



# ESA MesosphEO

**MesosphEO WP 4.2:**  
**MIPAS-IMK/IAA L2 Data ReadMe**  
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## 1. Introduction

This document explains the netCDF format used for MIPAS-IMK/IAA L2 data of several trace gases (CH<sub>4</sub>, CO, CO<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>O, NO, NO<sub>2</sub>, Ozone, temperature) in the ESA's MesosphEO project. The files contain a month's L2 data each and are named as follows:

MIPAS-E\_IMK.<YYYYMM>.<citation\_version>.nc

Here <YYYYMM> gives the year/month coded in 6 digits like, e.g., 200904 for April of 2009.

<citation\_version> is a string which gives a unique identification of 1) the L1b data version used for the L2 data processing, 2) the retrieval target (gas, temperature) contained in the data file, and 3) the retrieval setup for the target. An example would be V5R\_H2O\_522: here V5R means that L1b comes from the measurement period of reduced spectral resolution and L1b data was processed by ESA with the IPF5.X software. The delivery within the MesosphEO project only contains V5R data. H2O denotes the target gas, which in this case is water vapour. If this middle entry is composed of two targets connected by a lowercase "w", like in TwNO and NOwT, the target contained in the file is the former of the two.

The setup number 522 shows that the data was processed for the middle atmosphere mode (leading 5) with the setup specific to this gas of version number 522. Besides the 5XX setup numbers there are also 6XX and 7XX setup numbers. They denote processing of upper atmosphere and NLC mode data, respectively.

Examples:

MIPAS-E\_IMK.201109.V5R\_H2O\_622.nc: All September 2011 water vapour data processed from reduced resolution upper atmosphere measurements using retrieval setup 622.

MIPAS-E\_IMK.201204.V5R\_NOwT\_622: All April 2012 NO data processed from reduced resolution upper atmosphere measurements using retrieval setup 622 for the joint retrieval of NO and temperature, not to be mixed up with NO data from the file

MIPAS-E\_IMK.201204.V5R\_NO\_622 which contains data of „pure“ NO retrieval (height range of the two NO data products is different).

## 2. Level2 screening

The data given in the files cover an altitude range which usually is greater than the validity range of the data. Therefore the user should do some data screening:

The level2 screening differs for the different parameters, depending upon if they are based on a linear-space or a log-space retrieval.

For the CH<sub>4</sub>, CO<sub>2</sub>, N<sub>2</sub>O, Ozone and temperature data, which are retrieved in linear-space, the screening looks as follows:

- (1) data points with a visibility flag of 0 are discarded
- (2) data points with an average kernel diagonal element (aka AKD criterion) of less than 0.03 are discarded
- (3) data above the uppermost tangent height are not considered any further.



For the CO, H<sub>2</sub>O, NO and NO<sub>2</sub> data, which are retrieved in log-space, only screening (1) and (3) are applied.

### 3. Data gridding and units

The data are provided on a fixed altitude grid. There is one gas/temperature profile per MIPAS measurement geolocation.

Temperatures are provided in K. The trace gases are given in volume mixing ratio, which is the basic unit. A detailed description of all data fields is given in Sect. 6.

### 4. User guidance

The three MIPAS measurement modes do have the following altitude coverage:

middle atmosphere (MA) 15 – 100 km

upper atmosphere (UA) 40 – 170 km

NLC mode (NLC) 40 – 100 km

However, in the L2 processing only a subset of these altitude ranges is covered, namely:

MA (5XX) 15 – 100 km

UA (6XX) 40 – 100 km (exception: NowT and TwNO: 40 – 170 km)

NLC (7XX) 40 – 100 km

Note that additionally the screening criteria as presented in Section 2 have to be applied.

### 5. NetCDF format for MIPAS L2 data

The netCDF data files contain dimensional information, data variables, and global attributes. In detail there are:

#### Dimensions:

No	Dimension name	Content
1	timegrid	Number of measurements/geolocations
2	altgrid	Number of retrieval (result) altitude grid points
3	scangrid	Number of measurement altitude grid points
4	stringlength	Maximum stringlength

#### Data:

No	Variable	Unit	Dim	Description
1	time	days	timegrid	Days since 1.1.1970, 00:00:00



2	sub_id	n/a	timegrid x stringlength	IMK/IAA internal identifier
3	geo_id	n/a	timegrid x stringlength	geolocation identifier: 5 digits orbit number, 1 underscore, 16 digits date/time in ISO format
4	latitude	degrees north	timegrid	latitude, -90 to 90 deg
5	longitude	degrees east	timegrid	longitude, -180 to 180 deg
6	sza	degree	timegrid	solar zenith angle, 0 to 180 deg
7	dof	n/a	timegrid	degrees of freedom for retrieval result profile
8	chi2	n/a	timegrid	Chi square for the retrieval
9	rms	n/a	timegrid	rms of the residual
10	eta	km	scangrid x timegrid	engineering tangent altitudes delivered with L1b data
11	eta_indices	n/a	scangrid x timegrid	indices of eta values used for the retrieval (e.g. clouds invalidate lower altitudes)
12	los	km	scangrid x timegrid	line of sight of tangent altitude from retrieval
13	visibility	n/a	altgrid x timegrid	flag to indicate whether this altitude contributes to measurement
14	altitude	km	altgrid x timegrid	altitudes of the retrieval grid, result data is given for this altitudes
15	target	K (for temperature) ppmv (for gases)	altgrid x timegrid	retrieval result, either temperature or gas



16	pressure	hPa	altgrid x timegrid	pressure at altitude
17	temperature	K	altgrid x timegrid	If target is temperature: this gives the apriori temperature If target is gas: this gives the temperature as retrieved from L1b data
18	target_noise_error	ppmv	altgrid x timegrid	estimated standard deviation of the retrieval result derived from spectral noise
19	akm_diagonal	n/a	altgrid x timegrid	diagonal entries of the averaging kernel matrix
20	vr_col	km	altgrid x timegrid	Vertical resolution as calculated from the columns of the averaging kernel matrix
21	vr_row	km	altgrid x timegrid	Vertical resolution as calculated from the rows of the averaging kernel matrix
22	vr_akdiag	km	altgrid x timegrid	Vertical resolution as calculated from the diagonal entries of the averaging kernel matrix

The NetCDF files contain a number of **global attributes**. Of these only the following ones are important for the data user:

No	attribute	meaning
3	retrieval_in_logarithmic_parameter_space	Either TRUE (retrieval was done in logarithmic parameter space) or FALSE (linear parameter space); important for the application of the averaging kernel diagonal criterion (see Section 2)
4	use_data_only_in_altitude_range	Maximum altitude range the data can be used in; further restrictions apply, see Section 2 and next attribute entry: comment
5	comment	Explanation what should be used for data screening, see also Section 2



## 6. References

ESA MesosphEO project plan, version 1.5, 2016