

# ELECTROMAGNETIC INDUCTION (EM) STUDIES BY MAGNETOTELLURICS – IAGA DIVISION 1. INTERNAL MAGNETIC FIELDS

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The researches focused on the study of the Kőszeg-Rechnitz Penninic window, the Late Pleistocene Ciomadul volcano (SE Carpathians) and the construction and application of the EURHOM map. The main results are summarized in the following:

- One of the Penninic Nappes is the Kőszeg-Rechnitz (K-R) tectonic window at the Eastern end of the Eastern Alps. It has a complicated metamorphic history from the Jurassic time. The organic material of the Penninic Ocean was transformed to electrically conductive meta-anthracite. Its amount in the calcophyllite is estimated by geochemists to 0.2 per cent. Taking this conducting structure as a test area pilot deep magnetotelluric (MT) soundings have been carried out and determined: the structure of the conductivity anomaly due to 0.2 per cent meta anthracite in the K-R window and its surroundings, the different kinds of MT distortions as lateral (side) effect of the conductor appearing in the crust and mantle, the most probable depth of the conductive asthenosphere at the border of the Pannonian Basin (having extreme shallow asthenosphere). The obtained ~140 km depth is in correlation with value of the asthenospheric map based mainly on seismic data (Ádám et al. 2013).
- The Ciomadul is the youngest volcano of the Carpathian–Pannonian region, which erupted last time at 32 ka. It produced high-K dacitic lava domes and pumiceous pyroclastic rocks. A magnetotelluric survey was performed to reveal whether any melt-bearing magma body could presently reside beneath the volcano. Both the 2D and 3D inversion modeling calculations indicate low electric resistivity values in the depth interval of 5–25 km, just beneath the volcanic centers. This can be interpreted as implying a partially melted zone, i.e. a crystal mush body containing about 5–15% melt fraction. In addition, the 2D modeling calculation indicates also a deeper low resistivity anomaly at 30–40 km depth. The consistent petrologic and magnetotelluric constrains on the magma storage beneath Ciomadul are corroborated by the recent seismic tomography result, which pointed out a low-velocity anomaly at 8–20 km depth zone. Thus, results of independent models suggest the presence of a melt-bearing crystal mush body beneath the seemingly inactive volcano (Harangi et al. 2015).
- In connection with the EURISGIC WP2 (European Risk from Geomagnetically Induced Currents (GIS)) project the authors present those procedures which have been used to construct a map in cells on the electrical resistivity distribution in Europe at least till to the asthenosphere. The data are based on the deep magnetotelluric soundings published in the international literature. This map is the basis of the calculation of the induction risk endangering the electric network and communication systems. These data of the EURHOM project are partly used in the report of Viljanen et al. (2012). It has been giving how GIC modeling can be conveniently performed on a spherical surface, too (Ádám et al. 2012).
- In the Encyclopedia of Solid Earth Geophysics (edited by Harsh K. Gupta, 2011) includes the chapter “Goelectromagnetism” (Ádám and Szarka, 2011) summarizing the theory of the EM Induction methods and their efficiency in the study of the Earth interior with special attention to the deep geoelectric structure of the Carpathian-Pannonian Region.

## References

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