GLOBAL ASYMMETRY IN FIELD-ALIGNED CURRENT AND CONVECTION ASSOCIATED WITH THE IMF CLOCK ANGLE AND SOLAR ZENITH ANGLE

Renata LUKIANOVA (1)
Alexander Kozlovsky (2)
Freddy Christiansen (3)

Arctic & Antarctic Research Institute, St.Petersburg, Russia
Sodankyla Geophysical Observatory, Sodankyla, Finland
National Space Center DTU, Copenhagen, Denmark

Using joint modeling of field-aligned currents (FAC) and ionospheric electric fields we investigate the effect of IMF BY for different seasons in both hemispheres. The numerical convection model utilizes high-precision statistical maps of FAC derived from measurements by the Ørsted, Champ and Magsat satellites and takes into account the electrodynamic coupling of the opposite hemispheres and. The model allows obtaining the convection patterns developed simultaneously in both hemispheres for a given input parameters. The SuperDARN convection patterns for the periods of good data coverage when the imaging of large-scale convection is fairly precise are used to compare the model' predictions with measurements that were not part of the model' input data. We demonstrate how the mutual influence of opposite hemispheres can modify the global convection, how the seasonal and the IMF BY-related effects interplay at high latitudes. It confirms that the solar zenith angle (both seasonal and UT variation) should be linked to the IMF clock angle to fully characterize the convection patterns. The results show that during the solstice months the qualitatively different FAC and convection structures related to the BY effect contribute to the total, actually observed, convection patterns in the opposite hemispheres. The statistical relationship between the near-pole voltage Up in kV and the magnitude of IMF BY in nT averaged over seasons, hemispheres and the IMF conditions is obtained to be Up ~ 6 · BY. The fitting lines, however, show the IMF- and season-related trend. The effects are interpreted as the complicated interplay of different factors such as the ionospheric conductance, inter-hemispheric current and magnetospheric configuration.

electrodynamics, convection, field-aligned current

R. Lukianova, AARI, 38 Bering str., St.Petersburg, Russia, fax (+7)(812)3522688, renata@aari.nw.ru