Geophysical Research Abstracts, Vol. 7, 00273, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00273

One-dimensional elementary current systems and their use for determining ionospheric currents from satellite measurements

Liisa Juusola, **Olaf Amm**, and Ari Viljanen
Finnish Meteorological Institute, Space Research, P.O. Box 503, FIN-00101, Finland

The method of 1D spherical elementary current systems (SECS) is a new way for determining ionospheric and field-aligned currents in spherical geometry from magnetic field measurements by low-orbit satellites. In contrast to earlier methods, the full ionospheric current distribution, including both divergence-free and curl-free horizontal currents, as well as field-aligned currents, can be determined. Placing infinitely many 2D SECSs of identical amplitudes at a constant latitude results in two types of 1D SECSs, which are independent of longitude, and by superposition can reproduce any ionospheric and field-aligned current system with the same property. One type of 1D SECSs is divergence-free and toroidal with a poloidal magnetic field, and the other type is curl-free and poloidal. Associated with the divergence of the curl-free type are radial currents. The magnetic field of the combined curlfree 1D SECS and field-aligned currents is toroidal and restricted to the region above the ionosphere. Ionospheric currents are determined by placing several 1D SECSs at different latitudes and choosing their amplitudes in such a way that their combined magnetic field as closely as possible fits the measured one. The 1D SECS method has been tested using both modeled and real data from the CHAMP satellite, and found to work excellently in 1D cases.