sis we propose an emplacement scenario for the intrusions and AMS fabric development in oblique extensional regime.

Purely magmatic structure in the Thannenkirch granite is defined locally by strong alignement of feldspar phenocrysts. In the Brezouard granite is preserved transition from magmatic fabric, high temperature solid-state to low temperature solid-state, typical of syntectonic intrusions. Very weak magmatic fabric with no visible foliations and lineations is characteristic of the internal part of the intrusion. Towards the southern margin, the magmatic structure grades into sub-solidus S-C fabrics with steep pervasive foliation and development of a sinistral shear zone. The Bilstein granite is heterogenously deformed in green – schist facies conditions showing sinistral S-C structures, subvertical magmatic foliations and horizontal lineations. Shallowy dipping sillimanite gneisses exposed in northern part of the intrusions follow exactly the geometry of the plutons.

The magnetic fabric in all intrusions is generally characterised by low degree of anisotropy. The highest value of P` parameter corresponds to marginal parts of the intrusion, whereas towards the central part of intrusion the P` decreases. The shape of magnetic ellipsoid (parameter T) varies from oblate and neutral in the central parts, and prolate in marginal parts of the plutons. The AMS fabric in the Thanennkirch and Brezouard granites are characterized by the developement of NW-SE trending lineations in central parts of the plutons and E-W trending lineations along these borders. The Bilstein granite shows homogenous WNW-ESE lineations. The results of AMS are consistent with observations in the field.

Based on the above – mentioned assumptions we suggest that the depth of emplacement progressivelly decreased during the transtension deformation. Generally NW-SE stretching in the central and wide parts of plutons and dominantly horizontal flow in association with the development of sinistral shear zone in the pluton margins and the Bilstein granite reveal the importance of strain partitioning. We assume that the Thannenkirch granite intruded in mid-crustal levels controlled by two major tranccurent faults. Further extension is responsible for active thinning of gneissic unit, its strong anatexis (the Kaysersberg and Trois Epis migmatites) and coeval intrusion of the Brezouard granite. Finally, the Bilstein granite intruded already strongly thinned and molten crust in transccurent regime. This mechanism of successive magma batches is responsible for the actual disposition of medium-grade metamorphic rocks to the north and low pressure migmaties to the south stitched by granitic comlex. Telescoping of Ar-Ar cooling and U-Pb intrusion ages (330 Ma) and geochronological data in the migmatites (330 Ma) proved that the intrusion activity was coeval with crustal thinning and occured during a short period of time.

References

BOUTIN R., MONTIGNY R. and THUIZAT R., 1995. Chronologie K-Ar et 39 Ar -40 Ar du métamorphisme et du magmatisme des Vosges. Comparaison avec les massifs varisques avoisinants. *Géologie de la France*, 1: 3-25.

SCHALTEGGER U., SCHNEIDER J.-L., MAURIN J.-C. and CORFU F., 1996. Precise U-Pb chronometry of 345–340 Ma old magmatism related to syn-convergence extension in the Southern Vosges (Central Variscan Belt). *Earth and Planetary Sciences Letters*, 144: 403-419.

SCHALTEGGER U., FANNING C.M., GUNTHER D., MAURIN J.-C., SCHULMANN K. and GEBAUER D., 1999. Growth, annealing and recrystallization of zircon and preservation of monazite in high-grade metamorphism: conventional and in situ U-Pb isotope, cathodoluminiscence and microchemical evidence. *Contributions to Mineralogy and Petrology*, 134: 186-201.

Deformation Mechanisms, Mineral Chemistry, and P – Wave Velocity Patterns from Mylonitic Metagabbros Deformed at Amphibolite and Granulite Facies Conditions

Lenka KREJZLÍKOVÁ[1], Alice TOMÁŠKOVÁ[2], Karel SCHULMANN[1] and Pavla ŠTÍPSKÁ[1]

[1] *Institute of Petrology and Structural Geology, Charles University, Albertov 6, 128 43, Praha 2, Czech Republic*
[2] *Geophysical Institute, Academy of Sciences of the Czech Republic, Boční II/1401, 141 31, Prague 4, Czech Republic*

We have investigated two mylonitic metagabbro belts of C-O protolith ages (Staré Město belt, Czech Republic) deformed at oblique transpressive regime. The upper gabbro sheet was underplated by a Variscan tonalite body, one to two kilometre thick. The second gabbroic sheet occurs in the footwall of the tonalitic intrusion, from which it is separated by a 1 km wide sequence of metasediments. The temperature of metamorphism is therefore higher in the upper sheet than in the lower one. The aim of this study is to compare deformation mechanisms of gabbros deformed under the same tectonic regime approximately at the same time but at different temperatures. These data are compared with P-wave velocity patterns in order to make implications for seismic anisotropy of mafic lower crust deformed at different thermal regimes.

The structural evolution includes pre-Variscan C-O fabrics in weakly deformed parts of both metagabbro belts. The main Variscan fabrics show indentical foliation and lineation patterns as well as kinematics in both metagabbro sheets represented by the N-S trending W dipping steep planar structures and dextral kinematic indicators. However, deformation styles in the two metagabbro nappes are different. In the lower unit, the deformation is concentrated into localized shear zones which separate undeformed boudins with preserved magmatic textures. Whole unit is bounded by two mylonitic thrust zones at the top and at the bottom respectively. The deformation intensity in the upper unit is stronger, relict magmatic textures are rare. The metagabbro shows a well-developed planar structure with monomineral hornblende-plagioclase bands.

The main metamorphic phase is of Variscan age and it can be correlated with the deformation and also with the tonalite intrusion. Mineral associations in the metagabbros are following: hbl + pl ± ttn ± opq in the lower sheet and hbl + pl + grt ±

ttn ± opq or hbl + pl + cpx + opx + cum ± cor ± saph ± chl ± kfs ± ttn ± opq in the upper sheet. Hornblendes and plagioclases from both units are zoned. The amphibole cores are composed of actinolite or actinolitic hornblende replacing the magmatic pyroxene. Small recrystallized grains correspond to magnesio-hornblende in the lower belt and magnesio-hornblende up to tschermakite in the upper belt. Plagioclase evolves from magmatic andesine (An40–50) to metamorphic andesine-labradorite (An45–55) in both belts and rare bytownite (An71–90) in the upper one. Physical conditions of metamorphism were estimated using the thermometer by Holland and Blundy (1994): T = 650 ± 30 C for the lower unit and 750 ± 30 C for the upper unit. Moreover, the reaction sapphirine + H_2O – chlorite + corundum occurring in the upper gabbros determines the temperature of 750 °C for the pressures of 10 kbar.

The microstructural analysis performed using the PolyLX Toolbox by O. Lexa suggests that the deformation in a microscale changes depending on temperature. The eastern gabbros are characterized by "core and mantle" structures (Cumbest et al., 1989) typical for the less deformed domains. Amphibole and plagioclase grains deform preferentially by a mechanism of subgrain rotation. The newly formed recrystallized grains rim the host grain without attaining any significant crystal or shape preferred orientation (CPO, SPO). On the contrary, metagabbros from the mylonitic zones display a strong CPO and SPO of both elongated grains of amphibole and less elongated grains of plagioclase. The dominant slip system for amphiboles is supposed to be (100) [001] according to the CPO measurements.

The upper gabbros show a recrystallization mechanism of grain boundary migration with possible nucleation and growth of new recrystallized grains. The fabric with conserved original magmatic grains has already a strong CPO and SPO of amphiboles, probably due to a passive grain rotation and a subgrain formation at the early stages of the foliation development. With increasing intensity of recrystallization, amphibole grains lose the CPO and SPO and their fabric becomes more equigranular. On the contrary, the plagioclases attain stronger CPO and SPO than in the less deformed stages. The dominant slip system for amphiboles appears to be (100) [001] with minor contributions of (010) [001].

The microstructural analysis is going to be completed by the investigations of elastic properties of representative metagabbros, which were selected according to the relative proportion of amphibole and plagioclase, and to the intensity of deformation. To reveal the P-wave velocity distribution, the acoustic sounding technique by Pros et al. (1998) is used. Travel times of ultrasonic signal are measured, going through the sample sphere having 50 ± 0.02 mm in diameter. The measurements are conducted up to the pressure of 400 MPa. The P-wave velocities are calculated on the basis of measured travel times and sphere diameter. Furthermore, a map of isolines of the P-wave velocity distribution (Klíma and Pšenčík, 1977) is constructed in order to determine the real extreme velocities and the mean P-wave velocity as a weighted average of all independent measured directions for a given pressure. The P-wave velocity distribution in amphibolites depends on the proportion af amphibole and plagioclase as well as on the fabric intenisty (Barruol and Kern, 1996). This combined microstructural and P-wave velocity study will help to better understand the velocity anisotropy and shear wave splitting in the lower mafic crust.

References

BARRUOL G. and KERN H., 1996. Seismic anisotropy and shear-wave splitting in lower-crustal and upper mantle rocks from the Ivrea Zone - experimental and calculated data. *Phys. Earth Planet. Inter.*, 95: 175-194.

CUMBEST R.J., DRURY M.R., VAN ROERMUND H.L.M. and SIMPSON C., 1989. Dynamic recrystallization and chemical evolution of clinoaphibole from Senja, Norway. *Contrib. Min. Pet.*, 101: 339-349.

HOLLAND T. and BLUNDY J., 1994. Non-ideal interactions in calcic amphiboles and their bearing on amphibole-plagioclase thermometry. *Contrib. Min. Pet.*, 116: 433-447.

KLÍMA K. and PŠENČÍK I., 1977. Processing of the velocity anisotropy of rocks and minerals. Naukova Dumka.

PROS Z., LOKAJÍČEK T. and KLÍMA K., 1998. Laboratory Approach to Study of Elastic Anisotropy on Rock Samples. *Pure appl. Geophys.*, 151: 619-629.

P-T Paths within the Variscan Accretionary Prism Based on Illite Crystallinity and b Dimensions of Micas from Metamudrocks of the Kaczawa Mountains, SW Poland

Ryszard KRYZA[1], Jan ZALASIEWICZ[2], Richard J. MERRIMAN[3], Alan S. COLLINS[4] and Simon J. KEMP[3]

[1] *University of Wroclaw, Institute of Geological Sciences, Poland*
[2] *Department of Geology, University of Leicester, U.K.*
[3] *British Geological Survey, Keyworth, Nottingham, U.K.*
[4] *Tectonics Special Research Centre, Curtin University of Technology, Perth, W Australia*

Variably metamorphosed mudrock successions are present within the Variscan accretionary prism preserved in the Kaczawa Mountains in SW Poland (Fig. 1). Overall, the Kaczawa complex comprises diverse Cambrian? through Early Carboniferous sedimentary and volcanic rocks which include substantial bodies of mélange (Haydukiewicz 1987; Baranowski et al. 1998). These mélange bodies contain a remarkedly preserved assemblage of sedimentary and tectonic fabrics similar to those