

Radiophysical measuring complex of Geophysical Observatory “Mikhnevo”

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Study of interrelated processes in the magnetosphere-ionosphere-atmosphere-lithosphere system is carried out in the IG RAS using modern methods for obtaining coordinate measurement data from the receivers of global navigation systems, radio receiver HF, LF, VLF systems, magnetometric and electrical measuring equipment that make up a single measuring radio-physical complex of the geophysical Observatory of the IDG RAS "Mikhnevo".

New experiments have shown that physical processes in the upper ionosphere are significantly more dependent than previously thought on processes in the atmosphere and the lower ionosphere. In the course of studies using modern radiophysical systems to study the state and dynamics of the ionosphere and atmosphere, new methods of measurement using modern GLONASS-GPS receivers were developed, the hardware and methodological apparatus for studying the effect of small - and medium-scale ionospheric inhomogeneities, the influence of ionospheric parameters on the propagation of electromagnetic signals, including experiments for artificial modification of the ionosphere on heating facilities "Sura" and EISCAT-Heating. Using new high-sensitivity magnetometric equipment allowed to register and study the signals with amplitude of several femtotesla at distances up to 2000 km from the source. An important area of research was the study of the influence of solar X-ray flashes on changes in the atmospheric electric field and the propagation of VLF waves.

The problems of attracting additional experimental data and modern theoretical models to assess the impact of high-energy geophysical disturbances on the state and dynamics of the upper and lower ionosphere are formulated and solved: the influence of geometric factors and algorithms of data processing on the parameters of navigation satellite signals, the method of parameter recovery (ionization profile) of the D-region of the ionosphere during and after solar flares is studied, the software for determining the absolute values of the total electron content of the ionosphere by measurements using spatially separated multisystem GPS and GLONASS receivers, experimental data on the contribution of the lower ionosphere ionization to the total electron content of the ionosphere was created. By comparing the measurement data of the total electron content of the ionosphere with the phase and amplitude measurements of VLF-LF signals on global and regional routes, the structure and dynamics of the ionospheric plasma are investigated. Analysis of the accumulated experimental material not only allowed to obtain new data on the structure of the d-region of the ionosphere, but also showed the possibility of using measurement data to improve and verify the programs for calculating the propagation of VLF signals. The developed methods were verified on a large experimental material both in calm geophysical conditions and under significant disturbances of heliogeophysical conditions.