

Ann. Geophys. Discuss., referee comment RC2  
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## **Comment on angeo-2021-19**

Anonymous Referee #2

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Referee comment on "Polar tongue of ionisation during geomagnetic superstorm" by  
Dimitry Pokhotelov et al., Ann. Geophys. Discuss.,  
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The manuscript "Polar tongue of ionization during geomagnetic superstorm" by Pokhotelov et al. examines the 20 November 2003 geomagnetic storm to examine the development of the TOI anomaly using the TIEGCM driven by Weimer convection patterns. The authors compare the simulated TEC to IGS TEC maps and to ionospheric GNSS tomography results already published. The authors find that the TIEGCM simulations can reproduce the salient features associated with the TOI anomaly and mainly consistent with the IGS TEC maps and the tomographic TEC reconstructions. The authors confirm previous published results that the plasma uplift due to the expansion of the plasma convection to middle latitudes is a main mechanism for the formation of the TOI. In addition, the authors compare to CTIPe simulations with a lower spatial resolution which cannot reproduce the TOI anomaly correctly.

The manuscript is well written, logically organized, and presents new aspects. While the main mechanism of TOI formation was published before for other storms, the current study is focused on November 2003 and confirms these results and refers to them. In addition, the study adds the comparison to IGS TEC and GNSS tomography.

line 88: The authors use TIEGCM V2.0 which supports the 2.5deg resolution and ¼ scale height vertical resolution. TIEGCM-ICON is based on V2.0 but offers additional lower boundary forcing options.

Line 105: I assume that the ExB drift components are expressed in geographic directions but it is not totally clear. Maybe it would be good to explicitly state it.

Line 115: "given by a simplified version of the Whole Atmosphere Model" The word "simplified" does not add any value and I suggest to state what wave forcing is included to be more specific.

Line 120: Please double check if CTIPe is still operational or if WAM/IPE is the follow on.

Line 120: "computationally demanding" Why do the authors add this, because of the resolution? I would assume that the two models are similar- maybe CTIPe which includes a plasmasphere takes longer, but TIEGCM does not have this physics included.

Line 138 uisng -> using