

## ***Interactive comment on “Tomographic Imaging of a Large Scale TID during the Halloween Storm of 2003” by Karl Bolmgren et al.***

**Anonymous Referee #2**

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The submitted article is dedicated to the tomographic imaging of a particular large-scale TID occurred in the last day of the Halloween Storm of 2003, namely on October 31st. The authors studied the TID by means of the MIDAS tomography algorithm based on North American GPS receiver network data together with observational data from two ionosondes (Millstone Hill and Dyess) and the CHAMP satellite. I support an approach for fully or partly observational works to investigate events by fusing multi-measurement data. Therefore, I encourage the work done by the authors.

The authors note that the present paper is built on the publication of Bolmgren et al. (2020), where the MIDAS was used to imagine TIDs. Thus, the present work can be considered as another test for the MIDAS. It was demonstrated explicitly a validity of the MIDAS as a technique for searching and visualization of large-scale TIDs, that

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works effectively for sparse GPS receiver network. Moreover, it has been shown by simulation that the accuracy of the MIDAS raises noticeably with increasing number of receivers.

The reviewed article brings confirmation of developed earlier technique for imaging of TIDs. In addition, the work shows its novelty and actuality in the view of present-day attention to the deployment of dual-frequency GPS receivers for studies of processes in the Earth's ionosphere. I recommend the manuscript for publication in the *Annales Geophysicae* with minor revision.

Minor remarks:

Line 22: ". . . a series of large Coronal Mass Ejections. . .". The word "large" should be removed, since it brings a comparative feature, that is not needed in the context.

Line 92: The word in bold "... (same) ..." should be explained, since it is not clear what is meant.

Figure 3: The sTEC curves corresponding to PRNs 27 and 28 have the same brown colour that makes it difficult for a reader to distinguish them. The authors mentioned about the TIDs signatures in PRN 28 (Line 53). So, it is better to change the colour.

Figure 6: There are two plots showing foF2 and hmF2. The data were taken from the Dyess ionosonde observations and obtained with the MIDAS algorithm. Although, the MIDAS' tracks of foF2 and hmF2 demonstrate similar behavior to those Dyess' corresponding tracks, there are noticeable deviations. In this connection, what is the accuracy of determining foF2, hmF2 and Ne in the MIDAS algorithm with that set of GPS receivers? If the accuracy as a quantitative value can be obtained from the modeling presented in Section 4? The authors may consider mentioning about the algorithm's accuracy in the text.