

## ***Interactive comment on “Modeling upper tropospheric and lower stratospheric water vapor anomalies” by M. R. Schoeberl et al.***

### **Anonymous Referee #1**

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Review of "Modeling upper tropospheric and lower stratospheric water vapor anomalies" by Schoeberl et al.

This manuscript uses a trajectory model to analyze water vapor in the tropical tropopause region. The manuscript is generally well written and appropriate for ACP. There are a few typos and plural mismatches: please re-read for grammar. I think a few points need clarification as I detail below. Furthermore, the figures could be improved a bit, particularly labels on the color bars. There are some comments on the monsoon in the conclusions that need to be harmonized as I note below. But with these mostly minor revisions and clarifications this should be publishable in ACP.

Page 9655, L29: I think this has been called the Lagrangian cold point By Fueglistaler

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et al 2005)?

Page 9656, L3: "entering the stratosphere"

Page 9656, L9: as a spatial region

Page 9657, L16: Please Clarify: the level of net radiative heating is about 15km. The level of net diabatic heating is well below this (figure 1, zonal means), mostly because of the large scale patterns of convergence and divergence at upper levels induced by convective heating. So are you using the zero diabatic heating level? Not the radiative heating level. It might be useful to clarify this for the reader, and note these levels are very different.

Page 9658, L8: heating rates control...

Page 9658, L27: Why is the initialization level so different from the zero diabatic heating level in the winter hemisphere in figure 1?

Page 9658, NL: In figure 1, the color bar should denote the zero color. Perhaps even make it white so it is clear where it is. Or put a red line on the color bar as in the figure. In general, the color bars need more labels, and especially zero when appropriate.

Page 9659, L1: Don't need the year range twice in the same sentence.

Page 9659, L18: How are they adjusted? How does the adjustment contribute to the agreement or disagreement?

Page 9660, L15: Gettelman et al 2002 showed that a simple trajectory model like this could reproduce the water vapor field with minimal microphysics. I believe the Fueglistaler papers (2004,2005) showed this as well.

Page 9662, L11: The dry bias is due to temperature?

Page 9662, L17: Note that this is the Asian monsoon?

Page 9663, L7: Does this say something about transport? Overturning circulations?

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Convective sources, or the fact that the zero diabatic heating level is higher in the subtropics than on the equator in figure 1?

Page 9663, L17: But are polar parcels dehydrated in the troposphere or in the stratosphere?

Page 9664, L6: This is a very interesting conclusion. But might the monsoons be regions of higher water vapor?

Page 9664, L22: But doesn't that mean the monsoons re important if they contribute to the tail of the distribution? How does this fit with your statements in the previous section?

Page 9675: Final water vapor?

Page 9679: Might want to note that there are parcels that do not make it into the stratosphere. They are not shown on the diagram, but what fraction are they? How does it alter the picture of transport?

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9653, 2013.