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Interactive Comment

Interactive comment on "Experiments on sensitivity of meridional circulation and ozone flux to parameterizations of orographic gravity waves and QBO phases in a general circulation model of the middle atmosphere" *by* A. V. Koval et al.

Anonymous Referee #1

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The manuscript describes the influence of the orographic gravity waves (OGW) and QBO phase on the meridional wind, vertical motions and ozone fluxes simulated by the MUAM (model of the middle atmosphere). The authors have modified the original MUAM version by adding parameterization of OGW and performed sensitivity studies analyzing the changes in the model output. Therefore the subject of the manuscript is relevant to GMD scope. The manuscript is well structured. The quality of the figures is good. However, I do not clearly see why the obtained results could be interesting for the wider community. The importance of OGW and QBO was recognized a long ago

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Interactive Discussion
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and the author's conclusion about the necessity of their inclusion is just a confirmation of very well know information. It is not even new for MUAM model, because the same conclusion was already made in the recently published paper by Gavrilov et al. (2015, doi:10.1186/s40623-015-0259-2). There are some other issues (see below), which should be considered by the authors before publications.

1. The review of available and already used in the models OGW parameterizations is missing. The authors should discuss the benefits of the new scheme and its place among the existing models.

2. The authors should formulate better the motivation for the study and emphasize the novelty of the undertaken research.

3. Section 2 of the paper can be substantially reduced, because many technical details described there have been already presented in the previous publications.

4. The model set-up should be justified. It would be interesting to know how the MUAM reproduces polar night jet and polar temperatures in case of perpetual January simulation.

5. The authors should also explain why OGW and QBO effects are considered together. Is there any relation between them? As far as I understand OGW have been parameterized while QBO has been just prescribed.

6. In the discussion of Figure 2a the authors did not try to compare their results with the meridional circulation obtained from the reanalysis products. It would be interesting to show whether the improved version help to obtain better agreement or not.

7. I do not completely understand how exactly the statistical significance was calculated. Somehow it is missing in Figure 3,4. Therefore the analysis of the differences is difficult.

8. The analysis of the results is not sufficiently deep. The authors simply describe what is shown in the figures and do not try to put the obtained changes into context of the

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general behavior of meridional circulation.

9. I think that the analysis of the ozone fluxes is not instructive because the ozone field is prescribed and the changes of ozone fluxes mostly repeat the pattern of the circulation changes. The authors show that the ozone flux can change by up to 60%, therefore interactive ozone is necessary because the prescribed ozone will not be maintained. The using of 3-D ozone field in the model is also difficult to justify because it is not consistent with the simulated meridional circulation and shape of the polar vortex.

10. In the conclusions the authors claim that parametrized OGW and assimilated QBO improve the MUAM, but I do not see any solid confirmation of this. I guess, the improvement should be demonstrated by the comparison with observation data.

Interactive comment on Geosci. Model Dev. Discuss., 8, 5643, 2015.

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