfaces – 330/60 and 120/70 seldom forming