



Variability of winter-time middle atmospheric water vapour over the Arctic as observed with a ground-based microwave radiometer

Brigitte Tschanz (1,2), Rigel Kivi (3), Rolf Rüfenacht (1,2), Niklaus Kämpfer (1,2)

(1) University of Bern, Bern, Switzerland, (2) Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland, (3) Finnish Meteorological Institute, Arctic Research Centre, Sodankylä, Finland

Middle atmospheric water vapour has a long chemical lifetime and can therefore be used as a tracer for dynamics. The ground-based microwave radiometer MIAWARA-C is designed for the use on campaigns and measures profiles of water vapour in the upper stratosphere and mesosphere and thus provides valuable data for the investigation of atmospheric processes. It has been operational for five years and has successfully participated in measurement campaigns under various climatic conditions in Germany, Switzerland, California, Finland and on la Réunion. The temporal resolution of the obtained water vapour profiles approximately 2 hours depending on tropospheric conditions.

During two campaigns from January to June 2010 and from July 2011 to April 2013 in Sodankylä, Finland, MIAWARA-C monitored time series of polar middle atmospheric water vapour for three winters with three Sudden Stratospheric Warmings (SSW) occurring in early 2010, 2012 and 2013. The obtained time series are used to study the effects of the three SSWs on middle-atmospheric water vapour. During an SSW, humid mid- to low-latitude air is transported towards the polar region resulting in a fast increase in water vapour. The descent of water vapour after the SSW allows the estimation of the descent rate over the polar region as the normal wintertime circulation reforms. Results from the three SSWs are compared. The ground-based water vapour data is combined with sonde data of the Finnish Meteorological Institute and ground-based microwave wind measurements for one winter in order to obtain a more complete picture of the dynamics in the polar winter atmosphere.