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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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Review of the manuscript entitled "Modelling deep convection and its impacts on the tropical tropopause layer" by Hosking et al.

The manuscript shows how the UKMO unified model at high resolution (60 km horizontal resolution) is able to reproduce deep tropical convection at global scale and checks whether this impacts on the structure of the tropical tropopause layer (TTL). Consequently, the paper tends to highlight the impact of such rapid processes on the very short-lived species entering the stratosphere (e.g., bromine species) that could in fine affect the distribution of ozone via the Brewer-Dobson circulation. The seasonality of convective activity is presented for four different months, namely February, May, August and November 2005, considering different parameters to trace both the activity (outgo-

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ing longwave radiation, cloud top height) and the maximum altitude reached by the air masses (lower and/or upper TTL). The model output is consistent with the general idea of air rapidly entering the lower TTL mainly over the maritime continent and depending on the season, over South America and Indian Ocean. Thus, the study shows that the deep maritime convection might help bromine species emitted in coastal regions to easily reach the TTL and could explain the bromine missing loading of about 20% present in the models.

The paper is well written, the Figures are clear enough, the scientific results corroborate all the results presented so far in the community, at least all the results mainly based upon modelling. That is to say, unless I missed one important point, nothing is really new in the sense that, within zones associated with low OLRs, models tend to show high convective activity, particularly intense over the maritime continent and the Western Pacific to reach the TTL.

My main concern is seriously related to the diurnal activity of the convective processes and the underestimation of its impact in the presented analysis. It is indeed now widely admitted that convective activity has a tremendous diurnal cycle over land peaking in the local afternoon, whilst the ocean convective activity is rather flat over the diurnal cycle. I understand the outputs of the model were performed every 3 hours. But I wonder whether this 3-hour interval is high enough to represent such a short-term transition in the continental convection. Thus, it is crucial to know whether the undersampling of the diurnal cycle tends to favour the ocean convection compare to the continental convection. Indeed some measurements (referred in the manuscript) do not enter in this general and widely accepted understanding: overshooting features from TRMM, water vapour from balloons, long-lived species from satellites, etc. But nothing is really debated on this particular issue and this should be emphasized. Thus I can recommend the publication of the manuscript after this aspect is assessed in the new version.

Note, there is a typo P. 20284 1st line (assesssing) with 3 s.

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

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