ever, because the both cumulates, and fractionates, are metaaluminous, the parental melt was very likely metaluminous as well. Consequently, the protolith could be seen traced in the even strongly metaluminous rocks as amphibolites or chemically related rocks. The comparatively high contents of REE and HFS elements in the granites indicate, that their relatively refractory carrier-phases (O' Hara et al., 2001) e.g. zircon, apatite were involved in the melting of the protolith. Therefore it was probably a high-degree melting.

The emplacement of the batholith was probably related to the Westphalian extensional tectonics. The Upper Carboniferous and lower Permian extension seems to have been generally of great importance for magmatic history of the eastern margin of Bohemian Massif, as manifested in the Boskovice Furrow, where the extensional tectonics followed by magmatic activity could be also documented.

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A Polyphase Exhumation of Ultra-High-P Eclogites from Nowa Wieś in the Lądek-Śnieżnik Metamorphic Unit, the Sudetes

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Eclogites occurring to the NW of Nowa Wieś appear in a 10 m long exposure of successively alternating eclogite, amphibolite, eclogite, amphibolite, eclogite, layered gneiss, rodding gneiss, streaky gneiss and layered gneiss. A metabasite body has the form of an asymmetric boudin.

The eclogite underwent peak P-T conditions at 33 kbar and 770 °C inferred from inclusions of phengite (3.4 Si p.f.u.) in omphacite. Garnet and omphacite pairs (Ellis and Green, 1979) gave a temperature range of 750–680 °C at pressure between 15–20 kbar as estimated from equilibria among garnet, clinopyroxene and phengite in calibration of Waters and Martin (1993). The minimum pressure inferred from the jadeite content in secondary omphacite yielded pressure of 11 kbar (Holland, 1980) at 650 °C. Amphibolitisation of the eclogites started with an influx of fluids at temperatures of 700–640 °C and pressures of 12–6 kbar, and continued at temperature dropping to 560 °C and pressure decreasing to 6–4 kbar (Holland and Blundy, 1994; Plyusnina, 1982). The streaky gneiss underwent peak P-T conditions at temperature of 650-700°C and pressure of 10–11 kbar. A narrow strip of the layered gneiss between the streaky gneiss and metabasite might develop from a vein of a porphyritic granite.

The geothermobarometric estimates show that the minimum conditions of the eclogite facies metamorphism overlapped amphibolite formation and corresponded to the maximum P-T conditions recorded by the streaky gneiss. This consistency testifies to transport of the eclogitic bodies from a depth of c. 120 km upward to the lower crust (c. 30 km) where they became trapped by rheologically contrasting, fluid-rich gneisses and started to yield to retrograde amphibolitisation.

Most rocks of the studied assemblage have two sets of E/SE-ward dipping, steep to subvertical foliations and two sets of differently oriented lineations. Differences in structural inventories and kinematics imply separation of these rocks by tectonic boundaries. The eclogites contain planar fabric which was formed by rotational strain in a thrust regime (top-to-the-SW in present-day coordinates), with but weak overprint of sinistral oblique slip. The post-eclogitic amphibolites mimetically inherited planar fabric from the eclogites and mostly developed a new one in sinistral shear regime with oblique slip kinematics and subvertical folding. The linear rodding gneiss developed from the porphyritic granite by early subhorizontal, high-T constrictional flow and graded into the layered gneiss during sinistral oblique slip changing to NW-directed thrusting, followed by weakly expressed normal dip-slip ductile faulting. The streaky gneisses have records of an early mylonitic fabric obliterated by strong high-T recrystallisation/migmatisation, synmetamorphic folding and dextral slip. These processes led to a composite fabric which was later deformed during a superposed sequence of oblique sinistral slip passing to NW-directed oblique thrusting, followed by normal dip-slip. Accordingly, all the lithologic elements of the exposed assemblage represent a tectonic collage, the individual elements of which differ with early tectonic history, but share later deformation in the sinistral subhorizontal to oblique slip regime dated. Ductile shearing in this regime is dated between 340 and 334 Ma (Lange et al., 2002; Marheine et al., 2002). This constraints the minimum age of their juxtaposition.

The Nowa Wieś metabasite body is a boudin produced by both subvertical and subhorizontal extension. It belongs to a narrow, c. 4 km long belt, which is interpreted as a relict of a crustal shear zone, with early thrust and subsequent top-to--the-N strike-slip kinematics. The early W/SW-directed thrusting of the Nowa Wieś eclogites is inconsistent with kinematics of an oblique Carboniferous collision between the Sudetes and the Moravo-Silesian domains. This may suggest that the upward transport of the UHP rocks under eclogite facies conditions, monitored by blastesis of primary pargasite, occurred at different time and in different geodynamic setting.

In the eclogites no fabric can be assigned to the mineral relicts of the UHP event, thus deformation at the extreme P-T conditions remains undeciphered. A pronounced metamorphic layering expressed by garnet-rich/garnet-poor and occasional pargasite layers developed during the HP syntectonic eclogitic metamorphism. The earliest recognizable deformation in eclogites is marked by asymmetric aggregates of garnet or pyroxene, with pargasite in pressure shadows and by oblique growth of pargasite in the amphibole layers. They indicate oblique thrust associated with some dextral slip component due to top-to-the-SW/W movement marked by steep stretching lineation. The eclogites started their way to the surface from a depth of c. 120–100 km. At a depth of c. 70–60 km they already possessed a metamorphic layering associated with SW/W-directed thrusting, which may suggest exhumation of the Chemenda type. During the upward transport eclogites were fragmented into smaller bodies. At a depth of c. 35–30 km, eclogitic bodies became emboddied into streaky gneisses. Crustal fluids brought about the retrograde amphibolites with distinct fabric in localized shear zones. At a similar depth gneisses and eclogites were intruded and encompassed by a high-T porphyritic granite in which they form xenoliths subjected to further boudinage during subhorizontal constriction and ensuing sinistral oblique slip. These occurred still at high temperature evidenced by a polygonal fabric of dynamically recrystallized plagioclase. The sinistral shearing (top-to-the-N) imparted to the rocks exposed at Nowa Wieś subhorizontal stretching lineation, oblique fabric, subvertical folding, and subhorizontal boudinage at temperature of 560–640 °C and relatively shallow depth of 6–4 kbar. These features started to develop still at mid-crustal levels, possibly owing to lateral tectonic escape. The last ductile event recorded by the studied rock assemblage is normal faulting to the E. This represents the final stage of exhumation of the eclogites which occurred under extensional conditions of a collapsing orogen.

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Chromium Anomaly in Devonian Metapelite at Petrov (Northern Moravia, Czech Republic)

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The setting

The samples were collected during regional geological mapping of the Czech Geological Survey (•áček et al., 2000) at the old "fuchsite" locality near Petrov nad Desnou (Šumperk District, Northern Moravia, Czech Republic). The locality called formerly "Rauhbeerstein" is situated on the mountain ridge 1000 m south from the Sobotín railway station, 1700 m NNW from the top of Petrovský vrch Hill, 778.4 m (Fig. 1). Kretschmer (1911) gives first report on "fuchsite" from Petrov, much later Němec (1971) provided analytical data. The occurrence has a character of small blocks and loose chips restricted to very small area of some tens square meters. New geological mapping has shown, that the Cr-rich mica schist is situated in tectonic slice, only several tens meters thick surrounded by amphibolites of the Sobotín amphibolite massif (see •áček, 2000). The rocks are facially connected with mica schists and quartzites of a lower part of volcanosedimentary Vrbno Formation. Both Vrbno Formation (Devonian) and underlying Prevariscan Desná Unit (with extensive Sobotín amphibolite massiv of unknown age) underwent amphibolite facies (staurolite – kyanite/sillimanite zone) of Variscan metamorphism.

Rocks and minerals

Samples have variable mineral composition corresponding to the following rock types (see also Table 1):

1) garnet – staurolite mica-schist (samples 322/2, 3, 4)
2) staurolite (kyanite) hornfels (samples So-1, 322/1)
3) plagioclase (staurolite) schist (samples 322/5, 6).

Individual rock types are connected by continuous transitions. Strips and lenses of quartz are frequent. From 7 thin sections, 2 were studied using microprobe (samples So1 and 322/1, see Tables 2 and 3).

Muscovite is nearly colourless to grass-green according to the percentage Cr_2O_3, with greenish tint in thin section. Its quantity in rocks may reach about 35 vol.%. The concentration of Cr rapidly changes, from 0.0 to 0.92 wt.% of Cr_2O_3. New data correspond well to those of Němec (1971) who reported