GLOBAL EM INDUCTION IN THE EARTH: EFFECTS OF EXTERNAL FIELD GEOMETRY ON THE 1-D INVERSION PROBLEM

JAKUB VELÍMSKÝ[1;2], Nina Benešová[2], Hana Čížková[1;2]

1 Institute of Geophysics, ETH Zürich, Switzerland
2 Dept. of Geophysics, Faculty of Mathematics and Physics, Charles University in Prague

1-D global inversions of observatory and satellite data reveal radial conductivity profiles in the Earth's mantle. Traditionally, these have been interpreted as average values at given depth. However, the predominant P_{10} geometry of the magnetospheric ring current, and the P_{21} local-time related geometry of the ionospheric currents represent strong biases in 1-D interpretation of responses of fully 3-D heterogeneous Earth. We present a series of synthetic checks, applying 1-D time-domain inversion technique on 3-D simulated data for conductivity models ranging from simple configurations based on low-degree spherical harmonics to complicated structures derived from temperature, chemical and phase composition based on geodynamical modelling. We show that it is the presence or lack of lateral interconnection of highly conductive phases in the direction of prevailing external currents that determines the results of 1-D inversion. In particular, this effect can explain the recently shown invisibility of highly conductive postperovskite in the D'' layer to induction studies excited by strong transient signals — the geomagnetic storms.

EM induction, electrical conductivity, D''

Jakub Velímsky, Institute of Geophysics, ETH Zürich, Sonneggstrasse 5, 8092 Zürich, e-mail: velimsky@erdw.ethz.ch