

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

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We would like to thank you for your careful reading of the manuscript and valuable comments and suggestions. Please find our replies to individual comments below.

Line 23: Remove the phrase “travelling along the interplanetary magnetic field”. It is, at the very least, overly simplistic and a statement that is not needed in this sentence.

We agree that the sentence is not needed and it has been removed.

Line 69: algorithm - algorithm.

Corrected.

C1

Line 92: What is meant to be in the brackets where “same” is written?

This was left in the text by oversight, and has been removed.

Figure 4: The possible TID wavefronts that the authors note are not immediately obvious in this figure without the reader looking very carefully. It would be very helpful to the reader if a 1-hour running mean is subtracted from each voxel to remove the background ionosphere, as performed for the simulations given in Figure 8.

A clearer indication of the wavefronts would indeed be useful. We find that the full ionospheric TEC, especially in the areas sampled by the CHAMP PLP and the Dyess ionosonde, are important to keep visible. Therefore we have added arrows on top of the TEC maps in Fig. 8 to indicate the main wave features.

Figure 6: As the authors note in the text, the 15 minute sampling period of the ionosonde data make it impossible to find periodicities of less than 30 minutes, and 30 minutes itself is right on the limit for Nyquist sampling of a wave with this period. The figure itself does not show very clearly even a 30-minute periodicity. Perhaps it might be seen more clearly if the y-axis limits are reduced (e.g., to 10-13MHz or even 10.5-12.5MHz) to better show this. I guess the red and blue circles denote peaks and troughs respectively, but this is not described in the figure caption.

The y-axis has been reduced, and this reduced the need for red and blue circles that have been removed.

Figure 8: The caption should also note that a background subtraction was performed, otherwise use of the vTEC term is not strictly accurate as it implies absolute values.

Corrected.

Lines 156-158: This sentence is not clear: It states that a discrepancy is ob-

C2

served, but not the nature of that discrepancy.

This is indeed not clear. The following sentence has been added: "While indications of the TID was captured by the Dyess ionosonde and CHAMP PLP, this was in areas where the MIDAS reconstruction showed no clear wave pattern"

Lines 158-159: I suggest re-arranging this sentence to state, "However, this was identified from computer end-to-end simulation to be the result of poor receiver coverage available for the MIDAS inversion, as discussed in Section 5."

The sentence has been re-arranged as suggested.

Line 160: It might be useful to indicate at this point how the coverage of GPS receivers has improved since 2003, and whether it is now dense enough to be able to replicate the presence of a TID more accurately.

This is a very relevant point. The following sentence has been added: "For comparison, the modern North American network used by Bruno et al. (2020) has an average receiver density close to 15 per 10x10 deg."

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C3

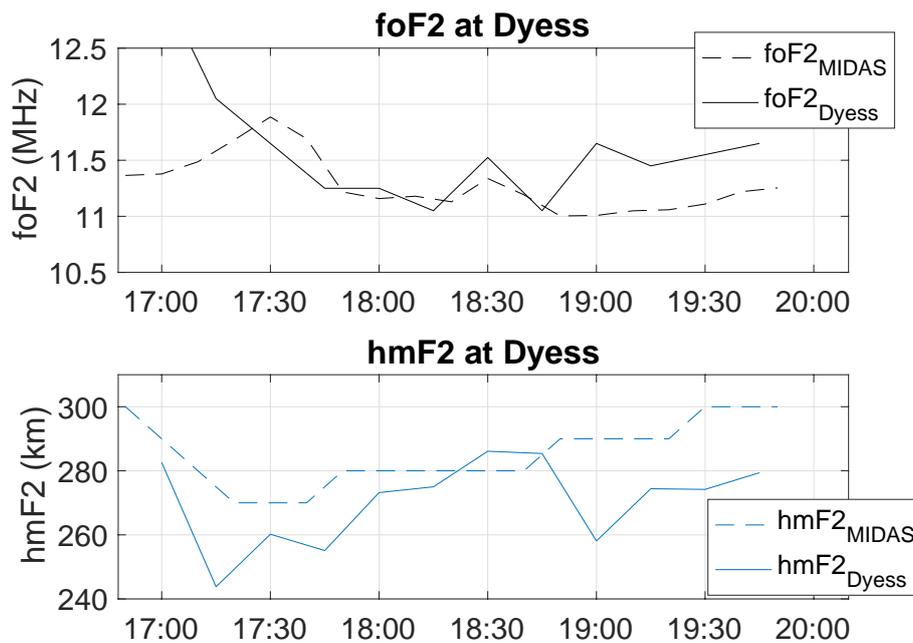


Fig. 1.

C4

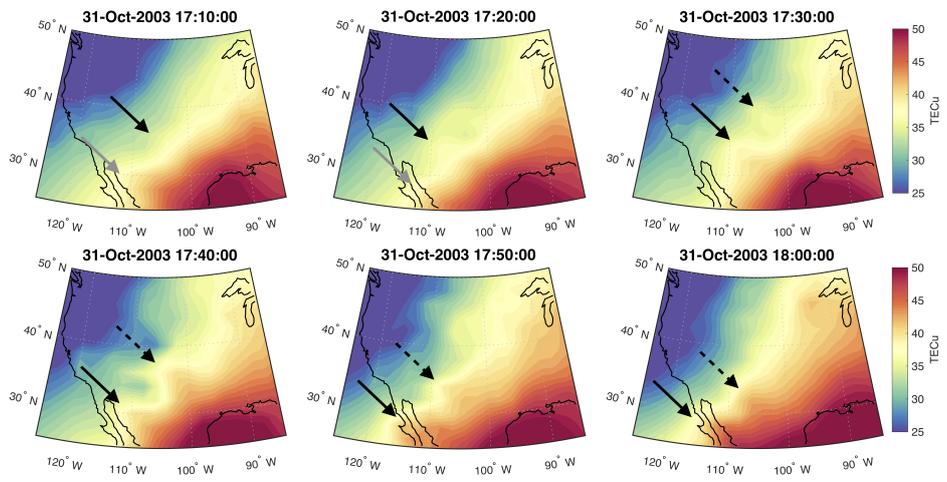


Fig. 2.