Manifestation of Substroms in the Polar Ionosphere by Oblique Sounding Data in Spring 1998

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Processes during disturbances in the high-latitude ionosphere are investigated not effectively by the vertical ionospheric sounding (VIS) method. An alternative to the mentioned VIS method could be oblique ionospheric sounding (OIS). According to experimental data, the latter proves to be correct even during strong geomagnetic disturbances. Actually only two parameters - the maximum observed frequency, MOF, and the lowest observed frequency, LOF, give practically full information about the state both the upper and low ionosphere. Moreover, the OIS method can give some information about ionosphere in areas where the VIS ionosondes are absent. The goal of this work is to study the substorm effects in the ionosphere by the OIS data on three high-latitude HF radio paths simultaneously. The first path (St. Petersburg – Lovozero) checks the main ionospheric trough region near its polar edge. The second path (St. Petersburg – Heiss Island) examines the auroral zone and the third path (Lovozero – Heiss Island) controls the boundary between the polar cap and the auroral oval. Difference of considered experiment from these carried out earlier on the high-latitude paths is that here we analyze no variations of signal level but the parameters of radio wave propagation MOF and LOF bearing some information about the ionosphere. Some results are following. 1) Discrepancy between the OIS and VIS data do not revealed because of their common physical reasons. Nevertheless, if the VIS data at high latitudes during the substorm expansion phase are often absent, the OIS data are practically exists and they characterize the ionospheric states. 2)The behaviour of the MOF and LOF are discovered to be not similar even for very close substorms due to drastic dynamical conditions which are created during disturbances in the polar ionosphere, the sharp gradients of ionization, drifts of layers, TID's. However, the general regularities of the MOF and LOF variations are revealed and explained physically here.