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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling deep convection and its impacts on the tropical tropopause layer" *by* J. S. Hosking et al.

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Reply to Referee #2

The authors would like to thank the referee for useful comments and suggestions that helped us to improve the manuscript.

Comments

Limitations and error sources should be discussed in more detail. We have now discussed the convective parameterisation in more depth and point out that, due to the resolution, we are unable to resolve clouds individually. Therefore, we are unable to capture the highest mass fluxes and CAPE that are presumably present in the real world.

Specific: - We have now referenced Russo et al (2010) and Hoyle et al (2010) which discusses the suitability of the model, along with its errors, for diagnosing vertical transport above Q=O.

- The variability at one grid-point is already discussed in the paper. The supplimentary Figure 1 is now provided to show this. However, as the TTL is meridionally averaged over 20N-20S, this $\pm$1km temporal variability is less significant compared to the spatial variability (e.g., regions of weak and strong convection). In the paper, the TTL surfaces are calculated using monthly mean fields and the 3-hourly data was not outputted for all months.

- The referee makes a very good point about the lower tropopause height. We have therefore amended the text accordingly.

- The boundaries for the mass flux integration are between the LRT and Q=0 levels (not model levels).

- Spelling mistake fixed. Thank you.

- We have removed the link between Fig 1 and Fig 6 as we agree that there is not enough evidence here to make such a statement.

Additional References

Hoyle, C. R., Marécal, V., Russo, M. R., Arteta, J., Chemel, C., Chipperfield, M. P., D'Amato, F., Dessens, O., Feng, W., Harris, N. R. P., Hosking, J. S., Morgenstern, O., Peter, T., Pyle, J. A., Reddmann, T., Richards, N. A. D., Telford, P. J., Tian, W., Viciani, S., Wild, O., Yang, X., and Zeng, G.: Tropical deep convection and its impact on composition in global and mesoscale models – Part 2: Tracer transport, Atmos. Chem. Phys. Discuss., 10, 20355-20404, doi:10.5194/acpd-10-20355-2010, 2010.

Russo, M. R., Marécal, V., Hoyle, C. R., Arteta, J., Chemel, C., Chipperfield, M. P., Dessens, O., Feng, W., Hosking, J. S., Telford, P. J., Wild, O., Yang, X., and Pyle, J. A.: Tropical deep convection and its impact on composition in global and mesoscale

models - Part 1: Meteorology and comparison with observations., Atmos. Chem. Phys. Discuss., 10, 19469-19514, doi:10.5194/acpd-10-19469-2010, 2010.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/10/C9971/2010/acpd-10-C9971-2010-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20267, 2010.