



ESA MesosphEO

MesosphEO WP 4.4:
Merged Multi-Instrument Time Series ReadMe
S. Lossow, KIT

FMI-TN-MesosphEO-WP4-004
Version 2.1
12.12. 2017

1. Introduction	2
2. Source data	2
3. Merging	2
4. NetCDF4 format for the merged time series	3
5. Version history	6
6. References	6

1. Introduction

This document explains the netCDF format that is used for the merged multi-instrument monthly and zonal mean time series data within the ESA's MesosphEO project. The data files are typically named as follows:

MESOSPHEO_parameter_L3_merging_time-of-day_data-type_file-version.file-extension.

If the data are not separated by day or night the "time-of-day" tag is omitted.

Examples:

MESOSPHEO_H2O_L3_merging_time-series_fv0001.nc

MESOSPHEO_T_L3_merging_nighttime_time-series_fv0001.nc

2. Source data

The input data for the merging are the time series created within WP 4.3 for the individual data sets. The time series are based on monthly and zonal means (90°S-80°S, 80°S-70°S, ..., 70°N-80°N, 80°N-90°N) and use a fixed altitude grid in steps of 1 km from 50 km to 100 km.

3. Merging

The merging approach is in detail explained in WP 3.3. It employs a de-seasonalisation of the input data as an intermediate step, but besides that no other modifications (e.g. by an additional screening) are performed. Besides the merged data also their combined standard error is provided as a statistical estimate.

The merging focuses on water vapour and temperature data. The merged water vapour data are provided in volume mixing ratio, the temperature in Kelvin. The merging is performed separately for time series based on the entire data sets as well as time series subsampled according to daytime (SZA 0°-97°) and nighttime (SZA 97°-180°).

Data from the following instruments are merged for the different parameter:

Water vapour: ACE-FTS, MIPAS, SCIAMACHY and SMR
coverage: 50 km - 100 km, 2001 - 2017

Temperature: GOMOS, MIPAS, OSIRIS and SMR
coverage: 50 km - 100 km, 2001 - 2016

For the merging of the daytime and nighttime water vapour data the occultation data sets from ACE-FTS and SCIAMACHY are not considered.

4. NetCDF4 format for the merged time series

Besides the merged data and the corresponding standard error the data files contain also the de-seasonalised input data and information on the coverage of the individual data sets in latitude, time, day of year and local time. Missing values are presented by NaNs.

No	Variable	Unit	Dim	Description
1	time	days since 1900-01-01	time	time given at the month centre
2	time_bands	days since 1900-01-01	time x 2	time bands
3	month		time	month
4	year		time	year
5	time_string		time	string combining the month and year, e.g. January 2003
6	latitude	degrees north	18	centre of latitude bands 85°S:5:85°N
7	latitude_bands	degrees north	18 x 2	latitude bands 90°S-80°S, ..., 80°N-90°N
8	altitude	km	51	altitude grid 50:1:100 km
9	data_set_id		datasets	running number of the data sets that are merged
10	data_set_name		datasets	names of the data sets that are merged
11	data_merged	VMR or K	time x 51 x 18	merged de-seasonalised data
12	data_sem_merged	VMR or K	time x 51 x 18	standard error of the merged de-seasonalised data
13	data	VMR or K	time x 51 x 18 x datasets	de-seasonalised data that are merged
14	data_sem	VMR or K	time x 51 x 18 x datasets	standard error of the de- seasonalised data that are merged



15	data_obs	number	time x 51 x 18 x datasets	number of observations binned together for the de- seasonalised data
16	data_abs	VMR or K	time x 51 x 18 x datasets	absolute data i.e not de-seasonalised
17	data_sem_abs	VMR or K	time x 51 x 18 x datasets	standard error of the absolute data
18	data_obs_abs	number	time x 51 x 18 x datasets	number of observations binned together for the absolute data NOTE: these numbers do not need to be exactly the same as “data_obs”, since the de-seasonalisation can fail
19	avg_time	days since 1900-01-01	time x 18 x datasets	average time of the binned data NOTE: all auxiliary information is adapted to the de-seasonalised data
20	avg_doy	days	time x 18 x datasets	average day of year of the binned data
21	avg_latitude	degrees north	time x 18 x datasets	average latitude of the binned data
22	avg_lt	hours	time x 18 x datasets	average local time of the binned data
23	coverage	number	time x 18 x 31 x datasets	number of observations binned together as function of day of month for every month 31 days are considered for simplicity

In addition the NetCDF files contain a number of global attributes. The most important ones are listed below:

No	Attribute	Description
1	date_created	file creation time as yyyymmddTHHMMSSZ
2	sensors_merged	the instruments of which data are merged
3	data_sets_merged	the data sets that are merged
4	value_for_nodata	fill value, NaNs are used
5	data_set_with_id_X	for convenience the data set IDs (i.e. X) and the corresponding data set names are listed here
6	minimum_number_of_observations minimum_number_of_sparse_observations	the minimum number of observations required for the binned data (as part of L3 screening) varies according to sparse data sets (5, like occultation data from ACE-FTS or SCIAMACHY) and dense data sets (20, like MIPAS or SMR)
7	time_of_day	time of day considered, i.e. either daytime, nighttime or all
8	solar_zenith_angle_min	minimum solar zenith angle considered
9	solar_zenith_angle_max	maximum solar zenith angle considered
10	time_coverage_start	start month of the merged time series
11	time_coverage_end	end month of the merged time series
12	file_version	the file version
13	file_version_description	description of file version
14	tracking_id	unique file identifier



5. Version history

version 1.0 / 24 May 2017:

- the initial version

version 2.0 / 20 July 2017:

- include data set IDs (running numbers)
- add “month” and “year” fields
- add the absolute data the NetCDF files
- smaller cosmetic changes

version 2.1 / 12 December 2017:

- small bugfixes

6. References

ESA MesosphEO project plan, version 1.5, 2016