MetaData File provided: November 1996.
Latest Revision : 02-September-2025.

Data License:

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): Earth Sciences New Zealand Ltd.
Lauder, NDACC Primary Station, New Zealand
45.0 S, 169.7 E, 370m
(see also separate meta file for Arrival Heights, Antarctic site)

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:

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Note:

Until the end of 2001, the P.I. for this programme was Nicholas B. Jones, who is now at the University of Wollongong, NSW, Australia.

From 2001 to 2011, the P.I. for this programme was Stephen W. Wood.

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:

Campaign based measurements with a Bomen DA2 were made at lauder over the period 1986-1987 (NIWA005).
This data is currently not submitted to the NDACC database. Any inquires on this data can be directed to the current PI.

A commercial Bruker IFS 120 HR operated from September 1990 to August 1992,
and was then replaced by a Bruker IFS 120M (NIWA002). Both instruments were/are fitted with MCT and INSb detectors. The nominal range covered is
750-1250, 1900-2200, 2400-3100, and 4000-4300 cm-1, based on a standard
set of NDSC filters. Spectra resolution: 0.0035cm-1 (257cm opd).
Some measurements have also been made out to 5000 cm-1
The 120M instrument is also uv/vis capable, and preliminary measurements
from 15,000-35,000 cm-1 have been made.

In 2000 a new Bruker IFS 120HR (NIWA001) was purchased.
NDACC filters were installed and the standard range of NDACC measurements
are being made on a daily basis, when weather permits.
It became the primary instrument for NDACC MIR-FTS measurements in October 2001.

From 2003-2011 NIR obs were also taken on the 120HR, time-share was required.

In 2011 a Bruker 125HR (NIWA006) was installed at Lauder for dedicated NIR TCCON observations.
Thus a MIR-120HR and NIR-125HR collected spectra in parallel.

In May 2017 a new Bruker 125HR (NIWA008) was installed at Lauder to replace the 120HR (NIWA001).
NIWA006 became the primary MIR-FTIR, with the new 125HR (NIWA008) becoming the primary NIR-FTIR.
An over lap of MIR obs (for inter-comparison purposes) between NIWA001 and NIWA006 was conducted
from Nov 2017 to Apr 2018.

Instrument IDs:
Lauder 125HR: NIWA006 (May 2017 - present)
Lauder 120HR: NIWA001 (Oct 2001- April 2017)
Lauder 120M: NIWA002 (1990- Oct 2001)
Bomem DA2:   NIWA005 (1986-1987)

also:
Lauder 125HR NIWA008 NIR/TCCON obs

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 ratios of fitted gases in individual layers to achieve the fit (profile fitting). Uncertainty estimates are also produced.

Ancillary data:
-Line compilation : HITRAN 2000-2020 with published updates, TOON GFIT linelists 'ATM' also used.
(special files -psuedolines- for ClONO2, CHClF2, ...)
-Physical models : PT profiles used are daily NMC.
-ILS: parameterized based on HBr and N2O cell measurements and analysis (LINEFIT)

Current retrieval strategy:
-SFIT4_v0944 or SFIT_v1018 (f90) with FITBIN (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
    47 layer atmosphere

Hitran 2000-2020 and/or Geoff Toon's (JPL) ATM linelist (2012,2016,2020) 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 for Hbr and N2O Cell analysis
-Monthly routine processing (bare minimum):
HBr and N2O cell tests, Pre-processing Spectra QA/QC, retrieval of CO, O3 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

An inter-comparison between the Lauder 120M (NIWA002) and the NPL 120M was carried out in 1996. A paper describing the inter-comparison (Griffith et al 2002) has been published.

HBr (and/or N2O) cell tests are performed monthly to quantify precision, accuracy and ILS.
HBr cell measurements started in 2002.
N2O cell measurements started in 2016.

An inter-comparison between the NIWA001 and NIWA006 was carried out between Nov 2017-Apr 2018.
Comparison results presented at the NDACC IRWG 2019:
"An inter-comparison of solar MIR-FTS measurements of atmospheric gases between a Bruker 120HR and a Bruker 125HR at Lauder, New Zealand (45S)",
Smale, D, et al. 2019, NDACC IRWG 2019
Available at:
https://www.acom.ucar.edu/irwg/IRWG_2019_posters/Smale_irwg_2019_lauder_120hr_125hr_comp_v1.pdf

NDACC Submission to date:
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Profile: H2CO, CO , N2O HNO3, CH4, C2H6, O3, HCl, HF, HCN, OCS from 2001 onwards (NIWA001)
Total column: ClONO2 and all molecules taken with NIWA002 (1990-2001)
HDF4 format
Data template: GEOMS-TE-FTIR-002, GEOMS-TE-FTIR-003 for Ozone (O3)
NIWA001 current till May 2018. NIWA006 data is from May 2018 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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