Validation of the model N(h)-profiles by the observational TEC values

Olga A. Maltseva* [(1)], Guanyi Ma[(2)], Natalia S. Mozhaeva[(1)], and Gennadij A. Zhbankov[(1)]
(1) Institude for Physics, Southern Federal University, Stachki, 194, Rostov-on-Don, 344090, Russia, mal@ip.rsu.ru
(2) National Astronomical Observatories, Chinese Academy of Sciences, 20 A Datun Road, Chaoyang District, Beijing 100012, China, guanyima@nao.cas.cn

Determination of a height profile of Ne always was the important task of measurements and modeling because knowledge of N(h)-profiles is necessary for theoretical researches and practical applications. However long time the main attention was given to distributions of Ne in bottom and topside parts of profiles. Measurements of TEC by means of navigation satellites at heights of ~20,000 km contain the information about N(h)-profile in all height range, including a plasmasphere. The IRI-Plas model was used in the present paper because this model not only includes a plasmaspheric part of a profile, but also admits ingestion of TEC in the model. The purpose of the paper is the estimation how much model N(h)-profiles correspond to observational TEC(obs). Such estimation has the greatest interest for the periods of disturbances and is fulfilled by four phases. Though the IRI model is average, it admits adaptation to the instant values foF2(obs). This adaptation is the first investigation phase. It was found that obtained values of TEC did not coincide with TEC(obs). Simultaneous adaptation to the instant values foF2(obs) and TEC(obs) was a following phase. It was found that values of Ne in a topside part did not correspond to the plasma frequencies measured on satellite CHAMP while a plasmaspheric part of the profiles obtaining during these two phases well enough corresponded to the RPI (radio plasma imager) model, therefore adaptation of model to these frequencies was the third phase. It was found that TEC(sat) values calculated for such model were lower, and frequently were much lower, than TEC(obs). The fourth phase consisted in compensation of difference TEC(obs)-TEC(sat) by increasing Ne in plasmaspheric parts using the special coefficient K(PL). It was found that such modification sometimes could lead to the nonphysical shape of a profile. Results are illustrated according to five global maps of TEC, four stations of South-East region, July 2004 and show that mismatch N(h)-profiles and TEC can be connected to underestimated values of Ne in topside parts and/or overestimated values of TEC.