

Numerical simulation of the impact of the middle atmosphere parameters on the lower ionosphere and VLF/LF radiowaves propagation using MLS EOS AURA data

Andrey N. Lyakhov, Andrey A. Egoshin, Julius I. Zetzer, Kateryna N. Yakimenko

Institute of Geospheres Dynamics, Moscow, Russia, idg.chph.ras.ru
199334, Moscow, Leninskij pr-kt 38, korp.1

EOS Aura Microwave Limb Sounder data on the middle atmosphere parameters have been used for the numerical simulation of the lower ionosphere. Real data on the temperature, geopotential height, water and ozone content were processed using the Fast Fourier Synoptic Mapping technique, providing the two-dimensional field along the radiopaths from European VLF/LF transmitters to the geophysical observatory “Mikhnevo” (55N,37E). These parameters have been used in the numerical simulation of the electron density distribution. The control run was evaluated using MSIS and AFGL empirical models. The resulted ionospheres have been used in the simulation of VLF/LF radiowaves propagation using LWPC code.

We present the comparison between the lower ionosphere parameters derived from satellite data, calculated on the empirical atmosphere models and two pure empirical models, namely, IRI and the built-in LWPC model.

The comparison has been done for various seasons, sunlit and nocturnal conditions.

The synoptic reconstruction has proven the existence of significant periodic perturbations in the mesosphere, which are important for the LF propagation and confirmed the results of SAVNET group on the C-layer complex dynamics.

The results of the VLF/LF propagation simulation in the frequency range from 19 to 77 kHz under four ionospheres are presented.