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NDACC Mobile Stratospheric Ozone Lidar Trailer Experiment (STROZ-LITE)
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Data Products
Ozone - vertical profile from 10 km - ~48 km
Temperature - vertical profile from ground to >70 km
Aerosol lidar ratio - vertical profile from ground to ~ 30 km
Water Vapor – vertical profile from ground to ~15 kms

Instrument Description

The Goddard Stratospheric Ozone Lidar has been a participant in NDACC since its inception. This lidar instrument was developed with funding from the NASA Upper Atmosphere Program in 1985. The instrument is housed in a 40' container allowing for transport around the world. The instrument is a combination Differential Absorption Lidar (DIAL), for the measurement of ozone; and a Raman and elastic backscatter lidar (for temperature, water vapor, and aerosol measurements).

The lidar instrument transmits two wavelengths, 308 nm from a XeCl excimer laser, and 355 nm from a YAG laser. The repetition rate for the excimer laser is 100 Hz, and 50Hz for the YAG. The lasers are triggered with a 5 msec offset so that there is no cross-talk between transmitted pulses Backscattered radiation is collected with a 30" Dall-Kirkham telescope and a 4” “mini” telescope for near field channels. Spectral separation is accomplished using beam-splitters and interference filters. Five

return wavelengths are recorded: the two transmitted wavelengths the N 2 Raman scattered radiation from each of the transmitted beams - 332 nm and 382 nm, and the 408 nm water vapor channel. Each of the elastically scattered signals is further split to improve the dynamic range - roughly 2 - 5% is used to retrieve data in the lower stratosphere. The 11 signals are then amplified, discriminated and recorded using photon counting techniques.

The ozone measurement is a two-wavelength differential absorption measurement; 308 nm is absorbed by ozone, and 355 nm is not. The Raman scattered 332 nm radiation includes and absorption signal from ozone, while the 387 nm radiation does not. The atmospheric ozone number density can be retrieved from the difference in slope between the absorbed and not absorbed lidar returns.

Temperature is extracted from the Raman and elastic returns from the YAG laser. A relative density profile is constructed using the 355 nm returns above ~28 km, and the 387 nm return below. When the atmosphere is relatively clean - i.e., little or no volcanic aerosol present - this works well down to below 15 km. When there is a heavy loading of aerosol, however, this vibrational Raman technique breaks down and is not satisfactory for retrieving temperature at those altitudes.

Aerosol information is extracted from the ratio of the elastic return at 355 nm to the normalized Raman return at 387. This is, in essence, the lidar ratio; no assumption of the extinction to backscatter ratio is required as in single wavelength techniques.

Water vapor is retrieved form the ratio of the 387nm to 408 nm signals. Currently this data product can be retrieved from the ground to about 15 kms. However, recent new laser upgrades should extend this range to higher altitudes.

For a discussion of these techniques in more detail please see the references in the accompanying Reference - Techniques list.

<u>Selected Measurement Campaigns</u>

October - November, 1988	Table Mountain, CA	Informal Comp.
July - August, 1989	Table Mountain, CA	STOIC
March - May, 1990	Cannon AFB, NM	Balloon Comp.
June - July, 1991	Table Mountain, CA	Engineering
March, 1992	Table Mountain, CA	UARS Validation
July - August, 1992	OHP, France	NDSC Comp.
October - December, 1992	Lauder, NZ	UARS Validation
March, 1994 - April, 1995	Lauder, NZ	ASHOE-MAESA/NDSC
August, 1995 - February, 1996	MLO, Hawaii	NDSC/TOTE/VOTE/STRAT
February - March, 1997	Table Mountain, CA	STRAIT
June - July, 1997	OHP, France	NDSC
February - March, 1998	Ny Alesund, Svalbard	NAOMI
Aug, 2002	Mauna Loa, HI	HOTI
May, 2003	Mauna Loa, HI	SWAVE
Oct 2005	HOH, Germany	HOPE
Mar-Apr 2005	Sodankyla, Finland	SAUNA-I
Feb, 2006	Sodankyla, Finland	SAUNA-II
Jun-Jul 2011	Lauder, NZ	TOPAL-II
Apr 2012	Lauder, NZ	TWOPAL
Nov, 2012 – Jan, 2014	Mauna Loa, HI	NOJGIE

May, 2015	Maido, Reunion Island	MORGANE
Apr, 2018	OHP, France	LAVANDE
Oct. 2018	HOH, Germany	HOPS
Sep. 2019	Cabauw, Netherlands	TROLIX

References - Technique

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