

Interactive comment on “The effects of convection on the summertime mid-latitude overworld” by A. E. Dessler

Anonymous Referee #1

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The article uses HALOE data to investigate moistening of the lower stratosphere associated with the Asian monsoon and convection over North America. The aim of the article was to establish how high the impact of convection on the water vapor budget extends. The subject is of importance to understanding the water vapor budget of the upper troposphere and lower stratosphere.

Specific Comments:

I was surprised to read that the vertical resolution of the HALOE water vapor measurements used in the article was 48 per pressure decade, giving 23 levels between 150hPa and 50hPa. I assume you used level 2 data for this and this needs to be stated in the text. I wonder how justified this very high resolution is given the vertical resolu-

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tion of the instrument (~2km). Randel et al. (2001) used version 19 level 2 data with 12 levels per pressure decade giving a 1.3km vertical resolution and noted that this was over-sampled. 48 levels per pressure decade seems a bit extreme and the use of HALOE data with such a fine vertical resolution needs to be explained and justified in the text.

Resting on this resolution issue is the claim that convection reaches 19km/460K based on the observation of moist air there. I wonder how 'new' this result is. Jackson et al. (1998) noted moistening by the Asian monsoon near 18km/420K and I wonder whether the observation of moist air near 19km is really just the result of using 48 levels per decade which as I stated above is perhaps questionable. The difference may also be due to the difference between version 18 used by Jackson et al. and version 19 used here, or due to the different time period studied (1992-1997 cf 1994-2005). Some discussion on this would be nice.

Some research has noted the discrepancy between the position of the maximum in water vapor and the position of deep convection related to the Asian monsoon. Bannister et al. (2004) found that the moist air doesn't enter the stratosphere immediately above the monsoon. Dethof et al. (1999) noted that the maximum in humidity seen by HALOE at 100hPa presented in Jackson et al (1998) is found over Iran which is displaced to the north-west of the the main areas of monsoon convection. Figure 1 for 380K would appear to confirm this, with the highest water vapor located over the Caspian Sea. So I would be interested to see if the area of high water vapor actually does line up with the location of deep convection. Some maps of OLR could be used to illustrate this.

Since I am not convinced that the deep convection does line up with the area of high water vapor, I would like to see more discussion of the role of the monsoon circulation versus direct transport of water vapor by convective penetration to the overworld. It seems to be a big jump to assert that convection reaches 19km and I would like to see more evidence in support of this. Quasi-horizontal transport of water vapor (such as described in Dethof et al. 1999) which avoids the cold point also results in a high

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moisture content over the Asian monsoon that does not involve convection reaching to 19km. The final paragraph does hint at the role of monsoon circulation and introduces doubt over the conclusion on the previous page. Finally the author concludes that the "effects of convection" extend to 19km. This is somewhat vague because the distinction between the convective penetration and quasi-horizontal transport cannot be made on the evidence presented in the article.

Dethof et al 1999, Q. J. Roy. Met.Soc. Volume 125, Number 556, April 1999 Part B, 1079-1106(28).

Jackson et al 1998, Q. J. Roy. Met.Soc. Volume 124, Number 545, January 1998 Part A, 169-192(24)

Randel et al 1998, J. Atmos. Sci. Vol. 55, No. 2, pp. 163-185

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