File Revision Date:
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Data Set Description:

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Instrument: LIDAR

Site(s): Lauder, New Zealand

Measurement Quantities: Vertical profiles of:
Aerosol Backscattering & Extinction
Scattering Ratio
Depolarization Ratio
Atmospheric Parameters (P,T,U)
Potential Temperature and Advection

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Reference Articles:

Morandi M. et al., ESA-LITE: IROE contribution to ground base lidar and LITE correlative measurements, Proceeding ELITE-94, Florence, Italy, 9-10 November 1995, esa WWP-107, 85-90, 1995

Guzzi D. et al., Four years of stratospheric aerosol measurements in the northern and southern hemispheres, Geophys. Res. Lett., vol.26, n.14, 2199-2202, 1999

Instrument Description:

This lidar has been designed by IROE of CNR (Italy) and it is implemented at the National Institute of Water and Atmospheric research ltd. (NIWA) base of Lauder, New Zealand.

The system is a two-wavelength depolarization lidar (355nm and 532nm.

The system includes:

- a Rayleigh lidar for high stratospheric Temperature measurements (355 nm)
- an aerosol backscattering depolarization lidar (532 nm)

The last system is the source for the NDSC datasets.

Algorithm Description:
The datasets include radiosonde meteo parameters from Invercargill station, placed 100km away from Lauder.

Scattering ratio formula is: [(Baer+Bmol)/Bmol] where
Baer= backscattering from aerosols
Bmol= " " pure molecular atmosphere

Depolarization ratio formula 1 is: [Bmie+Bray]s/{[Bmie+Bray]s+[Bmie+Bray]p}
Depolarization ratio formula 2 is: [Bmie]s/{[Bmie]s+[Bmie]p} where
Bmie = Mie backscattering
Bray = Rayleigh "
s = orthogonal polarization
p = parallel "

Molecular atmosphere (density) formula is:
ATM(z) = exp(C1 + C2*z+ C3*z^2 + C4*z^3 + C5*z^4) [Kg/m^3]

The aerosol extinction profile is computed from the aerosol backscattering profile (BACK(z) in the formula) and the K1 K2 & K3 constants as follows:
EST(z) = [K1 * BACK(z)/K2]^(1/K3)

Klett solution => K1 = 1
Iterative solution => K2 = K3 = 1

Expected Precision/Accuracy of Instrument:

The error related to the extinction to backscattering ratio (K) is a function of the optical depth. For thin aerosol layers (optical depth from 2E-2 to 5E-2) errors as large as 100% are possible for the retrieved values of K.
For optical depths larger than 1E-1 errors of the order of 20% or smaller can be expected.

Instrument History:
From January 1994 the complete system operates continuosly.
Data are stored in the NIWA data bank and then transfered via ftp to Florence for data processing.