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Title:The wintertime South Pole tropospheric water vapor column: Comparisons of radiosonde and recent terahertz radiometry, use of the saturated column as a proxy measurement, and inference of decadal trends
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Abstract: We use a fifty-year record of wintertime radiosonde observations at the South Pole to estimate the precipitable water vapor column (PWV) over the entire period. Humidity data from older radiosondes is of limited reliability; however, we think an estimation of PWV is possible using temperature data because the wintertime lower troposphere is very close to saturated. From temperature data we derived PWVSAT which is the PWV if the troposphere was saturated over the entire column. Comparisons to recent radiosonde humidity data indicate that PWV similar or equal to 0.88PWV(SAT). Since 1998 a CMU/NRAO 860 GHz atmospheric radiometer has been operating at the South Pole producing zenith opacity data, tau(o). It is expected that tau(o) proportional to PWV, and also tau(o) proportional to PWVSAT, since the lower atmospheric column is near to saturation. We compare trends in tau(o), PWVSAT, and PWV. PWV and PWVSAT showed little trend in the last fifty years, 1961 to 2010, except perhaps in the last two decades, when PWVSAT was below average, followed by an increasing trend to above average. This increasing trend in the last decade was also observed in tau(o), except for the final two years when it appears that something changed in the instrument response. PWVSAT is a useful metric for estimating PWV in the earlier years of wintertime South Pole radiosonde, and it is generally useful for evaluating the wintertime performance of radiosonde humidity and atmospheric opacity instrumentation.
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