- leptynite, locality: Horni Marsov (sample HO.MA); pinkish, fine-grained quartz-feldspar schists forming few m thick synsedimentary interlayer within dark micaschists, possible protolith: acid extrusive, pyroclastic rock (ash fall?), mean age: 507±11 Ma,
- Kowary gneiss , locality: Kowary-Pogórze (sample KOW); coarse-grain augen gneiss, protolith: porphyritic granite, mean age: 500±11Ma. For this sample also other zircon ages were determined: 564,0±8,4 Ma, 767,6±7,3 Ma and 1700,8±24,1 Ma, which seem to reflect an influence of older cores, inherited from zircons of melted source rocks.

Samples from Leszczyniec Unit:

- Paczyn gneiss , locality: Ogorzelec quarry (sample OGOR): undeformed to weakly deformed leucocratic, medium-grained albite granitoid, protolith: leuco-tonalite, mean age: 496,5±8,4 Ma,
- Paczyn gneiss , locality: outcrops N of Klatka (sample KL1A): medium-grained, augen chlorite-albite-quartz gneiss, possible protolith: granite, mean age: 499,3±8,0 Ma,
- Paczyn gneiss , locality: Klatka quarry (sample KLAT): weakly deformed fine- to medium-grained albite gneiss with amphibole and epidote, possible protolith: granodiorite, mean age: 497.9±6.2Ma,
- Paczyn gneiss, locality: Raszów (sample RAS): weakly deformed coarse-grained chlorite-albite granite-gneiss, possible protolith: granite, mean age: 507,2±9,0 Ma.

The new isotope data for KCU framed in a range of ca. 493 to 512 Ma – approximately covering the period from Late Cambrian to Early Ordovician – clearly indicate that volcanic activity documented by leptynites and meta-porphyroids are of nearly the same age with subsequent plutonism expressed by intrusion of the protolith of the Kowary gneisses.

Unfortunately no zircons were found in samples representing acid volcanics of the spilite-keratophyre association and meta-diorites from LU and all new isotope ages for this unit register only the time of emplacement of its acid igneous members, i.e. Paczyn gneisses. The ages are bracketed between 507–496 Ma and unequivocally point out that the time of plutonic activity in LU is very similar to that in KCU. Zircons from Paczyn gneisses yielded homogeneous ages around 500 Ma and show no disturbances from inherited constituents. This fact and the chemical affinity with surrounding meta-keratophyres proves that magmas of the Paczyn gneisses were fed from the same magma chamber as the nearly simultaneous spilites and keratophyres or originated by partial melting of this association.

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Anomalously Hot Gradient of Barrovian Sequence in the Silesian Zone (Bohemian Massif): an Interplay between Devonian Rifting and Carboniferous Collision

Monika KOŠULIČOVÁ[1], Pavla ŠTÍPSKÁ[2], Karel SCHULMANN[3] and Ondrej LEXA[3]

[1] Institute of Petrology and Structural Geology, Charles University,Albertov 6, 128 43 Prague, Czech Republic
[2] UMR CGS Geologie, 1 rue Blessig, 67 084, Strasbourg, France
[3] Centre de Geochimie de la Surface, Université Louis Pasteur,1rue Blesig,670 00 Strasbourg cedex, France

Tectonically inverted Barrovian metamorphic zonation is a characteristic feature of 180 km long belt of deformed Brunia microcontinent emerging through high-grade rocks of the internal Variscan root exposed along the eastern Variscan collisional front. Investigations of metamorphic evolution in the northernmost part of collisional margin have shown an anomalously hot geothermal gradient compared to the rest of the collisional zone further to the south. The variations in dP/dT ratios along the collisional margin during burial and exhumation are discussed in terms of heterogeneously developed pre-collisional rifting and lithospheric thinning within the Brunia microcontinent and in terms of emplacement of late syn-orogenic plutons.

Deformation evolution in the Silesian domain is characterized by a penetrative foliation (S1) in metasediments and discrete shear zones in gneisses. It is affected by heterogeneously developed upright folds and heterogeneous steep cleavage (S2) in the east and almost complete transposition into new foliation in the west. The first fabric is interpreted to result from continental underthrusting stage, while the second one corresponds to exhumation and buttressing stage of orogeny.

Metamorphic grade increases from east to west from chlorite, chloritoid, garnet, staurolite to staurolite-sillimanite zone with late andalusite. Geometry of the inclusion trails within chloritoide, garnet, staurolite and plagioclase indicate their prograde growth contemporaneous with main metamorphic fabric (S1). Staurolite continuously grows also at the beginning of development of late crenulation S2, sillimanite is associated with late cleavage, while andalusite is overgrowing the S2 fabric. The succession of observed mineral associations in metapelites, garnet and staurolite zoning in combination with pseudosections constructed in NCKFMASH system was used to determine prograde metamorphic path, peak P and peak T in individual zones, which were corroborated by average P-T calculations. P-T conditions of the exhumational path were studied on fluid inclusions in quartz veins and quartz-andalusite intrafolial boudinage.

Metamorphic field gradient determined for the peak T conditions for all zones vary between 25 and 50 °C/km and is higher compared to those of southern and central parts of the collisional front where the gradient of 18–20 °C/km was reported. This difference in field geothermal gradients is explained by existence of inherited high thermal gradient associated with Devonian lithospheric stretching affecting heterogeneously the Brunia microcontinent prior to the thickening. This is supported by Devonian sedimentation and volcanism that indicate very little time lag of 10–20 Ma between the end of rifting and onset of collision and burial of the continental margin rocks. Persistence of high metamorphic field gradient during growth of sillimanite and andalusite in late cleavage is interpreted as a result of syncollisional magmatism.

Morphology of the Carpathian Gravity Field in the Light of Seismic Data Provided by Experiment CELEBRATION 2000

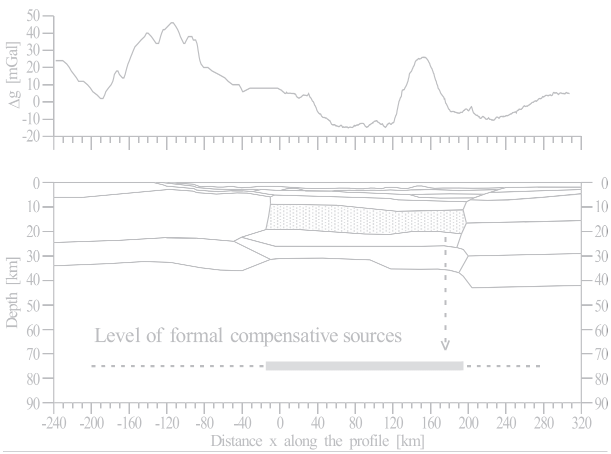
Lech KRYSINSKI

University of Warsaw, Institute of Geophysics, ul. Pasteura 7, 02-093 Warsaw, Poland

Experiment CELEBRATION 2000 provided a new image of v_P-velocity structure of the crust and the upper-most lithosphere in the area of Western Carpathians. Three cross sections along profiles CEL 01, CEL 04, CEL 05 crossing boundary of the orogen are crucial for studies of the gravity field morphology.

For a general recognition of the relation between these two kinds of data, the gravity modelling was performed in this study as a common fit of a set of densities attributed to seismic layers, where each density is space-constant in its layer. Each of densities conforms phenomenological limitation given by minimal and maximal velocity in the given layer, like it is illustrated by the well-known Nafe-Drake velocity-density relation. The simplified model of the subcrustal density distribution, where compensating masses are located near one horizontal plane, was used for testing presence of isostasy (Fig.). This preliminary study of the gravity field along these three profiles gave a clear evidence for presence of subcrustal isostatic compensation with estimation of the characteristic depth of compensating density structures.

The method being formulated as a universal procedure allows for comparison between profiles. The profile CEL04 gave at most spectacular results including semi-quantitative hypothesis as to the deviations from isostatic equilibrium in lithospheric segments along the profile and as to the horizontal density diversity in the upper-most mantle between platforms, while the two others profiles are not so promising for future studies. This two, less successful cases open questions as to the adequacy of the assumption of 2-D structure of the medium along the profiles CEL 01, CEL 05 or as to the quality of corresponding seismic data but first of all they show necessity of modifications in the modelling procedure. The last can be done by application of a velocity dependent density model in each of layer or by division of some layers, based on seismological or tectonic assumptions, what could improve accordance between seismic and gravity data.



■ **Fig. 1.** Draft illustrating anti-projection of mass distribution, used for construction of the model of formal compensative sources.