



Determination of ionospheric currents from ground-based and satellite data

O. Amm (1), H. Vanhamäki (1), L. Juusola (1), A. Viljanen (1), K. Kauristie (1), and J. Weygand (2)

(1) Finnish Meteorological Institute, Arctic Research Unit, Helsinki, Finland (olaf.amm@fmi.fi, +358 9 19294603), (2) Institute of Geophysics and Planetary Physics, University of California, Los Angeles, California, USA

We present a summary of recent, advanced techniques for determination of ionospheric currents from ground-based data, satellite-based data, and a combination of both, with a focus on techniques based on spherical elementary currents systems (SECS). Processed with these techniques, results of global-scale and mesoscale ionospheric current distributions are shown, based on data from the MIRACLE and THEMIS ground-based networks, and from the CHAMP satellite. We will present both statistical distributions of ionospheric currents as a function of various Geospace parameters and timeseries of instantaneous current distribution results, demonstrating the rapid spatio-temporal variability that ionospheric currents may exhibit. In the latter situations, significant induced currents can be generated both in the ionosphere and in the solid Earth. We will discuss how to determine such induced currents, show that in extreme cases they can amount to the same order of magnitude than the primary currents, and present techniques to separate the primary and induced magnetic field and current parts. Finally, as an outlook we inspect how the upcoming SWARM mission of three satellites in the upper ionosphere will improve our possibilities to determine ionospheric currents.