A NEW VERSION OF THE GLOBAL NUMERICAL MODEL OF THE EARTH'S UPPER ATMOSPHERE FOR STUDIES OF POLAR PHENOMENA

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The global numerical model of the Earth's upper atmosphere developed by Namgaladze et al. (1988, 1991, 1994) has been improved by means of significant increase of its spatial resolution. A new algorithm of numerical solution of the modelling equations has been constructed permitting us to use variable latitudinal steps of numerical integration and thus to enhance latitudinal resolution of the model at polar latitudes.

Numerical integration of the continuity, momentum and energy balance equations for neutral, ion and electron gases as well as the equation for the electric field potential has been performed with latitudinal steps varying from 10 degrees for the thermospheric parameters and 5 degrees for the ionospheric F2-region and protonosphere parameters at the equator to 2 degrees at the auroral zones for all parameters and the results have been compared with those obtained by the use of the regular latitudinal grids. The comparison shows the possibility to enhance the spatial resolution of the model at the polar regions without significant increase of the computer time and memory.

This model has been used to calculate the non-stationary three-dimensional distributions of electric field, thermospheric wind, electron, ion and neutral gas temperature and concentration for the quiet and disturbed days on 24 and 25 March 1987. The results of the calculations have been compared with empirical thermospheric and ionospheric model data as well as with the observation data of the EISCAT incoherent scatter facility and a good agreement between them has been found.

The interdependent variations of electric fields, winds, densities and temperatures caused by the action of varying field-aligned currents and precipitating magnetospheric electron fluxes have been studied and their physical mechanisms have been understood.

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