the South Bohemian batholith (SBB) with a number of isolated (at the present surface) granite intrusions surrounded by metamorphic rocks of the Moldanubian crystalline. The KSP itself is surrounded by retrogressed granulitic gneisses of the Křišťanov Granulite Massif at N and E, by several varietis of biotite to two-mica granites of SBB at S and W.

In the present study, we correlate magmatic fabrics and emplacement history of the KSP with structural evolution of the adjacent rocks. Granulite gneisses are dominated by steeply dipping NE or SE metamorphic foliation with relicts of isoclinally folded earlier anatectic structures. This foliation is associated with subvertical mineral lineation. The above structures are overprinted by later gently to moderately dipping NW foliation accompanied with gently plunging NNW stretching lineation that is probably related to the South Bohemian thrust systems. These later structures are also recorded in the magmatic to subsolidus fabric of the fine-grained leucogranites. In contrast, magmatic fabric in the coarse-grained to coarsely porphyritic granites of the Plechý massif, S of the KSP, is sharply discordant with all the host-rock structures.

In the Knížecí Stolec pluton, magmatic fabrics are defined by the alignment of large tabular K-feldspar phenocrysts (2 to 4 cm in length) and biotite aggregates. We have recognized multiple magmatic fabrics in the pluton: (i) older, steeply to moderately dipping NW magmatic foliation corresponding to the regional metamorphic foliation in the granulite gneisses; (ii) a younger, subhorizontal to moderately dipping SE to NW foliation bearing subhorizontal magmatic lineation plunging from the W to the N. The above described magmatic structures grade into narrow zones of high-temperature subsolidus deformation along pluton margins that are associated predominantly with dextral kinematics.

Based on our structural data combined with petrographic study we suggest that several textural and compositional varieties of the durbachitic rocks may represent several magma pulses. However, the preserved younger magmatic fabrics in the pluton postdate its final emplacement and likely recorded temporal evolution of regional strain field during slow crystallization of the magma. The geometry of this fabrics probably reflects the tectonic activity of the South Bohemian thrust systems. We have also found some pieces of evidence for multiple material transfer processes (MTP) that may have accommodated the pluton emplacement and involved ductile wall-rock shortening, sheeting along margins and magma stoping. Timing and structural relationships suggest that the KSP was emplaced roughly at the time of retrograde metamorphism of the Křišťanov granulite body.

New results from the KSP as well as data from other durbachitic intrusions in the Moldanubian Zone suggest that although these rocks are compositionally closely similar each-other and were emplaced during relatively short time span, the emplacement processes could vary dramatically even within the same pluton. Such behavior has significant consequences for the geodynamic evolution of the Moldanubian Zone.

Structural and Petrological Relations among Granitoids Near Nová Pec (Moldanubian Zone, Šumava – Bohemian Forest)

Kryštof VERNER[1,2] and Jaroslava PERTOLDOVÁ[3]

[1] *Institute of Petrology and Structural Geology, Faculty of Science Charles University, Albertov 6, Prague, Czech Republic*
[2] *Czech Geological Survey, Klárov 3, 118 21 Praha, Czech Republic*
[3] *Czech Geological Survey, Klárov 3, 128 21 Praha 1, Czech Republic*

Petrological and structural study of granites, durbachites (amphibole-biotite melasyenites) and retrogressed granulitic gneisses was conducted in the context of geological mapping of the map sheet Nová Pec 32–142. This work is part of the Project No. 6201 of the Czech Geological Survey – Geological mapping of the National Park Šumava.

Durbachites of the Knížecí stolec area show variation in composition of rock-forming minerals. Phenocrysts of perthitic K-feldspar carry Bt and Pl inclusions and exhibit zoning from core Or_{92} to rim Or_{97}. Plagioclase composition varies from core An_{63} to rim $An_{10.}$ Biotite is compositionally homogeneous with $Fe^{2+}/(Fe^{2+} + Mg)$ =0,4. Amphibole (actinolite) cores contain relics of diopside and actinolite with increased Mg.

Fine-grained granitoids contain plagioclase of albitic to oligoclase composition, K-feldspar is homogeneous (Or_{89} to Or_{99}). Biotite shows variation in Mg/Fe^{2+} ratio and Al^{IV} content, deformed granites contain biotite with increased Mg. Biotite in granulitic gneisses contains increased Al^{IV} in biotite, minor garnet contains Alm~70 mol.% and some Sps~15–20 mol.%, Prp~10–15 mol%.

The oldest structures have been observed in retrogressed granulitic gneisses. Three phases of deformation correspond to respective generations of metamorphic foliation planes (S_1, S_2 and S_3). The foliation S_2 (with some relicts of S_1) steeply dipping from the NE to SE. S_3 observed in domains with re-foliated S_2 planes has a shallow to moderate dip to the N and NW and carries lineations plunging to the NNW.

Fine-grained granitoids show sub-solidus deformation of variable intensity. Planar structures dip to the SW under a low angle and become indistinct toward the W. Durbachites show a rather strong magmatic foliation, defined by orientation of feldspar phenocrysts. Two planar textures have been observed: (i) relict subvertical, (ii) penetrative subhorizontal dipping to the NW. Subsolidus deformation in durbachites occurs only in narrow zones along margins of intrusions.

The Plechý granite massif shows weak magmatic planar structures (foliations), which are discordant in relation to the regional structures.

Based on the petrological-geochemical data and the above structural characteristics, several granitoid rock-types are defined. They show the following petro-structural properties: (i) recrystallized (retrogressed) granulites of the Křišťanov massif represent the oldest unit of the area. The phase D_2 recorded in these rocks pre-dates emplacement and deformation of all types of granitoid rocks; (ii) the implacement of fine-grained granitoids is interpreted as polyphase, with a relative younging of intrusions toward the W. The relatively older batches of melt crystallized under conditions of the regional deformation (D_3); (iii) the magmatic fabrics in durbachites are closely tied to the regional deformation D_3; however, structural relations between fine-grained granitoids and durbachites are not safely recognised. Subsolidus fabrics in durbachites are interpreted as resulting in domains of increased deformation coinciding in time with emplacement of new melt batches; (iv) the marginal parts of the Plechý massif were emplaced post-tectonically in relation to deformational evolution of the region. It is thus the youngest granite massif in the area.

Tectonic Control of Glacialy Induced Deformations within Kleczew Graben Zone (Konin Elevation, Great Poland)

Wojciech WŁODARSKI[1]

[1] *Institute of Geology, Adam Mickiewicz University, Maków Polnych 16, 61-686 Poznań, Poland*

The glaciotectonic deformations of the Neogene as well as lower and middle Quaternary sediments are the object of considerations here. These deformations was observed within the Kleczew Graben zone. This graben represents one of many local structures of this type located within the Konin Elevation (Fig. 1a, b). It consists of three segments which trend NW-SE (eastern segment), NNE-SSW (western segment) and WNW-ESE (northern segment). These directions are characteristic for structural plan of the whole Konin Elevation (fig. 1b). The origin of grabens located within the Konin Elevation and thus the Kleczew Graben so far has not been defined in unambiguous way. It is believed that these grabens may have originated in effect of: 1) tangencial extension influenced by bending of the Mesozoic bed-rocks and uplifting of the Konin Elevation, 2) transtension along bounding faults of these grabens due to strike-slip dextral motion of primary dislocations (Gopło-Ponętów and the Poznań – Rzeszów). The main stage of graben formation took place in the Oligocene – Miocene. In this time they performed the role of local sedimentary basins in which the thick series of the Middle Miocene brown coals and the Middle-Upper Miocene Poznań Formation clays were deposited. The high degree of tectonization of these sediments is common within the Kleczew Graben. The faults as well as dense net of fractures of tectonic nature developed here. Their orientation is consistent with orientation of individual segments of the Kleczew Graben as well as bounding faults of this structure. The brown coals and the Poznań Formation clays analysed here were deformed again during the Odranian Glaciation period. Additionally, the South-Polish glacial tills T1 and partially lower beds of the glaciofluvial sands and gravels from anaglacial phase of the Odranian Glaciation were deformed too. In effect of uniaxial subhorizontal compression in front of the advancing Odranian ice-sheet, the folds as well as overthrusts developed. These structures were in detail analysed within zone of bounding fault which encloses the northern segment of the Kleczew Graben from the NNE direction (Fig. 1c). Taking into account the scale, mechanics and kinematics of strains, these structures consitute the proglacial structural domain. The amplitudes of folds achieve on the average 20 metres, maximally 50 metres. The fold axes trend WNW-ESE and ENE-WSW (Fig. 1c). The overthrusts, having the character of macrostructures, achieve the vertical slips about 10–20 metres. They usually form the serial structures of imbrication fan type. The sole thrust is developed within upper part of the brown coal layer. The overthrusts as well as associated with them small faults and cleavage arrange in two systems which trend WNW-ESE and NE – SW (Fig. 1c), respectively. The structures of proglacial structural domain are overlied discordantly by the glacial tills T2 of Odranian age. These tills together with uppermost part of the glaciofluvial sands and gravels from anaglacial phase of the Odranian Glaciation make the subglacial structural domain. The meso- and microstructural studies indicate that these sediments were subjected mainly to (sub)horizontal simple shear induced by ice-sheet motion. On account of strains influenced by pore water migration, deformations observed in subglacial structural domain may have been probably of filter nature. Additionally, the glacial tills T2 were subjected to synsedimentary deformations under conditions of pore-water oversaturation and at porosity ca 40 %. The Riedel shears, observed in mezo- and microscale (deforming bands), are result of such deformations. The mutual intersection between Riedel shears was the basis for recognition of two sets of the B type lineation: WNW-ESE-trending L1 set and NE-SW-trending L2 set (Fig. 1c), respectively.

Summarising, deformation structures induced by the Odranian ice-sheet result from tectonic transport in two principal directions: towards SSW and ESE-SE. The first of them is consistent with orientation of the clast fabric within the glacial tills T2, ribs on the bottom surface of these tills and glacial channel axis of the Struga Kleczewska river. Moreover, the latter runs along NNE-SSW-trending bounding fault which encloses from E western and northern segment of the Kleczew Graben. This direction of tectonic transport may be considered to be glaciotectonic. The other direction of tectonic transport is more problematic. Such complex kinematics of glaciotectonic deformations within the Kleczew graben zone may be interpreted in two ways:

- as an effect of strain partitioning along the older Alpine structures within the Neogene sediments, reactivated glaciotectonicaly during the Odranian glacial period,
- as an effect of coexistence of glacitectonic and neotectonic agents in the same time. It is possible to identify the neotectonic agent with dextral movement of bounding fault enclosing from NNE the northern segment of the Kleczew Graben. Such kinematic pattern has analogy with transpression and related with it strain partitioning. In light of two tectonic transport directions within the Odranian glacial tills T2 induced by synsedimentary (sub)horizontal simple shear, the second interpretation seems to be more possible.