



Possible technique for analysis the ionospheric characteristics at the Polar Regions

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Ionosphere is ionized part of the atmosphere and can be characterized as inhomogeneous and non-stationary medium. Plasma inhomogeneities of the ionosphere make a significant impact on the characteristics of radio waves propagating in it. Large-scale irregularities are relatively well studied and adequately described by contemporary ionospheric models. Irregular scale plasma disturbances are significantly less studied. Plasma inhomogeneities at the auroral and polar cap regions are most intensive and unpredictable in comparison with ones at other areas, and sometimes make a severe impact on the quality of communication and navigation there. At the same time, the Polar Regions are areas with high air traffic, especially in the northern hemisphere. Therefore, improving analyzes and forecasts of ionospheric conditions in these areas is an important task for space weather centers.

For the analysis of the climatic characteristics of the ionosphere, medians of its parameters, such as foF2, M(3000), foEs, etc. are traditionally used. In the first stage of data processing, these parameters are estimated by means of automatic or manual scaling of ionograms. Unfortunately, this technique usually does not apply to regions of the polar ionosphere, even during weak geomagnetic disturbances. Under these conditions, the median dependence of height versus time (HT diagrams) can be used to estimate the averaged climatic characteristics of the polar ionosphere, excluding manual or automatic scaling of ionograms.

The proposed technique is tested on data obtained with the use of ionosonde designed by the Space Research Centre of the Polish Academy of Sciences (CBK PAN), which has been working for many years at the Polish Hornsund Polar Station (Svalbard, 77.00 N, 15.55 E). The features of the diurnal and seasonal variability of the polar ionosphere over the Svalbard Archipelago were investigated. We analyzed the response of the ionospheric layers above Hornsund to solar and geomagnetic activity using median HT-diagrams calculated for days with different levels of the respective indexes.