EARLINET Level 3 Data Product Catalogue

Sergio Ciamprone, Lucia Mona, Giuseppe D’Amico

Consiglio Nazionale delle Ricerche

CNR-IMAA

Version 1.0 - 01/03/2019

Summary

1- Introduction

This document describes the ACTRIS/EARLINET Level 3 Data products. Level 3 data are the climatological products obtained from the fully quality controlled (Level 2) data for providing useful aggregated information to the users. The methods applied for obtaining Level 3 products from Level 2 ones are described in a companion document, the EARLINET Level 3 - Algorithm Theoretical Basis Document. This document describes instead the content of the products, including data format and data organization.

Following the standards adopted within EARLINET DC and in agreement with the whole ACTRIS database, Level 3 data are netCDF files, and the variables nomenclature and file format is aligned with the new data format of the pre-processed and processed aerosol remote sensing data. Information about the origin of the files are reported for traceability needs.

The Level 3 data are centrally obtained by the ACTRIS aerosol remote sensing Data Center node of the CNR in Potenza. This allows the harmonization and reproducibility of the products.

2- File naming conventions

Filenames for the Level 3 aerosol profiles follow this convention:
ACTRIS_AerRemSen_sss_Lev03_ mmmmmm _pppp_ttt_vxx_qcyyy.nc

with

- sss: station ID code (see below)
- mmmmmm: average mode (Season= seasonal averages, Annual = annual averages; NorMon =normal monthly averages; NorSea = normal seasonal averages)
- pppp: period of the calculated averages (for the seasonal and annual averages pppp=yyyy; for normal averages pppp code can be written as iiff ii=yy of the initial year; ff=yy for the final year)
- ttt: product type (Int=integrated; Pro=profile)
- vxx: version of the data product. The first verson is 01, the second 02 and so on
- qcyyy: version of the qc used for the evaluation of Level 3 data products (see https://www.earlinet.org/index.php?id=125

the station code is as follows:

ARR	Andøya	LEI	Leipzig	ABY	Aberystwyth
ATZ	Athens	LLE	Lille	HBU	Hamburg
BRC	Barcelona	LIM	Limassol	OHP	Haute-Provence
COG	Belsk	MDR	Madrid	JFJ	Jungfraujoch
INO	Bucharest	MAS	Minsk	KUH	Kuehlungsborn
CBW	Cabauw	NAP	Naples	LAQ	L'Aquila
PUY	Clermont-Ferrand	HPB	Hohenpeissenberg	LKP	Linkoping
UCC	Cork	SIR	Palaiseau	LIS	Lisbon
DUS	Dushanbe	POT	Potenza	MUC	Maisach
EVO	Evora	PAY	Payerne	MUN	Munich
GAR	Garmisch-Partenkirchen	SOF	Sofia	NEU	Neuchatel
GRA	Granada	THE	Thessaloniki		
IPR	Ispra	WAW	Warsaw		
KUO	Kuopio				
SAL	Lecce				

3- Database organization

The Level 3 data products are stored in a zip file containing all the netcdf files, this document describing the file organization and content and the algorithm theoretical basis document.

For each station a new version of the Level 3 dataset contains: 2 annual average files (one for integrated quantities and one for profiles) and 2 seasonal average file (one for integrated quantities and one for profiles) per year plus 2 files (one for integrated and 1 for profiles) for normal seasonal average over the whole considered time period and 2 files (one for integrated and 1 for profiles) for normal month averages over the whole considered time period.

4 - Definition and meaning of the parameters

Each one of the above shortly described file is structured in such a way that for a single station and the decided temporal interval and aggregation the parameters are reported all together. This will allow the users to easily investigate the evolution of the different parameters all together instead of having fragmentary information reported in several files.

For implementing this, both profiling and integrated products have the ***wavelength*** **dimension** (accommodating products at different wavelength in the same variable) and ***time*** **dimension** (accommodating to have different years or season in the same variable, so that temporal analysis can be performed easier). The **dimension *n_char*** instead allows the recording of the names of source files from which the level 3 products are evaluated. The **dimension *nv*** is used following the cf convention whenever a bound is needed for some evaluation. In our case nv is used for defining variables which have per definiotn some bound as time_bounds reported below.

For the profile products an additional **dimension** is defined which is ***altitude*** for reporting the information as a function of the altitude.

All the quantities (variables and attributes) are mandatory for this product, in the sense that the files are written in such a way that all the fields are set up and filled in case information are available and empty or with Fill_Value if not.

In the following the definition and meaning of the variables are reported.

altitude: is the altitude for which the profiles are reported. The profiles indeed are reported at a fixed grid of 200 m of vertical resolution starting from 0 m above the sea level. This harmonized grid allows easier multi-stations combined study. This variable is reported only in profile products. This is linked to the *altitude* dimension.

time: this is the central time for which the climatological values are reported. In annual files, there is just one, while for seasonal products there are 4 times correspondingly to the central day of the 4 seasons. This is linked to the *time* dimension.

wavelength: this variable reports the wavelengths now available for the aerosol extinction and backscatter products in EARLINET, i.e. 355, 532 and 1064 nm. Data at 351 nm are assimilated at the 355 nm and treated as such. However, the different wavelength information is completely traceable through the source file list available inside the Level 3 file itself (see below *source* variable). This is linked to the *wavelength* dimension.

time_bounds: these are the extremes of the temporal range on which calculations are done.

source: this variable contains as text the list of level 2 (or e- and b- files for previous releases) files from which are retrieved values averaged in this file.

latitude: latitude in degrees of the ACTRIS/EARLINET station.

longitude: longitude in degrees of the ACTRIS/EARLINET station.

station_altitude: station altitude above sea level of the ACTRIS/EARLINET station.

Optical property profiles

The aerosol extinction and backscatter profiles are the primary products of the ACTRIS/EARLINET component. In the Level 3 data these quantities are aggregated over different time period for providing climatological information.

The statistical methods for obtaining climatological information is reported in the ATBD (Algorithm Theoretical Basis Document) document. Climatological profile products are reported in a fixed altitude range allowing direct comparisons between the different stations. The grid for the Level 3 profiles starts from 0 m asl and reaches 12 km asl with a vertical resolution of 200 m. This resolution is a good compromise between the need of providing tiny resolution and the needs for collecting a statistically significant number of point for each point in the vertical profile of the Level 3 product.

mean_of_extinction (altitude, wavelength, time): mean of the aerosol extinction value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

median_of_extinction (altitude, wavelength, time): median of the aerosol extinction value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

standard_deviation_of_extinction (altitude, wavelength, time): standard deviation of the aerosol extinction value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

statistical_error_mean_of_extinction (altitude, wavelength, time): mean of the statistical error of the aerosol extinction value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The values of statistical error affecting the aerosol extinction from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

number_of_extinction_profiles_averaged (altitude, wavelength, time): number of the aerosol extinction profiles averaged within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

number_of_extinction_values_averaged (altitude, wavelength, time): number of the values of aerosol extinction averaged within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions). This quantity provides an information about the vertical coverage of the single original EARLINET aerosol extinction profiles.

mean_of_backscatter (altitude, wavelength, time): mean of the aerosol backscatter value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol backscatter values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

median_of_backscatter (altitude, wavelength, time): median of the aerosol backscatter value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol backscatter values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

standard_deviation_of_backscatter (altitude, wavelength, time): standard deviation of the aerosol backscatter value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol backscatter values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

statistical_error_mean_of_backscatter (altitude, wavelength, time): mean of the statistical error of the aerosol backscatter value observed within the time_bound and correspondingly to the specific altitude range and wavelength. The values of statistical error affecting the aerosol backscatter from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

number_of_backscatter_profiles_averaged (altitude, wavelength, time): number of the aerosol backscatter profiles averaged within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol backscatter values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

number_of_backscatter_values_averaged (altitude, wavelength, time): number of the values of aerosol backscatter averaged within the time_bound and correspondingly to the specific altitude range and wavelength. The aerosol backscatter values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions). This quantity provides an information about the vertical coverage of the single original EARLINET aerosol backscatter profiles.

Aerosol Boundary Layer

The lowest portion of the atmosphere where the most of the aerosol are confined is particularly important because of the impacts aerosol can have on different sectors of life, like air quality, health, solar energy production, aviation management, agriculture and fishery. For this reason, since the beginning particular attention was paid by EARLINET to the identification of the top of planetary boundary layer through aerosol lidar measurements. It was agreed within EARLINET community to use aerosol as tracer for identifying a proxy of the planetary boundary layer. In order to clearly state that this proxy has been obtained using aerosol as tracer this quantity is called: aerosol boundary layer. **Aerosol boundary layer** (previously called dust layer height, but renamed in 2019 for avoiding misunderstanding) is defined as the lowest layer that generally contains most of the aerosol except special elevated layers like Saharan dust etc (Matthias et al., 2004) . Within EARLINET, aerosol boundary layer is considered as the mixing layer plus the residual layer, if that exists. The top of this layer can again be identified by a minimum of d/dR (PR^2) (where PR2is the range corrected lidar signal P), but the existence of mixing processes is not required. If several layers exist that are clearly separated, only the lowest layer is labeled "aerosol boundary layer". In the morning, when both mixing layer and the residual layer on top of it may exist, these layers are typically well connected, but 2 local minima of d/dR (PR2) are observed.

The aerosol boundary layer is not evaluated centrally but at the stations. In the Level 3 products, only statistical value of this quantity are reported and evaluated with statistical methods as reported in the level 3 ATBD document.

mean_of_aerosol_boundary_layer (time): mean of the aerosol boundary layer values as reported calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

median_of_aerosol_boundary_layer (time): median of the aerosol boundary layer values as reported calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

standard_deviation_of_aerosol_boundary_layer (nv, time, wavelength): standard deviation of the aerosol boundary layer values as reported calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

statistical_error_mean_of_aerosol_boundary_layer (nv, time, wavelength): mean statistical error of the aerosol boundary layer values as reported calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

number_of_ aerosol_boundary_layer_averaged (nv, time, wavelength): number of the aerosol boundary layer values as reported calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

Optical properties integrated values

The **aerosol optical depth (AOD)** and the **integrated backscatter (IB)** are the integrals over the altitude of the aerosol extinction and backscatter profiles, respectively. These integrated properties directly provide an information about the quantity of aerosol present in the considered portion of the atmospheric column. However, aerosol optical depth and integrated backscatter also depend on the type of the particles, because the extinction and backscatter efficiencies depend on the size, shape and refractive index of the particles. So that it is also important to store the information as a function of the wavelength and also differentiating between extinction and backscatter integrated quantities. In particular, aerosol optical depth is a relevant quantity because it is directly comparable with the same quantity (sometimes called as aerosol optical thickness) retrieved by photometer instruments like the AERONET ones available worldwide and from satellite passive sensors like MODIS and MISR. Then the lidar profiling capability also allows to provide the integrated quantities not only for the whole column but also inside the aerosol boundary layer whenever this is available into the original aerosol optical property profile files.

It has to be noted that for calculating these properties we assume that below the first data provided in altitude by the stations the aerosol is well mixed and the corresponding optical property is constant with the altitude down to the ground. This is a typical hypothesis made in such kind of study and of course is more accurate for stations equipped with lidar with a low overlap range.

Details on how the AOD and IB are calculated from the Level 2 (or e- and b- files for previous versions) are reported in the Level 3 ATBD document.

The following variables are reported about the integrated optical properties:

integral_bounds: this variable indicates whether the integration has been done on the toal comun (integral_bounds=0), or into the aerosol planetary boundary layer (integral_bounds= 1).

mean_of_aerosol_optical_depth (nv, time, wavelength): mean of the aerosol optical depth values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

median_of_aerosol_optical_depth (nv, time, wavelength): median of the aerosol optical depth values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

standard_deviation_of_aerosol_optical_depth (nv, time, wavelength): standard deviation of the aerosol optical depth values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

statistical_error_mean_of_aerosol_optical_depth (nv, time, wavelength): mean statistical error of the aerosol optical depth values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

number_of_aerosol_optical_depth _averaged (nv, time, wavelength): number of the aerosol optical depth values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

mean_of_aerosol_integrated_backscatter (nv, time, wavelength): mean of the aerosol integrated backscatter values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

median_of_aerosol_integrated_backscatter (nv, time, wavelength): median of the aerosol integrated backscatter values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

standard_deviation_of_aerosol_integrated_backscatter (nv, time, wavelength): standard deviation of the aerosol integrated backscatter values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

statistical_error_mean_of_aerosol_integrated_backscatter (nv, time, wavelength): mean statistical error of the aerosol integrated backscatter values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

number_of_aerosol_integrated_backscatter_averaged (nv, time, wavelength): number of the aerosol integrated backscatter values observed correspondingly to the specific integration altitude range (nv), at the specific time range (time) and wavelength. The aerosol extinction values from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or e-files for previous versions).

Indicators of the aerosol vertical distribution

Center of mass

In physics, one refers to the **center of mass** of a body as the hypothetical point where entire mass of an object may be assumed to be concentrated to visualize its motion. In other words, the center of mass is the punctual particle equivalent of a given object for application of Newton's laws of motion. So that, this quantity is important for understanding the dynamics of an aerosol layer and to visualize where is the core of the aerosol content. For estimating the center of mass of the aerosol layer, the **center of mass of the aerosol content** in the portion of atmospheric column is estimated as the backscatter weighted altitude in the considered altitude range (Mona et al., 2006). This quantity is an approximation of the center of mass of the aerosol layer, that exactly coincides with the true center of mass if both composition and size distribution of the particles are constant with the altitude. This estimate of the center of mass gives us information about the altitude where the most relevant part of the aerosol load is located.

The calculation of the center of mass for the total column and inside the aerosol boundary layer is calculated centrally for the Level 3 products delivery. The center of mass is calculated from backscatter profiles (reported in Level 2 products or b-files (or e- when not available in the b-files) for previous releases). Aerosol backscatter profiles are preferred because of the better vertical resolution when compared to extinction profiles. All the wavelengths are considered for the calculation for eventually taking into account the wavelength dependence of the aerosol backscatter.

Details on how the center of mass is calculated from the Level 2 (or e- and b- files for previous versions) are reported in the Level 3 ATBD document.

The following variables are reported for the center of mass:

mean_of_center_of_mass (nv, time, wavelength): mean of the center of mass values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The center of mass is calcaukeed bioth for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

median_of_center_of_mass (nv, time, wavelength): median of the center of mass values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The center of mass is calcaukeed bioth for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

standard_deviation_of_center_of_mass (nv, time, wavelength): standard deviation of the center of mass values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The center of mass is calcaukeed bioth for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

statistical_error_mean_of_center_of_mass (nv, time, wavelength): mean statistical error of the center of mass values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The center of mass is calcaukeed bioth for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

number_of_ center_of_mass_averaged (nv, time, wavelength): number of the center of mass values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The center of mass is calcaukeed bioth for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

H63

The aerosol profiling capability offered by ACTRIS aerosol remote sensing provides the possibility to also investigate the so called **h63**, i.e. altitude below which 63% of the total column aerosol content is confined. This is particularly important because it is the main product used in the study about the vertical distribution of the aerosol at global scale using CALIPSO obsrevations (Winker at al., 2013) and can be also used in studies for compairison with aerosol models.

Both aerosol optical depth and aerosol integrated backscatter are considered because the H63 from AOD is used in CALIPOS and potentially available from AEROCOM, while the aerosol backscatter profiles could be preferred because of the better vertical resolution when compared to extinction profiles. All the wavelengths are considered for the calculation for eventually taking into account the wavelength dependence of the aerosol backscatter.

Details on how the h63 is calculated from the Level 2 (or e- and b- files for previous versions) are reported in the Level 3 ATBD document.

The following variables are reported for h63:

mean_of_h63_of_aerosol_optical_depth (nv, time, wavelength): mean of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

median_of_h63_of_aerosol_optical_depth (nv, time, wavelength): median of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

standard_deviation_of_h63_of_aerosol_optical_depth (nv, time, wavelength): standard deviation of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

statistical_error_mean_of_h63_of_aerosol_optical_depth (nv, time, wavelength): mean statistical error of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

number_of_ h63_of_aerosol_optical_depth_averaged (nv, time, wavelength): number of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

mean_of_h63_of_ integrated_backscatter (nv, time, wavelength): mean of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

median_of_h63_of_ integrated_backscatter (nv, time, wavelength): median of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

standard_deviation_of_h63_of_ integrated_backscatte (nv, time, wavelength): standard deviation of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

statistical_error_mean_of_h63_of_ integrated_backscatter (nv, time, wavelength): mean statistical error of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

number_of_ h63_of_ integrated_backscatter_averaged (nv, time, wavelength): number of the h63 values calculated from the aerosol backscatter coefficient profiles correspondingly to the specific time range (time) and wavelength. The h63 is calculated both for the whole profile and the aerosol boundary layer (accordingly to nv). The aerosol backscatter profiles from which these values are calculated are the ones reported in the EARLINET file (Level2 optical products or b-files for previous versions).

Attribute description

The attributes of the variables are structure in such a way to provide all needed information about units, corresponding name (if existing) in the CF convention, FillValue, and indications about statistical methods applied for the calculation underlying such variable definition.

Global Attributes are mainly information related to traceability of the data where are reported information about: software used for generating Level 3 products, station to which Level 3 data refer to, data originator and data provider and info about potential modification and versions of the Level 3 data. In particular, in agreement with the GEOMS definition (https://evdc.esa.int/documents/1/geoms-1.0.pdf), the **Data Originator** is the person that generated and quality controlled the data. Where no single Data Originator (DO) exists, the DO_NAME and DO_AFFILIATION will hold the name of the entity responsible for the instrument, while the DO_ADDRESS and DO_EMAIL will contain the appropriate contact information. The DO may or may not be the same person as the PI. Specifically, for the ACTRIS/EARLINET Level 3 data, original profiles datafile did not contain the DO information (and often neither the PI information) till beginning of 2019, while this information becomes mandatory with the release of the new version of the database.

4 - Level 3 average profile file NetCDF structure

Example for Annual file structure

Dimension:

- o Name=altitude
- o Name=time
- o Name=wavelength
- o Name=nv
- o Name=n_char

Variables:

- o Name=**altitude**
  Type=double
  N. Dimension=1
  Dimension=altitude
  Number of attribute=5

  Attribute name=units
  Attribute value=m
  Type=text

  Attribute name=long_name
  Attribute value=Altitude of middle point of layer
  Type=text

  Attribute name=axis
  Attribute value=Z
  Type=text

  Attribute name=positive
  Attribute value=up
  Type=text

  Attribute name=standard_name
  Attribute value=altitude
  Type=text

- o Name=**time**
  Type=double
  N. Dimension=1
  Dimension=time
  Number of attribute=6

  Attribute name=units
  Attribute value=seconds since 1970-01-01T00:00:00Z
  Type=text

  Attribute name=long_name
  Attribute value=Time
  Type=text

  Attribute name=calendar
  Attribute value=gregorian
  Type=text

  Attribute name=axis
  Attribute value=T
  Type=text

Attribute name=standard_name
Attribute value=time
Type=text

Attribute name=bounds
Attribute value=time_bounds
Type=text

- Name=**wavelength**
  Type=double
  N. Dimension=1
  Dimension=wavelength
  Number of attribute=2
  Attribute name=units
  Attribute value=nm
  Type=text

  Attribute name=long_name
  Attribute value=Wavelength of the transmitted laser pulse
  Type=text

- Name=**mean_of_extinction**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=5
  Attribute name=units
  Attribute value=1/m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=mean of aerosol particle extinction coefficient
  Type=text

  Attribute name=statistical_method
  Attribute value=mean within months; mean over months
  Type=text

  Attribute name=standard_name
  Attribute name=mean_of_volume_extinction_coefficient_in_air_due_to_ambient_aerosol_particles
  Type=text

- Name=**median_of_extinction**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=5
  Attribute name=units
  Attribute value=1/m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

Attribute name=long_name
Attribute value=median of aerosol particle extinction coefficient
Type=text

Attribute name=statistical_method
Attribute value=weigthed median; weights are computed
inverting the amount of measured profiles by month
Type=text

Attribute name=standard_name
Attribute value=median_of_volume_extinction_coefficient_in_
air_due_to_ambient_aerosol_particles
Type=text

- Name=**standard_deviation_of_extinction**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=5
  Attribute name=units
  Attribute value=1/m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=standard deviation of aerosol particle extinction coefficient
  Type=text

  Attribute name=statistical_method
  Attribute value=weigthed standard deviation; weigths are computed
  inverting the amount of measured profiles by month
  Type=text

  Attribute name=standard_name
  Attribute value=standard_deviation_of_volume_extinction_coefficient_
  in_air_due_to_ambient_aerosol_particles

- Name=**statistical_error_mean_of_extinction**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=5
  Attribute name=units
  Attribute value=1/m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=statistical error mean of aerosol particle extinction
  coefficient
  Type=text

  Attribute name=statistical_method
  Attribute value=mean within months; mean over months
  Type=text

Attribute name=standard_name
Attribute value= statistical_error_mean_of_volume_extinction_coefficient
_in_air_due_to_ambient_aerosol_particles
Type=text

- Name=**number_of_extinction_profiles_averaged**
  Type=integer
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=1
  Attribute name=long_name
  Attribute value=number of aerosol particle extinction coefficient profiles averaged
  Type=text

- Name=**number_of_extinction_values_averaged**
  Type=integer
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=1
  Attribute name=long_name
  Attribute value=number of aerosol particle extinction coefficient values averaged
  Type=text

- Name=**mean_of_backscatter**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=4
  Attribute name=units
  Attribute value=1/m*sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=mean of aerosol particle backscatter coefficient
  Type=text

  Attribute name=statistical_method
  Attribute value=mean within months; mean over months
  Type=text
- Name=**median_of_backscatter**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=4
  Attribute name=units
  Attribute value=1/m*sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=median of aerosol particle backscatter coefficient
  Type=text

Attribute name=statistical_method
Attribute value=weighted median; weights are computed inverting
the amount of measured profiles by month
Type=text

- Name=**standard_deviation_of_backscatter**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=1/m*sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=standard deviation of aerosol particle backscatter coefficient
  Type=text

  Attribute name=statistical_method
  Attribute value=weighted standard deviation; weights are computed
  inverting the amount of measured profiles by month
  Type=text

- Name=**statistical_error_mean_of_backscatter**
  Type=double
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=1/m*sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=statistical error mean of aerosol particle backscatter coefficient
  Type=text

  Attribute name=statistical_method
  Attribute value=mean within months; mean over months
  Type=text

- Name=**number_of_backscatter_profiles_averaged**
  Type=integer
  N. Dimension=3
  Dimension=altitude, time, wavelength
  Number of attribute=1

  Attribute name=long_name
  Attribute value=number of aerosol particle backscatter coefficient profiles
  averaged
  Type=text

- Name=**number_of_backscatter_values_averaged**
  Type=integer
  N. Dimension=3

Dimension=altitude, time, wavelength
Number of attribute=1
Attribute name=long_name
Attribute value=number of aerosol particle backscatter coefficient values averaged
Type=text

- o Name=**time_bounds**
Type=double
N. Dimension=2
Dimension=nv, time
Number of attribute=1
Attribute name=units
Attribute value=seconds since 1970-01-01T00:00:00Z
Type=text

- o Name=**source**
Type=char
N. Dimension=1
Dimension=n_char
Number of attribute=2
Attribute name=long_name
Attribute value=source files
Type=text

Attribute name=description
Attribute value=List of level 2 files from which are retrieved values averaged in this file
Type=text

- o Name=**latitude**
Type=float
N. Dimension=0
Number of attribute=3
Attribute name=units
Attribute value=degrees_north
Type=text

Attribute name=long_name
Attribute value=latitude of station
Type=text

Attribute name=standard_name
Attribute value=latitude
Type=text

- o Name=**longitude**
Type=float
N. Dimension=0
Number of attribute=3
Attribute name=units
Attribute value=degrees_east
Type=text

Attribute name=long_name
Attribute value=longitude of station
Type=text

Attribute name=standard_name
Attribute value=longitude
Type=text

- o Name=**station_altitude**

Type=float
N. Dimension=0
Number of attribute=2

Attribute name=units
Attribute value=m
Type=text

Attribute name=long_name
Attribute value=station altitude above sea level
Type=text

Global attributes (all mandatory):

- Name=processor_name Type=text
- Name=processor_version Type=text
- Name=processor institution Type=text
- Name=system Type=text
- Name=location Type=text
- Name=institution Type=text
- Name=PI Type=text
- Name=PI_affiliation Type=text
- Name=PI_affiliation_acronym Type=text
- Name=PI_address Type=text
- Name=PI_phone Type=text
- Name=PI_email Type=text
- Name=data_originator Type=text
- Name=data_originator_affiliation Type=text
- Name=data_originator_affiliation_acronym Type=text
- Name=data_originator_address Type=text
- Name=data_originator_phone Type=text
- Name=data_originator_email Type=text
- Name=data_provider Type=text
- Name=data_provider_affiliation Type=text
- Name=data_provider_affiliation_acronym Type=text
- Name=data_provider_address Type=text
- Name=data_provider_phone Type=text
- Name=data_provider_email Type=text
- Name=conventions Type=text
- Name=references Type=text
- Name=station_ID Type=text
- Name=__file_format_version Type=text
- Name=history Type=text
- Name=title Type=text

5 - Level3 average integrated values file NetCDF structure

Example for Annual file structure

Dimension:

- Name=nv
- Name=time
- Name=wavelength
- Name=n_char

Variables:

- Name=time
  Type=double
  N. Dimension=1
  Dimensions=time
  Number of attribute=6
    Attribute name=units
    Attribute value=seconds since 1970-01-01T00:00:00Z
    Type=text

    Attribute name=long_name
    Attribute value=Time
    Type=text

    Attribute name=calendar
    Attribute value=gregorian
    Type=text

    Attribute name=axis
    Attribute value=T
    Type=text

    Attribute name=standard_name
    Attribute value=time
    Type=text

    Attribute name=bounds
    Attribute value=time_bounds
    Type=text
- Name=**wavelength**
  Type=double
  N. Dimension=1
  Dimensions=wavelength
  Number of attribute=2
    Attribute name=units
    Attribute value=nm
    Type=text

    Attribute name=long_name
    Attribute value=Wavelength of the transmitted laser pulse
    Type=text

- Name=**integral_bounds**
  Type=byte
  N. Dimension=1
  Dimensions=nv
  Number of attribute=3
    Attribute name=long_name
    Attribute value=integral bounds of integrated values
    Type=text

Attribute name=flag_value
Attribute value=0,1
Type=text

Attribute name=flag_meaning
Attribute value=0:total, 1:aerosol planet boundary layer
Type=text

- Name=**mean_of_aerosol_optical_depth**
Type=double
N. Dimension=3
Dimensions=nv, time, wavelength
Number of attribute=5
Attribute name=units
Attribute value=1
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=mean of aerosol optical depth
Type=text

Attribute name=statistical_method
Attribute value=mean within months; mean over months
Type=text

Attribute name=standard_name
Attribute value=mean_of_atmosphere_optical_thickness_due_to_ambient_
aerosol_particles
Type=text

- Name=**median_of_aerosol_optical_depth**
Type=double
N. Dimension=3
Dimensions=nv, time, wavelength
Number of attribute=5
Attribute name=units
Attribute value=1
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=median of aerosol optical depth
Type=text

Attribute name=statistical_method
Attribute value=weighted median; weights are computed inverting the
amount of measured profiles by month
Type=text

Attribute name=standard_name
Attribute value=median_of_atmosphere_optical_thickness_due_to_ambient
_aerosol_particles
Type=text

o Name=**standard_deviation_of_aerosol_optical_depth**
Type=double
N. Dimension=3
Dimensions=nv, time, wavelength
Number of attribute=5

Attribute name=units
Attribute value=1
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=standard deviation of aerosol optical depth
Type=text

Attribute name=statistical_method
Attribute value=weighted standard deviation; weights are computed inverting the amount of measured profiles by month
Type=text

Attribute name=standard_name
Attribute value=standard_deviation_of_atmosphere_optical_thickness_due_to_ambient _aerosol_particles
Type=text

o Name=**statistical_error_mean_of_aerosol_optical_depth**
Type=double
N. Dimension=3
Dimensions=nv, time, wavelength
Number of attribute=5

Attribute name=units
Attribute value=1
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=statistical error mean of aerosol optical depth
Type=text

Attribute name=statistical_method
Attribute value=mean within months; mean over months
Type=text

Attribute name=standard_name
Attribute value=statistical_error_mean_of_atmosphere_optical_thickness_due_to_ambient_aerosol_particles
Type=text

o Name=**number_of_aerosol_optical_depth _averaged**
Type=integer
N. Dimension=3
Dimensions=nv, time, wavelength
Number of attribute=1

Attribute name=long_name
Attribute value=number of aerosol optical depth averaged
Type=text

- o Name=**mean_of_integrated_backscatter**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=1/sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=mean of aerosol integrated backscatter
  Type=text

  Attribute name=statistical_method
  Attribute value=mean within months; mean over months
  Type=text

- o Name=**median_of_integrated_backscatter**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=1/sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=median of aerosol integrated backscatter
  Type=text

  Attribute name=statistical_method
  Attribute value=weighted median; weights are computed inverting the amount of measured profiles by month
  Type=text

- o Name=**standard_deviation_of_integrated_backscatter**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=1/sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=standard deviation of aerosol integrated backscatter
  Type=text

Attribute name=statistical_method
Attribute value=weighted standard deviation; weights are computed inverting the amount of measured profiles by month
Type=text

- o Name=**statistical_error_mean_of_integrated_backscatter**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=1/sr
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=statistical error mean of aerosol integrated backscatter
  Type=text

  Attribute name=statistical_method
  Attribute value=mean within months; mean over months
  Type=text

- o Name=**number_of_integrated_backscatter_averaged**
  Type=integer
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=1

  Attribute name=long_name
  Attribute value=number of aerosol integrated backscatter averaged
  Type=text

- o Name=**mean_of_center_of_mass**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=mean of aerosol center of mass
  Type=text

  Attribute name=statistical_method
  Attribute value=mean within months; mean over months
  Type=text

- o Name=**median_of_center_of_mass**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=median of aerosol center of mass
Type=text

Attribute name=statistical_method
Attribute value=weigthed median; weigths are computed inverting the amount of measured profiles by month
Type=text

- Name=**standard_deviation_of_center_of_mass**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=standard deviation of aerosol center of mass
Type=text

Attribute name=statistical_method
Attribute value= weighted standard deviation; weigths are computed inverting the amount of measured profiles by month
Type=text

- Name=**statistical_error_mean_of_center_of_mass**
  Type=double
  N. Dimension=3
  Dimensions=nv, time, wavelength
  Number of attribute=4

Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=statistical error mean of aerosol center of mass
Type=text

Attribute name=statistical_method
Attribute value=mean within months; mean over months
Type=text

- Name=**mean_of_aerosol_boundary_layer**

Type=double
N. Dimension=1
Dimensions=time
Number of attribute=4

Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=mean of aerosol planet boundary layer altitudes
Type=text

Attribute name=statistical_method
Attribute value=mean within months; mean over months
Type=text

- Name=**median_of_aerosol_boundary_layer**
  Type=double
  N. Dimension=1
  Dimensions=time
  Number of attribute=4

  Attribute name=units
  Attribute value=m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=median of aerosol planet boundary layer altitudes
  Type=text

  Attribute name=statistical_method
  Attribute value=weighted median; weigths are computed inverting the amount of measured profiles by month
  Type=text

- Name=**standard_deviation_of_aerosol_boundary_layer**
  Type=double
  N. Dimension=1
  Dimensions=time
  Number of attribute=4

  Attribute name=units
  Attribute value=m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=standard deviation of aerosol planet boundary layer altitudes
  Type=text

  Attribute name=statistical_method
  Attribute value=weighted standard deviation; weights are computed

inverting the amount of measured profiles by month
Type=text

- Name=**number_of_aerosol_boundary_layer_measurements_averaged**
Type=double
N. Dimension=1
Dimensions=time
Number of attribute=1
Attribute name=long_name
Attribute value=number of aerosol planet boundary layer altitudes averaged
Type=text

- Name=**mean_of_h63_of_aerosol_optical_depth**
Type=double
N. Dimension=2
Dimensions=time, wavelength
Number of attribute=4
Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=mean of the altitudes below which stays 63% of total aerosol optical depth
Type=text

Attribute name=statistical_method
Attribute value=mean within months; mean over months
Type=text

- Name=**median_of_h63_of_aerosol_optical_depth**
Type=double
N. Dimension=2
Dimensions=time, wavelength
Number of attribute=4
Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=median of the altitudes below which stays 63% of total aerosol optical depth
Type=text

Attribute name=statistical_method
Attribute value=weighted median; weights are computed inverting the amount of measured profiles by month
Type=text

- Name=**standard_deviation_of_h63_of_aerosol_optical_depth**
Type=double
N. Dimension=2
Dimensions=time, wavelength

Number of attribute=4

Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=standard deviation of the altitudes below which stays 63% of total aerosol optical depth
Type=text

Attribute name=statistical method
Attribute value=weigthed standard deviation; weights are computed inverting the amount of measured profiles by month
Type=text

- Name=**mean_of_h63_of_integrated_backscatter**
  Type=double
  N. Dimension=2
  Dimensions=time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=mean of the altitudes below which stays 63% of total integrated backscatter
  Type=text

  Attribute name=statistical method
  Attribute value=mean within months; mean over months
  Type=text

- Name=**median_of_h63_of_integrated_backscatter**
  Type=double
  N. Dimension=2
  Dimensions=time, wavelength
  Number of attribute=4

  Attribute name=units
  Attribute value=m
  Type=text

  Attribute name=__FillValue
  Attribute value=9.96920996838687e+36
  Type=double

  Attribute name=long_name
  Attribute value=median of the altitudes below which stays 63% of total integrated backscatter
  Type=text

  Attribute name=statistical method
  Attribute value=weighted median; weights are computed inverting

the amount of meaured profiles by month
Type=text

- o Name=**standard_deviation_of_h63_of_integrated_backscatter**
Type=double
N. Dimension=2
Dimensions=time, wavelength
Number of attribute=4
Attribute name=units
Attribute value=m
Type=text

Attribute name=__FillValue
Attribute value=9.96920996838687e+36
Type=double

Attribute name=long_name
Attribute value=standard deviation of the altitudes below which stays 63% of total integrated backscatter
Type=text

Attribute name=statistical_method
Attribute value=weigthed standard deviation; weigths are computed inverting the amount of measured profiles by month
Type=text

- o Name**=time_bounds**
Type=double
N. Dimension=2
Dimensions=nv, time
Number of attribute=1
Attribute name=units
Attribute value=seconds since 1970-01-01T00:00:00Z
Type=text

- o Name=**latitude**
Type=float
N. Dimension=0
Number of attribute=3
Attribute name=units
Attribute value=degrees_north
Type=text

Attribute name=long_name
Attribute value=latitude of station
Type=text

Attribute name=standard_name
Attribute value=latitude
Type=text

- o Name=**longitude**
Type=float
N. Dimension=0
Number of attribute=3
Attribute name=units
Attribute value=degrees_east
Type=text

Attribute name=long_name
Attribute value=longitude of station

Type=text

Attribute name=standard_name
Attribute_value=longitude
Type=text

- o Name=**station_altitude**
  Type=float
  N. Dimension=0
  Number of attribute=2
    Attribute name=units
    Attribute value=m
    Type=text

    Attribute name=long_name
    Attribute value= station altitude above sea level
    Type=text
- o Name**=source_file**
  Type=char
  N. Dimension=1
  Dimensions=n_char
  Number of attribute=2
    Attribute name=long_name
    Attribute value=source files
    Type=text

    Attribute name=description
    Attribute value=List of level 2 files from which are retrieved values averaged in this file
    Type=text

Global attributes (all mandatory):

- o Name=processor_name Type=text
- o Name=processor_version Type=text
- o Name=processor institution Type=text
- o Name=system Type=text
- o Name=location Type=text
- o Name=institution Type=text
- o Name=PI Type=text
- o Name=PI_affiliation Type=text
- o Name=PI_affiliation_acronym Type=text
- o Name=PI_address Type=text
- o Name=PI_phone Type=text
- o Name=PI_email Type=text
- o Name=data_originator Type=text
- o Name=data_originator_affiliation Type=text
- o Name=data_originator_affiliation_acronym Type=text
- o Name=data_originator_address Type=text
- o Name=data_originator_phone Type=text
- o Name=data_originator_email Type=text
- o Name=data_provider Type=text

- Name=data_provider_affiliation Type=text
- Name=data_provider_affiliation_acronym Type=text
- Name=data_provider_address Type=text
- Name=data_provider_phone Type=text
- Name=data_provider_email Type=text
- Name=conventions Type=text
- Name=references Type=text
- Name=station_ID Type=text
- Name=__file_format_version Type=text
- Name=history Type=text
- Name=title Type=text

6 - References

Matthias, V., et al. (2004), The vertical aerosol distribution over Europe: Statistical analysis of Raman lidar data from 10 EARLINET stations, J. Geophys. Res., 109, D18201, doi:10.1029/2004JD004638.

Mona, L., Amodeo, A., D'Amico, G., Giunta, A., Madonna, F., and Pappalardo, G.: Multi-wavelength Raman lidar observations of the Eyjafjallajökull volcanic cloud over Potenza, southern Italy, Atmos. Chem. Phys., 12, 2229–2244, https://doi.org/10.5194/acp-12-2229-2012, 2012b.

Winker, D. M., Tackett, J. L., Getzewich, B. J., Liu, Z., Vaughan, M. A., and Rogers, R. R.: The global 3-D distribution of tropospheric aerosols as characterized by CALIOP, Atmos. Chem. Phys., 13, 3345-3361, https://doi.org/10.5194/acp-13-3345-2013, 2013.