HIGH DYNAMICS OF THE GEOMAGNETIC FIELD SOURCES: REALITY OR EFFECT OF MANTLE CONDUCTIVITY

PAVEL BATALOV, Irina Demina, Tatiana Koroleva

SPbF IZMIRAN, Saint-Petersburg, Russia, dim@izmiran.spb.ru

The developed dynamic model of the main geomagnetic field sources includes dipoles of three
levels, which have existed and continuously changed during the 100-year period. Eight powerful dipoles are obtained to be situated in the liquid core. But the most part of sources are located at the core-mantle boundary or even at the lower mantle bottom. Earlier it has been obtained that it is impossible to describe local anomalies of the observed secular variations ignoring dynamics of these sources. Moreover the fact that they are geographically situated near the hot spots or the global tectonic faults is an evidence of a possibility of existence of real physical processes at the core-mantel boundary which can be able to generate the magnetic field. Objections were raised that the obtained depth of these sources is underestimated since the effect of mantle conductivity was not taken into account. To obtain a numerical evaluation of the mantle effect we have investigated its filtering properties within the scope of the model of the homogeneous conductivity layer. The motionless dipole which is located at the core-mantle boundary and whose magnetic moment (MM) magnitude varies as sine function was taken as a magnetic field source. The frequency-phase responses of the mantle filter were obtained for the different values of conductivity. As main results the phase shift and the decrease of the amplitude oscillation were obtained for MM. Spatial structure of magnetic field components of such source calculated with mantle conductivity taking into account differs from the dipole field. The approximation of such quasi-dipole field by dipole source results in the “seeming” oscillation of the dipole depth. The amplitude of these oscillations depends on a period of the MM sine function and mantle conductivity. But the middle depth value practically doesn’t distinguish from assigned one. The amplitude of the “seeming” depth oscillation is considerably less then that was obtained for dipoles approximating local anomalies of geomagnetic field. Thus the location of dipoles at the bottom of the lower mantle can’t be explained by the mantle conductivity only and demands further investigations.

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Pavel Batalov, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation St.-Petersburg Filial (SPbF IZMIRAN), Russia, 199034 St.-Petersburg, Mendeleevskaya d.1,
tel: +7 (812)3237845, fax: +7 (812) 3105035,
e-mail: lebvm@mail.ru