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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of convection on stratospheric water vapor in the North American Monsoon region" *by* Wandi Yu et al.

Anonymous Referee #1

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This is an interesting paper and certainly should be published, however the major claim in the paper has not been supported by the data. It is not that the interpretation is implausible, but insufficient evidence has been provided. The paper is certainly of sufficient interest even if this claim is withdrawn.

From my understanding of the manuscript, I do not believe that the primary conclusion "... most of the convectively moistened air is then transported to the center of the NA anticyclone and the anticyclonic structure helps maintain high water vapor content there." is necessarily supported by the evidence provided. What is shown is that there is an offset between the region that corresponds to the authors chosen metric of deep convection, and the region of maximum H2O anomaly as measured by MLS.

Even if one accepts the chosen convective proxy, there seems to be another plausi-

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ble explanation for this geographic mismatch. Air simply resides in the Southern US region for a longer period before being transported downwind to other longitudes, and therefore has greater convective moisture efficiency. Thus, it is not clear to me to that transport from higher latitudes is required. The claim that can easily be made is that there is a strong correlation between air that has a long residence time over NA and air with a large H2O anomaly.

I am also skeptical about the relevance of the fact that in June the back trajectories travel through very cold regions. These are back trajectories, so these low temperatures are influencing the parcels before they are moistened by the deep convection. Perhaps the authors are suggesting that these parcels are moistened over the US, travel to the tropics, and then come back to the US, but I would have thought that such a trajectory path would only be followed by only a very small fraction of parcels and the authors have provided no evidence to the contrary.

Additional comments:

Abstract line 8– I'm not sure what the "hypothesis" is, nor is there a particular need to mention or have one.

Line 52 – The convective radar data play a fundamental role in this paper. Although the reference to Cooney et al. is good, please devote a few lines to describing the reflectivity observations and what they mean. For instance, is a reflectivity Zn over 10 dBz a well-accepted value for tropopause overshooting convection?

Figure 1 – I understand that in panel 'A' different very different quantities are being plotted, but just putting a y-axis that says "normalized" is unacceptable. There needs to be some way for the reader to connect the plotted value with a physical quantity (ppmv, fractional occurrence of convection, etc.). Also, the two reddish lines in panel 'A' (apparently one is orange) are very difficult to distinguish.

Figure 3 – This is an interesting figure, and the fact that the convective influence ra-

tio looks not dissimilar from the MLS H2O anomaly is very interesting. The black line single value GridRad contour is useful because it makes it easier to see the offset between the maximum convection and the maximum H2O anomaly, and if this specific convection contour represented all convection, then one would be forced into the conclusion presented by the authors, i.e. that high H2O air is being transported from these regions to the lower latitude regions. But there is nothing special about the specific convection level contour that the authors have chosen. While some of the moist air may have been brought down from the North, some of the moistening in the Southern US is almost certainly caused by local convection in this region. This figure therefore include a full row showing a color contour of the convective occurrence by month throughout the US.

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