EURHOM – INDUCTION MODEL OF THE EUROPEAN LITHOSPHERIC PLATE – IAGA DIVISION 1. INTERNAL MAGNETIC FIELDS

Viktor Wesztergom, Ernő Prácser, Veronika Barta, Dóra Bán, László Bányai, József Bór, Árpád Kis, Dávid Koronczay, István Lemperger, János Lichtenberger, Tamás Nagy, Attila Novák, Sándor Szalai, László Szarka, Judit Szendrői, Eszter Szűcs

1 Introduction

Surface geomagnetic variations ultimately origin from the complex interaction of the solar wind and the Earth magnetosphere. The temporal variation of the geomagnetic field induces currents in the conductive subsurface.

The induced currents' magnetic field contributes to the total surface field, superimposed on the primary field variations arose from the ionospheric-magnetospheric electric currents. These so-called telluric currents enhanced by strong specific resistance may find their way into transformers and transmission lines where they can do significant damage. Essential infrastructure in Europe, including telecommunication systems, has become so complex that even a minor malfunction at any point is bound to have an effect on the entire network. Within the framework of the EU supported EURISGIC (European Risk on Geomagnetically Induced Currents) project the GGI has been participating in an international co-operation aiming to identify the most vulnerable areas of the continent. The Institute has conceived a model of the electric conductivity of the European continental plate named EURHOM to identify and localize areas most vulnerable to geomagnetic storms caused by major solar eruptions.

2 Discussion

In the EURHOM (EUropean RHO Model) the 1D layered conductivity structure is given for rectangular blocks of different size both in horizontal and vertical directions. Blocks are limited horizontally by latitude and longitude for computational reasons. Horizontal size depends on the data availability, spatial representativeness of MT soundings, topography and a priori geological information (eg tectonic lines, asthenosphere upwelling etc.).

Blocks extentends vertically from the surface down, at least, to the Lithosphere-Asthenosphere Boundary (LAB). The LAB represents a boundary where the conductivity increases remarkably. Its depth varies from 60 km (at the Pannonian Basin to 200 km at the fennoscandinavian Shield. Magnetovariation (MV) and magnetotelluric (MT) data had been taken from data archives, different literature and former MT deep soundigs carried out by the Geodetic and Geophysical Institute of the Hungarian Academy of Sciences. Results of former regional studies were also utilised, The electric asthenospheric depth determination of Jones et al. (2010), and Korja (2007). Arhive analogue data we digitised by a special digitising method (NTD method), and inverteted by Pracser's inversion algorithm. Although many small scale conductivity anomaly are knovn within the European lithosphere plate like the Transdanubian Conductivity Anomaly, (Ádám et al. 2001) small scale anomalies are out of interest in GIC calculations. The potential difference between the earthing points of the long conductors like power transmission lines, pipelens is determined by the integration of the electric field along the line, which is a smoothing operation. Spatial scale of 100 km of the conductivity anomalies prooved to be perfect. The EURHOM has been validated by comparision of direct GIC measurement in Finland, an Russia, and continuous induced electric field measurements at the Széchenyi István geophysical Observatory of he Hungarian Academy of Sciences.

MTA CSFK Geodetic and Geophysical Institute
E-mail: wesztergom.viktor@csfk.mta.hu

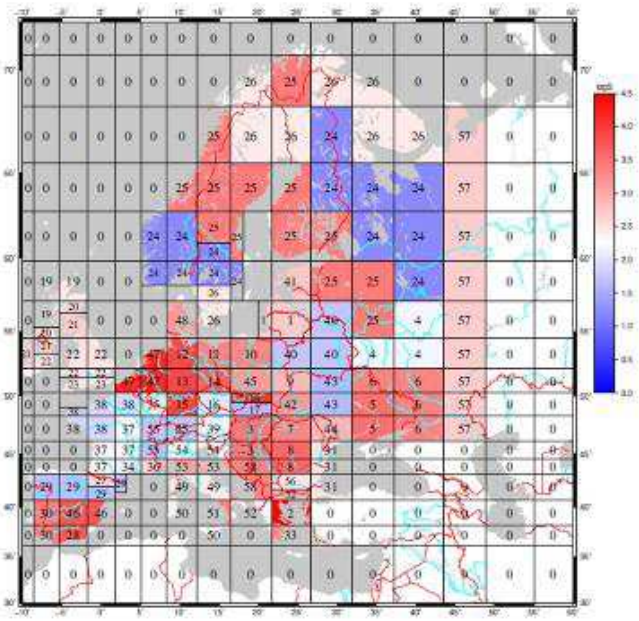

Figure 1. This figure depicts the specific resistance of the European plate at a depth of 80 kms. Blue colour indicates large specific resistance, the most vulnerable areas

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