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The Solar Wind Dynamics and the High-Latitutude Ionosphere Implications

A. Shirochkov and L.Makarova

Arctic and Antarctic Research Institute Saint - Petersburg 199397 Russia Phone 7-812-352-06-01; FAX 7-812-352-26-88; E-mail shirmak@aari.nw.ru

It is well known that the high-latitude ionosphere as a footprint of the Earth's magnetosphere is under strong control of the solar wind. The main channel of the solar wind impact on the ionosphere is thought to be precipitation of the charged particles of a wide energy range. However the solar wind could effectively influence on the polar ionosphere by means of the polarization electric fields E generated during compression of the Earth's magnetosphere by enhanced solar wind dynamic pressure. In this study we explore behaviour of the ionospheric plasma components at two levels:800 km (data of the DMSP satellites); b) 300 km - maximum of F2 layer ionisation (EISCAT data). The influence of the electric fields is different for electrons and ions due to difference in their charge and mass. Enhancement of E leads to violation of thermodynamic equilibrium which leads to "escape" of electrons while for ions such enhancement will mean increased intensity of the ions (h$>$800 km). At ionospheric heights (h$<$300 km) the situation is different comparing with that at h=800 because the collision frequencies "ion-neutral" and "electron -neutral" increase greatly and anisotropy of plasma conductance appears. In this case Joule heating of plasma plays a significant role. We present experimental evidences of these phenomena.