

Comments on paper “Variability of TEC and improvement of performance of the IRI model over Ethiopia during the high solar activity phase (angeo_2018-48)” by Tariku (2018).

July 3, 2018

The paper attempts to discuss the performance of the IRI model over the low latitude region (Ethiopia) in comparison with total electron content derived from Global Navigation Satellite Systems (GNSS), specifically Global Positioning System (GPS) observations. Analysis is done based on computed mean values. The title and the text are not in agreement. In the title there is text “... improvement of performance of the IRI model...”, but it is not clear what the IRI model would be improving. If the author is referring to improvement based on different versions of the IRI model, then a sufficient background about the determination of TEC within IRI 2007, IRI 2012 and IRI 2016 should have been provided. In the abstract, the author mentions “The results reveal that both the measured and modelled seasonal diurnal VTEC values start increasing at 03:00 UT (06:00 LT) and attain their peak values (mostly in the time interval of 09:00-13:00 UT or 12:00-16:00 LT)”. I do not find this information new to be included in the abstract. The same can be said for the text in lines 22-26.

1 Summary of the paper

It is difficult to find new findings in this paper. Most of the results over this region using the same data set have been reported, and even compared to the IRI model. In fact, the same author has reported most of them and so he/she is presenting something that he/she knows has been published. For example in the abstract of Tariku (2015), EPS (paper number 3 below), there is a statement in the abstract “ It has been found that the diurnal variability of VTEC has shown minimum values at around 0300 UT (0600 local time (LT)) and maximum values nearly between 1000 and 1300 UT (1300 and 1600 LT) during both the low and the high activity phases”: How different is this from the text in lines 14-16 in this submitted manuscript?

Entire subsection 2.1: TEC from dual frequency GPS receiver has been published as many times as the author has published the paper about this topic. In fact equations 1-6 are almost in the same order in the published papers. Examples of the author’s papers are provided below where this information appears.

1. TEC prediction of the IRI-2012 model over Ethiopia during the rising phase of solar cycle 24 (2009-2011): Tariku (2015), *Earth, Planets and Space*, 201567:140, <https://doi.org/10.1186/s40623-015-0312-1>
2. Comparison of GPS-TEC with IRI-2012 TEC over the African equatorial and low latitude regions during the period of 2012-2013: Tariku (2015), *Advances in Space Research*, 56, 1677-1685.
3. Patterns of GPS-TEC over low latitude regions (African sector) during the deep solar minimum (2008 to 2009) and solar maximum (2012 to 2013) phases: Tariku (2015), *Earth, Planets and Space*, 201567:35, <https://doi.org/10.1186/s40623-015-0206-2>

Other comments are

- In line 171, an elevation threshold of 10 degrees was used. In addition to data being prone multipath errors, I find this low threshold given that the author is performing analysis in low latitude region where electron density gradients are significant.
- Lines 197-202: This text appears in some of the author's papers above and is essentially a repetition or simply some sort of self plagiarism
- Lines 287-304: I think the STORM option is effective for mid-latitudes; Please consult Araujo-Pradere et al., (2002): STORM: An empirical storm-time ionospheric correction model, 2, Validation. *Radio Science* 37 (5), 1071, doi:10.1029/2002RS002620 and Araujo-Pradere et al., (2004): Time empirical ionospheric correction model (STORM) response in IRI2000 and challenges for empirical modeling in the future. *Radio Science* 39, RS1S24, doi:10.1029/2002RS002805. Araujo-Pradere et al., (2002): STORM: An empirical storm-time ionospheric correction model, 1, Model description. *Radio Science* 37 (5), 1070, doi:10.1029/2001RS002467. The author missed these important references about the STORM option model development.

In section 3, subsections 3.1 and 3.2, even the headings are almost the same, with minor editing in the text reported in Tariku (2015), ASR.

Unless the authors show what is different in the submitted paper compared to earlier published papers both by the same author and other existing literature, I find the reported results to have been reported multiple number of times over the same region. I encourage the author to formulate the objective of the paper and differentiate it from the previously published papers over the same region. Apart from the author's papers, there are other literature sources for this region, e.g, Olwendo et al., (2013); Comparison of GPS TEC variations with IRI-2007 TEC prediction at equatorial latitudes during a low solar activity (2009-2011) phase over the Kenyan region; ASR, Adewale et al., (2012): Solar activity dependence of total electron content derived from GPS observations over Mbarara, ASR; etc.