scale foliation can be distinguished on many granite outcrops. Foliation strikes mainly SW–NE, which is parallel to the main planar structures of the country rocks. In hand specimens it is characterized by a pervasive mineral alignment or shape-preferred orientation of biotite (± hornblende) accompanied by less obvious shape-preferred orientation of feldspar and quartz ribbons. Aligned hornblende occurs as independent, euhedral grains, which rather suggests magmatic alignment of the crystals but is not a useful criterion on its own. Lineation, present at almost all outcrops, plunges southwest at low angles.

Despite solid-state deformation and recrystallization, rare but clear microstructural evidence of magmatic flow and deformation in the magmatic to submagmatic state can be found in these rocks. Tabular, euhedral feldspar crystals with zone and twin boundaries parallel to grain boundaries are aligned on foliation planes. Isolated grains of biotite and hornblende also lie on foliation planes. Locally, these minerals are bimodally oriented, defining S-C fabric. Quartz-filled 'submagmatic' extensional microfractures (Bouchez et al. 1992) oriented perpendicular to mineral lineation are indicative of stretching parallel to lineation during late stages of crystallization. Magmatic fabric is overprinted by the solid-state texture characterized by abundant evidence of recrystallization to finer-grained aggregates (e.g., of quartz, feldspar or mica). Solid-state foliation, defined by elongated aggregates of quartz, biotite and muscovite, parallels the main foliation in the country rocks. Several lines of evidence suggest that this foliation was formed at least under moderate temperatures. Feldspar megacrysts are rimmed by myrmekite recording solid-state dynamic recrystallization, which suggests deformation at temperature in excess of 500 °C. Straining of quartz grains is typical of high-temperature plastic deformation, exhibiting a mosaic of square subgrains and forming chessboard-like patterns. These subgrains evolve into new grains, often with irregular boundaries due to grain-boundary migration.

The Jawornickie granitoids show parallel or subparallel magmatic and solid-state foliations suggesting syntectonic emplacement. Kinematic indicators, including shear bands, S-C fabrics, and asymmetric recrystallized tails on feldspar porphyroclasts show evidence of top-up-to-the-southwest displacement. However, attempts at interpreting the type of emplacement and the potential interplay between regional structures and intrusion-related deformation are poorly constrained because of the lack of consistent deformation history in the country rocks.

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Pattern of Seismic Energy Release in West Bohemia

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West Bohemia/Vogtland seismic swarm region covers an area of about 3,000 km². Seismicity is closely related to the system of principal tectonic faults intersecting the region. Weak seismic activity mostly of swarm-like character persists in whole region between the consecutive macroseismically felt swarms. Foci of micro-earthquakes predominantly cluster in at least seven focal zones.

Depth of hypocentres varies from 3 km (near Klingenthal) to 20 km (near Adorf and Plauen). Most seismic events (about 80%) occurred in the main focal zone of Nový Kostel. Foci of the individual swarms in this zone concentrate in very narrow volumes at depths from 6 to 12 km. An important feature of the spatial distribution of hypocentres is the lamella-like character of the focal belt. While the strike of the entire focal belt declines slightly from N to W, the strikes of the particular segments decline generally from N to E. In many cases the hypocentre clusters of individual swarms tie in with one another. Seismic activity of others focal zones is much lower than in the Nový Kostel zone, but events in these zones are often of larger magnitudes.

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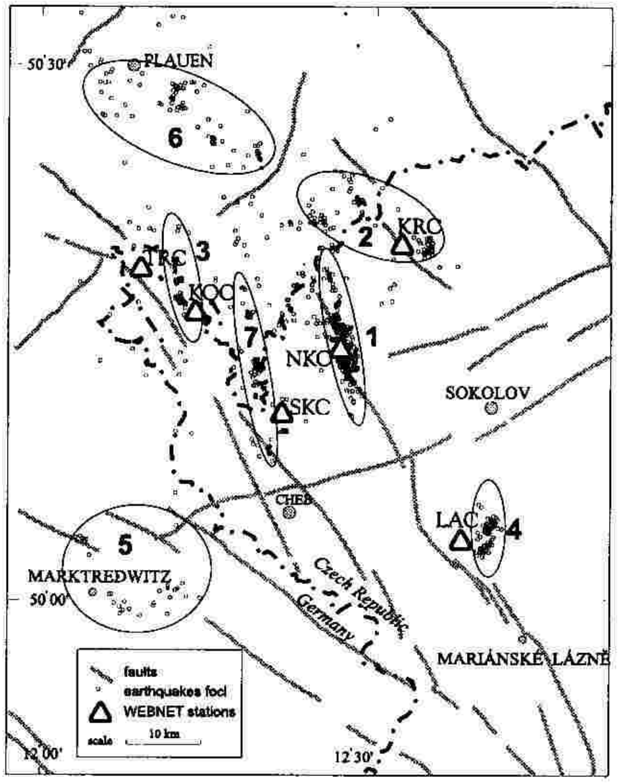

Fig. 1. Map of epicentres of microearthquakes which occurred in West Bohemia/Vogtland/NE Bavaria since 1991. Focal zones numbered 1–7: 1 = Nový Kostel area, 2 = Kraslice-Klingenthal area, 3 = Kopaniny area, 4 = Lazy area, 5 = Marktredwitz area, 6 = Plauen area, 7 = Plesná area.

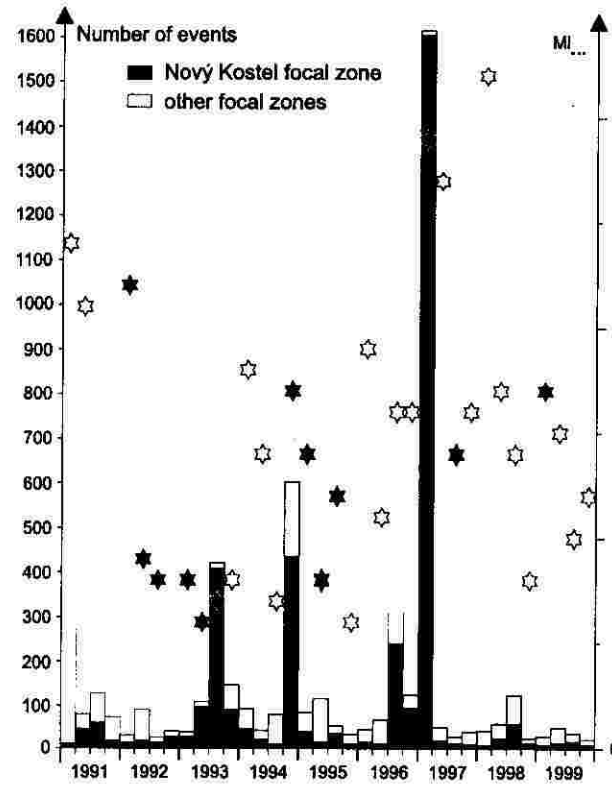

Fig. 2. Histograms of events which occurred in Nový Kostel area and other focal zones since 1991.

Metamorphic Zoning in the Polička Crystalline Unit

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The Polička crystalline unit (PCU) is a metamorphosed volcano-sedimentary complex situated in the E part of the Bohemian Massif. The PCU is composed of different gneisses containing intercalations of amphibolites, quartzites, mica-schists, marbles and calc-silicate rocks. Dominant gneisses and mica-schists can be divided into two chemically different groups. The first group (metagreywackes) is characterised by uniform mineral assemblage: Q + Pl + Bi ± Mu ± Grt ± Chl; staurolite is also locally present in the eastern part of the PCU. The second group (metapelites) is important for the study of metamorphic zoning. Metapelites form small lenses and strips in metagreywackes parallel to the foliation in the PCU (strike NW–SE). In the north-eastern part of the PCU, the mineral assemblage of metapelites (mica-schists) is: Q + Mu + Bi + St ± Pl ± Grt ± Ky ± Il ± Mg; late chlorite (after biotite) is locally formed along rock cleavage. The mineral assemblage: Q + Pl + Bi ± Sill + Grt ± Mu ± Kfs ± Il ± Tour is typical in other parts of the PCU.

Three metamorphic zones of Barrovian regional metamorphism can be distinguished with an increasing grade from staurolite zone in the NE across kyanite zone to sillimanite zone in the southern PCU. Near the NW margin, the old regional metamorphism in rare interbedded metapelites was overprinted by young contact metamorphism, and cordierite-bearing rocks with mineral assemblage Q + Pl + Cor + Grt + Bi originated.

Chemistry of rock-forming minerals from staurolite to sillimanite zones was studied by electron microprobe. Biotite shows variation in the Fe/(Fe+Mg) ratio of 0.47–0.51 in the staurolite zone to 0.50–0.58 in the sillimanite zone. Muscovite contains different amounts of paragonite component Na/(Na+K) of 0.21–0.24 in the staurolite zone to 0.19–0.12 in the sillimanite zone; ranges of the phengite components are similar (Si^{IV+}= 6.19–6.28). Oligoclase displays elevated anorthite component from the staurolite zone (An_{13}) to sillimanite zone (An_{30-16}). Garnet from the staurolite zone has composition Alm_{75} Py_{13} Spe_{9} Gr_{3} in core and Alm_{79} Py_{14} Spe_{4} Gr_{3} in rim. Two types of garnets of different but weak zoning patterns occur in the sillimanite zone. The first one is characterised by increase in Ca from core to rim and has composition Alm_{69} Py_{15} Spe_{13} Gr_{3} in core and Alm_{73}