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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of tropical land convection on the water vapour budget in the Tropical Tropopause Layer" *by* F. Carminati et al.

Anonymous Referee #1

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General comments:

This paper follow the line of study by Liu and Zipser 2009 and focusing on the day vs. night differences in the MLS water vapor retrievals in the northern and southern hemisphere. The results are interesting, especially on the stronger day vs. night difference in the southern TTL over land, as well as the level of the impact of convection indicated by the day vs. night water vapor differences. These results are firm evidences of the impact of deep convection to the TTL over land. Manuscript is well written. Therefore, I recommend accepting the paper for publish after a few minor points being addressed.

Recommendation: accept with minor revision

Major comments:

One main question I have is the uncertainty of the retrievals at 100 hPa and above. Day vs. night water vapor differences from mean values in Figure 6 are very small at levels above 100 hPa, I am wondering how robust is these results.

Minor comments:

1. P33056, L10, This is a quite long sentence. Might be helpful to break into a few shorter sentences. Why TTL is defined as 121-68 hPa? Does full oceanic areas share the same diurnal cycle as maritime continents?

2. P33056, L15, the amplitude of water vapor diurnal cycle larger does not directly indicate a stronger convection. Water vapor variations due to the convective detrainment may also depend on the surrounding ambient water vapor concentration (how dry it is). What if the southern LS is dryer?

3. P33059, L20, please mention that the boxes used in this study are shown in Figure 2.

4. P33061, L1-3, Would the definition of the TTL change your conclusions? Note that 121-68 hPa basically include the upper troposphere and lower stratosphere. With low vertical resolution, this is > 6 km depth.

5. P33062, 14, both MAM and SON are active seasons for deep overshooting convection in tropics (Liu and Zipser 2005).

6. P33065, L1-5, I am wondering about this speculation. It is proven that the stronger convection happens over the regions with dry air aloft combined with the low level jet of moist air, such as Argentina and SE US. Central Africa and Amazon convection have very different convective intensity properties. Regarding the explanation of CAPE, I am wondering if there is any study to support this statement.

7. P33067, L10, are you implying that the TTL could be up to 68 hPa? Or this should be said the convection impact stops at 68 hPa.

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8. P33071, L5, Bottom panels shows the “anomaly” of the water vapor mixing ratio.

9. P33071, at 171, there is not much day vs. night water vapor variation in winter. Then why there is opposite day vs. night water vapor variation at 100 hPa in winter, when there is no deep convection? Could this be related to the diurnal tide? Also the amplitude of water vapor variation is very small. I worry about the error bar is greater than the signal at this level and above.

10. P33073, why do not showing this in the main text? I think the result over the western Pacific is compensating the rest results and it should be shown as Figure 7, if not combined into Figure 6. Also, please be specific on how you define the region.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 33055, 2013.