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Data Set Description:
PI: Leopoldo Stefanutti
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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,

**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  \(\Rightarrow K1 = 1\)
Iterative solution  \(\Rightarrow K2 = K3 = 1\)

**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.