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Study on possible topside ionosphere improvements for the electron density model NeQuick

P. Coïsson (1,2), S. M. Radicella (1), R. Leitinger (2), B. Nava (1)

(1) Abdus Salam International Centre for Theoretical Physiscs, Trieste, Italy, (2) University of Graz, Austria, (Contact coissonp@ictp.trieste.it)

The formulation of the topside electron density in NeQuick model has been analysed looking at possible improvements of the model performance. The present topside formulation is based on a semi-Epstein layer with a height-dependent thickness parameter, which allows to take into account in a simplified way the electron content up to plasmaspheric heights. The shape of the topside profile is determined by an empirical parameter k, which has two different formulations for different months of the year. The original relations were based on TEC and ionosonde data recorded at mid-latitude stations. In the last few years a large amount of experimental topside sounders profiles of electron density have been made available to the scientific community. A revision of the empirical parameter k governing NeQuick topside shape has been studied on the basis of these experimental profiles. A unique formulation valid for all months of the year has been proposed. The present work analyses the global behavior of the proposed new formulation, considering its effects on profile shape and satellite to ground electron contents computed by the model. Possible anomalous high values of TEC in the equatorial anomaly region for very high solar activity conditions could be avoided using the new formulation. Slant TEC observations obtained from GPS receiving stations of the IGS service have been used for comparison with modeled values. Both the present and the proposed formulation of NeQuick topside have been used.