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Comment on acp-2021-33

Anonymous Referee #2

Referee comment on "Climatology of migrating and non-migrating tides observed by three meteor radars in the southern equatorial region" by Jianyuan Wang et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-33-RC2, 2021

General Comments

Tides are important dynamic motions in the MLT region, and they are believed to play a central role in the vertical coupling of the atmosphere and ionosphere specifically for the equatorial region. In this work, the authors present their analysis of the climatology of migrating and nonmigrating diurnal and semidiurnal tides using the multi-year zonal and meridional wind observations by three meteor radars near the equator. The authors attempt to use the Whole Atmosphere Community Climate Model (WACCM) simulations to determine the dominant tidal components and to guide their analysis of the radar observations. Limiting to the dominant tidal components, they analyze the DW1, DE3, SW2 and SE2 tides and compare the seasonal variations of these tides with the WACCM and CTMT results.

The paper is straightforwardly arranged. However, the description of the method and approach is not adequate (noted below), and the manuscript contains many grammatical errors (not listed).

Specific Comments

The analysis presented here, that attempts to decompose various tidal components from three meteor radar observations is an interesting piece of work. However, the manuscript has several problems that I believe need to be addressed before it is considered for publication. These problems include:

- The method used in this study for fitting the radar observations over three longitudes to DW1, SW2, DE3 and SE2 tidal components is flawed. As the manuscript states, “the fits of the tides with zonal wavenumbers greater than or equal to two cannot be considered (P7, Lines 15-16).” The fits to DE3 (wavenumber-3) is thus not reliable.
- The model results (shown in Figure 3) show large amplitudes for D0, DE1 and DE2 components in addition to DW1 and DE3. Specifically, D0 and DE1 are shown to have larger amplitudes than DE3 and both are stronger than semidiurnal components. However, the authors fit the data to only DW1, SW2, DE3 and SE2 (stated in P7, lines 16-17) and other components are not included. Also, DE2 tides can approach large

amplitudes as demonstrated in previous climatological studies (e.g. Forbes et al., 2008), thus should be included.

Forbes, J. M., X. Zhang, S. Palo, J. Russell, C. J. Mertens, and M. Mlynczak (2008), Tidal variability in the ionospheric dynamo region, J. Geophys. Res., 113, A02310, doi:10.1029/2007JA012737.

- This work uses the model results to infer tidal components that dominate in the meteor radar observations, but no validation of the model is provided or referenced. The modeled tides should be compared with other observational data for the same time periods as the radar data. In addition, the tidal amplitudes have a large seasonal variation, so the model-observation comparisons should be conducted for individual seasons. These model validations are lacking in the manuscript.