File Revision Date:
May 3rd, 2025

Data Set Description:

PI: Yao Té, Pascal Jeseck, Hao Fu, Corinne Boursier and Christof Janssen
Instrument: Fourier Transform Infrared Spectrometer (FTIR)
Site: Paris, France, (48.846 N, 2.356 E, 60 m asl)
NDACC Urban site
Measurement Quantities: Atmospheric trace gases using direct solar absorption spectroscopy. Vertical column abundances (in molecules per cm^2) and profiles of several trace gases above Paris (in volume mixing ratio)

Contact Information:

Name: Yao Té
Address: Sorbonne Université – Campus Pierre et Marie Curie
MONARIS laboratory
4 Place Jussieu
75005 Paris
France
Phone: +33 1 44 27 96 07
Email: yao-veng.te@sorbonne-universite.fr

DOI:

Data License:

Instrument Description:

A Bruker IFS 125-HR Fourier Transform infrared Spectrometer (FTS) has been operating in Paris since 2007, using only a CaF_2 beamsplitter with the InSb detector coupled to several optical filters. From 2011 on, measurements became more regular.
The FTS is operated in a solar absorption geometry. The maximum optical path difference that can be realized is 258 cm, corresponding to a spectral resolution of 0.0035 cm^{-1} (using Bruker's spectral resolution formula). Normally, a resolution of 0.005 cm^{-1} (OPD of 180 cm) is chosen. For solar observations the spectral range between 1900 and 5000 cm^{-1} and the NDACC optical filter set are used.
The instrumental line shape (ILS) is routinely monitored through HBr (#80) gas cell measurements. The cell spectra are analyzed using the LINEFIT software (F. Hase, 1999).

Algorithm Description:

All data in the NDACC archive has been processed with the latest versions of SFIT4 (version 1.0.18, March 2022) following the current NDACC/IRWG standard retrieval guidelines (https://www2.acom.ucar.edu/irwg). This includes HITRAN 2020 or ATM2020 plus updates, NCEP temperatures and pressures as distributed by NDACC, as well as a priori profiles from the WACCM version 7. The actual version of SFIT4 includes uncertainty estimates based on sensitivities that are calculated in the retrieval model for many retrieved, forward model and

instrumental parameters. These uncertainty estimates are included in the HDF archived data files along with the best estimate of the water vapor profile at the time of the measurement, the mixing ratio profile and the air mass profile.
Previous privately delivered data were retrieved using PROFFIT9.6 (Hase *et al.*, 2004).

Expected Precision/Accuracy of Instrument:
According to NDACC-IRWG requirements.

Instrument History:

2006:

- Purchase of the IFS-125HR and sun-tracker from Bruker. The IFS-125HR was delivered with InSb and MCT detectors in October.
- HeNe laser Spectra Physics model 117A
- Purchase of the sun-tracker protection dome (Astroplast, Germany).

2007 - 2012:

- On March 2007, first solar absorption measurements of the FTS-Paris from the terrace of the Tower 45-46.
- Purchase of 7 NDACC optical filters.
- Regular measurements using the InSb detector together with NDACC optical filters.
- Use of the first HBr cell (#10).
- Purchase of the InGaAs detector (D424H) from Bruker.

2013:

- Purchase of the HCl cell.
- Instrument optical alignment of the IFS-125HR with Frank Hase.
- Monitoring of the IFS-125HR Instrumental Line Shape (ILS).
- KBr entrance window.

2014:

- Replacement of the scanner motor.
- Optical realignment of the IFS-125HR instrument to maintain the required values (ME and phase).
- Alternatively switching between TCCON measurements using InGaAs detector and part of NDACC measurements using InSb detector associated with optical filters.
- TCCON data starts on September 2014.

2015:

- Purchase of the second HBr (#80) and N_2O cells for NDACC ILS measurements.
- Replacement of the HeNe laser (new laser SIOS#01).

2016:

- Reception of the HBr and N_2O cells.
- Optical realignment of the IFS-125HR to maintain the required values (ME and phase).
- Replacement of the IFS-125HR electronics (M15 → M16). Optimization of the potentiometer to reduce possible ghosts and XSM = 1. Adding a patch for the new electronic.

2017:

- Beginning of 2017: no solar absorption measurement due to ozone gas cell measurements for a laboratory spectroscopic study.

2018:

- February to end of April: no solar absorption measurements due to renovation of the sun-tracker (old photodiode pointing system → cam-tracker system + new mirrors for the sun-tracker).
- 6th July 2018: exchange of entrance windows (KBr → CaF_2).
- Installation of the cam-tracker with a Bruker engineer and following control of the IFS-125HR ILS.
- Alternatively switching between TCCON and NDACC measurements; since mid-2018, 4 NDACC optical filters are associated with the InSb detector.

2019:

- October 2019: replacement of the SIOS#01 laser (new laser SIOS#02) and optical alignment of the instrument.

2020:

- March to end of April 2020: no solar absorption measurement due to sanitary lockdown. The IFS-125HR was OFF following the campus rules.

2021:

- No comment.

2022:

- January to April 2022: the automatic opening of the sun-tracker dome is out of order. However, the dome can still be operated manually and solar absorption measurements are ongoing.
- November 2022: damage to the coating of the two entrance mirrors in the source compartment. Replacement of both mirrors in March 2023.

2023:

- January 2023: HeNe laser (SIOS#02) break-down after an unscheduled power breakdown. Repair & replacement of the laser until May 2023.

2024:

- June 2024: start of FTSpectRA, a new software for the automation of FTS-Paris measurements in NDACC & TCCON configurations.

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