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Measurements of mesospheric O_3 and H_2O using ground-based microwave radiometry in the high Arctic

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At the AWIPEV research base in Ny Ålesund, Spitsbergen, an extensive set of atmospheric experiments is conducted. Among those, mesospheric O_3 and H_2O using ground based microwave radiometry are measured (Project SACOSAT in the DFG priority programm SPP-1176 CAWSES).

Ground based microwave radiometry offers a high time resolution of the evolution of the atmospheric constituent at a well defined and small spot. Together with the slow change of the solar illumination those measurements offer the opportunity to observe chemical and dynamical effects in the middle atmosphere depending on the solar illumination.

Measurements for the winters 2006/07, 2007/08 and 2008/09 are presented and analysed. The measurements are comparable to previous measurements of mesospheric O_3 and H_2O and, in the stratosphere, compare well to the O_3 obtained using ECMWF ERA 40 data. The mesospheric O_3 (ECMWF ERA 40), however, shows deficiencies.

Three detailed studies were conducted using the measurement set obtained so far: The variation of O_3 and H_2O with solar illumination and the signature of the SPE 2006 in the measured O_3. While the diurnal variation of O_3 can be reproduced using a state of the art 1D model there are hints, that H_2O shows also a distinct dependency on the solar illumination which is not captured using the same chemical model. The analysis of the SPE shows a strong chemical as well as a dynamical effect during the event.