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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The CCCma third generation AGCM and its extension into the middle atmosphere" *by* J. F. Scinocca et al.

Anonymous Referee #5

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Review of Scinocca et al "The CCCma Third Generation AGCM and its Extension into the Middle Atmosphere"

This paper describes the CCCma third generation model and simulations using its version to cover the middle atmosphere (CMAM). It concisely shows overall and unique features of the model such as the double transform, advanced gravity wave parameterization, and tracer transport schemes, so it would be useful for those who are interested in the model. Evaluation of the CMAM with sensitivity tests provides insights and technical information on the climate modeling of the middle atmosphere. Therefore, I recommend to accept the paper. I only have minor comments that the author could consider before finalizing the paper.

Minor comments

1. I think it would be nice to have a table (tables) to summarize features of the model. It would also be nice to have tables on standard and experimental settings of tunable parameters.

2. This paper extensively describes options in the representation of tracer transport, but to me it is not very easy to follow. It firstly describe a semi-Lagrangian scheme in Section 2 to conclude it it to diffusive. Secondly, following this notion, a hybrid spectral treatment is introduced extensively, but it is concluded that the hybridization is applied only to specific humidity. At this moment, I thought that the former, semi-Lagrangian transport scheme is used for other quantities. Later on, however, another treatment to alleviate the demerit of the spectral transport is introduced in Section 3.1. Then I cannot tell what choices are to be made even in standard cases. The description of tracer transport schemes should be sort out.

3. Appendix A makes comparison only between the naive spectral transport and the hybridized version. However, given the introduction of the other two options (semi-Lagrangian scheme and use of the physic filter), I think a comparison should be made among the four.

4. In the evaluation of CMAM, I think it would be useful to evaluate the Brewer-Dobson circulation for the following two reasons. In the evaluation of the polar vortex (Sect 3.4), it could give a guidance to distinguish dynamical and radiative contributions to temperature biases. As for the QBO (3.5), the upwelling of the BD circulation is a important factor that control the oscillation period (or even whether a QBO-like oscillation appears or not).

5. p.7912 l.28: refer the original contribution rather than a review paper (Baldwin et al 2001). – should be Plumb (1977) ?

6. p.7905: Is filtering with eq.(15) applied at each time step? I guess it would be more

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physical if the expression of the coefficient is related to time, if possible, with the units of 1/second, along with an estimation of the e-folding time for the largest wavenumber.

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