

Ann. Geophys. Discuss., referee comment RC2
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Comment on angeo-2021-21

Anonymous Referee #2

Referee comment on "Analysis of migrating and non-migrating tides of the Extended Unified Model in the mesosphere and lower thermosphere" by Matthew J. Griffith and Nicholas J. Mitchell, Ann. Geophys. Discuss.,
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Atmospheric tides are one of the key drivers of middle and upper atmosphere coupling. Its correct representation in models of the middle and upper atmosphere is therefore essential for our understanding of the atmospheric dynamics. Since still there are not too many models of the coupled middle and upper atmosphere are available, results from new model initiatives are of interest to the scientific community.

The paper describes the results of tidal analyses using the recently developed Extended Unified Model. Both migrating and non-migrating tidal components are presented and discussed. Global pictures of the tides are shown, and the authors in particular focus on two latitudes, where radar observations are available, although the model validation using these is presented in another paper.

The paper is well written and the results are clearly presented. In particular I like the summaries given at the end of each section. The results are of interest to the community and I recommend publication after minor modifications.

Specific comments:

Lines 147 – 168: These paragraphs to a certain degree belong to the model description.

Page 6: Are these footnotes necessary? It is textbook knowledge.

Line 211: There has been rocket observations of mesopause temperatures lower than in CIRA (e.g. Lübken et al., 2004). Would you like to comment on that?

Line 220, Figure 2: Some authors have reported a double mesopause (e.g. Yu and She, 1995). Would you like to comment on that?

Line 268, Figures 6: The summer wind reversal at middle latitudes seems to be a bit too low. Would you like to comment on this?

Section 2: Could you add a brief description of latent heat release in the model?

Lines 360 pp, summary of section 3.2: To what degree are these values supported by observations? This is the topic of another paper, but a brief discussion would be helpful here (also for the summary of 68°S results)

Line 362: Add here that this is at high altitudes

Figure 13: Observed SDT amplitudes at NH middle latitudes have been found to be > 40 m/s (e.g. Pokhotelov et al., 2018). This seems to be more than the modeled ones. There is a SH/NH difference, and do the SH amplitudes agree better with the observations?

References

Yu, J. R., and She, C. Y. (1995), Climatology of a midlatitude mesopause region observed by a lidar at Fort Collins, Colorado (40.6°N, 105°W), *J. Geophys. Res.*, 100(D4), 7441–7452, doi:10.1029/94JD03109.

Lübken, F.-J., Müllemann, A., and Jarvis, M. J. (2004), Temperatures and horizontal winds in the Antarctic summer mesosphere, *J. Geophys. Res.*, 109, D24112, doi:10.1029/2004JD005133.

Pokhotelov, D., Becker, E., Stober, G., and Chau, J. L.: Seasonal variability of atmospheric tides in the mesosphere and lower thermosphere: meteor radar data and simulations, *Ann. Geophys.*, 36, 825–830, <https://doi.org/10.5194/angeo-36-825-2018>, 2018.