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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of the spatial distribution of gravity wave activity on the middle atmospheric circulation and transport" *by* Petr Šácha et al.

Anonymous Referee #2

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The paper by Sacha et al. investigates the impact of a locallized GW forcing on the circulation of the middle atmosphere. This is a highly interesting topic which merrits publication in ACP. I support the comment of Referee#3 that for fully appreciating the results, it is necessary to assess the variability of the model and the influence of this on the results. There is one point, in addition, I would like to comment on.

Both the authors and Referee#3 emphasize the intermittency of gravity waves. The quoted intermittency investigations focus on the high variability considering single waves / individual observations. This intermittency may be used for instance to develop / improve GW parametrization schemes (de la Camera et al., JGR, 2014). The situation is different, however, if we consider regional averages. Regional averages for

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regions with prominent mountain wave forcing also yield highly intermittent GW variances and GWMF, with variations of more than an order of magnitude from day to day (e.g. Eckermann and Preusse, 1999, Jiang et al., JGR, 2002, Schroeder et al., GRL, 2009). The situation is different, for instance, for subtropical convective gravity waves (i.e. summer subtropics). Considering single wave events, there is also large intermittency between events. GWMF and also other wave parameters (phase speed, wavelengths) are highly variable. Considering a larger region as in the current paper, the average behavior however does vary much less (e.g. Schroeder et al., GRL, 2009). For the wintertime forcing discussed here, shear would be a likely source (e.g. Leena et al., JASTP, 2012; Pramitha et al., ACP, 2015; Atmos. Res. 2016). Unfortunately, we have for this forcing a lack of sufficiently frequent remote sensing observations (i.e. insufficient temporal resolution), in order to quantify the temporal variability, but it may be argued that also the winter time regional average would not lead to strong pulses (i.e. day-to-day variations). Thus, assuming a constant forcing after the onset of some general meteorological condition, seems a plausible assumption and therefore focussing on the average response after a few days a plausible approach.

Concerning the comment of Referee#3 about highlighting the novel findings of the paper. I find the discussion section interesting and relevant. How about adding a very short summary section which just highlights a few findings?

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