

Latest Revision: 27 September 2025

MetaData File provided: September 2018

Data Set Description:

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Instrument: Eureka Stratospheric Ozone Lidar (SOLID)

Site(s): NDACC Station "eureka.pearl"
Polar Environment Atmospheric Research Laboratory (PEARL)
Eureka, Nunavut, Canada
80.05°N, 86.42°W, 607 m above sea level

Measurement Quantities: Vertical profiles of:
stratospheric ozone in units of [molecules/cm³, ppmv]
stratospheric and mesospheric temperature in units of [K]
aerosol extinction in units of [km⁻¹]

Data license type: CC-BY-NC-SA license (Attribution-NonCommercial-ShareAlike)

Data DOI: No DOI has been assigned to data archived on NDACC

Location of L0/L1 data: CANDAC servers at Dalhousie University and University of Toronto

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Instrument Description:

The Eureka Stratospheric Ozone Lidar (SOLID) is installed in the building first known as the Arctic Stratospheric Ozone Laboratory (AStrO, operated by Environment Canada) and later renamed the Polar Environment Atmospheric Research Laboratory (PEARL) Ridge Lab, operated by the Canadian Network for the Detection of Atmospheric Change (CANDAC) from 2005 onwards.

[UVB: Include list of instrument spec's that are or are not met. See UVB instrument validation appendix for list of instrument spec's.]

Transmitter:

Laser	LightMachinery Inc., IPEX-848 (unstable resonator optics)
Laser type	Excimer, XeCl
Wavelength	308 nm
Beam size	10 mm x 22 mm
Beam divergence	0.4 mrad
Pulse width	<20 ns
Repetition rate	198 Hz
Pulse energy	up to 250 mJ
Average power	up to 50 W

Raman cell 1.8 m long, 60 psi, H₂

Wavelengths	308 nm (generated by laser) 353 nm (Raman, 1st Stokes vibrational in H ₂)
Pulse energy	152 mJ(@308nm), 20 mJ(@353nm)
FWHM	0.3 nm
Beam divergence	0.15-0.20 mrad (65% of energy)

Receiver:

Telescope	1 m, f 2.5, Newtonian
Field of view	0.2-1.0 mrad
Channels	308, 353, 332, 385, 405 nm
Bandwidth	0.5-20 nm FWHM
Data acq.	Photon Counting
Range resol.	150 m typically

Optical chopper:

Blade	4-slot
Motor	BLDC (Koford Engineering., LLC)
Speed	8910 rpm
Laser trig.	198 Hz (every 3rd slot)
Control type	PID

Detectors and Signal Processing:

Photomultiplier	Thorn EMI, 9863/350 (308, 353, 332, 385 nm); Hamamatsu H5783P-03 (405 nm)
Amplifier	Phillips 770 (308, 353, 332, 385 nm); Optech Inc. PAD-1G (405 nm)
Discriminator	Phillips 704 (308, 353, 332, 385 nm); Optech Inc. PAD-1G (405 nm)
Counters	3 x Optech Inc. FDC-700M, 2 ch, 8 bit/ch, 700 MHz

Algorithm Description:

A traditional data processing algorithm is used to retrieve ozone and temperature vertical profiles from SOLID backscattered signals. During the data processing the ozone number density profiles from elastic (308/353 nm) and Raman channels (332/385 nm) are merged together and averaged in time in order to generate either a nightly mean ozone profile, or a mean profile over some other predetermined time interval. The backscattered signals from elastic 353 nm and Raman 385 nm channels are used to retrieve temperature in the stratosphere and mesosphere (20-80 km). The ozone and temperature retrieval software (GLASS) is written in IDL. Detailed description of the GLASS algorithm can be found in Leblanc et al. 2016, AMT, part 1-3.

Expected Precision/Accuracy of Instrument:

Listed in the data files.

Instrument History:

[dates and description of significant changes in instrument or algorithm]

Note: a typical winter measurement season in Eureka starts from October and ends in March]

- 1992/1993 - system installation and beginning of measurements.
- 1993/1994 - nitrogen Raman channels installed (332, 385 nm).
- 1994/1995 -
- 1995/1996 -
- 1996/1997 -
- 1997/1998 -
- 1998/1999 - water vapour Raman channel installed (405 nm, January 16, 1999).
- 1999/2000 -
- 2000/2001 -
- 2001/2002 -
- 2002/2003 -
- 2003/2004 - nominal operations by EC (Feb 19 - Mar 8, 2004), data processed with AStrO DIAL Analysis software Version 1, data archived in AMES format.
- 2004/2005 - nominal operations by EC (Feb 19 - Mar 6, 2005), data processed with AStrO DIAL Analysis software Version 1, data archived in AMES format.
- 2005/2006 - nominal operations by EC (Feb 18 - Feb 26, 2006), data processed with AStrO DIAL Analysis software Version 1, data archived in AMES format.
- Feb 2006 - Replacement of filters in Raman and Rayleigh channels on February 18, 2006.
- 2006/2007 - nominal operations by EC (Feb 17 - Mar 6, 2007), data processed with AStrO DIAL Analysis software Version 1, data archived in AMES format.
- 2007/2008 - nominal operations by EC (Feb 17 - Mar 4, 2008), data processed with AStrO DIAL Analysis software Version 1, data archived in AMES format.
- 2008/2009 - nominal operations by EC (Feb 8 - Mar 6, 2009), data processed with AStrO DIAL Analysis software Version 1, data archived in AMES format, original laser (Lumonics EXCIMER-600) became inoperable at the end of the campaign.
- 2009/2010 - new laser and chiller installed (LightMachinery Inc., IPEX-848; Thermo Fisher Scientific, Neslab HX300), no operations due to funding issues.
- 2010/2011 - no operations due to funding issues.
- 2011/2012 - no operations due to funding issues.
- 2012/2013 - no operations due to funding issues.
- 2013/2014 - development and testing of new chopper (198 Hz, PID control, BLDC), no measurements.
- 2014/2015 - development and testing of ISA-to-USB adapter for Optech Inc., FDC-700M counter boards, new data acquisition software (LabView), secondary optics and servo control system upgrade, no measurements.
- 2015/2016 - SOLID is operational, using all 5 channels, final tuning and optimization performed, test measurements performed.

- Jan 2017 - nominal operations by DAL (Jan 25 - Mar 10, 2017), participation in 2017 Canadian Arctic ACE/OSIRIS Validation Campaign.
- Oct 2017 - nominal operations by DAL (Oct 18 - Nov 10, 2017).
- Feb 2018 - nominal operations by DAL (Feb 07 - Mar 10, 2018), participation in 2018. Canadian Arctic ACE/OSIRIS Validation Campaign.
- Sep 2018 - traditional ozone data retrieval algorithm is applied (GLASS, JPL, Leblanc et al. 2016, AMT, part 1-3), ozone data are achieved in HDF4 at NDACC.
- Oct 2018 - nominal operations by DAL (Oct 21 - Nov 07, 2018).
- Feb 2019 - nominal operations by DAL (Feb 03 - Feb 24, 2019), participation in 2019 Canadian Arctic ACE/OSIRIS Validation Campaign, laser high voltage power supply failure.
- Aug 2019 - replacement of failed laser high voltage power supply, no operations due 24-hour sunlight.
- Nov 2019 - nominal operations by DAL (Nov 11 - Dec 04, 2019).
- Feb 2020 - nominal operations by DAL (Feb 03 - Mar 10, 2020), participation in 2020 Canadian Arctic ACE/OSIRIS Validation Campaign.
- Sep 2021 - Since Mar 2020 no qualified personnel on site due to COVID-19 travel restrictions. All measurement campaigns are suspended.
- Oct 2021 - nominal operations by DAL (Oct 24 - Nov 19, 2021). Laser high voltage capacitor failure.
- Sep 2023 - Since Nov 2021 no operations due to COVID-19 travel restrictions, laser failure and lack of qualified personnel.
- Nov 2023 - General maintenance of the LIDAR and laser repairs: high voltage capacitor and magnetic assist cable replacement (Oct 20 - Nov 20, 2023). Nominal operations by DAL (Nov 1 - 15, 2023).
- Oct 2025 - Since Nov 2023 no operations due to lack of qualified personnel on site. Data from 2017-2023 processed with GLASS algorithm. Data from 1993-2009 which was already processed with previous algorithms was converted from AMES to HDF format without reprocessing. GLASS reprocessing of 1993-2016 data ongoing.

Reference Articles:

Instrument References

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Refereed Journal Publications

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Other Refereed Publications

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PhD Theses

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