

File Revision Date:

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Data Set Description:

PI:

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until March 2008, also:

Bo Galle
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Instrument:

Fourier Transform Infrared Spectrometer (FTIR) Bruker 125M (from September 2008)

Site:

Harestua solar observatory
Piperveien 490, 2716 Harestua
Norway
60.20 N, 10.80 E, 596 masl

Measurement Quantities:

Column density (molec/cm²) and volume mixing ratio (vmr) vertical profile:
C₂H₆, CFC12 (CCl₂F₂), CH₄, ClONO₂, CO, HCFC-22 (CHF₂Cl),
HCl, HF, HNO₃, N₂O, NO₂, O₃

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Reference Articles:

Van Malderen, et al.: Ground-based Tropospheric Ozone Measurements: Regional tropospheric ozone column trends from the TOAR-II/ HEGIFTOM homogenized datasets, EGU sphere [preprint], <https://doi.org/10.5194/acp-25-9905-2025>, 2025.

Zhou, et al. (2024). Recent decreases in the growth rate of atmospheric HCFC-22 column derived from the ground-based FTIR harmonized retrievals at 16 NDACC sites. *Geophysical Research Letters*, 51(22). <https://doi.org/10.1029/2024GL112470>

Flood, et al. (2024). Evaluating modelled tropospheric columns of CH₄, CO, and O₃ in the Arctic using ground-based Fourier transform infrared (FTIR) measurements. *Atmospheric Chemistry and Physics*, 24(2), 1079–1118. <https://doi.org/10.5194/acp-24-1079-2024>

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Vigouroux, C. et al., Trends of ozone total columns and vertical distribution from FTIR observations at eight NDACC stations around the globe, *Atmospheric Chemistry and Physics*, 15, 2915–2933, <https://doi.org/10.5194/acp-15-2915-2015> (2015).

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de Laat, A.T.J. et al., Validation of five years (2003–2007) of SCIAMACHY CO total column measurements using ground-based spectrometer observations, *Atmospheric Measurement Techniques*, 3(5), 1457–1471 (2010).

Dupuy, E. et al., Validation of ozone measurements from the Atmospheric Chemistry Experiment (ACE), *Atmospheric Chemistry and Physics*, 9, 287–343 (2009).

Vigouroux, C. et al., Evaluation of tropospheric and stratospheric ozone trends over Western Europe from ground-based FTIR network observations, *Atmospheric Chemistry and Physics*, 8, 6865–6886 (2008).

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Dils, B. et al., Comparisons between SCIAMACHY and ground-based FTIR data for total columns of CO, CH₄, CO₂ and N₂O, *Atmospheric Chemistry and Physics*, 6, 1953–1976 (2006).

Yurganov, L.N. et al., Increased Northern Hemispheric CO burden in the troposphere in 2002 and 2003 detected from the ground and from a satellite, *Atmospheric Chemistry and Physics*, 5, 563–573 ((2005).

Yurganov, L.N. et al., A Quantitative Assessment of the 1998 Carbon Monoxide Emission Anomaly in the

Northern Hemisphere Based on Total Column and Surface Concentration Measurements, Journal of Geophysical Research, 109, (D15), D15305, <https://doi.org/10.1029/2004JD004559> (2004).

Mellqvist, J. et al., Ground-based FTIR observations of chlorine activation and ozone depletion inside the Arctic vortex during the winter of 1999/2000, Journal of Geophysical Research, 107 (D20), 8263 (2002).

Galle, B. et al., Ground based FTIR measurements of stratospheric species from Harestua, Norway during SESAME and comparison with models, Journal of Atmospheric Chemistry, 32 (1), 147-164 (1999).

Paton Walsh, C. et al., An uncertainty budget for ground-based Fourier transform infrared column measurements of HCl, HF, N₂O, and HNO₃ deduced from results of side-by-side instrument intercomparisons, Journal of Geophysical Research, 102, 8867-8873 (1997).

Chipperfield, M.P. et al., On the use of HF as a reference for the comparison of stratospheric observations and models, Journal of Geophysical Research, 102, 12,901-12,919 (1997).

Instrument Description:

A Bruker instrument IFS 120M was installed in May 1994 at Harestua which is a solar observatory situated about 50km north of Oslo. Since the first measurements in Sept. 1994, the solar coeliostat of the solar observatory was used. A home made solar tracker has been in operation from 2006, and the instrument was upgraded to IFS 125M (Brault aquisition) and has been used since then.

Instrument IDs:

CTH001 - IFS 120M

CTH002 - IFS 125M

Algorithm Description:

Our data has been evaluated with sfit2 and saved in Ames format up to 2023. Since 2024, Harestua data has been evaluated using the SFIT4 retrieval software (following the NDACC infrared working group harmonization guidelines) and has been archived in HDF file format. We are planning to perform a full reanalysis of all species of the spectral database to produce consistent datasets from 1994 to present.

Expected Precision/Accuracy of Instrument:

Precision and accuracy are species dependent and are usually described in the papers listed above. Line shape measurements with HBr cell are performed monthly. We use linefit v9 for ILS.

License Type

Attribution-NonCommercial-ShareAlike

Instrument History:

July 2008 Upgrade of instrument to IFS 125M

Sep. 2008 New KBr beamsplitter

Oct. 2009 Compressor connected to instrument

Apr. 2010 New aperturewheel installed in instrument

May 2013 Tracker controller problem again. 4 weeks downtime

Sep. 2013 Laser encoder failure. Sent to Bruker. 7 weeks downtime

Oct. 2013 Sun tracker failure. 8 weeks downtime

Nov. 2015 Laser-freq. stability problem. 9 weeks downtime.

Dec. 2015 A new laser was installed

Aug. 2016 Installation of new control PC running Windows 10
Dec. 2016 Laser encoder problems. Encoder/motor sent to Bruker.
July 2017 Tracking problems due to defect photo diode.
Sep. 2019 No measurements during the next four months due to a broken laser
Jan. 2020 The new laser has straylights. No measurements until May.
March 2021. New laser was installed.
2023: Major power failure of several winter months at the measurement station
resulting in damaged KBr beamsplitter. In December 2023/January 2024, the
instrument was running again with a new laser and a new KBr beamsplitter.

Days of observations with the IFS 125M instrument:

2008	46
2009	54
2010	56
2011	55
2012	49
2013	29
2014	53
2015	43
2016	49
2017	47
2018	57
2019	39
2020	35
2021	37
2022	41
2023	22
2024	56