Dear Editor,

Please find below the review of the manuscript by Nadia Imtiaz, Waqar Younas and Majid Khan entitled "Response of low to mid latitude ionosphere to the Geomagnetic storm of September 2017", submitted to Annales Geophysicae.

The manuscript presents a description of the impact at the Earth's surface of the geomagnetic storm of September 7-8, 2017. This is made by using the total electron content derived by GNSS stations, the horizontal component of the Earth's magnetic field measured at ground observatories, and data of the O/N2 ratio obtained by the GUVI instrument.

General comments:

The paper is logically structured, but its readability is barely sufficient. The language is not precise being the manuscript really full of typos (indicated separately and directly in an annotated pdf) and inaccuracies, giving the idea of a manuscript written without the required care.It lacks a lot of information on how things are made, thus not giving the reader the possibility to replicate the work presented. Moreover, it represents a mere description of a single event without any interpretation or discussion of found results. Therefore, the manuscript does not present novel ideas and substantially new findings.

Going more in details of the different sections, I found the Abstract and Title clear and providing the correct information. The Introduction provides an extensive review of papers by other authors related to the specific topic of the manuscript. These papers, however, give the impression to be listed in an unorganized way rather than in a reasoned way; a sequential link between them is missing as well as the role they have in the study presented in the manuscript (they are no more mentioned in the rest of the manuscript). The Results/Discussion section actually copes only with the description of results, it completely lacks the any physical interpretation and discussion of results. Findings by other authors, as those cited in the Introduction, could have been a base for an extended discussion.

Specific comments:

1. Table 1 and 2 displays the geographic coordinates of GPS stations and of magnetic observatories however, since you are investigating the effects of a geomagnetic storm on the ionosphere, the position in the magnetic reference frame is much more relevant.
2. Figure 1 would be much more useful if all plots were all stacked up, instead of being separate. Moreover, Figure 1 seems to have been downloaded by the OMNI webpage, it is preferable for the authors to draw their own figures.
3. It is not clear how vTEC has been evaluated. Please specify it.
4. The description of the event investigated, given in the Case Study section, is very inaccurate and incorrect. Values of the peaks of SymH and AE are wrong, as well as their occurrence time. The time of the arrival at the Earth's surface of the effect of the CME is wrong, being the correct time 23:00 UT (see http://www.obsebre.es/php/geomagnetisme/vrapides/ssc_2017_d.txt). G-classes of geomagnetic storms are here mentioned but never explained or referenced. The

sentence “with the value of geomagnetic index kp = 8 at 23 : 50UT. ” makes no sense, being Kp an index estimated on intervals of 3 hours. Also the sentence “The solar wind speed increased from 500 to 785km/s.” makes no sense, the time interval when this happened being not specified. The timing of AE maxima does not coincide with that of Sym-H minima.

5. Data (as well as figures, see above) from the OMNI website are used, but the acknowledgement to OMNI is completely missing.
6. Figures 3 and 4 are missing the labels on the horizontal axes.
7. Concerning the description of Figure 3: 1) the increase of TEC on the day of the storm is visible only in BJFS, not in YAR2; 2) in Africa the enhancement during the storm is clearly visible also in WIND (why do you say that is less significant?).
8. Concerning Figure 4. It is not explained how maps covering the latitudinal range from -60° to 60° have been obtained.
9. Concerning Figure 4. It would be very helpful in the interpretation of this figure to have the SymH plot aligned and with the same size of those above.
10. Concerning the description of Figure 4: 1) in the Asian sector a pattern similar (in shape and values) to that observed on the 8th of September is observed also on the day after the storm; 2) in the African sector a pattern similar to that observed on the 8th of September is observed also on the two days preceding the storm. How do you explain these features?
11. Concerning the “interpretation” of Figure 5, this is just a mere description of what is the well-known and expected behaviour of the geomagnetic field during a geomagnetic storm.

Targeted comments:

Page 1, lines 15-17: The classification of geomagnetic storms that is most widely accepted in the magnetospheric/geomagnetic community is that compiled by Gonzalez et al. (1994), so I suggest to refer to it in place of that by Loewe and Prolls (1997). Moreover, the citation of Tsurutani et al. (1992) at this point is not appropriate. I therefore suggest to cite Tsurutani et al. (1992) in place of Gonzalez et al. (1994) and *vice versa*. Of course, when citing the classification of Gonzalez et al. (1994) please check the thresholds of the Dst intervals and change the names of the different intensities of the geomagnetic storms.

Page 1, line 19: Change “Therefore, the effects of geomagnetic storms are non uniform in different regions of the magnetosphere.” Into “Therefore, geomagnetic storms produce effects that are different in the different regions of the magnetosphere”.

Page 1, line 21: Change “…observed which is almost two times higher than that of the quiet day value.” Into “…observed, these have an amplitude that is almost twice that of a quiet day.” Here the authors refer to “the quiet day”. Are they referring to a specific quiet day or in general to “a quiet day”?

Page 2, line 1: PPEF is generally used as the acronym of Prompt Penetration Electric Field and not Prompt Penetration Effects. Please correct the sentence.

Page 2, line 2: Change “It is also found that the prompt penetration effect is almost uniform along the longitudinal direction.” Into “It is also found that the effect of the prompt penetration electric field is almost uniform along the longitudinal direction.”

Page 1, line 19: “The ionosphere features vary along the latitudes and longitudes due to different current systems flowing in the magnetosphere.“ This sentence is too general and not completely correct. Better to say “**During geomagnetic storms**, the ionosphere features vary along the latitudes and longitudes **also** due to different current systems flowing in the magnetosphere.”

Page 2, line 29: Please specify something about the “energy transfer”, e.g. it occurs between …

Page 2, line 32: I do not understand the logical sense of using “However” at this point.

Page 3, line 1: For the first time in the manuscript you mention here a “Northern equator anomaly”. Which anomaly are you talking of? Please add something more.

Page 4, lines 5-10: Please add a reference for Sym-H index and for AE index.

Page 4 line 15 Change “definite” into “definitive”.

Page 5, lines 17-19: What differences are you talking of? Please specify. Correct, accordingly, also the caption of Figure 2.

Page 5, line 19: What do you mean by “the five quiet days”? Maybe “the five quietest days”? In any case you have to specify, for these days, the level of geomagnetic activity by using some geomagnetic activity index (e.g., Dst, Kp…).

Page 5, lines 24-29: Change “panel” into “plots” everywhere in these lines. Panels are usually a composition of plots.

Page 5, line 28: Invert the order of “daily” and “quiet”.

Page 6, line 19: Change “magnetometer variations” into “magnetic field variations”.

Page 7, line 1: Invert the order of “daily” and “quiet”.

Page 7, line 1: Specify how the “disturbances” have been calculated.

Page 11: Caption of Figure 3, indicate what the dashed line is for.

Typo/language comments:

Most Typo/language comments have been made directly on an annotated pdf. Below, additional comments.

“Data” is commonly used as with a plural meaning, please change verbs accordingly throughout the manuscript.

Add a space between the value and its unit (for instance, change 10nT into 10 nT) throughout the manuscript.

Change “Index” into “index” if not at the beginning of a sentence, throughout the manuscript.

When referring to mid latitudes you use both “mid” and “middle”, choose one of the two terms and use it always.

Concerning the use of acronyms. Two ways can be followed: 1) not to define them, 2) to define them but then to use them. For instance HSSWS is defined twice and never used.

References in the bibliography are formatted with different styles, please refer to the specific reference style of the journal.