AERO-SAT

Aerosol Climate Data Records

CDR = time series of sufficient length, consistency, and continuity to determine climate variability and change (NRC, 2004)

www.aero-sat.org

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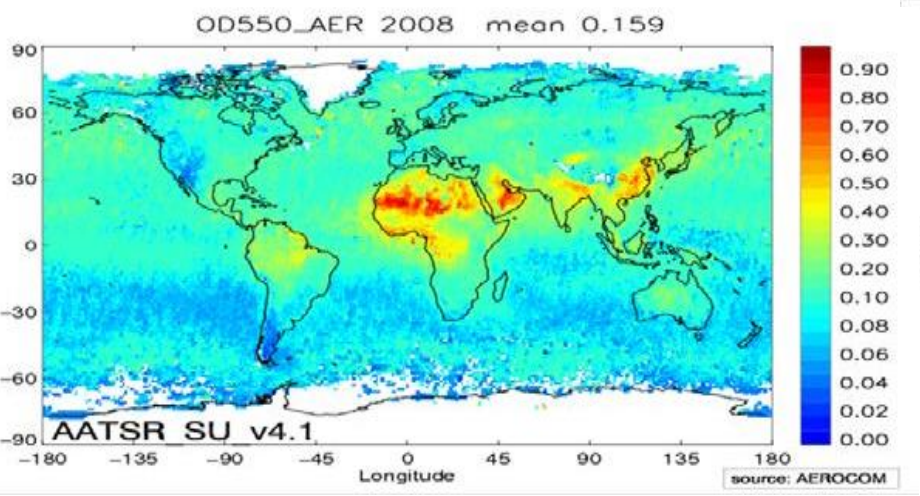
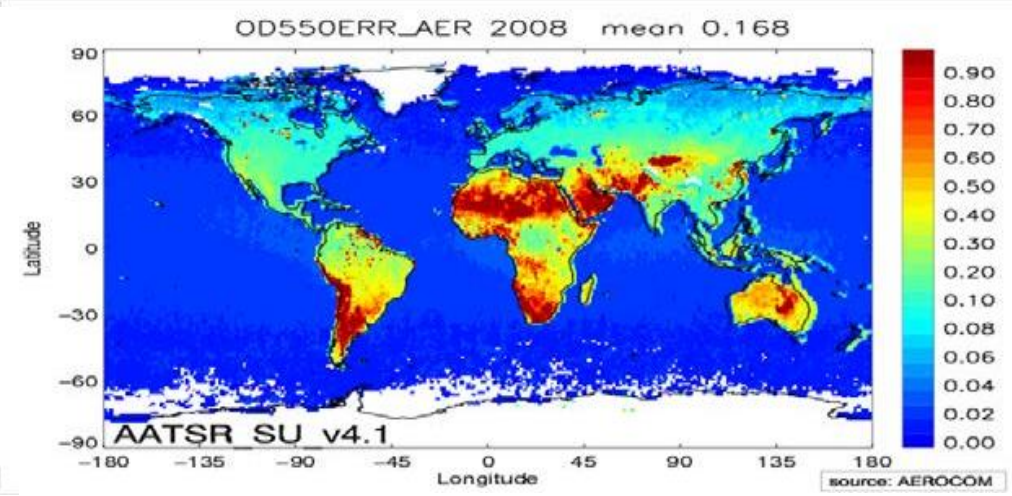
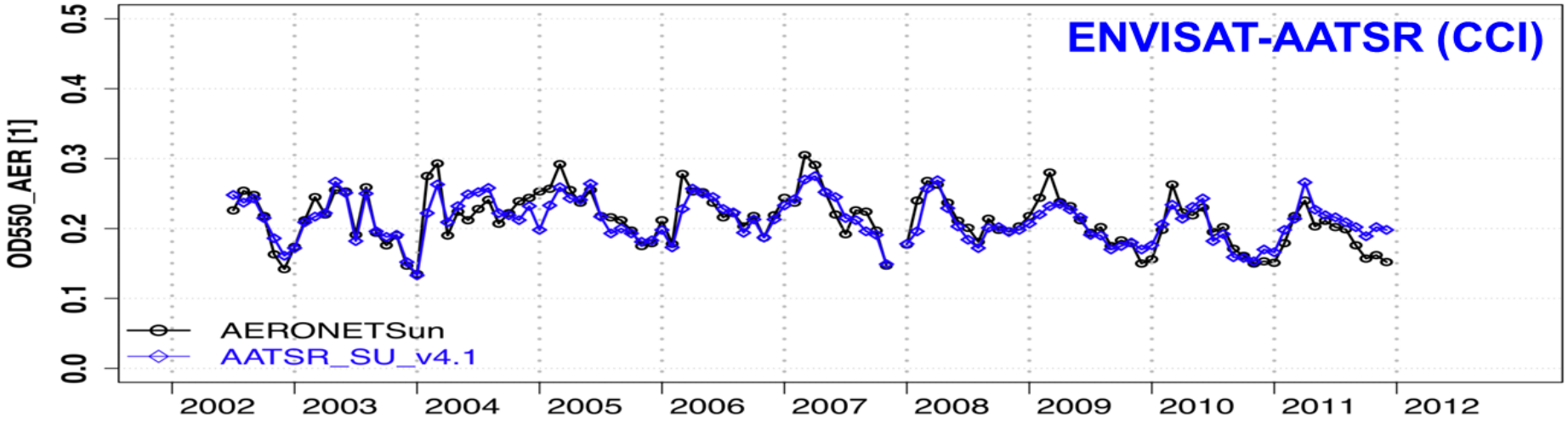
Example CDR from ESA's aerosol_cci







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GCOS Aerosol CDR Requirements

Product A.10.1 Aerosol optical depth
Product A.10.2 Aerosol single scattering albedo
Product A.10.3 Aerosol layer height
Product A.10.4 Aerosol extinction profiles from the troposphere to at least 35km

Benefits

- Improved aerosol products, thereby leading to a reduction in uncertainty as to the quantitative role of aerosols in climate forcing identified by the IPCC;
- Improved products that are needed to validate and improve the capability of climate simulation models and reanalyses to represent aerosol effects.

Target Requirements

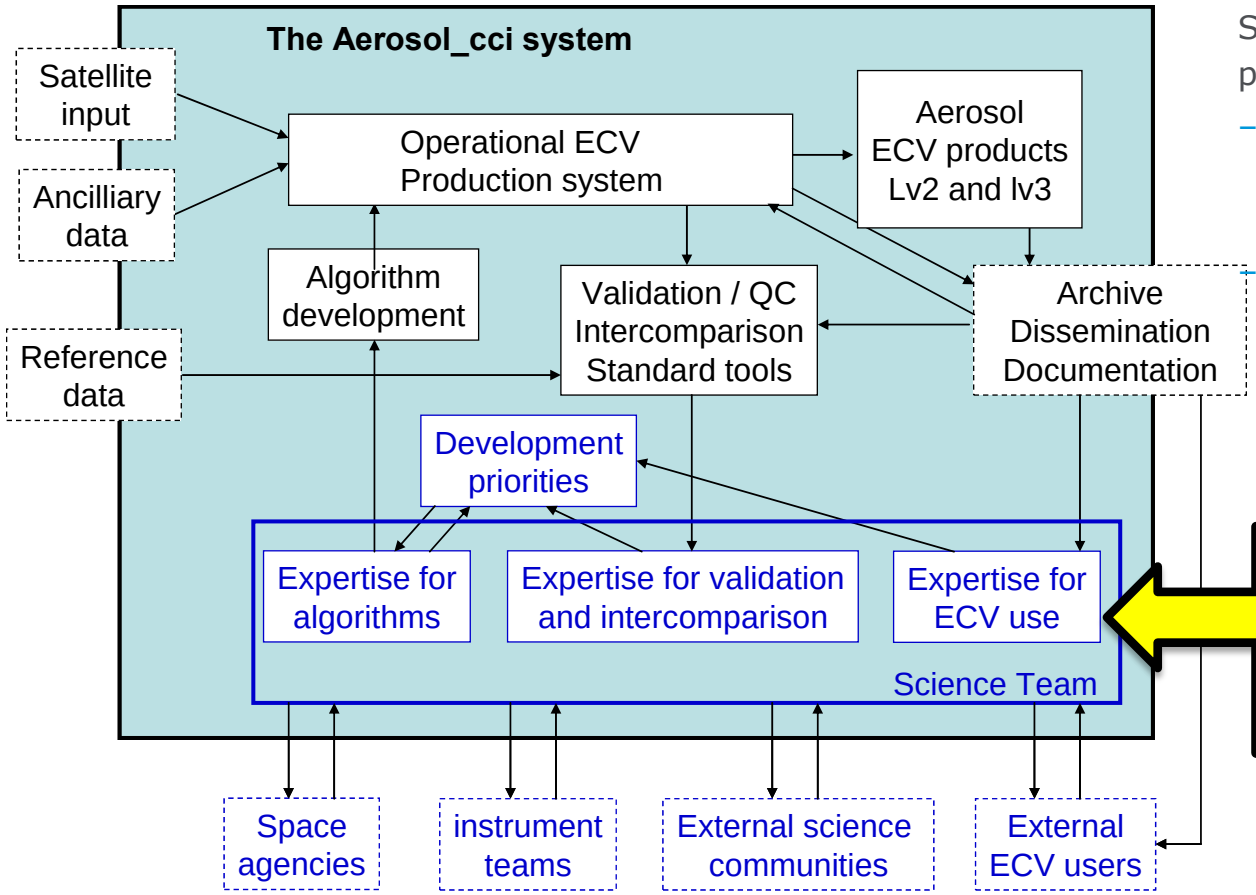
Variable/ Parameter	Horizontal Resolution	Vertical Resolution	Temporal Resolution	Accuracy	Stability
Aerosol optical depth	5-10km	N/A	4h	Max (0.03; 10%)	0.01
Single-scattering albedo	5-10km	N/A	4h	0.03	0.01
Aerosol-layer height	5-10km	N/A	4h	1km	0.5km
Aerosol-extinction coefficient profile	200-500km	<1km near tropopause, ~2km in middle stratosphere	weekly	10%	20 %

GCOS CDR Requirements

1.	Full description of all steps taken in the generation of FCDRs and ECV products, including algorithms used, specific FCDRs used, and characteristics and outcomes of validation activities
2.	Application of appropriate calibration/validation activities
3.	Statement of expected accuracy[6], stability and resolution (time, space) of the product, including, where possible, a comparison with the GCOS requirements
4.	Assessment of long-term stability and homogeneity of the product
5.	Information on the scientific review process related to FCDR/product construction (including algorithm selection), FCDR/product quality and applications[7]
6.	Global coverage of FCDRs and products where possible
7.	Version management of FCDRs and products, particularly in connection with improved algorithms and reprocessing
8.	Arrangements for access to the FCDRs, products and all documentation
9.	Timeliness of data release to the user community to enable monitoring activities
10.	Facility for user feedback
11.	Application of a quantitative maturity index if possible
12.	Publication of a summary (a webpage or a peer-reviewed article) documenting point-by-point the extent to which this guideline has been followed

A Current Challenge…

How can we guarantee scientific excellence in an operationally produced satellite aerosol CDR ?

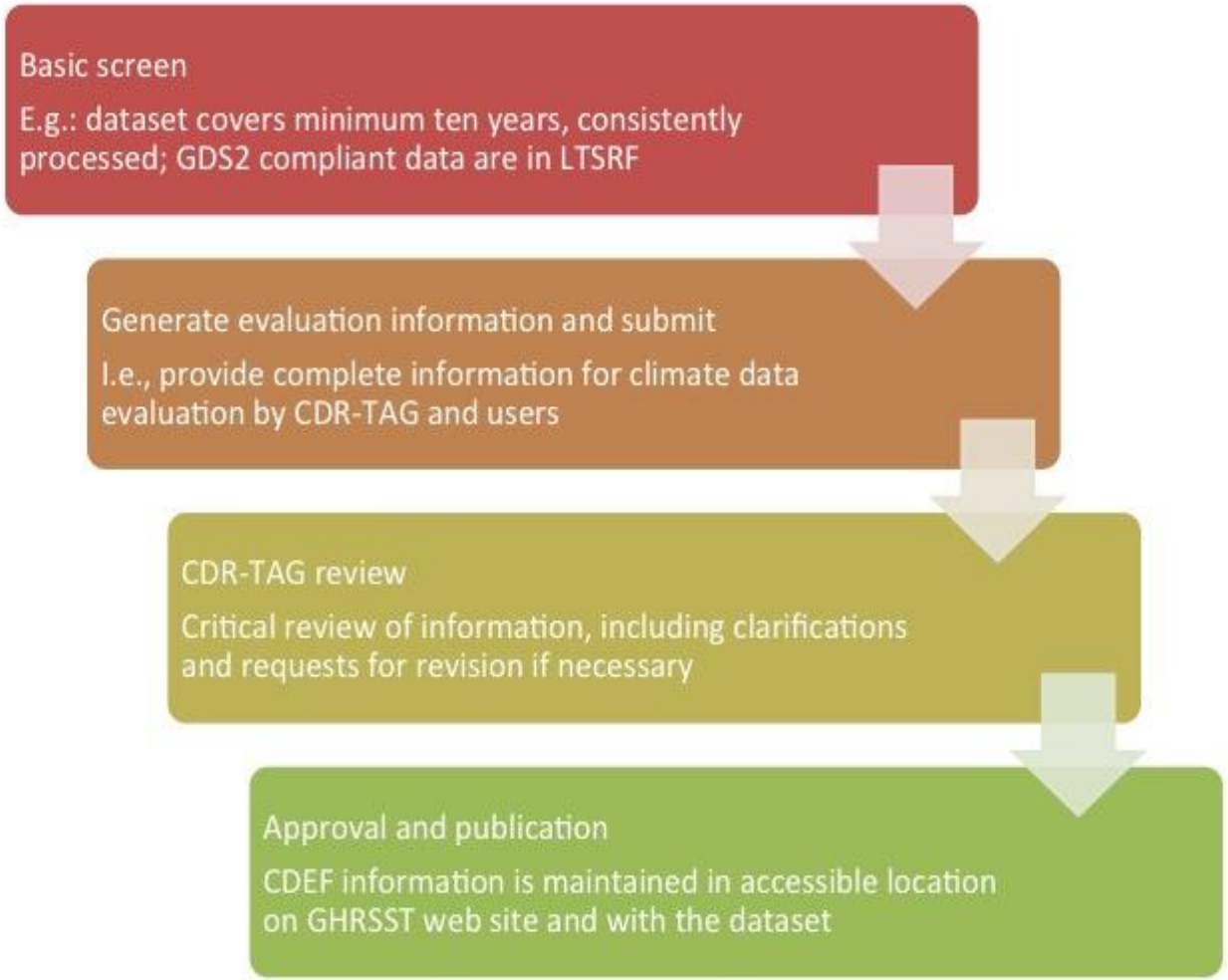


CDR must be at the Cutting Edge of technical capability and must have Scientific Credibility from the Users' perspective

- CDR development must be ***driven*** by the recognised community of **leading international** scientists
- Development, production, validation must be done **openly** and must be **inclusive**, ideally through open **international collaboration**.

Science Team is an integral component of the operational CDR production system

Climate Data Evaluation Framework



Do we need one of these for aerosol CDRs?

Objectives for the Aero-Sat WG on CDRs

To strengthen the uptake of satellite aerosol CDRs in climate research

- Improve the quality of aerosol CDRs by strengthening international collaboration
- Identify best-practice (e.g. minimum set of aerosol optical models, approach to uncertainty characterisation, ancillary data, ...?)
- Improve consistency by recommending standards for information content, formats, documentation and delivery mechanisms to facilitate uptake by users.
- Encourage intercomparison and consistent validation of aerosol CDRs for the benefit of users

List of candidate aerosol CDRs

here

Seed Questions

Overall Objective:

- To strengthen the uptake of satellite aerosol CDRs in climate research

Question 1:

- What can we do to provide technically better quality aerosol CDRs ?

Question 2:

- What can we do to provide CDRs that better meet climate users' needs in terms of:

    - format, specification, delivery

    - quality assurance

    - documentation, communication, training

    - other...?

Spare Slides

Initial Workplan

- Define consensus requirements for aerosol CDRs
  (already done?)
- Compile an inventory of aerosol CDRs, and assess against requirements
  (in progress)
- Consider adopting a common format to facilitate interoperability
  (obs4MIPs?)
- Consider setting up a common portal for access to aerosol CDRs
  (ESGF?)
- Organise workshop on aerosol CDR development
  (to be discussed today)
- Set up a CDR intercomparison and validation exercise
  (to be discussed today)

Proposed Actions to Complete the Initial Workplan:

- Complete the list of candidate satellite aerosol Climate Data Records, with an assessment against the GCOS requirements. Upload to AeroSat web site. (Action on SP)
- Encourage all aerosol CDR providers to submit obs4MIPs versions, include in above list, and promote use of this data in CMIP6.
- Organise a dedicated workshop on multi-mission aerosol CDRs – reviewing current status and defining an R&D agenda focussing on issues of inter-satellite consistency (and consistent uncertainty estimates).
  e.g. AVHRRs, ATSR-2/AATSR/SLSTR, MODIS+VIIRS,
  TOMS+GOME+SCIAMACHY+GOME-2+OMI+Sentinel-5P,
  SAGE+OSIRIS+GOMOS,
  CALIPSO+EarthCARE
- Support aerosol intercomparison and assessment exercises (e.g. GEWEX) on a regular/rolling basis (e.g. every 3 years) including all candidate data sets, and ensure climate-relevant measures of quality are included (e.g. long term stability), and that fitness for purpose is judged against GCOS requirements. (Should be led by users, but European contribution could be supported by

Seed Questions

Q1: Can/should we try to provide an assessment of the fitness for purpose of candidate CDRs?

- List candidate CDRs and document which GCOS requirements they meet
- Perform regular intercomparison & validation assessments
- Set up a full CDEF or Maturity Matrix approach

... or should we just leave it up to the users and peer-review to decide?

Q2: Do we need a workshop focussed on the development of multi-decadal multi-mission CDRs?

- assessing and quantifying long term stability of candidate CDRs
- look at ways to improve consistency between different instrument time series
- building long time series from multiple similar instruments (e.g. AVHRRs)
- techniques to bridge & fill data gaps (e.g. AATSR and SLSTR)
- hold during next AeroSat in Frascati in week of 5-9 Oct 2015?

Seed Questions

Q3: What can we do to facilitate the use of satellite aerosol data by climate modellers?

- common data and metadata format
- common definition of product uncertainties
- common documentation
- virtual aerosol data access portal (e.g. on the ESGF)
- build a satellite aerosol CDR multi-product ensemble
- hold a satellite aerosol "training session" aimed at modellers at next AeroCom
- other ideas...?