



Water vapor pressure versus environmental lapse rate near the tropopause

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The relationship between water vapor pressure and temperature lapse rate in the vicinity of the tropopause was investigated using in situ observations. The water vapor partial pressures and the lapse rates within a vertical distance of ± 1.5 km around the first thermal tropopause were calculated from the vertical soundings conducted by the NOAA/CMDL at several locations in the last few decades (GMD Data Archive). A positive non-linear relationship between the two quantities was found to hold across the studied tropopause region at mid-latitudes and polar latitudes. A similar analysis was performed on the 300 and 250 hPa pressure levels (which often intercept the tropopause region), by collecting temperature and humidity observations within 1979-2008 from the Integrated Global Radiosonde Archive (IGRA). A relationship having almost the same shape was detected for statically stable lapse rates at all latitude zones. Given the relevance of water vapor in the radiative transfer in the upper troposphere, the results are an indication of a local influence of water vapor on the thermal structure of the transition layer between the troposphere and stratosphere