

***Interactive comment on* “Emergence of a localized total electron content enhancement during the G4 geomagnetic storm of September 8, 2017” by Carlos Sotomayor-Beltran**

Anonymous Referee #2

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Referee report on the paper “Emergence of a localized total electron content enhancement during the G4 geomagnetic storm of September 8,” by Carlos Sotomayor-Beltran

The paper is devoted to the study of the ionospheric storm, using total electron content data occurred on 7-9 September 2017. In particular the author put in evidence what he calls a localized total electron content enhancements, and increase of TEC respect a background, at Southern mid latitude hemisphere.

General Comments

Abstract A common response to geomagnetic storms due to the southern vertical interplanetary magnetic field (B_z) is the enhancement of the electron density in the iono-

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sphere

This statement general is incorrect. Not all ionospheric storms start with a positive phase. The storm pattern depends on season, longitudinal sector, the intensity of a geomagnetic storm, LT of a magnetic storm commencement.

Looking at the figure 2 I see that the increase of TEC is more extended versus the mid-latitude in the Southern hemisphere but it is possible to see it also in the northern hemisphere. So for my point of view is not a localized enhancement .Looking at the paper by Lei et al. (2017 - 0.1029/2017JA02516) that analyze the same event with TEC and ionosonde data and in their figures it can be seen an increase of differential TEC for all latitudes in the first hours of 8 September, that corresponds to the storm main phase, in the northern hemisphere and in the southern also(but they arrive at 24 degree in latitude)that correspond to a positive ionospheric storm. In the following days a negative ionospheric storm occurred from higher to lower latitude. So it is a typical ionospheric storm with a positive and negative phase , the physical mechanism for the positive phase occurred at 02UT(daytime) that the author identify as a localized event seeing only the figure at 2UT could be due to an expanded convection electric field during geomagnetic storms in these cases frequently it is observed dTEC enhancements in the mid latitude dayside ionosphere but more investigations are necessary.

L 6 P1 What is “the G4 storm”? G4 should be explained

L8 P1 what it is was unexpected Grammar

L26 P1 Global Navigation Satellite System (GNSS) receivers, due to its global coverage, are used as one of the main tools for ionospheric studies. This is not so. The whole morphology of ionospheric storms has been obtained and understood using the world-wide ground-based ionosonde network observations. Only vertical ionospheric sounding gives directly electron concentration in the ionospheric layers. VTEC on one hand is obtained from slant TEC observations on the other hand it includes the plasmaspheric part which is not related to the underlying ionosphere. For this reason VTEC



may be only considered as a complementary source of information for such type of analysis.

Introduction should formulate the problem which is solved in the paper rather than general words related to ionospheric variations. The increase of daytime plasma uplift from the geomagnetic equator due to penetrating electric field was discussed repeatedly in the past, but the author did not mention all these publications. So, this is not clear what is a new ionospheric effect discussed in the paper in a comparison to what is already known.

L 18 P2 ...we apply a running window of 8 days... Why 8 day window? What is the idea for such choice? What to do with such background if these 8 previous days were disturbed?

L 17 P3 Figure 1 shows that $K_p = 8$ during the last 3 hours (UT) of March 7 and the first three hours of March 8. March has not been discussed yet in the paper.

A positive storm phase (the first phase) of a two-phase ionospheric storm is a normal reaction of the day-time mid-latitude ionosphere to a strong geomagnetic storm (started in the daytime sector). Some examples and mechanisms may be found in J. Atmos. Solar-Terr. Physics., 81-82, 59-75, 2012." Two types of positive disturbances in the daytime mid-latitude F2-layer: Morphology and formation mechanisms".

L 1 P 5 Looking at the figure 2 I see that the increase of TEC is more extended versus the mid-latitude in the Southern hemisphere but it is possible to see it also in the northern hemisphere. So for my point of view is not a localized enhancement .Looking at the paper by Lei et al. (2017 - 0.1029/2017JA02516) that analyze the same event with TEC and ionosonde data and in their figures it can be seen an increase of differential TEC for all latitudes in the first hours of 8 September, that corresponds to the storm main phase, in the northern hemisphere and in the southern also(but they arrive at 24 degree in latitude)that correspond to a positive ionospheric storm. In the following days a negative ionospheric storm occurred from higher to lower latitude. So it is a typical

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In general the paper does not present either any new morphological effect or physical interpretation. I cannot recommend this paper publication.

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