

Annual variations of the absolute value of the TEC of the mid-latitude ionosphere according to the GNSS receivers in the GFO "Mikhnevo"

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Currently, data from global navigation satellite systems (GNSS), such as GLONASS, GPS, as well as BeiDou, Galileo, are actively used to study the processes taking place in the ionosphere. The use of phase and code measurements of two-frequency GNSS receivers makes it possible to obtain variations of the total electronic content (TEC) on the satellite receiver beam. TEC is the main parameter that provides information about the processes in the ionosphere according to GNSS signals. At the same time, the value of TEC variations mainly gives a qualitative idea of changes in the ionosphere. Therefore, the problem of restoring the absolute value of TEC is relevant. The solution of this problem requires correction of the obtained data by taking into account the differential code delays in the receiving and transmitting paths of the navigation channel.

The algorithm developed by us made it possible to obtain the absolute value of TEC, corrected not only for the DCB, but also taking into account the data of the height of the maximum F2 layer of the ionosphere. The technique was tested in the analysis of ionospheric disturbances caused by x-ray flashes of M and X class. Also, the developed method allowed to restore the absolute value of TEC over the geophysical observatory «Mikhnevo». Based on the results, the annual distribution of the absolute value of TEC in different heliogeophysical conditions was constructed. The results are in good agreement with data from global networks such as Madrigal and MGEX.

Further development of research involves the joint use of the results of the restoration of the absolute value of the TEC with the data of ionosondes and data on the propagation of VLF signals. This should allow to obtain the most complete data on the altitude distribution of the electron concentration in the ionosphere in calm and perturbed heliogeophysical conditions.