



Evaluation of NeQuick 2 derived vertical TEC at three northern mid-latitude locations

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NeQuick 2 is the latest version of the three-dimensional and time dependent ionospheric electron density model developed at the T/ICT4D (former ARPL) of the Abdus Salam International Centre for Theoretical Physics (ICTP) - Trieste, Italy and at the Institute for Geophysics, Astrophysics and Meteorology of the University of Graz, Austria.

The purpose of this work is to identify possible limitations of the model. Therefore, the ability of NeQuick 2 in reproducing the vertical Total Electron Content (vTEC) derived from GPS observations using different input sources has been evaluated. The daily solar flux in 10.7 cm, the monthly smoothed solar flux and the hourly daily ionosonde derived F2 peak parameters, foF2 and hmF2, have been therefore used as model drivers to compute the vTEC at the relevant locations. Peak parameter values from three ionosonde stations (Ebre, El Arenosillo and Ramey) and GPS-derived vTEC data obtained from the corresponding co-located receivers (ebre, sfer, pur3) have been processed for the present work. The available data for the years 2000 and 2004, corresponding to high and moderate solar activity periods, have been considered to be able to estimate the model performance in a wide range of geophysical conditions.

For each location, the data analysis has been based on statistical comparisons between experimental and retrieved vTEC. The results indicate that the differences between NeQuick 2-computed and GPS-derived vTEC exhibit well defined diurnal and seasonal patterns that depend on the location and period considered.

On average, NeQuick 2 underestimates the vTEC during nighttime, mainly in the winter months and slightly during the summer months. In the daytime hours on the European locations, the model generally overestimates the vTEC in winter months, having an opposite behavior in the summer months.

At PRJ18/pur3 location the NeQuick 2 response is more complex. During high solar activity, the daily difference between modeled and GPS derived TEC mean behavior are similar to the observed on the European locations. During the mid-to-low solar activity period the model generally overestimates vTEC for all seasons. In addition, the post-sunset enhancements of the TEC values are usually overestimated by the model.

For all locations and solar activity conditions evaluated, the local sunrise hours and the equinoctial months are usually the best reproduced periods.