Is There Evidence of Convectively Injected Water Vapor in the Lowermost Stratosphere Over Boulder, Colorado?

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Anderson et al. (2012) reported the frequent presence of convectively injected water vapor in the lowermost stratosphere over North America during summertime, based on aircraft measurements. They asserted that enhanced catalytic ozone destruction within these wet stratospheric air parcels presents a concern for UV dosages in populated areas, especially if the frequency of deep convective events increases. *Schwartz et al.* (2013) analyzed 8 years of more widespread Aura Microwave Limb Sounder (MLS) measurements of lower stratospheric water vapor over North America and concluded that anomalously wet (>8 ppm) air parcels were present only 2.5% of the time during July and August. However, given the 3-km vertical resolution of MLS water vapor retrievals in the lowermost stratosphere, thin wet layers deposited by overshooting convection may be present but not readily detectable by MLS.

Since 1980 the balloon-borne NOAA frost point hygrometer (FPH) has produced nearly 400 high quality water vapor profiles over Boulder, Colorado, at 5-m vertical resolution from the surface to the middle stratosphere. The 34-year record of high-resolution FPH profiles obtained over Boulder during summer months is evaluated for evidence of convectively injected water vapor in the lowermost stratosphere. A number of approaches are used to assess the contributions of deep convection to the Boulder stratospheric water vapor record. The results are compared to those based on MLS profiles over Boulder and the differences are discussed.

REFERENCES:

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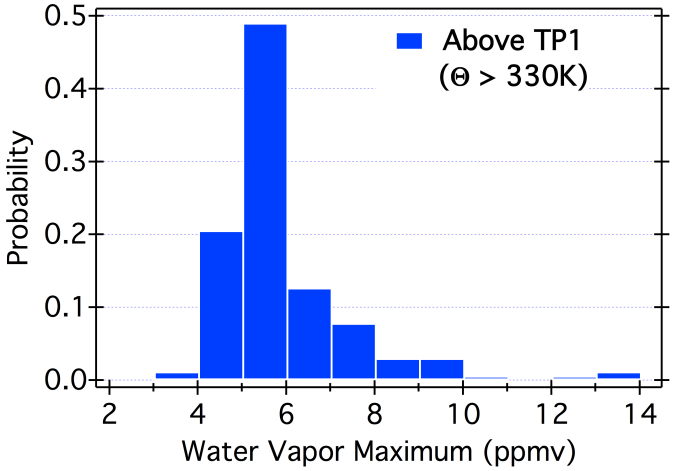

Figure 1. Histogram of the maximum summertime water vapor mixing ratios measured by the NOAA Frost Point Hygrometer above the first lapse rate tropopause (TP1) over Boulder from 1980-2014. Values exceeding 8 ppmv denote anomalously wet air masses and may indicate that convective activity significantly moistened the lowermost stratosphere.