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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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Below is our detailed response to the second referee's comments. The changes in the text are highlighted in yellow. Note that the changes are tracked with respect to the version modified after the first referee's comments. Numbers of sections below correspond to sections in the referee's report.

1. We have to point out that the paper is prepared for the AnnGeo Communicates section and has to be limited to 4 journal pages. The paper is thus bound to be focused on a limited number of issues. The main purpose is to show that the KMCM model provides reasonable description of thermal tides, consistent with radar obser-

vations, and thus this model can be used to force the ionospheric circulation model (TIEGCM) from below. This purpose is clearly stated in paragraph 10-15, page 4 and in the abstract. A direct comparison of KMCM with other atmospheric GCMs, while interesting, is way beyond the scope of this short paper. We added extra clarification of the study purpose in the text. We already included a brief review of earlier modelling results. Other modern GCMs produce similar climatologies of semidiurnal tides but, to our knowledge, all models have certain deficiencies, e.g., CESM/WACCM is known to produce substantially weaker tides (e.g., Smith, 2012). GSWM mentioned by the referee does not account for important processes such as nonlinear interactions with GWs and PWs, which is already noted in the paper. The main advantage of KMCM is in its simplified mechanistic character which makes it more suitable for the forcing of ionospheric GCM from below and for conducting numerical experiments. We have included further clarification of this in the text.

2. Fig. 5 already shows meteor radar data and KMCM together. Unfortunately the short paper format does not allow us to add extra figures.

3. We agree in principle that the tidal phases are important to analyse. However we have to leave this for a future study due to the length limitations.

4. This comment conflicts with the first referee's suggestion to remove all the details of fitting procedure and only refer to Stober et al., 2017 paper, so we have to compromise. The fitting method is least squares, further details are described in Stober et al., 2017. The length of sliding window is 3 days, we added in the text. The linear trend is fitted in this procedure and subtracted, we added the clarification. Fitted tidal periods are 24hr and 12hr, subtracted in this order.

5. We have now included extra discussion on the tidal amplification in spring seen in the KMCM simulations, as it was also requested by the first referee. The analysis of phases we believe should be left for another study, due to the length limitations of the article.

6. The main topic of the paper is a comparison of tides between meteor radar observations and the KMCM model. There are several other studies using meteor radars to investigate the GW seasonal properties (e.g., Hoffmann et al., 2010), so that we did not want to include and discuss these waves in the submitted manuscript. The used spectral filtering accounts for the full error propagation of the radial velocities plus iterative solution of the non-linear errors. In so far, we add no further noise to the derived quantities. The error due to angle of arrival is also accounted in our wind retrieval. The phase calibration of the meteor radar is checked using the astronomical position of meteor showers. We do not agree to the referee's comment that a radial velocity error "due to its radial nature" cannot be transferred to the zonal and meridional wind. In fact, this is mathematically included in our retrieval by making use of the covariance matrix.

Line 15-22: Variabilities do not contaminate the data but could make comparisons with models inconclusive. For instance, in the case of Davis et al., 2013, the natural short-term tidal variabilities, combined with radar measurement errors, are included into monthly variabilities (order of few m/s), meaning the modelled mean tidal amplitudes, both from CMAM and from WACCM models, generally fall in between the variability bars (see Fig. 10 in Davis et al., 2013).

Line 13, Page 2: Mitchell et al., 2002 used GSWM; Davis et al., 2013 used CMAM and WACCM. The text has been clarified.

Please also note the supplement to this comment:
https://www.ann-geophys-discuss.net/angeo-2018-17/angeo-2018-17-AC2-supplement.pdf

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