TOWARD AN IMPROVED SOURCE MODEL FOR ELECTROMAGNETIC INDUCTION STUDIES

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The traditional approach to estimation of the electrical conductivity of Earth's mantle is based on interpretation of ground-based observatory recordings of geomagnetic variations of external origin on time scales from hours to months. Most electromagnetic induction studies with observatory data to date have assumed that long period external magnetic variations are due to a symmetric magnetospheric ring current, and are hence describable on the Earth's surface by an external geomagnetic axial dipole. This simple model would appear to be supported by the observation that on the Earth's surface geomagnetic variations for periods beyond about 5 days are very well approximated (at least at mid-latitudes) by a dipole source (Banks, 1969). However, there is growing evidence for significant source asymmetry. Recently, Balasis and Egbert (2006) using observatory magnetic data show clear evidence for large scale non-dipole source structure. The observed asymmetry agrees with that inferred previously by Balasis et al. (2004), from the local time dependence of biases in satellite induction transfer functions. Furthermore, Vennerstrom et al. (2007) found that the long-distance effect of the high-latitude field aligned currents constitutes the major source to external magnetic field related magnetic east-west disturbances at mid- and low latitudes. The development of a current source model of the magnetosphere and ionosphere based on the aforementioned results would be suitable for purposes of global induction studies. Progress on this effort will be reported.

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