Interactive comment on "Diurnal, seasonal and solar cycle variation of total electron content and comparison with the IRI-2016 model at Birnin Kebbi" *by* Aghogho Ogwala et al.

Anonymous Referee #1

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The paper presents GPS-TEC data investigation at the equatorial region Birnin-Kebbi in Nigeria for the years 2011-2014, the rising and maximum phase of the 24th solar cycle. These data are compared with IRI-2016 ionospheric model to evaluate the confidence of this model in that region. The study presents new data analysis, comparing the TEC behavior in different time scales associated with diurnal, seasonal and solar cycle variations. The presentation of the data analyses needs an improvement to show clearly the results, and also it is necessary to include in the discussion and conclusion the possible physical processes involved. Comments and suggestions Line 15: Inform the geomagnetic coordinates of the Birnin-Kebbi station The bibliography must be improved. Most of the citations are only recent papers that refer to that subject, but there

are references more fundamental in most of the cases. For example, in Lines 102 and 103 and the following ones please give more representative references. Lines 52-55: The authors must include references related to ionopsheric features during quiet and disturbed periods (lines 52-55). Line 147 - Give a reference for equation 4. Line 170: Specify that you are using diurnal variation of the hourly OBS-TEC Lines 185-205: All this paragraph must be revised. Line 189: The short phrase about day-to-day variation and error definition is not clear. Lines 191-198: The definition of times and values of TEC variation is not clear. The correct daytime maximum TEC is between 12:00 and 14:00 LT. Figures 1-4: Is the time information of the IRI-2016 model correct? It seems that the diurnal IRI model curve is shifted in time. This is crucial for the comparisons. Figures 5-8: draw a x-axes in the zero deviation. Lines 312-317: Very confuse explanation about the TEC variations related to pre- and pos-midnight. What is the time period considered to evaluate the TEC differences? Lines 318-322: This paragraph is very confused. What annual range error of 8m of delay means? Figure 10: The best way to show the influence of solar cycle in the TEC variation is consider only one figure for all years. Do it again with all data in only one frame. Lines 323-331: The text must be revised. For example in Figure 10a the increase of Rz was on March 2011 not in February. Lines 334-345: The text is not clear. Give a more precise description of the impact of solar phenomena in the ionosphere, citing the used references. Lines 346-378: After improving the paper, put in the conclusion your new results and give some physical explanation for them. For example the role of solar activity and EIA anomaly.