

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 #1

Received and published: 10 September 2018

About basic formula (3) used by authors to obtain vertical TEC (authors response #4). Used formula (3) is not another approach, it looks incorrect. Let me explain.

The relation between slant and vertical TEC in unbiased situation is widely known, and can be found, for example, in

<https://link.springer.com/content/pdf/10.1007%2Fs00190-010-0367-5.pdf> (eq.4)

<https://www.novatel.com/assets/Documents/Bulletins/APN070.pdf> (page 4, eq.4)

http://gnss.be/ionosphere_tutorial.php (eq.2.15)

http://cdn.intechopen.com/pdfs/27723/InTech-Ionospheric_propagation_effects_on_C1

gnss_signals_and_new_correction_approaches.pdf (eq.29)

<http://www.denshi.e.kaiyodai.ac.jp/kubo/TEC.pdf> (eq.14)

So in unbiased situation $VTEC = STEC/S(E)$

The correct formula, that takes into account bias in STEC estimation, and that should be used by authors instead of (3) is also well known. It can be found, for example, in:

<https://www.ann-geophys.net/21/2083/2003/angeo-21-2083-2003.pdf> (eq.7).

As one can see from the comparison, the authors variant is

$VTEC = STEC - [b_1 + b_2 + b_3]/S(E)$,

but must be:

$VTEC = (STEC - [b_1 + b_2 + b_3])/S(E)$ (according to mentioned [AnnGeo,2003] paper)

Which formula is correct? Let us check them in unbiased situation ($b_1 = b_2 = b_3 = 0$). The formula (3) used by authors in unbiased situation becomes $VTEC = STEC$. It is incorrect. [AnnGeo,2003] formula becomes $VTEC = STEC/S(E)$. It is correct.

So the formula (3) used by authors is incorrect one.

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2018-95>, 2018.