ION TEMPERATURE DISTRIBUTION IN THE HIGH-LATITUDE THERMOSPHERE-IONOSPHERE REGION PRODUCED BY FIELD ALIGNED CURRENTS – EISCAT OBSERVATIONS

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Magnetosphere-ionosphere-thermosphere (M-I-T) coupling represents a nonlinear dynamical system having very complex properties. Recent studies on processes of (M-I-T) coupling have revealed that the global electromagnetic energy input mostly exceeds the charged particle energy input. The electromagnetic energy flux between the magnetosphere and ionosphere consists mainly of field-aligned currents (FAC) and plasma wave processes. In its turn, the neutral atmosphere (the thermosphere) can have significant influence on the ionospheric electrodynamics. While the electron concentration and electron temperature disturbances are caused mainly by ionization and heating processes due to the particle precipitation, the ion temperature disturbances are influenced strongly by Joule heating due to the electric field/field-aligned current disturbances in the polar ionosphere. As expected the ionospheric disturbances produced by FAC have appreciable magnitudes at geomagnetic latitudes between 60°-85° depending on the solar wind velocity and the IMF orientation. The thermospheric disturbances generated mainly by the Joule heating propagate to lower latitudes as large-scale atmospheric gravity waves, with associated travelling ionospheric disturbances (TIDs). These waves have appreciable influences at significant distances from the FAC sources. This modelling study gives qualitatively and quantitatively the ion temperature distribution in height at auroral regions which are compared with ionospheric observations by EISCAT UHF/VHF radars and FAC observations by a satellite.

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