MetaData File provided: July 1999.
Latest Revision : 02-September-2025.

Data License:

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Data Set Description:

PI: Daniel. SMALE
Earth Sciences New Zealand Ltd
(ESNZ)
Lauder, New Zealand

Co-PI: John. ROBINSON
Earth Sciences New Zealand Ltd
(ESNZ)
Lauder, New Zealand

Instrument: Infrared Fourier Transform Spectrometer (FTIR)

Site(s): Arrival Heights, Ross Island, Antarctica
77.83 S, 166.66 E, 220m

Measurement Quantities: Profile and total vertical column abundances above measurement site
(profile: volume mixing ratio .total column: number of molecules per sq. cm)

Contact Information:

Name: D.SMALE, J.ROBINSON
Address: Earth Sciences New Zealand Ltd.
Private Bag 50061
Omakau
Central Otago
New Zealand
Phone: +64/3.4400424 or +64/3.4400055
FAX: +64/3.4473348
Email: dan.smale@niwa.co.nz, john.robinson@niwa.co.nz

Note:

Until the end of 2001, the Co-P.I. for this programme was Frank Murcray, who was at the University of Denver, USA.

Until the end of 2010, the P.I. for this programme was Stephen Wood, formally of the National Institute for Water and Atmospheric Research Ltd (NIWA)

The current MIR-FTIR team would like to thank the former PI's for their past and continuing contribution to the current MIR research program.

Instrument Description and History:

MIR-FTIR measurements were made at Arrival Heights
with a Bomem DA2 FTS (NIWA005) (opd=50cm) and EOCOM FTS (opd = 20) from 1992 to 1996 and for some short campaigns
before that. HNO3 and HCl only.
This data has been reprocessed with the most current retrieval strategies, total column only.

A Bruker 120M (opd 257cm-1, 0.0035cm-1) was installed at the site in December 1996.

Full NDACC filter set and two detectors (MCT and InSb)
Solar absorption measurements are made in 6 bandpass region spanning 2 to 10 microns (700 to 4100 cm-1)

A Lauder designed tracker can track either sun or moon.

In 2006 a new laboratory was built, 50 metres away. instruments moved over in Dec 2006.

From 1996 to 2009 in the winter period lunar absorption measurements are made at 10 microns.

Operation is semi-automated and logistic support is provided by Antarctica New Zealand.

Since 2002 monthly HBr cell spectra measurements are made and analyzed with Frank Hase's LINEFIT code.

In November 2014 a Bruker-125HR has been installed at Arrival Heights using standard NDACC filters and detectors.
Spectra are taken at a 0.0035cm-1 resolution (257cm opd).
Both the 120M and 125HR operated in parallel over the period Nov 2014 to February 2016.
The inter-comparison was completed and the Bruker 120M is retired as of February 2016.
Analysis and results presented at the NDACC IRWG, 2017, Paris.
Results can be found at:
https://www.acom.ucar.edu/irwg/IRWG_2017_posters/Smale_AHT_comp_2017_poster_v1.pdf

The Bruker 120M was retired in February 2016.
The Bruker 125HR continues measurements.

In Dec 2017 a new solar tracker replaced the older one.
From Dec 2017 Hbr Cell spectra measurements were replaced with N2O cell measurements.

In the winer of 2019 lunar obs restarted and made when possible.

Effect of Covid-19: Measurements from Aug to Oct 2020 were effected by Covid, there were no measurements.
The instrument could not be fixed until Oct 2020.

Metrology laser failure on 24th Jan 2023, no measurements until it was fixed ~15th August 2023. From April to August is the polar night, so
only lost observations for Feb and Mar 2023.

Instrument IDs:
Bomem DA2: NIWA005 (1191-1995)
AHTS Bruker 120M: NIWA003 (1996-2016)
AHTS Bruker 125HR: NIWA004 (2014- present)

Algorithm Description:
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Vertical abundances for total and selected partial columns are retrieved by matching synthetic spectra to the measured absorption spectra in selected micro-windows containing isolated and well characterized line(s) of the target gas.

The algorithm algorithm in use for the curve fitting is SFIT4 (versions 0944 and 1018), developed by B.J.Connor,
C. P. Rinsland, J. Hannigan and M. Palm. It uses a forward
model that simulates the measured spectrum given a model atmosphere, instrument parameters and viewing direction. The SFIT4 codes use optimal estimation techniques and can vary mixing rations of fitted gases in individual layers to achieve the fit (profile fitting).

Even where the goal is the retrieval of total column, the profile fitting can give better sensitivity, especially in the Antarctic context, where vertical profiles of target species

have larger seasonal perturbations. However, the algorithm does use a priori data and a decision
has to be made as to whether a priori profiles in the retrievals are kept constant for all days,
or if a priori profiles are chosen or adapted for the meteorological conditions on a given day.
For details of retrievals of particular molecules, contact the P.I.

Ancillary data:
-Line compilation : HITRAN 2000-2020 with published updates, TOON GFIT linelists 'ATM' also used.
(special files for ClONO2, CHClF2, ...)
-Physical models : PT profiles used are daily NMC.

Current retrieval strategy:
-SFIT4_v0944 and SFIT4_v1018(f90) with FITBIN41 (f90) or WRAPDAT(IDL) batching codes
    Column and profile retrievals
    IRWG compliant micro-windows
    NCEP daily P,T profiles
    A priori species profiles: from WACCMv6 CCM model simulations
    48 layer atmosphere
    Hitran 2000-2020 and/or Geoff Toon's (JPL) ATM linelist (2012,2016) compilation (species dependent)
-Prepdat5 spectra pre-processing (f90)
    OPUS to BNR
    Contains hard-coded legacy timing adjustments, site specific coding.
-IDL post processing, visualization, QC/QA, HDF formatting
-Linefit14
-Monthly routine processing (bare minimum):
    HBr and N2O Cell tests, Pre-processing Spectra QA/QC, retrieval of O3, CO and CH4

Expected Precision/Accuracy of Instrument:
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Based on tests with NDACC N2O and HCl sealed cells,precision and accuracy are estimated at +/- 2% and +/- 4% respectively.
Uncertainty analysis is performed per retrieval and reported as systematic and random components.

NDACC IRWG N2O cell #18 measured in Arrival Heights 120M (NIWA003) and 125HR (NIWA004)

NDACC Submission to date:
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Profile: H2CO, CO, N2O, HNO3, CH4, C2H6, HCl, HF, O3, HCN, OCS (from 1996 onwards)
Total column: ClONO2 (from 1996 onwards)
HDF4 format
Data template: GEOMS-TE-FTIR-002, GEOMS-TE-FTIR-003 for Ozone (O3)
Bruker 120M data till end of 2015. Bruker 125HR data is from 2015 onwards.

Data rules of use in NDACC HDF files:
These data have been provided with the understanding
that anyone accessing the data will contact the PI of the Lauder FTIR program, Dan Smale (dan.smale@niwa.co.nz), to discuss the intended uses of the data. Measurement work at NIWA is funded
under a contract that requires identification of end-users of the data. Use of these data without consultation with the programme PI may jeopardize the renewal of this contract and hence the
future of the FTIR measurement programme.'

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