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Gravity Modelling of the Krkonoše-Jizera Pluton

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A detail gravimetric survey (in the scale of 1:25 000, i.e. with the density of 4–5 stations per 1 sq. km) was realized in the northern Bohemia during 2001–2003. The total extent of the surveyed area was 800 sq. km. It included the eastern marginal part of the Lužice (Lusatian) Granodiorite Massif, the Jizera Metamorphic (mostly orthogneiss) Complex, the Ještěd-Kozákov Belt of the South Krkonoše Metamorphic Complex and the substantial Jizera part of the Krkonoše – Jizera Granite Pluton.

The data processing and interpretation stages which followed the field works during 2004–2006 embraced an enlarged rectangular area sized 90 km (W-E) and 65 km (N-S), i.e. the area of 5850 sq. km situated on the German–Polish–Czech borderland. The corners demarcating this enlarged area are situated near the towns of Reichenbach (NW)–Zlotoryja (NE)–Trutnov (SE)–Mnichovo Hradiště (SW). The evaluated area includes the whole Krkonoše–Jizera Pluton, the whole Jizera Metamorphic Complex, substantial part of the Kaczawa Metamorphic Complex, the whole South Krkonoše Metamorphic Complex, the South Krkonoše Piedmont Late Paleozoic Basin, the eastern part of the North Sudetic Depression and the marginal part of the Czech Cretaceous Basin. The unified gravimetric maps of this extended area were compiled using gravimetric data advanced by the Polish Ministry of Environment in Warsaw, by the Saxonian State Department of Environment and Geology in Dresden, and by the CGS-Geofond in Prague.

The regional (low pass) map is depicted in the Fig. 1. The most remarkable gravity anomaly is a large gravity zone L1-L2-L3 situated in the central part of the area studied. This zone is almost 100 km long with the axis drawn-out in the direction of WSW-ESE. Three partial gravity lows are developed along this axis. The westernmost low (L1) reaching –51 mGal is situated in the northern marginal part of the Czech Cretaceous Basin, the central low (L2) with the extreme of –40.5 mGal occurs in the Jizera part of the Krkonoše–Jizera Pluton (in the surroundings of the town of Liberec) and the largest eastern partial low (L3) of –48 mGal is on the northern Polish slope of the Krkonoše Mts. in the southern vicinity of the town of Jelenia Góra. All the three partial minima represent the effect of the low-density variscan granite rocks of the Krkonoše–Jizera Pluton (in case of the L1 low there is also a substantial influence of the “light” Cretaceous sediments covering the buried gran-

ites). The large Jizera Metamorphic Complex situated to the N of the Krkonoše–Jizera Pluton which is mostly built by various kinds of orthogneisses and migmatites also partly contributes to the central gravity low.

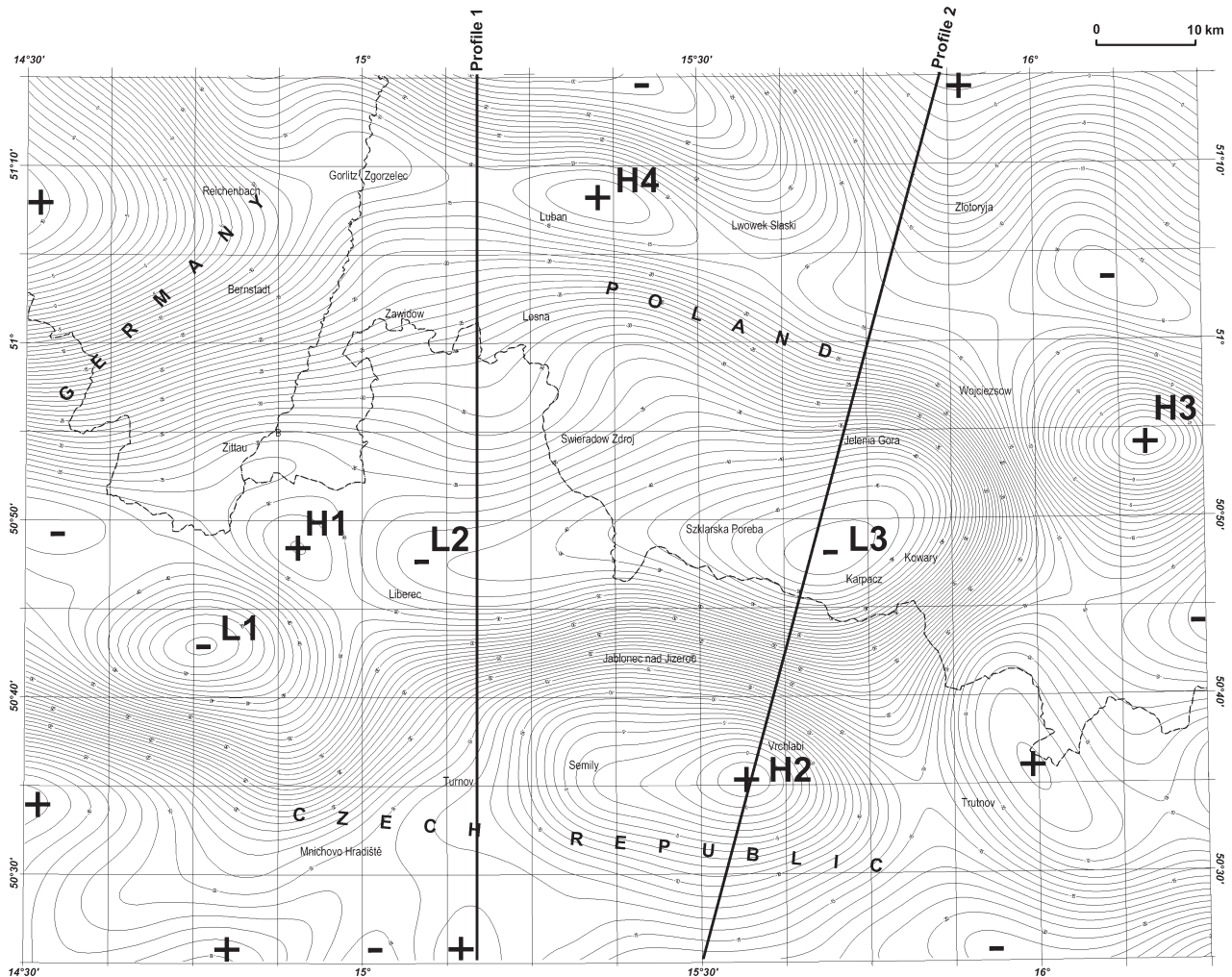
The partial lows L1 and L2 are separated one from another by the local gravity high H1 caused by the Proterozoic to Early Paleozoic sedimentary-volcanic sequences building the Ještěd-Kozákov Mountain Belt.

The steepest horizontal gradients rim the main gravity low especially on its southern and eastern margins. In the direction to the South, it reflects the density contrast toward the South Krkonoše Metamorphic Complex built by metamorphosed Proterozoic and Early Paleozoic sedimentary-volcanic sequences covered by the South Krkonoše Piedmont Late Paleozoic Basin. The Late and Early Paleozoic Complexes cause the gravity high H2. In the direction to the E the steep horizontal gradient manifests the contact with the Kaczawa Metamorphic Complex covered partially also with the Late Paleozoic Formations. The Kaczawa Complex and its Late Paleozoic cover create the gravity highs H3 and H4.

The gravity modelling focused to the shape and deep position of the Pluton body was solved using the software GM-SYS along the two almost 150 km long profiles. The first one of the S-N direction started in the Czech Cretaceous Basin, crossed over the western Jizera part of the Krkonoše – Jizera Pluton (partial gravity low L2) and finished in the Odra Lineament Zone. The second one of the SSW – NNE direction began also in the Czech Cretaceous Basin, crossed over the gravity high H2, the western partial gravity low (L3), then the whole Fore-Sudetic Block and finished also near the Odra Lineament Zone. The resulting models show very steep (almost vertical) southern wall of the Pluton. The bottom boundary of the Pluton is expected to be in depth of about eight kilometers in the Jizera Mts. and to ten kilometers in the Krkonoše eastern part of the Pluton.

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■ Fig. 1. Regional gravity anomalies with location of the two interpretation profiles.

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