

File Revision Date:

October 1, 2019

Data Set Description:

PI: Peter Forkman  
Instrument: Ground-based 22 GHz microwave spectrometer  
Site(s): Onsala Space Observatory, Sweden  
Measurement Quantities:  
Mixing ratio of H<sub>2</sub>O

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Reference Articles:

Nedoluha, G. E.,..., Forkman, P., et.al.: The SPARC water vapor assessment II: intercomparison of satellite and ground-based microwave measurements, *Atmos. Chem. Phys.*, 17, 14543-14558, doi:10.5194/acp-17-14543-2017, 2017

Christensen, O. M. and Eriksson, P.: Time series inversion of spectra from ground-based radiometers, *Atmos. Meas. Tech.*, 6, 1597-1609, doi:10.5194/amt-6-1597-2013, 2013

Scheiben, D., Straub, C., Hocke, K., Forkman, P., and Kämpfer, N.: Middle atmospheric water vapor and ozone anomalies during the 2010 major sudden stratospheric warming, *Atmos. Chem. Phys.*, 12, 7753–7765, 2012

Haefele, A, E. De Wachter, K. Hocke, N. Kaempfer, G. E. Nedoluha, R. M. Gomez, P. Eriksson, P. Forkman, A. Lambert, and M. Schwartz: Validation of ground based microwave radiometers at 22 GHz for stratospheric and mesospheric water vapour *J. Geophys. Res.*, 114, 2009

Forkman P., P. Eriksson and A. Winnberg: The 22 GHz radio-aeronomy receiver at Onsala Space Observatory, *Journal of Quantitative Spectroscopy & Radiative Transfer*, Vol. 77, pp.23-42, 2003

#### Instrument Description:

The instrument is a microwave spectrometer observing atmospheric thermal emission at 22.23 GHz from the ground. It consists of an ambient heterodyne receiver and multi-channel spectrometer, and records the spectral lineshape of a water vapor rotational transition every 5 minutes at 20 and 90 degrees elevation. Observations continue 24 hours a day whenever weather permits. A water vapor mixing ratio profile as a function of pressure can be retrieved from each of the water vapor spectra obtained. Averages of the spectral data over 24 hour periods are processed routinely.

#### Algorithm Description:

A water vapor mixing ratio profile (ppmv) from 10 hPa to 0.024 hPa (or 32 - 77 km) is retrieved for every hour period using the optimal estimation retrieval method. We report weekly averages to the NDACC database.

#### Expected Precision/Accuracy of Instrument:

Observation error, measurement response and vertical resolution for each water vapor profile at each retrieved pressure level are reported in the NDACC data set.

#### Instrument History:

Version 1: 2002 – 2012 , Spectrometer bandwidth: 20 MHz, resolution: 25 kHz

Version 2: 2013 - , Spectrometer bandwidth: 200 MHz, resolution: 12.2 kHz