Comparison of GPS TEC Measurements with IRI-2007 TEC Prediction over the Kenyan Region during the Descending Phase of Solar Cycle 23. (2012).

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Abstract

This paper presents an analysis of the Total Electron Content (TEC) derived from the International GNSS Service receiver (formerly
IGS) at Malindi (2.9°S,40.1°E), Kenya for the periods 2004–2006 during the declining phase of solar cycle 23. The diurnal, monthly and seasonal variations of the TEC are compared with TEC from the latest International Reference Ionosphere model (IRI-2007). The GPS–
TEC exhibits features such as an equatorial noon time dip, semi-annual variations, Equatorial Ionization Anomaly and day-to-day var-iability. The lowest GPS–TEC values are observed near the June solstice and September equinox whereas largest values are observed near the March equinox and December solstice. The mean GPS–TEC values show a minimum at 03:00 UT and a peak value at about 10:00UT. These results are compared with the TEC derived from IRI-2007 using the Ne Quick option for the topside electron density (IRI–TEC). Seasonal mean hourly averages show that IRI-2007 model TEC values are too high for all the seasons. The high prediction pri-marily occur during daytime hours till around midnight hours local time for all the seasons, with the highest percentage deviation in TEC of more 90% seen in September equinox and lowest percentage deviation in TEC of less than 20% seen in March equinox. Unlike the GPS–TEC, the IRI–TEC does not respond to geomagnetic storms and does overestimate TEC during the recovery phase of the storm.

While the modeled and observed data do correlate so well, we note that IRI-2007 model is strongly overestimating the equatorial ion fountain effect during the descending phase of solar cycle, and this could be the reason for the very high TEC estimations.

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