SPECIFIC COMMENTS (MAJOR COMMENTS)

1. As of my awareness, CODE provides interpolated (spherical harmonic fitted) TEC maps (please provide a citation at L105). This may result in biases generated by data interpolation. What accuracy is expected for the derived vTEC values over the epicenter based on CODE TEC maps? Why authors found it is necessary to analyze interpolated CODE maps, instead of just considering 5 available stations (Table 1) and calculating TEC over epicentral position with them? Also, does CODE use the same IGS stations in the considered region to produce vTEC maps? If so, authors analyze the same data twice (e.g., Figure 4 and 5). Please, clarify which stations in the considered region are used by CODE. Again, how good "anomaly maps" are for the estimation of absolute deviations (as they also based on CODE GIM interpolated data)? Were they cross-checked with vTEC over the epicenter calculated based on 5 stations? Do values agree?

- The main purpose of using GIM TECs was to validate the calculated GNSS TECs with a reliable data. Now, we have expanded this validation even further (the analyzes and results in below are not included in the article. It was only carried out in response to your question.)
- We estimated the CODE GIM vTEC values at the location of the GNSS stations (ankr, aruc, bshm, isba and tehn) similar to the vTECs of the epicenter. The RMSE and Bias values are seen in the Fig.1. RMSE values range between 0.52-0.68 TECU and Bias values range between 0.01-0.44 TECU.
- The RMSE and Bias values indicated that GIM vTEC values of CODE compatible with GNSS TECs of IGS stations. These values also prove the accuracy of "anomaly maps".
- A citation added for CODE GIM at L100.

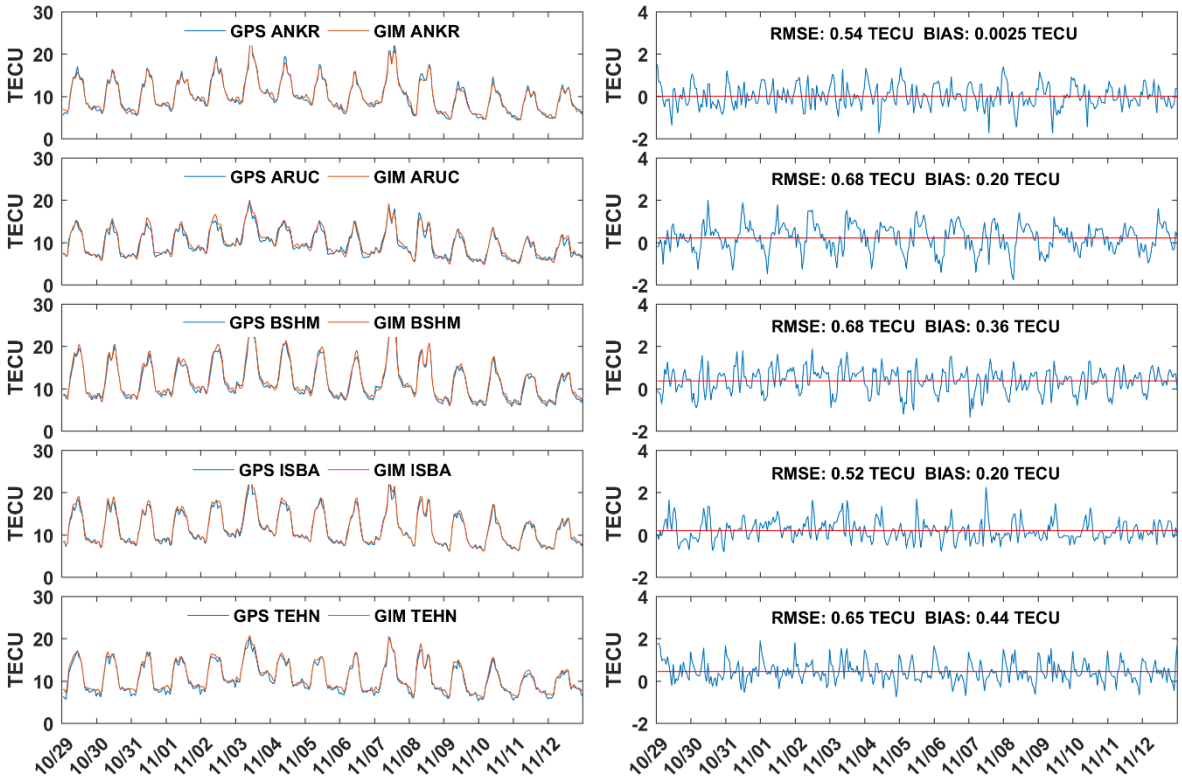


Figure 1 GNSS TECs and GIM vTECs at the location of IGS stations (left panel), differences between GNSS and GIM, RMSE and Bias values (right panel).

2. Authors introduce satellite and receiver biases (eq. 2), but do not indicate if these biases were corrected. It is not clear what methodology is used for the correction of these biases and what errors are expected for the determination of vTEC. The analysis and incorporation of these biases is an important factor while discussing the variations of absolute vTEC and I believe this should be clarified in the text.

- We used the TEC time series of IGS station so DCBs were obtained from daily IONEX files.
- We added a new sentence in L130. *"The DCBs of satellites and receivers are available in the daily IONEX files for IGS stations, but receiver DCBs of no-IGS stations must be calculated in the TEC calculation process."*

3. Authors provide the equation for the calculation of TEC averaged from all satellites (eq. 7). However, it is not clear if all Ionospheric Pierce Points (IPP) for used observations were over the earthquake preparation area (determined as 1380 km). If authors carry out the selection of TEC observations outside this area, it seems possible that found anomalies results from the area outside of it. For eq. 6, it is not clear what ionospheric shell height is used for the calculation of vTEC. Also, it is not clear what elevation angle cut-off is used for vTEC observations based on eq. 7.

- In the vTEC weighting process of obtaining TEC values of a station zenith, the VTEC value of a satellite with a low elevation angle already has low weight. TEC values are generally calculated as the VTEC value of a satellite with an elevation angle between 70^0-90^0 (these IPPs are already very close to the station). Also, the earthquake preparation area is an empirical value and it is not absolute.
- We added a new sentence in L220. *"In the TEC calculation process, the satellite and receiver DCBs were obtained from IONEX files of CODE. The height of the single-layer was selected as 450 km and the elevation cut-off angle of 30° is taken."*

4. In my opinion, authors use very narrow range of days and only prior to the earthquake (from 10/29 to 11/13). It is crucial to understand whether positive anomalies appear only before the earthquake or on a constant basis during quite times. Such analysis requires additional processing of data before and after the earthquake. I would consider range between -3/+3 months, along with the analysis of geomagnetic indexes and the use of the same stations over the same region.

- We revised the Fig.4 as below. In the new version of Fig. 4, the 30 pre- and post-earthquake days were analyzed with the same method in the previous version.
- We also revised texts in all manuscript related to the change in Fig. 4.
- In Fig.4 (Fig.2 in this file), it was seen that anomalies occurred only on 3-4 November for quiet Dst (Dst > -20) during 60 days. Also, GIM and GNSS TEC values are in good agreement as stated in Q1, so we did not perform the same analysis for GNSS data. GNSS time series includes 15 days before the earthquake as the previous version of the article.
- We added a new sentence in L310. *"Only the CODE GIM time series were analyzed for 60 days, including 30 days before and after the earthquake. Thus, it has been revealed that the anomalies obtained are not a coincidence. Abnormalities are observed only on 3-4 November, when the Dst values represent quiet geomagnetic conditions (Dst > -20 nT)."*

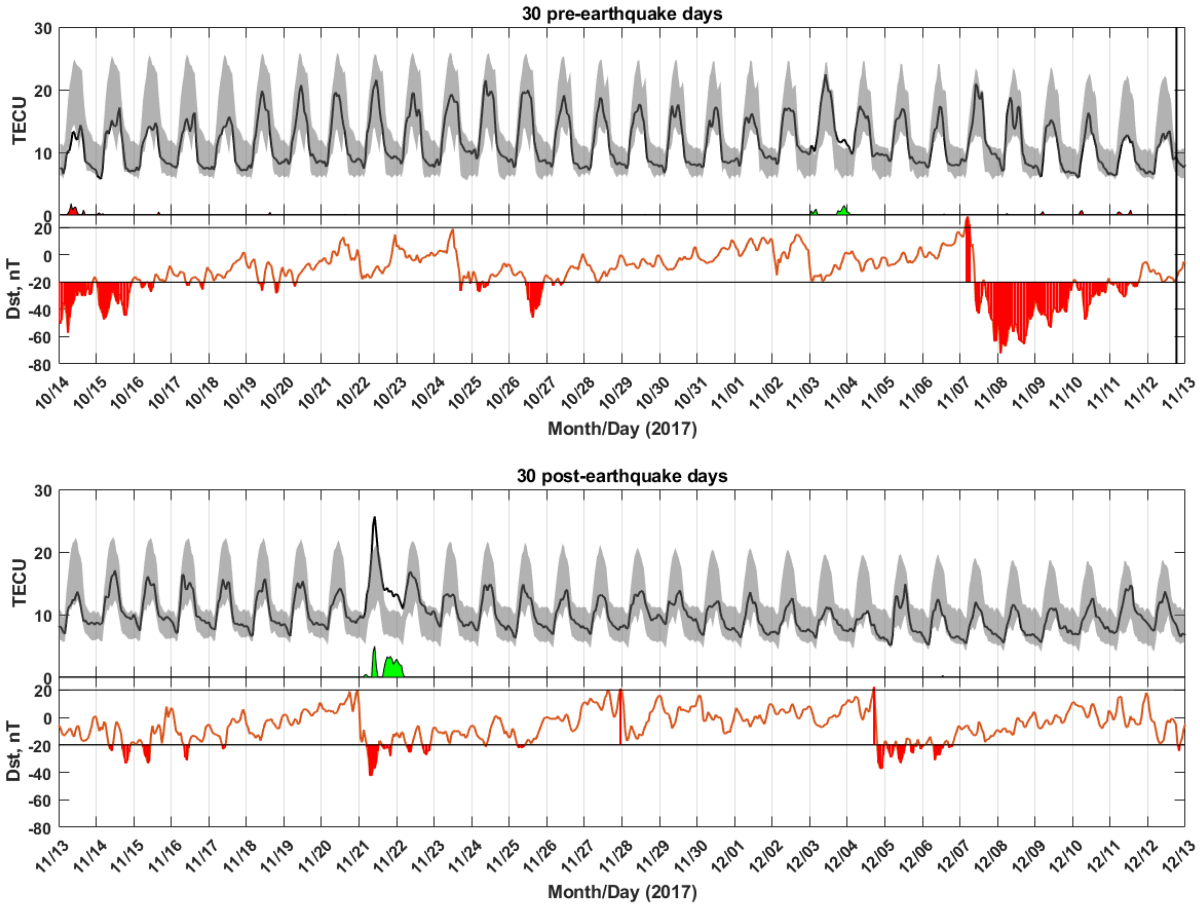


Figure 2 TEC values of CODE GIMs over the epicenter, positive/negative anomalies and Dst values during 30 pre- and post-earthquakes days.

5. Authors reference publications by Forbes et al., 2020 and Mendillo et al. 2002, but they do not explicitly mention that TEC observation variability cannot exceed 30%, incorporating possible satellite and instrumentation biases as well as integrated nature of TEC, IPP locations, recalculation of vTEC from sTEC etc. Also, Forbes et al., 2000 discuss "high frequency" variability of 25-35% under quite Kp index < 1, whereas (according to Figure 3), Kp index on 3rd and 4th of November seem to be higher than 1 (especially on 3rd of November, where Kp index approaches 4). Do authors expect the same ~25-35% variability for Kp index of 4?

- Please examine the anomalies in Fig. 5 and the situations exceeding ±30% in Fig. 6. You will notice the similarity. In Fig. 5, no-abnormal TEC conditions are determined with a 95% confidence level. DTEC values were within the 30% limit when GNSS TECs do not exceed upper or lower bounds. Here, the ±30% limit for DTECs represented quiet ionospheric conditions. However, I need to examine more data to reach a definitive conclusion about this. That's why I have cited some previous studies.
- In fact, it is important here not what Kp index values are, but whether TEC values represent abnormal conditions in the time series. The ±30% limit for DTEC is equivalent to the TEC value between the upper and lower limit (no-abnormal condition) in the running median method.
- We added a new sentence in L245. *"Fig. 6 also indicated that the ± 30% limits of DTEC variation are consistent with the no-abnormal condition of running median method (see Fig. 5)."*

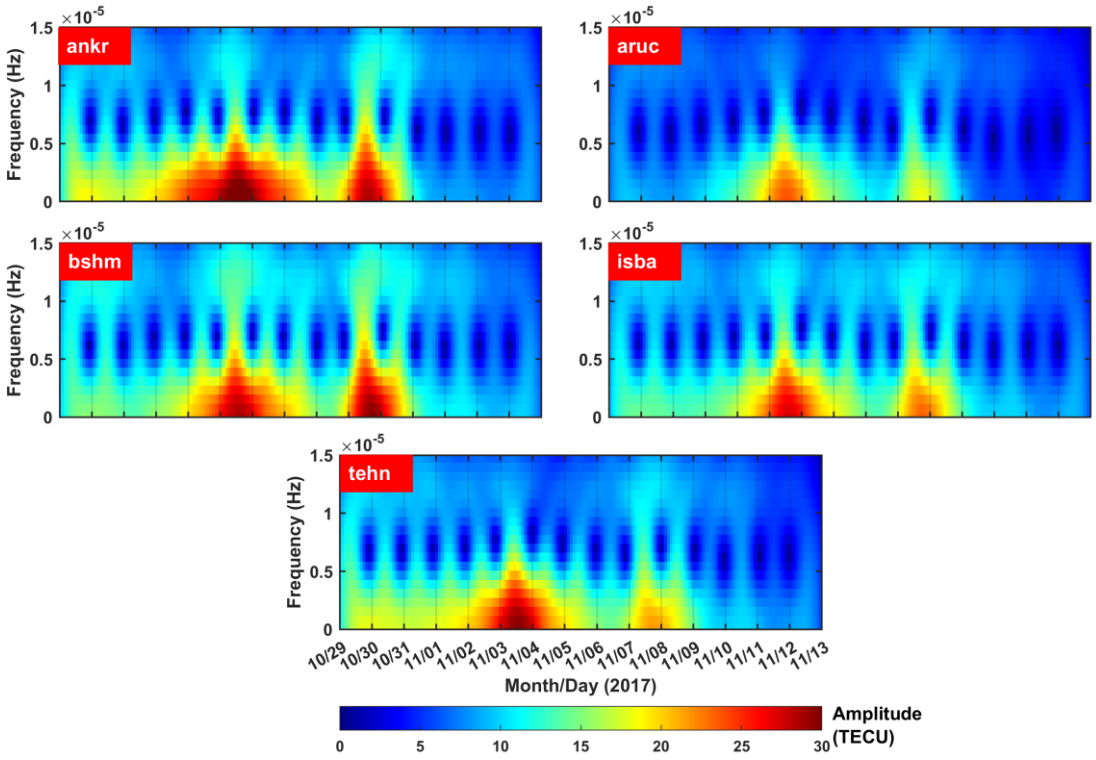
TECHNICAL COMMENTS (MINOR COMMENTS)

1. Please, clarify the choice of the window for Gaussian function as 0.005. What period it corresponds?

- A value of 0.005 is a coefficient that controls the frequency resolution of the gauss window function. It is not related to the period. We used it because we provide the best resolution with this value.
- We added a new explanation in L170. *"Since it provided the best resolution, the α was chosen as 0.005 for this study."*

2. Consider using the same x-axis on all plots (e.g., on Figure 7, there are days prior to the earthquake, although on Figure 5 there are Month/Day). Also, authors may want to indicate periods instead of frequencies, as it is difficult to assess the period from ~10^-5 Hz).

- We revised the x-axis of Fig.7 as "Month/Day". The revised version of Fig. 7 is below.
- The y-axis in graphs indicate Fourier frequencies according to sampling rates of the TECs. So it is not necessary to convert them into periods.



3. From Figure 5, I didn't find anomalies up to 4 TECu, nor from Figure 4 (as stated in the Conclusion). Please, clarify what is a maximum absolute deviation/anomaly value found and if it is higher than expected threshold for the calculation of vTEC.

- We revised as 1-3 TECu in all text.
- These values statistically represent the values outside the 95% confidence intervals of the normal distribution curve. Even if we assume that there are systematic errors in GPS TEC values, these errors remain within the distribution curve.

4. Authors may consider moving Figure 10 and appropriate discussion to Section 3, instead of discussing data analysis results in the Conclusion.

- We opened a new section as Section 3.4 with a headline **"The Prompt Penetration Electric Fields (PPEFs) Variation in Abnormal Days"**. We added Figure 10 and related explanations to this section.

5. Please, consider introducing all abbreviations in the text (not only in the abstract), e.g., LMTF, CMONOC, IGS, GIM etc., along with indexes in paragraph 80 (IMF, Ey, Vsw).

- All abbreviations in the text were introduced.

6. Please revise paragraphs 25-60, as they discuss studies that are related to both post-seismic (acoustic-gravity driven disturbances in the ionosphere) and pre-seismic activity. These are 2 completely different fields of studies and this should be clarified for readers not familiar with the topic (instead, the discussion of post-seismic studies may be fully excluded from the text).

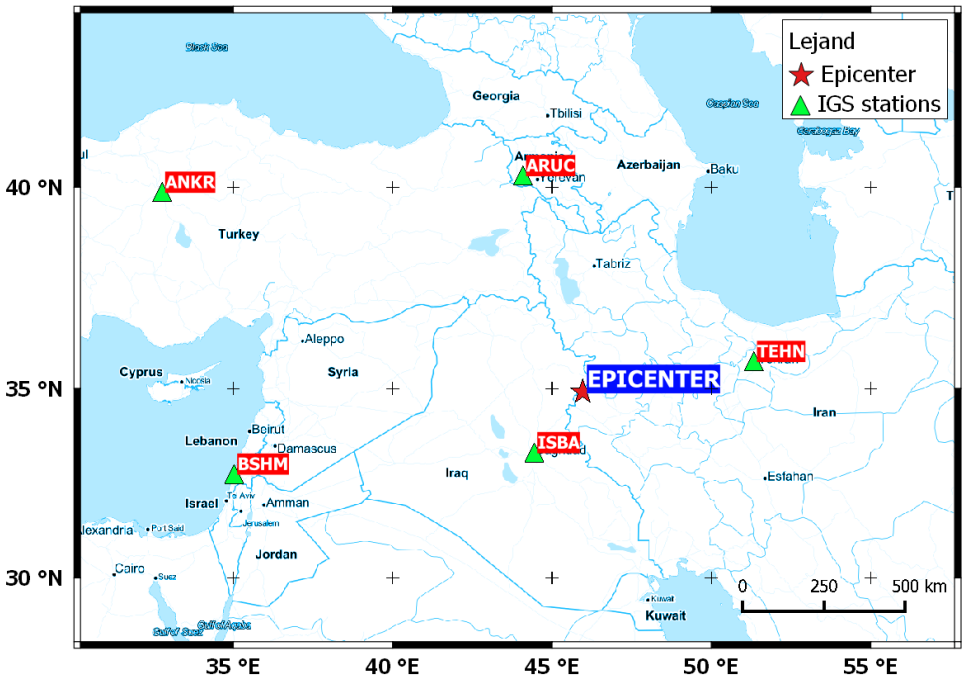
- We removed the paragraph from L24 to L29 which is including a lot of citation related to post-seismic (acoustic-gravity driven disturbances in the ionosphere) activity.

7. Paragraph 205-210 – Should it be November instead of October?

- The typo was corrected as "November".

8. Figure 1 – Should it be the indication of the northern hemisphere latitudes as N (not K)?

- The typo was corrected. The new version of Fig. 1 is below.



9. Why abnormal TEC variations are seen 8-9 days after the earthquake and not in closer dates? What is a physical explanation authors may suggest for this?

- We added possible physical explanations about the earthquake-ionosphere coupling to the introduction section of the article. There is not enough data in the study to make another comment on the physical explanation. Also, some researchers indicated the pre-earthquake ionospheric anomalies about 1-10 days before earthquakes (Xia et al., 2011; Inyurt et al., 2019, etc.).