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Data Set description:

PI: Axel Murk
Institute of Applied Physics
University of Bern, Switzerland
Instrument: GROMOS-C (GRound-based Ozone MOnitoring System for Campaigns)
Site: Ny-Alesund
Measurement Quantities: Ozone profiles

Contact Information:

Name: Axel Murk
Address: Institute of Applied Physics
University of Bern, Switzerland
Sidlerstr. 5
CH-3012 Bern, Switzerland
Phone: +41 31 631 86 74
Email: axel.murk@iap.unibe.ch

Reference Articles:

Fernandez, S., Murk, A., & Kämpfer, N. (2015). Design and Characterization of a Peltier-Cold Calibration Target for a 110-GHz Radiometer. IEEE Transactions on Geoscience and Remote Sensing, 53(1), 344–351.

Fernandez, S., Murk, A., & Kämpfer, N. (2015). GROMOS-C, a novel ground based microwave radiometer for ozone measurement campaigns. Atmospheric Measurement Techniques, 8(3), 3001–3048. http://doi.org/10.5194/amt-8-2649-2015

Fernandez, S., Rüfenacht, R., Kämpfer, N., Portafaix, T., Posny, F., & Payen, G. (2016). Results from the validation campaign of the ozone radiometer GROMOS-C at the NDACC station of Réunion island. Atmospheric Chemistry and Physics, 16, 7531–7543. http://doi.org/10.5194/acp-16-7531-2016

Schranz, F., Fernandez, S., Kämpfer, N., & Palm, M. (2018). Diurnal variation in middle atmospheric ozone by ground-based microwave radiometry at Ny-Ålesund over 1 year. Atmospheric Chemistry and Physics, 18, 4113–4130. http://doi.org/10.5194/acp-18-4113-2018

Schranz, F., Tschanz, B., Rüfenacht, R., Hocke, K., Palm, M., & Kämpfer, N. (2019). Investigation of Arctic middle-atmospheric dynamics using 3 years of H2O and O3 measurements from microwave radiometers at Ny-Ålesund. Atmospheric Chemistry and Physics, 19, 9927–9947. http://doi.org/10.5194/acp-19-9927-2019

Schranz, F., Hagen, J., Stober, G., Hocke, K., Murk, A., and Kämpfer, N.: Small-scale variability of stratospheric ozone during the sudden stratospheric warming 2018/2019 observed at Ny-Ålesund, Svalbard, Atmos. Chem. Phys., 20, 10791–10806, https://doi.org/10.5194/acp-20-10791-2020, 2019

Instrument description:

GROMOS-C, the GRound-based Ozone MOnitoring System for Campaigns, is a microwave radiometer built at the University of Bern. It is a campaign instrument and the design is very compact. It needs a power connection and an Internet connection and is then controlled remotely. The instrument has an uncooled heterodyne receiver system with a system temperature of 1080 K. The spectral analysis of the signal is performed with an FFT spectrometer of 1GHz bandwidth and a spectral resolution of 30.5 kHz. In its basic mode GROMOS-C measures the pressure-broadened emission line of ozone at 110.8 GHz. It can however switch to measure the CO line at 115.3 GHz. Additionally, it is possible to retrieve wind profiles from the ozone spectra. Therefore GROMOS-C observes subsequently in the four cardinal directions (N–E–S–W) at 22◦ elevation with a sampling time of 4 s.

Retrieval algorithm:

The retrieval of ozone is performed with QPACK (Eriksson et al., 2005) and ARTS2 (Eriksson et al., 2011), using an optimal estimation method (Rodgers, 1976). The a priori is taken from an MLS climatology of the years 2004–2013. The ozone profiles of GROMOS-C have an altitude range of 20–70 km with a vertical resolution of 10–12 km in the stratosphere and up to 20km in the mesosphere. The time resolution is 2 h.

Accuracy:

GROMOS-C ozone profiles from Ny-Alesund were intercompared with satellite measurements and model data for a 3 year period starting in September 2015 (Schranz et al. 2019). In the stratosphere GROMOS-C shows good agreement with EOS-MLS, ACE-FTS, SD-WACCM and OZORAM (ozone microwave radiometer of the University of Bremen, co-located at Ny-Alesund) during winter, whereas in summer GROMOS-C measures about 10 % higher ozone values than the other datasets. On average GROMOS-C profiles are mainly within 5 % of the other datasets up to 0.5 hPa (about 55 km).

Instrument History:

Ny-Alesund	September 2015 - present
Jungfraujoch, Switzerland:	01/2014 - 04/2014
Maido, La Réunion:	05/2014 - 02/2015