



Copernicus Atmosphere Monitoring Service



Description of the quality control system for targeted NDACC data

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Introduction

The international Network for the Detection of Atmospheric Composition Change (NDACC) was established during the late 1980s in response to the need to document and understand worldwide stratospheric perturbations resulting from increased anthropogenic emissions into the atmosphere of long-lived halogenated source gases with strong ozone-depleting and global-warming potentials. According to the NDACC data protocol¹ the primary goal of NDACC is to obtain high-quality measurements of a broad range of atmospheric chemical species and parameters. The initial objective of NDACC was to make observations through which changes in the physical and chemical state of the stratosphere could be determined and understood. While the network remains committed to monitoring changes in the stratosphere, with an emphasis on the long-term evolution of the ozone layer (i.e. its decay, likely stabilization and expected recovery), its priorities have broadened considerably to encompass amongst others detecting trends in overall atmospheric composition and understanding their impacts on the stratosphere and troposphere and the links with climate, studying atmospheric composition variability at interannual and longer timescales, calibrating and validating space-based measurements and numerical models of the atmosphere.

The NDACC is an international activity, it has been endorsed by the United Nations Environment Programme (UNEP) and the International Ozone Commission (IO3C) of the International Association of Meteorology and Atmospheric Sciences (IAMAS). It has also been recognized by the World Meteorological Organization (WMO) as a major contributor to WMO's Global Atmosphere Watch (GAW).

According to the NDACC data protocol all NDACC Principal Investigators (PIs) shall place their data in the NDACC Data Host Facility (DHF) hosted at NOAA as rapidly as possible and no later than one year after the measurement. One year after data acquisition, the data become public. Use of the data is subject to a data policy available on the NDACC Website (<http://ndacc.org>). The CAMS27 contract aims at supporting NDACC so that data becomes available more rapidly, i.e. within 1 month after measurement. CAMS27 requires that the data is of sufficient quality so that it can be used for model validation purposes.

Table 1: Targeted NDACC data sources

Instrument	Targets
FTIR	HCHO, CO and CH4: tropospheric profile O3 and NO2: stratospheric profile
LIDAR	O3: stratospheric profile
MWR	O3: stratospheric profiles
UVVIS.DOAS.OFFAXIS UVVIS.DOAS.ZENITH UVVIS.DOBSON	H2CO, NO2 and Aerosol: lower tropospheric profiles NO2 and O3: stratospheric columns O3 total columns

¹ <http://www.ndaccdemo.org/data/protocols>



Table 1 lists the NDACC data product types targeted in CAMS27. In CAMS27

- a quality control (QC) routine is developed that monitors all incoming NDACC data files targeted at in CAMS27
- a scoring system is developed to check the timely submission of new data files that pass the quality control

This document describes the quality control routine in more detail.

NDACC Data Formats

Measurement data can be made public on NDACC using the GEOMS (Generic Earth Observation Metadata Standard) HDF data format (<http://avdc.gsfc.nasa.gov/GEOMS> and <https://git.nilu.no/geoms>). Using this data format, data products can be uniquely determined and a time series measured by an instrument for a given target at a given station are called throughout this document a ***NDACC data product***.

Each targeted NDACC data product is delivered to NDACC as a series of GEOMS hdf4 files and, depending on the measurement technique the measurement data is reported following pre-defined GEOMS templates (<https://git.nilu.no/geoms/templates>).

A template specifies which variables should be reported (mandatory) and which variables are optional; it specifies the dimensions of the reported variables (time, altitude,...) and the units.

For the comfort of the data user the GEOMS templates are not minimal in the sense that they contain variables that can be derived from other variables: for example an ozone column can be computed from an ozone concentration profile by integration.



1. Description of the QC routine

List of abbreviations used in this section:

VMR=volume mixing ratio

ND=number density

OT=optical thickness

EC=extinction coefficient

PC=partial column

1.1 Mandatory variables with only fill values

Variables with only fill values should be allowed because the temporal granularity of the data files is important in this: eg the surface temperature measured by an independent meteo station may be out of service for one day; the daily data file then contains a mandatory variable with only fill values while the yearly file containing that day.

Mandatory variables reporting data on the target of the data product should not contain only fill values and are rejected by the QC routine: for example an FTIR.O3 data file is not allowed to have fill-values in the target O3 VMR profile and its uncertainty matrices, the O3 column and its uncertainty, the O3 AVK matrices and the O3 a priori profile and column data.

Variables reporting the geographical position (latitude, longitude, ...) should not contain **any** fill value.

1.2 Consistency between profile and integrated data

As mentioned in the introduction, GEOMS data files may contain redundant data. The QC routine will check the consistency, on a per measurement basis, between

1. concentration profiles (ND or VMR) or PC profile and the integrated column for the target gas
2. EC profile (or OT profile) and total optical depth for aerosol data
3. PC of (dry) air profile and reported temperature and pressure profiles
4. concentration profile (ND or VMR) and PC profile
5. EC profile and OT profiles
6. 2D averaging kernel data and the derived 1D averaging kernel data: eg a 2D AVK matrix acting on VMR profile data and a 1D column AVK acting on a PC profile
7. Uncertainty covariance matrices for profile variables (VMR, ND, PC, EC, OT) and uncertainties on the integrated column or optical depth
8. the measurement time and solar position variables
9. altitude boundaries and instrument altitude

Because numerical artefacts may play in these computations (eg solar position routines typically have significant numerical errors close to the zenith) the routine will

- only generate a warning if a difference is observed (1.,2.,3.,4., 5.)
- generate an error if only a significant number of measurements have inconsistencies (6.,)
- generate an error if the consistency fails for one measurement (7., 8., 9.)



1.3 Correctness of numerical representation

Uncertainty variables must satisfy certain mathematical properties. The numerical representation must comply with this.

1. Uncertainty covariance matrices must be strictly symmetric (no tolerance allowed)
2. Uncertainty covariance matrices must have non-negative eigenvalues (some tolerance allowed)
3. Uncertainty standard deviation variables must be non-negative (no tolerance allowed)

The numerical correct representation of the 2D AVK data (often the AVK is stored as its transpose) is discovered in the consistency check with the 1D column AVK (Section 1.2).

1.4 Physically meaningful data

Averaging kernel data must satisfy some properties in order to represent a physically meaningful retrieval. Per target the QC routine has thresholds available to check

1. the degrees of freedom (DOF=the trace of the AVK), eg MWR O3 retrievals have DOF between 2.1 and 6.1
2. the sensitivity curve of the 2D AVK
3. the column AVK or the optical depth AVK
4. uncertainties

Because of the statistical nature of this check, some tolerance is allowed in the number of deviating measurements.

Table 1 in the appendix contains the configuration of thresholds as implemented in version 1 of the QC routine.

1.5 Versioning

Each data file has a version number attached which must be compatible with the GEOMS guidelines (https://evdc.esa.int/documents/2/geoms_guidelines_conventions_2.1.pdf) .

2. QC Reports

The QC routine creates

1. an ascii log file containing a list of messages that can have 3 levels: informational, warning or error messages. Error messages lead to the rejection of the file. Warning messages are there for the data originator and may lead to the rejection of the file in the future when the QC routine uses more stringent conditions.
2. time series plots of the target variable
3. a plot of the 2D averaging kernel as reported in the file, and a plot of the 2D averaging kernel acting on profiles relative to the apriori

4. a plot of the 1D AVK
5. a profile plot comparing a single measurement against the osuiteAN co-located profile, including the original and smoothed model profile

All these elements (log file, plots) are merged into an html file.

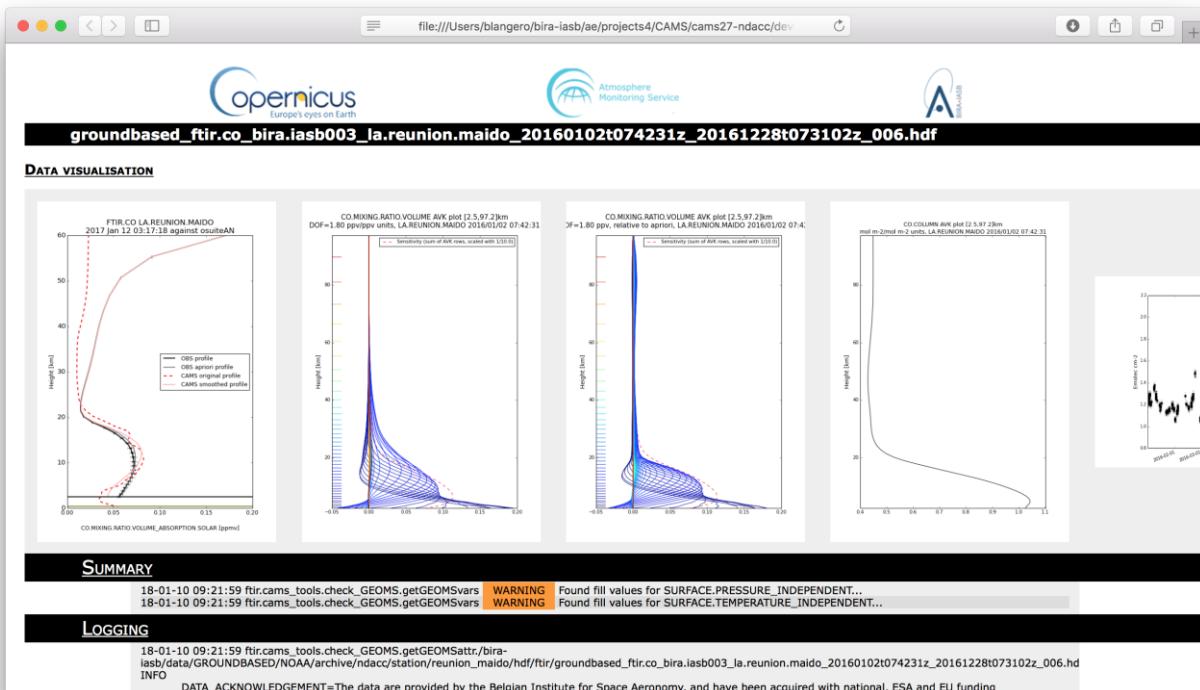


Figure 1 Example html report. The summary section allows a quick view on possible issues with the GEOMS file. The Logging section contains the detailed information of the QC report. The most left plot shows the comparison of a single measurement against CAMS osuiteAN

3. Implementation of the QC routine

3.1 Data streams

On a daily basis the NDACC DHF will stage all newly submitted GEOMS files that match the glob patterns listed in Table 3 in the appendix. BIRA-IASB downloads these staged files and generates the QC reports and uploads the results to NOAA. According to these results, NOAA will then publish or reject the files.

3.2 Data storage and accessibility

The html reports are stored at BIRA-IASB in an SQL database which is accessible to the PIs. The access is private and requires a login.



ECMWF will be allowed to view all QC reports. See Figure 1 for an example of the online cams27 site.

SUBMISSION DATE	PRODUCT ID	FILENAME	RD	QA	REPORT
2018-02-21	ftir.ch4_bira.iasb003	groundbased_ftir.ch4_bira.iasb003_la.reunion.maido_20180110t042816z_20180110t042816z_001.hdf	✓	✓	✗
2018-02-21	ftir.co_bira.iasb003	groundbased_ftir.co_bira.iasb003_la.reunion.maido_20180110t033907z_20180110t042246z_001.hdf	✓	✓	✗

Figure 2 Browse functionality of the private cams27 website containing all QC reports. PIs can filter based on station, target, instrument and have quick access to the html reports.

4. Appendix

1. Table with thresholds for physical variables (version 01.20).

[FTIR.CO]
CO.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.SYSTEMATIC.STANDARD = [1,4]
CO.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.RANDOM.STANDARD = [0.3,5.2]
#sensitivity height limit for AVK
CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY.HEIGHT = [-np.inf,60e3]
CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY = [0,1.5]
CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS.HEIGHT = [-np.inf,35e3]
CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS = [1.5,3.5]
CO.COLUMN_ABSORPTION.SOLAR_AVK.HEIGHT=[-np.inf,60e3]
[FTIR.CH4]



CH4.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY.HEIGHT = [-np.inf,60e3]
CH4.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY = [0,1.5]
CH4.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS.HEIGHT = [-np.inf,55e3]
CH4.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS = [1.5,3.5]
CH4.COLUMN_ABSORPTION.SOLAR_AVK.HEIGHT=[-np.inf,60e3]
CH4.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.SYSTEMATIC.STANDARD = [2,6]
CH4.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.RANDOM.STANDARD = [0.3,6]
[FTIR.O3]
O3.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY.HEIGHT = [-np.inf,60e3]
O3.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY = [0,1.5]
O3.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS.HEIGHT = [-np.inf,55e3]
#6.5 for Thule and Ny Alesund...
O3.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS = [2.5,6.5]
O3.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.SYSTEMATIC.STANDARD = [1.8,6]
O3.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.RANDOM.STANDARD = [0.2,6]
O3.COLUMN_ABSORPTION.SOLAR_AVK.HEIGHT=[-np.inf,80e3]
O3.COLUMN_ABSORPTION.SOLAR_AVK=[0,1.5]
[FTIR.H2CO]
H2CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY.HEIGHT = [-np.inf,15e3]
H2CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.SENSITIVITY = [0,1.5]
H2CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS.HEIGHT = [-np.inf,15e3]
H2CO.MIXING.RATIO.VOLUME_ABSORPTION.SOLAR_AVK.DOFS = [0.8,1.8]
H2CO.COLUMN_ABSORPTION.SOLAR_AVK.HEIGHT=[-np.inf,6e3]
H2CO.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.SYSTEMATIC.STANDARD.ABSOLUTE = [2.5e-6,10e-6]
H2CO.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.RANDOM.STANDARD.ABSOLUTE = [1e-6,7e-6]
H2CO.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.SYSTEMATIC.STANDARD = [10.,40.]
H2CO.COLUMN_ABSORPTION.SOLAR_UNCERTAINTY.RANDOM.STANDARD = [3.,15.]
[UVVIS.DOAS.OFFAXIS.AEROSOL]
AEROSOL.OPTICAL.DEPTH.TROPOSPHERIC_SCATTER.SOLAR.OFFAXIS_UNCERTAINTY.SYSTEMATIC.STANDARD=[15,30]
AEROSOL.OPTICAL.DEPTH.TROPOSPHERIC_SCATTER.SOLAR.OFFAXIS_UNCERTAINTY.RANDOM.STANDARD = [.5,15]
AEROSOL.OPTICAL.DEPTH.TROPOSPHERIC_SCATTER.SOLAR.OFFAXIS_UNCERTAINTY.RANDOM.STANDARD.ABSOLUTE = [0,.02]
[UVVIS.DOAS.OFFAXIS.NO2]
NO2.COLUMN.TROPOSPHERIC_SCATTER.SOLAR.OFFAXIS_UNCERTAINTY.SYSTEMATIC.STANDARD=[1,35]
NO2.COLUMN.TROPOSPHERIC_SCATTER.SOLAR.OFFAXIS_UNCERTAINTY.RANDOM.STANDARD=[.5,25]
NO2.MIXING.RATIO.VOLUME_SCATTER.SOLAR.OFFAXIS_AVK.SENSITIVITY.HEIGHT=[-np.inf,4e3]
NO2.MIXING.RATIO.VOLUME_SCATTER.SOLAR.OFFAXIS_AVK.SENSITIVITY=[0,1.5]
[UVVIS.DOAS.OFFAXIS.H2CO]
H2CO.COLUMN.TROPOSPHERIC_SCATTER.SOLAR.OFFAXIS_UNCERTAINTY.SYSTEMATIC.STANDARD=[3,35]
H2CO.COLUMN.TROPOSPHERIC_SCATTER.SOLAR.OFFAXIS_UNCERTAINTY.RANDOM.STANDARD=[.5,25]
H2CO.MIXING.RATIO.VOLUME_SCATTER.SOLAR.OFFAXIS_AVK.SENSITIVITY.HEIGHT=[-np.inf,4e3]
H2CO.MIXING.RATIO.VOLUME_SCATTER.SOLAR.OFFAXIS_AVK.SENSITIVITY=[0,1.5]
[UVVIS.DOAS.ZENITH.O3]
O3.COLUMN.STRATOSPHERIC_SCATTER.SOLAR.ZENITH_UNCERTAINTY.SYSTEMATIC.STANDARD=[2.8,10]
O3.COLUMN.STRATOSPHERIC_SCATTER.SOLAR.ZENITH_UNCERTAINTY.RANDOM.STANDARD=[3.5,6]
[UVVIS.DOAS.ZENITH.NO2]
NO2.COLUMN.STRATOSPHERIC_SCATTER.SOLAR.ZENITH_UNCERTAINTY.SYSTEMATIC.STANDARD=[1.5,52]
NO2.COLUMN.STRATOSPHERIC_SCATTER.SOLAR.ZENITH_UNCERTAINTY.RANDOM.STANDARD=[2.0,40]



[MWR.03]
O3.MIXING.RATIO.VOLUME_EMISSION_AVK.SENSITIVITY.HEIGHT=[25e3,np.inf]
O3.MIXING.RATIO.VOLUME_EMISSION_AVK.SENSITIVITY=[0,1.65]
O3.MIXING.RATIO.VOLUME_EMISSION_AVK.DOFS=[2.1,6.1]
O3.MIXING.RATIO.VOLUME_EMISSION_UNCERTAINTY.SYSTEMATIC.STANDARD=[.9,35]
O3.MIXING.RATIO.VOLUME_EMISSION_UNCERTAINTY.RANDOM.STANDARD=[.9,35]
[LIDAR.03]
O3.MIXING.RATIO.VOLUME_DERIVED_UNCERTAINTY.RANDOM.STANDARD=[0.9,20]
O3.MIXING.RATIO.VOLUME_DERIVED_UNCERTAINTY.SYSTEMATIC.STANDARD=[0.9,12]
O3.MIXING.RATIO.VOLUME_DERIVED_UNCERTAINTY.COMBINED.STANDARD=[0.9,20]
O3.NUMBER.DENSITY_ABSORPTION.DIFFERENTIAL_UNCERTAINTY.SYSTEMATIC.STANDARD=[0.9,12]
O3.NUMBER.DENSITY_ABSORPTION.DIFFERENTIAL_UNCERTAINTY.RANDOM.STANDARD=[0.9,20]
O3.NUMBER.DENSITY_ABSORPTION.DIFFERENTIAL_UNCERTAINTY.COMBINED.STANDARD=[0.9,20]
O3.MIXING.RATIO.VOLUME_DERIVED_UNCERTAINTY.ORIGINATOR=[0.1,30]
O3.NUMBER.DENSITY_ABSORPTION.DIFFERENTIAL_UNCERTAINTY.ORIGINATOR=[0.1,30]
O3.COLUMN.PARTIAL_DERIVED_UNCERTAINTY.ORIGINATOR=[0.9,10]
[UVVIS.DOBSON]
O3.COLUMN_ABSORPTION_UNCERTAINTY.COMBINED.STANDARD=[0.5,7.5]

2. Table with thresholds on number of outlier measurement within one file (version 01.20).

Test Description	Threshold on how many outliers allowed (relative to total measurements in file)
Compatibility between 2D AVK and 1D AVK	50%
Sensitivity curve for 2D AVK within boundaries (Table 1)	30%
DOF values within boundaries (Table 1)	30%
Measurements with uncertainty above threshold	50%

3. Table with glob patterns for participating NDACC targets as implemented at NOAA (Feb 2021)

Glob patterns for participating NDACC targets (176 items)
groundbased_uvvis.doas.zenith.no2_*_aberystwyth*.hdf
groundbased_uvvis.doas.zenith.o3_*_aberystwyth*.hdf
groundbased_ftir.ch4_unam001_altzomoni_*.hdf
groundbased_ftir.co_unam001_altzomoni_*.hdf
groundbased_ftir.o3_unam001_altzomoni_*.hdf
groundbased_ftir.ch4_niwa004_arrival.heights_*.hdf
groundbased_ftir.co_niwa004_arrival.heights_*.hdf
groundbased_ftir.o3_niwa004_arrival.heights_*.hdf
groundbased_uvvis.doas.zenith.no2_niwa003_arrival.heights*.hdf
groundbased_uvvis.doas.zenith.no2_niwa005_arrival.heights*.hdf
groundbased_uvvis.doas.zenith.no2_niwa103_arrival.heights*.hdf
groundbased_uvvis.doas.zenith.o3_niwa005_arrival.heights*.hdf
groundbased_uvvis.doas.zenith.o3_niwa103_arrival.heights*.hdf



groundbased_uvvis.doas.offaxis.no2_niwa103_arrival.heights*.hdf
groundbased_uvvis.doas.zenith.o3_iup008_athens_*.hdf
groundbased_uvvis.doas.zenith.no2_iup008_athens_*.hdf
groundbased_uvvis.doas.zenith.o3_iup002_bremen_*.hdf
groundbased_uvvis.doas.zenith.no2_iup002_bremen_*.hdf
groundbased_uvvis.doas.offaxis.no2_iup002_bremen_*.hdf
groundbased_uvvis.doas.offaxis.no2_iup008_athens_*.hdf
groundbased_uvvis.doas.offaxis.h2co_iup001_bremen_*.hdf
groundbased_uvvis.doas.offaxis.h2co_iup008_athens_*.hdf
groundbased_mwr.o3_ubern001_bern_*.hdf
groundbased_ftir.ch4_*_boulder.co*.hdf
groundbased_ftir.co_*_boulder.co*.hdf
groundbased_ftir.o3_*_boulder.co*.hdf
groundbased_ftir.h2co_*_boulder.co*.hdf
groundbased_ftir.ch4_iup001_bremen_*.hdf
groundbased_ftir.co_iup001_bremen_*.hdf
groundbased_ftir.o3_iup001_bremen_*.hdf
groundbased_ftir.h2co_iup001_bremen_*.hdf
groundbased_uvvis.doas.offaxis.h2co_bira.iasb008_bujumbura_*.hdf
groundbased_uvvis.doas.offaxis.no2_bira.iasb008_bujumbura_*.hdf
groundbased_uvvis.doas.offaxis.aerosol_knmi001_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.h2co_knmi001_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.no2_knmi001_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.aerosol_knmi004_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.h2co_knmi004_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.no2_knmi004_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.h2co_knmi006_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.no2_knmi006_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.aerosol_knmi006_cabauw_*.hdf
groundbased_uvvis.doas.offaxis.aerosol_*_de.bilt*.hdf
groundbased_uvvis.doas.offaxis.h2co_*_de.bilt*.hdf
groundbased_uvvis.doas.offaxis.no2_*_de.bilt*.hdf
groundbased_ftir.ch4_utoronto001_eureka_*.hdf
groundbased_ftir.co_utoronto001_eureka_*.hdf
groundbased_ftir.o3_utoronto001_eureka_*.hdf
groundbased_lidar.o3_*_eureka*.hdf
groundbased_uvvis.doas.zenith.no2_utoronto001_eureka.pearl_*.hdf
groundbased_uvvis.doas.zenith.o3_utoronto001_eureka.pearl_*.hdf
groundbased_ftir.ch4_*_harestua*.hdf
groundbased_ftir.co_*_harestua*.hdf
groundbased_ftir.o3_*_harestua*.hdf
groundbased_uvvis.doas.zenith.no2_bira.iasb004_harestua_*.hdf



groundbased_uvvis.doas.zenith.o3_bira.iasb004_harestua_*.hdf
groundbased_lidar.o3_cnrs.latmos002_haute.provence_*.hdf
groundbased_uvvis.doas.zenith.no2_cnrs.latmos013_haute.provence_*.hdf
groundbased_uvvis.doas.zenith.o3_cnrs.latmos013_haute.provence_*.hdf
groundbased_lidar.o3_dwd001_hohenpeissenberg_*.hdf
groundbased_uvvis.doas.zenith.no2_inta001_izana_*.hdf
groundbased_uvvis.doas.zenith.o3_inta001_izana_*.hdf
groundbased_ftir.ch4_ulg002_jungfraujoch_*.hdf
groundbased_ftir.co_ulg002_jungfraujoch_*.hdf
groundbased_ftir.o3_ulg002_jungfraujoch_*.hdf
groundbased_ftir.h2co_ulg002_jungfraujoch_*.hdf
groundbased_uvvis.doas.offaxis.aerosol_*_jungfraujoch*.hdf
groundbased_uvvis.doas.offaxis.h2co_*_jungfraujoch*.hdf
groundbased_uvvis.doas.offaxis.no2_*_jungfraujoch*.hdf
groundbased_uvvis.doas.zenith.no2_bira.iasb002_jungfraujoch_*.hdf
groundbased_uvvis.doas.zenith.o3_bira.iasb002_jungfraujoch_*.hdf
groundbased_uvvis.doas.offaxis.aerosol_*_la.reunion.leport*.hdf
groundbased_uvvis.doas.offaxis.h2co_*_la.reunion.leport*.hdf
groundbased_uvvis.doas.offaxis.no2_*_la.reunion.leport*.hdf
groundbased_ftir.ch4_bira.iasb003_la.reunion.maido_*.hdf
groundbased_ftir.co_bira.iasb003_la.reunion.maido_*.hdf
groundbased_ftir.o3_bira.iasb003_la.reunion.maido_*.hdf
groundbased_ftir.h2co_bira.iasb003_la.reunion.maido_*.hdf
groundbased_lidar.o3_ureunion.lacy001_la.reunion.maido_*.hdf
groundbased_uvvis.doas.zenith.no2_cu002_la.reunion.maido_*.hdf
groundbased_uvvis.doas.zenith.o3_cu002_la.reunion.maido_*.hdf
groundbased_uvvis.doas.zenith.no2_cnrs.latmos020_la.reunion.stdenis_*.hdf
groundbased_uvvis.doas.zenith.o3_cnrs.latmos020_la.reunion.stdenis_*.hdf
groundbased_ftir.ch4_niwa001_lauder_*.hdf
groundbased_ftir.co_niwa001_lauder_*.hdf
groundbased_ftir.o3_niwa001_lauder_*.hdf
groundbased_ftir.h2co_niwa001_lauder_*.hdf
groundbased_ftir.ch4_niwa006_lauder_*.hdf
groundbased_ftir.co_niwa006_lauder_*.hdf
groundbased_ftir.o3_niwa006_lauder_*.hdf
groundbased_ftir.h2co_niwa006_lauder_*.hdf
groundbased_lidar.o3_*_lauder*.hdf
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