On the variability on the formation of Equatorial Ionization Anomaly Crest over the East African low latitude region

Olwendo O. J* (1), ***P. Baki*** (2), and ***P. J. Cilliers*** (2)

(1) Pwani University, School of Pure and Applied Sciences, Department of Mathematics and Physics, P.O Box 195-80108, Kilifi, Kenya. *castrajoseph@yahoo.com.

(2) Kenya Technical University, School of Pure and Applied Sciences, Department of Physics, P.O Box 52428-00200, City Square Nairobi, paul.baki@gmail.com.

(3) South African National Space Agency, Space Science Directorate, P.O Box 32, Hermanus, South Africa. pjcilliers@sansa.org.za.

Abstract

The variation of Total Electron Content (TEC) derived from the International GNSS service receiver (formerly IGS) over the East African low latitude region from up to 12 observation stations for the period 2012 was analyzed. The diurnal and annual TEC contour plots generated from data over the region shows that the equatorial anomaly crests manifest remarkable seasonal variations. The crest of the Equatorial Ionization Anomaly (EIA) is fully formed and yields the maximum values of TEC during the equinoxes (March/April and September/October) and minimum in the solstice (June/July and November/December). The results of this observation show and an intensified amplitude and expansion in latitudinal extent of the crests with the Northern crest close to the magnetic equator being much stronger than that to the south; the crest develops between 12:00 and 16:00 LT but can however persist till two to three hours after local sunset which leads to observations in TEC enhancements after sunset local time. The results also show that long term variations of TEC are mainly controlled by the variation in solar activity levels. The biggest correlation coefficient of 0.8 was however noted in the daily maximum TEC and solar radio flux F10.7 cm. The observed features can be fully explained by the fact that this region is within the proximity of the magnetic equator where the magnetic fields lines are nearly horizontal which enhances the uplifting of the ionosphere around mid-day local time leading to the formation of post-noon anomaly crests. Other factors such as the transequatorial neutral wind and the sub solar point also affect the formation of the crests.