

Interactive comment on “Seasonal variability of atmospheric tides in the mesosphere and lower thermosphere: meteor radar data and simulations” by Dimitry Pokhotelov et al.

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We thank the Referee for raising important issues. Below is our detailed response to the comments. We also highlighted changes in the text and attached the modified version as a supplement.

The first issue raised is the enhancement of semidiurnal tides is observed during the fall transition (September), while the model produces more seasonally symmetric climatology with the enhancement of semidiurnal tides during the fall transition and the lesser enhancement during the spring transition (April-May). Observationally, the tidal enhancement during the fall transition at high and middle latitudes is well reported

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(e.g., Manson et al., 2009; Jacobi et al., 1999; Jacobi, 2012), as well as the fact that at lower latitudes the tidal climatology becomes more seasonally symmetric, with the enhancements both during the spring and the fall transitions (see Fig.1 attached below to the response showing semidiurnal tide climatology from the Canadian meteor radar, CMOR, at 43 deg N). To our knowledge, there is no definite theoretical explanation for the fall tidal enhancement being dominant at higher latitudes and, consequently, it is difficult to address this deficiency of the first-principle model. A possible explanation would be a height/slope of the mesospheric wind reversal boundary during May-August leading to stronger tidal amplification near the fall transition. Since the simulated wind reversal boundary is located somewhat lower and is less inclined (from May to August) comparing to the observations (see Fig. 5 in the article), one should expect more seasonally symmetric tidal climatology in the model. If the effect is related to the tidal amplification through interactions with mean flow and GWs in the MLT region, the new KMCM simulations with resolved GWs are likely to clarify the issue. This would be addressed in future studies. We added an extra discussion of this in the article.

The second issue raised is the overall enhancement of model tides above 85 km from June to September. We point out that the increase of tidal amplitudes above 85 km in summer is also seen in the observations in June-August, especially over Juliusruh radar (see Fig. 2 in the article, both zonal and meridional components), though to less extent than in the model. Again, the discrepancy is likely to be due to the lower height of mean flow reversal and to stronger summer zonal winds seen in the model. We commented on this in the text.

Regarding technical corrections: Page 2 line 19: The adaptive spectral filtering algorithm has been earlier described by the co-authors of the current paper (Stober et al., 2017), though its application to the extraction of tidal climatologies has not been previously published. We removed the term “novel” from the text/abstract, but this is a unique method for extracting tides, developed in our group. Page 2: We removed the footnote. Page 2, line 25: The IAP stands for the Leibniz-Institute of Atmospheric

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Physics, we clarified this. Page 2 lines 31-32: The reference to Stober et al., 2017 is already in the text, but we also think it is useful to have one sentence briefly describing the method. Page 3 line 27: this sentence refers to the difference between modelled and observed dynamics, which is addressed earlier.

Please also note the supplement to this comment:

<https://www.ann-geophys-discuss.net/angeo-2018-17/angeo-2018-17-AC1-supplement.pdf>

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2018-17, 2018>.

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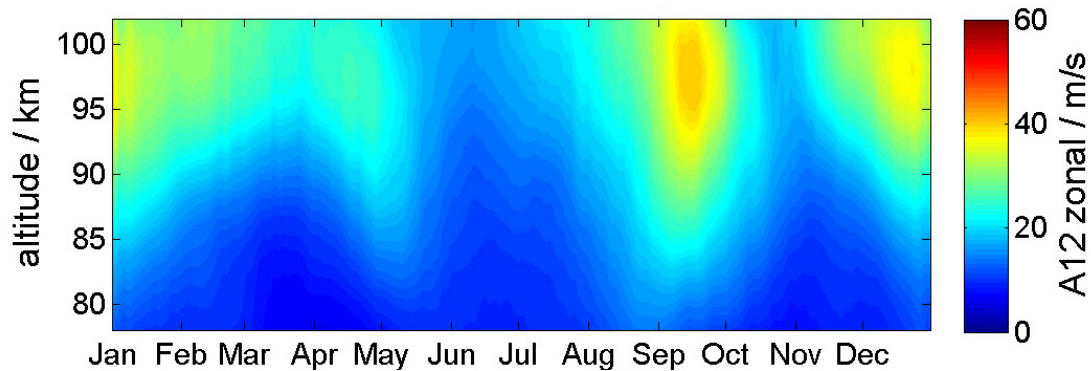


Fig. 1. Amplitudes of semidiurnal tides extracted from the Canadian meteor data (43 deg N) using the same adaptive filtering technique.

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