

Interactive comment on “Variation in total electron content with sunspot number during the ascending and maximum phases of solar cycle 24 at Birnin Kebbi” by Aghogho Ogwala et al.

Anonymous Referee #2

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General comments

This paper attempts to reveal the features of the diurnal variation of ionospheric TEC in different months derived from one low latitude GPS station’s observation in African sector, also attempts to reveal the solar activity dependence of the ionospheric TEC in African low latitude. Due to the limitation of observations in African low latitude, the ionospheric variations in this region were studied seldom, and the clear understanding about the ionospheric variations in different time scales haven’t obtained. For this paper, the study seems too limited to promote our understanding of the ionospheric variation in this region.

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Specific comments

1, the illustration of the data and method are not enough, for example, how much the sample rate of the raw GPS data? how to obtain the hourly TEC data for every day, is it the hourly averaged vertical TECs from all satellite-receiver pairs with elevation > 20 degrees? the cutoff elevation (20 degrees) seems small in this region. How to get the receivers DCB? How much the ionospheric shell height selected?

2, It is wrong formula 3 for the converting of slant TEC to vertical TEC

3, Line: 150-151 “Space Physics Interactive Data Resource 150 (SPIDR) website (www.ionosonde.spidr.com).” This website cannot be opened

4, Line: 60-62: “incoherent scatter radar: a technique for detecting and studying remote targets (elections) by transmitting radio waves in the direction of the target at high speed. They are also limited to the bottom-side of the ionosphere (Zhang and Holt, 2008)”

Incoherent scatter radar can obtain the ionospheric parameters not only in the bottom side of the ionosphere, also in the top side of the ionosphere.

5, Line: 168-169 “The diurnal variation of GPS TEC reveals the typical characteristics of an equatorial/ low latitude ionosphere. Generally, day-to-day TEC variation is higher during the daytime than nighttime for all the years.”

Because Figure 1-4 only give the diurnal variations of monthly averaged TEC, they are impossible to reveal the day-to-day variation of ionospheric TEC

6, Line: 174-178 “The steep increase in TEC has been attributed to the solar EUV ionization together with the upward vertical $E \times B$ resulting from the rapid filling up of the magnetic field tube at sunrise (Dabas et al., 2003; Somoye et al., 2011; Hajra et al. 2016; D’ujanga et al., 2017) and meridional winds (Suranya et al., 2015). These magnetic field tubes collapse after sunset due to low thermospheric temperature and Releigh Taylor Instability (RTI) (Ayorinde et al., 2016)”

It is a little puzzled about this statement. Is the magnetic field tube important for the ionospheric variation during sunrise and sunset? How the Raleigh Taylor Instability affect the ionospheric variation during sunset? RTI is usually used to explain the triggering and developing of the ionospheric irregularities in low latitude and equatorial region.

7: Line: 203-204 “The diurnal variation reveals that the peak of TEC of some months were delayed till after noon.”

Statistically, it is a normal phenomenon for the peak TEC occurs after the noon.

8: Line: 208 “Another major phenomenon seen in the diurnal variation of TEC is the post-sunset decrease and slight enhancement in some months. “

According to the photo-chemical process, TEC should decrease after sunset. But, due to the pre-reversal of zonal electric field after sunset, the TEC increase occurs in some days. Because the diurnal variation of TEC here is given through monthly averaging process, it is difficult to judge whether this phenomenon is a real one.

9: Line: 225-232 “Another important feature of ionospheric parameters (known as equinoctial asymmetry) as reported in the work of Bolaji et al., (2012); Akala et al., (2013); Eyelade et al., (2017); D’ujanga et al., (2017); Aggarwal et al., (2017) and others, is clearly seen in all years used in this work.”

This statement in this paragraph about “equinoctial asymmetry “ is a little confusion.

10: line 265-276 “High solar activity.resume normal operations”

This section is superfluous for the subject matter of the paper.

Technical corrections There are lot of grammar and a little spelling mistakes throughout the paper. Please check them carefully.

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