GLOBAL MODELING OF THE GEOMAGNETIC SQ FIELD FROM GROUND-BASED AND SATELLITE DATA

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The quiet-time, daily geomagnetic variation observed at mid-to low latitudes is generated by electrical currents flowing in the lower ionosphere, around 110 km altitude. These co-called Sq currents are produced by dynamo electric fields associated with thermospheric winds on the dayside of the Earth, where the electrical conductivity is increased by solar radiations. They induce secondary currents in the Earth's electrically conducting interior which contribute to the total daily variation. In this presentation we will report on the development of a spherical harmonics model of the average Sq field in quasi-dipole coordinates (Richmond, 1995), using a combination of ground-based and CHAMP satellite data. Quasi-dipole coordinates are aligned with the geometry of the main field and make it possible to significantly reduce the number of model parameters. Due to its low altitude (around 400 km) and rapid drift in local time (12 hour drift in a little more than 4 months) CHAMP is best suited for modeling the spatio-temporal variations of the Sq field, including its seasonal variations. The core, lithospheric and magnetospheric contributions are removed from satellite data using dedicated models and a 1-D mantle conductivity model is used to calculate the induced component. We will compare the obtained models with previous models of the geomagnetic Sq field, including CM4 (Sabaka et al., 2004), and discuss the benefits of including observatory data in the model dataset.

Sq currents, geomagnetic modeling

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