

# On the Spatial-Temporal Variation of GPS-Measured Total Electron Content over Nigeria within Equatorial Ionospheric Anomaly Region

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## Abstract

This paper examined the spatial variations of the ionospheric Total Electron Content (TEC) over Nigeria, a country within the equatorial ionospheric anomaly region, using the GPS data obtained from 11 stations of the Nigeria GNSS Network (NIGNET) in the year 2012 during the ascending phase of solar activity. TEC is considered as a proxy to space weather. At sunrise at about 07:00 LT, TEC decreases westwards across all the latitudes. Meanwhile, at about sunset (around 17:00 LT), TEC decreases eastward across all latitudes. This variability pattern is attributed to the time-related depreciation in the ionization due to the relative motion of the earth with respect to the position of the Sun. Daytime TEC value is found to be consistently weakest at sunrise and maximized in daytime at about local noon across all latitudes. Generally, daytime values of TEC are observed to be greater than the nighttime values.

**Keywords:** Ionosphere, Total Electron Content, GPS-TEC, Equatorial ionospheric anomaly

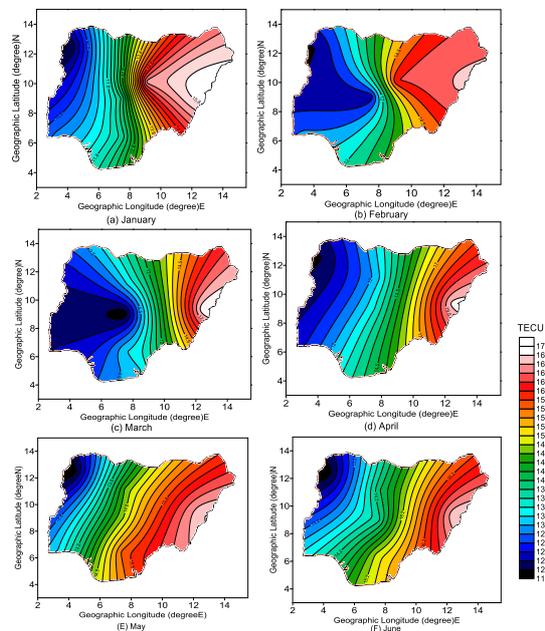


Figure 1: Spatial variation of TEC at 07:00LT (Sunrise) in January to June as a function of Geographic latitude and Longitude

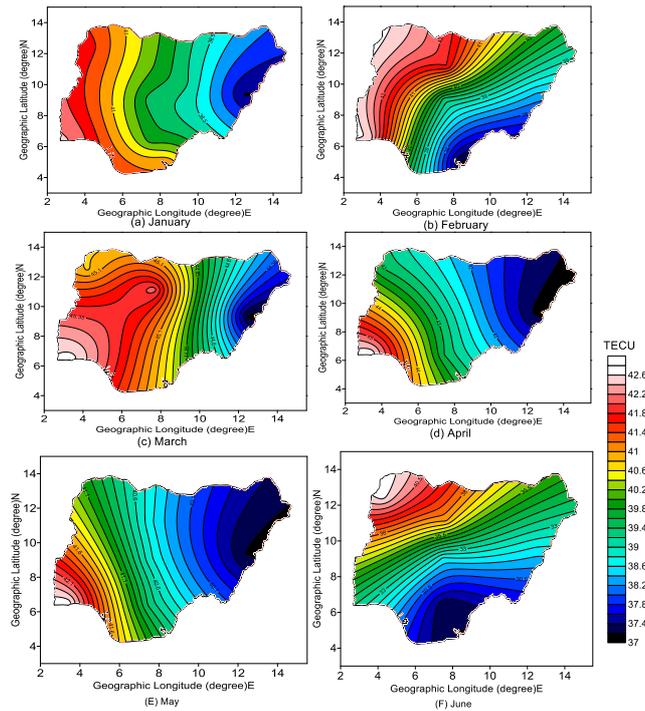


Figure 2: Spatial variation of TEC at 17:00LT (Sunset) in January to June as a function of Geographic latitude and Longitude

## Conclusion

The Total Electron Content exhibited spatial variation in their magnitudes. The Sunrise, 12 noon, Sunset as well as the spatial variation of the daily maximum of TEC derived from all the stations were studied for a 12-month period from 01 January to 31 December, 2012.

This paper shows that due to the relative position of the sun as the sun rises at 07:00 LT, TEC decreases westwards across all the latitudes and it is found to be weakest at this time because the intensity of solar radiation is quite low. It also shows that greater magnitude of TEC was observed at 12:00 LT while it decays gradually and smoothly at 17:00 LT through the midnight until pre-sunrise hours and it is evident that the magnitude of TEC sunset depression is always greater than its sunrise period.

Also, the paper shows TEC decreases eastward across all latitudes as a result of reduction in the ionization at the east due to the relative position of the sun as the sun begins to set at 17:00 LT. The higher magnitude is attributed to solar activity.

## Acknowledgements

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