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Overview of middle atmospheric water vapour and ozone measurements at Ny-Alesund in winter 2015/16

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The ground based microwave radiometers MIAWARA-C (middle atmospheric water vapour radiometer) and GROMOS-C (ground based ozone monitoring system) measure water vapour and ozone in the middle atmosphere respectively. The instruments are located at the AWIPEV research base at Ny-Alesund/Svalbard (78°N/12°E) in the Arctic since September 2015. Both microwave radiometers have been developed by the University of Bern, Switzerland. The advantage of the ground based microwave radiometry is a continuous observation of the vertical water vapour and ozone profiles with a high time resolution, depending on tropospheric opacity. In case of ozone hourly profiles are possible whereas in the case of water vapour two to four hours are realistic. As the ozone radiometer is able to observe in the four cardinal directions it is possible to have observations inside and outside of the vortex in case the vortex edge is close to Svalbard. The time series of water vapour profiles clearly shows the decent of air within the polar vortex with a velocity of approximately 300 m/day. In the ozone time series a strong diurnal variation is observed during the transition from polar day to polar night. The observation of water vapour and ozone in parallel allows us to investigate the link between these two quantities in the middle atmosphere. Additionally the effect of the sudden stratospheric warming of February 2016 on water vapour and ozone is analyzed. Inter-comparisons are performed with the microwave radiometer of the University of Bremen (OZORAM) which is also located at Ny-Alesund and with satellite data. We further use the specified dynamics version of the whole atmosphere community climate model (WACCM) to compare model output and data from the different instruments in order to better characterize processes in the Arctic winter.