Statistical analysis of results of updating the ionospheric model IRI-Plas from slant total electron content

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Describing the current ionospheric conditions is crucial to solving applied problems of radio communication, radar, and navigation. Techniques to update ionospheric models by using current ionospheric measurements found a wide application to improve the ionosphere description. This research presents a statistical analysis of the results of updating IRI-Plas empirical ionospheric model from the slant total electron content (TEC) observed by ground-based GPS/GLONASS receivers. The updating method is based on calculating the effective value of the solar activity index, at which we minimize the discrepancy between the measured and the model-calculated slant TEC. We estimated the updating efficiency based on the *foF*2 observational data obtained by ionosonde measurements. Previously we received, that in average the model/data discrepancy decreases in two times after updating procedure. So this updating procedure is strongly effective for TEC improvement. Of the four addressed magnetically quiet days in 2014, our updating method operates, in the best way in term of *foF*2 reproduction, for equinox conditions, and, in the worst way, it operates for solstice conditions. We studied a seasonal interrelation between the model calculation improvement upon updating the models and the correctness of the models describing the TEC latitude-longitude distribution. The IRI-Plas, generally, reproduce the latitude-longitude structure of the TEC better during equinox, and do the same worse during solstice. So in this research we made statistical analysis of results of updating procedure. The calculations were carried out on an annual data set array of observational data of mid-latitude ground-based GNSS receivers. Based on the obtained results, a study of the effectiveness of the updating model for describing *foF*2 was conducted. These results can be used in over-the-horizon radar and HF radio communication. The dependence of the model updating results on the choice of the angular sector of elevation angle for GNSS satellites in the entire azimuth sector was investigated for the following cases: (i) one satellite with the highest elevation angle; (ii) satellites with an elevation angle from 45 to 90 degrees; (iii) satellites with elevation angle from 30 to 90 degrees.

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