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Raman Lidar Water Vapor Measurement Validation Using a One-Year Radiosonde Dataset in Payerne

E. Brocard (1), R. Philipona (1), A. Haefele (1), D. Ruffieux (1), V. Simeonov (2), and B. Calpini (1)
(1) MeteoSwiss, Payerne, Switzerland (emmanuel.brocard@meteoswiss.ch), (2) EFLUM, EPFL, Lausanne, Switzerland

The Raman Lidar for Meteorological Observations (RALMO) was installed at the MeteoSwiss Regional Center of Payerne, Switzerland, in Summer 2008. One of its aim is to provide continuous vertical profiles of tropospheric water vapor during day and night at a high temporal resolution. Twelve months (10.2009-09.2010) of lidar data are analyzed. During this period of time, the lidar produced 9'086 profiles, representing 52.6% of the time (this figure reached 63.2% for the first 6 months of 2011). In order to validate the capabilities of the instrument, the year of lidar data was compared to the collocated radiosondes. On average, lidar water vapor mixing ratio was found to be within 5 to 10% of radiosonde values up to 8 km at night, and within 3% up to 3 km during the day. Relative humidity results show an agreement within 2 and 5% for day and night, respectively. Integrated water vapor comparison also shows a good correlation with both radiosondes and GPS measurements. The lidar had a 4.2% dry bias compared to radiosondes and a 5.3% wet bias compared to GPS. These results validate the excellent performance of the lidar and the humidity profiles with a 30-minute time resolution.