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MODEL CALIBRATION OF TOPEX/JASON IONOSPHERIC ELECTRON CONTENT FOR ITS CONSISTENCY WITH GPS-TEC DEPENDING ON SOLAR ACTIVITY

Tamara Gulyaeva[⋆], Feza Arikan[†] and Susan Delay[‡]

[⋆]ZMIRAN
142190 Troitsk
Moscow Region, Russia

[†]Department of EEE, Hacettepe University
Beytepe, Ankara 06800, Turkey

[‡]Institute for Scientific Research, Boston College
Chestnut Hill, MA 02467, USA

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Abstract. The paper presents results from a study of GPS-TEC grid maps and the ionospheric electron content IEC over the oceans delivered by the Topex/Jason satellites from maximum (July 2001) to minimum (December 2008) of the 23rd solar cycle. The IEC data are averaged and binned at latitudes from 60^oS to 60^oN in a step of $5^o \pm 2.5^o$, longitudes from 180^0W to 180E in a step of $15^o \pm 7.5^o$, for 0 to 23 h UT with a step of 1 ± 0.5 h UT. Ratio of monthly averaged TEC/IEC over the oceans from the observations has been compared to the reference model ratio of TECm/IECm obtained using the plasmaspheric model augmented with the International Reference Ionosphere (http://ftp.izmiran.ru/pub/izmiran/SPIM/). To make simulation results fit with observation, we have integrated the electron density distribution from 65 km to 1336 km (Topex altitude) to obtain model value of IECm in the ionosphere with IRI while total electron content TECm through the ionosphere and plasmasphere is produced with IRI extended option in the range of 65 km to 20,000 km near the GPS satellites orbit.

It is found that as solar activity tends to the minimum, IEC values exhibit systematic overestimate of the GPS-TEC data. An empirical scale factor is derived in terms of the smoothed sunspot number which reduces a systematic excess of the Topex/Jason-derived IEC over GPS TEC by a factor of 1.5 towards the solar minimum[1]. Application of the scale factor is demonstrated in Figure 1 where the original Topex observations (TPX) are corrected (TPX*) disclosing the plasmaspheric electron content as a residual of the GPS TEC and modified Topex/Jason derived the ionospheric electron content.

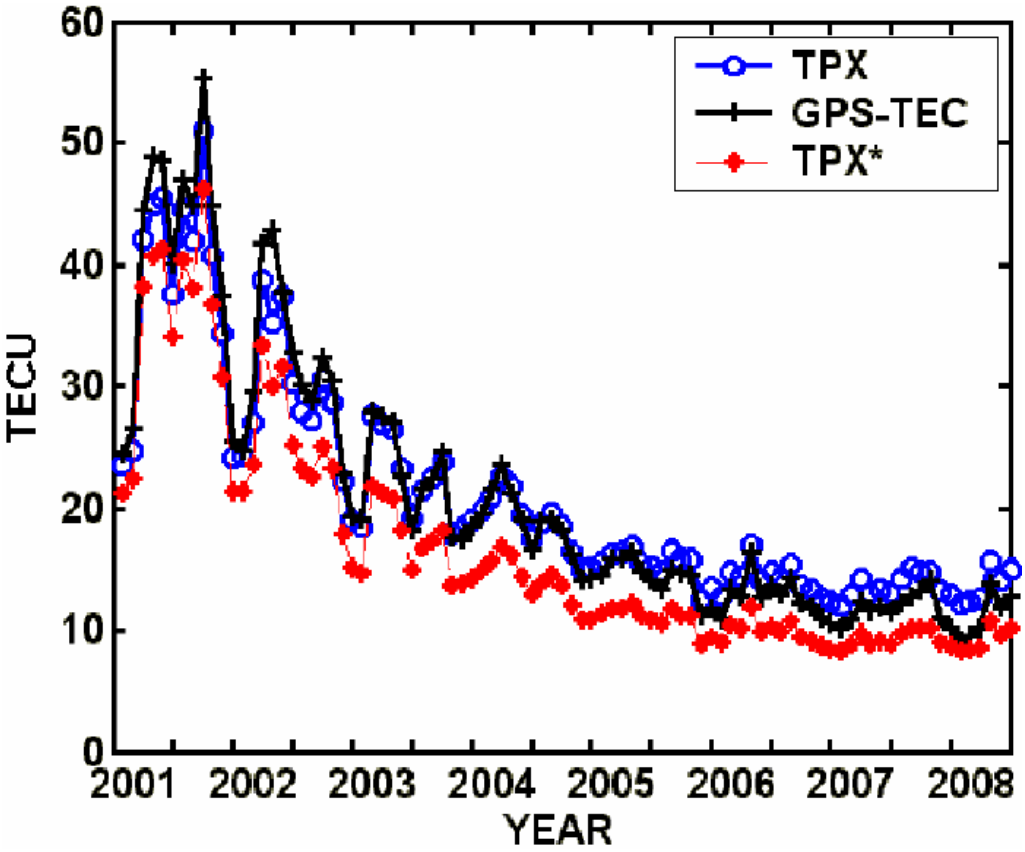

Figure 1: Monthly mean total electron content averaged over the Earths sea surface using Topex observations (TPX) and GPS-TEC observations, and results of calibration of Topex data (TPX*) with model scale factor.

REFERENCES

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