Update on Stratospheric Water Changes

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A recent paper (Hurst et al. 2011) detailed temporal changes in stratospheric water vapor over Boulder for the period 1980-2010. This paper showed periods of varying change, some of which were due to changes in stratospheric methane oxidation. Using satellite observations, we are able to look specifically at the region of stratospheric entry in the tropics. This record, using UARS HALOE and Aura MLS data extends from the early 1990s to the present. There are some notable breakpoints in this record. The drop in water vapor at the end of 2000 has been described in detail (Randel et al. 2006; Rosenlof and Reid, 2007). More recently, in late 2010, another breakpoint occured; in this case the stratospheric entry value of water vapor increased significantly. This starts in late 2010, and a positive anomaly of greater than 0.5 ppmv is seen in the MLS 82 mb tropical data record (Figure 1). In this presentation, we will show the water vapor time series, both in the tropics and at higher latitudes, discuss possible reasons for the noted changes and potential radiative impacts.

Hurst, D.F., S.J. Oltmans, H. Vömel, K.H. Rosenlof,S.M. Davis, E. A.Ray, E.G. Hall, A. F. Jordon (2011), Stratospheric water vapor trendsover Boulder, Colorado: Analysis of the 30 year Boulder record, J. Geophys. Res., 116, D02306, doi:10.1029/2010JD015065.

Randel, W. J., F. Wu, H. Vomel, G. E. Nedoluha, and P. Forster (2006), Decreases in stratospheric water vapor after 2001: Links to changes in the tropical tropopause and the Brewer-Dobson circulation, J. Geophys.Res., 111, D12312, doi:10.1029/2005JD006744.

Rosenlof, K. H., G. C. Reid (2008) Trends in the temperature and water vapor content of the tropical lower stratosphere: Sea surface connection, J. Geophys. Res., 113, D06107, doi:10.1029/2007JD009109.

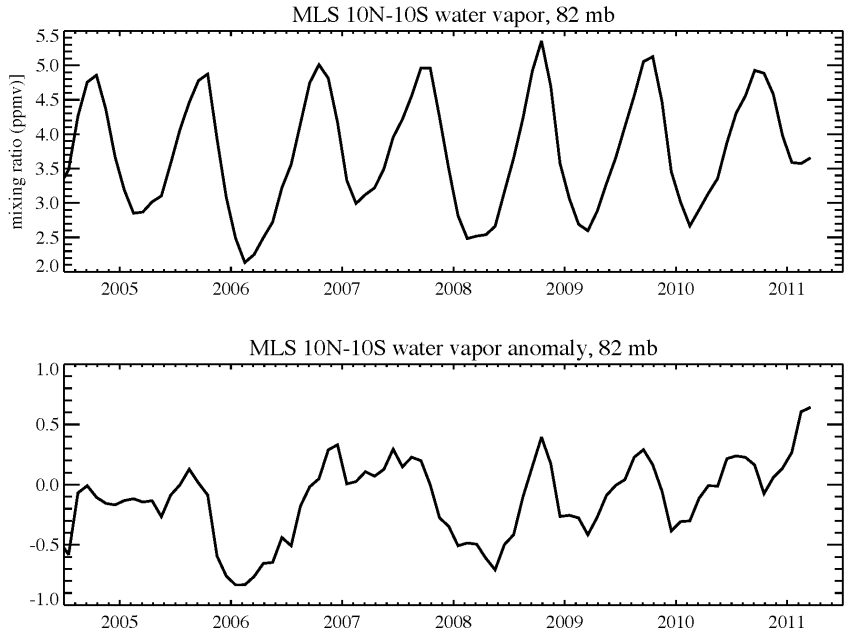

Figure 1. Top panel, MLS tropical water vapor at 82 mb. This corresponds to the entry value of stratospheric water vapor. Bottom panel, the same time series, shown in anomaly space, with anomalies calculated relative to monthly means.