



Analysis of middle atmospheric H₂O measurements by ground based microwave radiometry and SD-WACCM simulations at Ny-Ålesund, Svalbard

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Two ground based microwave radiometers for water vapour and ozone, MIAWARA-C and GROMOS-C, have been located at the arctic research station AWIPEV at Ny-Ålesund, Svalbard (79° N, 12° E) since September 2015. Both radiometers are specially designed for campaigns and were built at the University of Bern, Switzerland. The instruments provide water vapour and ozone profiles in the middle atmosphere with a high time resolution and under most weather conditions. The time resolution of MIAWARA-C is 2–4 hours, depending on the atmospheric opacity, whereas for GROMOS-C the time resolution is 1 hour. These unique datasets offer the possibility to investigate phenomena in the polar atmosphere like the dynamical events related to the polar vortex or the diurnal cycle of ozone.

In this study we concentrate on the analysis of the continuous water vapour measurements for the last two and a half years at Ny-Ålesund. An intercomparison to MLS measurements, SD-WACCM simulations and the ERA5 reanalysis is performed and reveals good agreement between MIAWARA-C and SD-WACCM in the upper stratosphere and lower mesosphere. However the intercomparison with MLS reveals a bias which persists over the whole altitude range. Further the variability of water vapour is studied on different time scales. We look at the annual cycle including an analysis of the decent rate within the polar vortex and at the diurnal variations in the mesosphere. The water vapour time series shows signs of two and five day wave activity. Special emphasis is given to the investigation of the link between water vapour and ozone chemistry in the mesosphere. The specified dynamics version of the Whole Atmosphere Community Climate Model SD-WACCM is used to support this investigation.