east. Occasionally is developed east-dipping S2 cleavage. The sequential growth of porphyroblasts shows garnet and staurolite growing in the S1 foliation and during the beginning of the S2 overprint. The S1 foliation in the matrix is marked by alignment of muscovite, biotite, quartz and plagioclase and is crenulated into S2. Locally the steep S2 foliation is crenulated with F3 microfolds with subhorizontal axis and underlined by crystallization of chlorite and new muscovite. The NCKFMASH pseudosection constructed for a metapelite sample shows maximum P-T conditions of 650 °C and 8 kbar.

The orthogneiss belt in the vicinity of the eclogite boudins shows mylonitic predominantly steep fabric with no relicts of early HT monomineral banding. This vertical foliation S2 is locally folded by open to close folds with N-S trending subhorizontal axes and subhorizontal axial planes or cut by strongly localized subhorizontal shear-zones with N-S trending lineation. Going to the east the orthogneiss shows relicts of monomineral bands of recrystallized quartz, plagioclase and K-feldspar with ill defined foliation and predominantly linear fabric. This feature is interpreted in agreement with Zelazniewicz (1988) and in agreement with the structural superposition observed in surrounding rocks as a result of superposed subhorizontal S1 and subvertical S2 weakly developed foliation systems. Due to unsuitable bulk-rock composition of the orthogneiss it is difficult to estimate metamorphic conditions of the three observed fabrics. However, the character of monomineral banding in the orthogneiss attributed to the D1 deformation indicates HT conditions, but below the upper stability of muscovite. The presence of eclogites within the S2 fabrics and metamorphosed at c. 18 kbar and 800 °C point to the possibility that part of the enclosing orthogneiss underwent similar metamorphic conditions.

The southern part of the studied area involves a belt of the Stronie group surrounded by orthogneiss and shows a succession of two fabrics. The first foliation S1 is preserved in relicts as HT bands of recrystallized quartz and feldspar in the orthogneiss and in metapelites of the Stronie group as compositional banding. On a few places the original orientation of S1 was probably found and dips to the NE. The foliation S1 is reworked by W–vergent close to isoclinal folds with axial planes dipping to the east under intermediate angles. The S2 foliation is characterized by destruction of monomineral HT bands in the orthogneisses into fine grained mylonitic fabric and almost complete transposition in metapelites. The relicts of S1 and the process of transposition into S2 are apparent only in shorter steeply dipping shoulders of folds. Foliation S2 dips to E-ESE under intermediate to high angles. In order to correlate the structural succession with P-T conditions we have constructed pseudosection for a metapelite sample in the system NCKFMASH in THERMOCALC. The metamorphic evolution is characterized by following succession of mineral assemblages: Ctd-Grt, St-Grt-Bt-Ms-Plg and Chl-Ms. The inclusions of Ctd, St and Qtz in garnet are interpreted to be contemporaneous with the development of the S1 foliation. The S2 foliation is represented by bands of biotite, muscovite, recrystallized quartz, plagioclase and staurolite in the matrix. These bands are crenulated which is associated with growth of chlorite and white mica at the expense of plagioclase and biotite. The P-T path was obtained through the correlation of observed mineral succession and chemistry of the phases with modelled mineral assemblages and compositional isopleths. Maximum P-T conditions were estimated to 8 kbar and 650 °C.

The metamorphic conditions attained by eclogites and metapelites show that the rocks were exhumed from different depths, the eclogites from the base of the thickened root and the metapelites from the middle crust. The structural succession in the whole profile shows very similar evolution and therefore we suggest that the exhumation operated though similar mechanisms, independently of crustal depth. The prograde evolution up to maximum burial in metapelites is contemporaneous with the development of the S1 structure whereas there is no increase in pressure during the F2 folding. Therefore we suggest that the F2 folding is responsible for the beginning of the exhumation path in metapelites. The steep fabric in the orthogneiss-eclogite belt may have originated also by F2 folding as in metapelites and may represent a flattened crustal-scale antiform as suggested recently for a omphacite-granulite belt farther east by Štípská et al. (2004). Folding was followed by localized vertical ductile extrusion in the core of orthogneiss-eclogite antiform from a depth of 70 km (18 kbar) to mid-crustal level and is attributed to E-W compression.

References

ŠTÍPSKÁ, P., SCHULMANN, K. and KRÖNER, A., 2004. Vertical extrusion and middle crustal spreading of omphacite granulite: a model of syn-convergent exhumation (Bohemian Massif, Czech Republic). *J. Metamorphic. Geol.*, in print

The Trans-European Suture Zone Revisited: New Geological and Geophysical Evidence from SE Poland

Andrzej ŻELAŹNIEWICZ[1], Michał MALINOWSKI[2], Jerzy ŻABA[3] and Mark FANNING[4]

[1] *Instytut Nauk Geologicznych PAN, Podwale 75, 50-449 Wrocław, Poland*
[2] *Instytut Geofizyki PAN, Księcia Janusza 64, 01-452 Warsaw,Poland*
[3] *Wydział Biologii i Nauk o Ziemi, Uniwersytet Śląski, Będzińska 60, 41-200 Sosnowiec, Poland*
[4] *Research School of Earth Sciences, Australian National University, Mills Road, Canberra ACT 0200, Australia*

The Trans-European Suture Zone (TESZ) is assumed as a complex zone of Palaeozoic terrane accretion at the SW margin of the East European Craton (=Baltica) (Berthelsen, 1998). Remarkable thinning of the Baltican crust was encountered along the craton edge at the Thor Suture in the North Sea (Abramowitz et al., 1998), in NE Germany and still further south-east in NW Poland (Grad et al., 2002), parallel to the Teisseyre-Tornquist Line. Seismic experiments revealed the SW-ward extended high-velocity layer in the lower crust which is taken as a characteristic feature of the SW Baltica margin (Bayer et al., 2002). The thinned cratonic crust is traceable in a ca. 100–200 km wide belt along this margin. The border zone is characterized by the presence of the 10–20 km thick upper crustal layer with relatively low P-wave velocities (<6 km/s). Such velocities are typical of metasediments. A nature and provenance of the inferred metasediments are unclear in the NW section of the Baltica edge because of thick Permo-Mesozoic cover. An accretionary wedge related to the collision of East Avalonia and Baltica in late Ordovician times is obviously part of the metasedimentary series, but possibly not the whole of it. The other part may be interpreted as deposits of an early Palaeozoic passive continental margin (Bayer et al., 2002).

In SE Poland, the CELEBRATION 2000 seismic refraction experiment also revealed the presence of the low-velocity upper crust in the Małopolska Block. The metasediments which form the ca. 15 km thick low-velocity layer in the upper crust were drilled in many places at the 100–150 km wide border zone. This allows for a direct geological control on sesimic velocity data. Unmetamorphosed Palaeozoic sedimentary rocks (Vp <4.8 km/s) ca. 2–4 km thick overlay there Neoproterozoic rocks (5.2–5.8 km/s), and their Vendian age were confirmed by acritarchs in some boreholes. Thus the entire low-velocity upper crust, ca. 15 km thick, was interpreted as composed of Neoproterozoic series. In the border zone, these series are represented by two layers differing in P-wave velocities: the upper layer ca. 5 km thick (Vp of 5.2–5.4 km/s) and the lower layer ca. 10 km thick (Vp of 5.7–5.9 km/s). Only the SW part of the upper layer was penetrated by boreholes which proved the presence of flysch-type sandstone to siltstone lithologies. Most of them underwent low-grade metamorphism and deformation resembling a foreland fold-and-thrust belt, expressed by overturned folds with the steeply-dipping axial-plane cleavage, accompanied by thrusting. Metamorphism was generally decreasing N-ward toward the craton. Some of these rocks yielded Vendian-early Cambrian acritrachs (Moryc and Jachowicz, 2000). Most of them contain now detrital zircon grains that grew in the source rocks between 680 and 544 Ma, occurring in the Upper Silesia Block adjacent to the Małopolska Block on the SW.

Combining the geological and geophysical data, it is proposed to interpret the SW margin of Baltica as a Neoproterozoic passive continental margin which originated from the break-up of the supercontinent Rodinia (estimated elsewhere at 750-720 Ma). After some 150-170 m.y. long period of at first rift-related and than passive margin accretion (lower layer), the passive margin of Baltica was eventually overprinted in its present SE Polish section by the docking of terrane(s) from the S/SW. This brought about a foreland basin (upper layer) and resulted in a broad zone of thin-skinned Vendian deformation in the uppermost crust overlying the once attenuated high-velocity cratonic lower crust. Accordingly, the Trans-European Suture Zone is a complex zone consisting of the 100-200 km wide margin of the thinned Baltica crust overlain by Neoproterozoic rift-slope and passive margin metasediments successively overprinted by terrane accretion during Vendian and Palaeozoic times.

References

SABRAMOWITZ T., THYBO H. and MONA LISA Working Group, 1998. Seismic structure across the Caledonian Deformation Frot along MONA LISA profile 1 in the southeastern North Sea. *Tectonophysics*, 288: 153-176.

BAYER U., GRAD M., PHARAOH T.C., THYBO H., GUTERCH A., BANKA D., LAMARCHE J., LASSEN A., LEWERENZ B., SCHECK M. and MAROTTA A.-M., 2002. The southern margin of the East European Craton: new results from seismic sounding and potential fields between the North Sea and Poland. *Tectonophysics*, 360: 301-314.

BERTHELSEN A., 1998. The Tornquist Zone northwest of the Carpathians: an intraplate-pseudosuture. *Geologiska Föreningens i Stockholm Förhandlinga*, 120: 223-230.

GRAD M., GUTERCH A. and MAZUR M., 2002. Tectonophysical characteristics of the crustal structure in the central part of the Trans-European Suture Zone in Poland. In: Winchester, J.A, Pharaoh ,T.C., Verniers, J. (eds.), *Palaeozoic Amalgamation of Central Europe.* Geological Society Special Publication London, 201: 295-309.

MORYC W. and JACHOWICZ M., 2000. Utwory prekambryjskie w rejonie Bochnia-Tarnów-Dębica. Precambrian deposits in the Bochnia-Tarnów-Dębica area (southern Poland). *Przegląd Geologiczny*, 48: 601-606.