Geophysical Manifestation of the Metabazite Zone of the Brno Massif

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The Brno massif is a triangular geological body 600 sq. km in size located between Brno, Boskovice and Miroslav. To the WNW the massif is bounded by the marginal fault of the Boskovice Furrow, while to the east it is overlain by sedimentary formations of Devonian and Lower Carboniferous age. To the SW the massif dips beneath the deposits of the Carpathian Neogene Foredeep.

The lithological composition of the Brno massif is mainly granodiorite. A metabasite zone of northern trend has been recognized in the center of the massif dividing the granodiorite body into two independent parts. The petrophysical contrast between granodiorite and surrounding geological units is less significant than that between the granodiorites and metabasites. This is the reason why the metabasite zone accounts for most important geophysical anomalies within the massif.

Both the Brno massif and nearby located geological units were covered by homogeneous gravity survey as well as airborne magnetometry and radiometry. The massif is expressed through a distinct longitudinally oriented anomalous zone within the gravity field. Three local maxima: 1. west of Blansko, 2. along the western edge of Brno and 3. south of Brno in the area of Želešice, correspond to areas of maximum surface and depth extent of the metabasite zone. The amplitudes of the anomalies coincide both with metadiorite and metadiabase occurrences (2.90 g/cm^3) within granodiorites (2.67 g/cm^3) and amount from 15 to 25 mGal.

Quantitative interpretation of the gravity field suggests that the metabasite zone dips steeply west to the depth of 1.5-3.5 km and then underlies the granodiorite of the eastern part of the Brno massif. Taking into account the fact that the densities of metadiabase and metadiorite are virtually identical the metabasite zone is reflected in the gravity field as a homogeneous unit. However, these lithologies are locally separated by a narrow belt of granodiorite (Jundrov type granodiorite at the southern edge of Brno), which is also evident from gravity and magnetic fields.

To the south of Brno the metabasite zone turns gradually to the SSW. The absolute value of the gravity anomaly reaches its peak in areas where the heavy rocks start to dip beneath the light deposits of the Carpathian Neogene Foredeep (2.30 g/cm^3). The author believes that this anomaly may be to some extent also associated with the presence of hornblendite. This lithology with a density of 2.94 g/cm^3 has been identified in the Želešice quarry.

Manifestation of the metabasite zone in the magnetic field is more variable. Increased concentrations of magnetite account for four longitudinal magnetized belts. Two of them occur within granodiorite in the western and eastern parts of the Brno massif. Two more distinct anomalies are then located within the matabasite zone. Amplitudes within a narrow anomaly identified along the eastern margin of the metadiorite zone in the proximity of its contact with the Jundrov type granodiorite locally exceed 1,000 nT. The fourth anomalous belt follows the trend of the metadiabase zone.

Petrophysical characteristics of the Brno massif allow to analyse its composition by means of regional geophysical survey. Quantitative interpretation enables modelling of the surface configuration of the metabasite zone and determination of its trend in deeper parts of the massif.