



aerosol_cci2
Data Access Requirements
Document

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ESA Climate Change Initiative
aerosol_cci

DARD - Data access requirements document
Deliverable D1.4

Version 3.3


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EXECUTIVE SUMMARY

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The Data Access Requirements Document (DARD, deliverable D1.4) describes in detail all necessary data sources (ground-based, the in-situ, the satellite L1 and L2, and ancillary datasets) required to generate and validate the CCI aerosol properties ECV, includes detailed descriptions of the Suitability of Use and Quality Information of each dataset, ensures that those data are freely available and accessible in their entirety for use in the CCI aerosol project.

The full ATSR archive was distributed by ESA via a NAS archive. All ATSR algorithm teams pulled the lv1 data from this archive to their own storage systems. This was done for the full processing of ATSR dataset, so that in the final year of the project, all partners have the full archive on their servers available.

This document is based on the most recent and preferably final dataset versions available, including several options (e.g. MERIS, SEVIRI). In this final version information on IASI and SEVIRI data was added, for which access is directly coordinated with EUMETSAT who are providing very helpful support. The document contains also data requirements for datasets which were only used in phase 1 of Aerosol_cci (AAI, MERIS at ICARE).

The document starts with the overview of the required Level 1 products from ESA and Third Party Missions. A subsequent overview of the ancillary data summarizes additional data sources needed in the retrieval algorithms for each EO group. Then in-situ observation data sources and higher-level products needed for product inter-comparison are described (section 4). The remaining part of the document then describes the detailed Aerosol_cci requirements for ECMWF Data and other required agreements with data providers (ICARE, ESA (Cat-1), NASA, Eumetsat) including access conditions.

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1.0	31.07.2014	Update of DARD aerosol_cci phase 1 Issue 3.4 integrated from respective proposal sections and CCI EO data requirements
2.0	31.07.2015	Update after year 1 aerosol_cci2
3.0	31.10.2016	Update after year 2 aerosol_cci2
3.1	31.03.2017	Corrected due to RID
3.2	04.04.2017	Science leader review (minor corrections)
3.3	02.05.2017	Corrected due to RID

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1 INTRODUCTION

The Data Access Requirements Document summarizes all relevant information for the accessibility of the required input datasets in the Aerosol CCI project.

The Aerosol_cci phase 2 project aims to produce the following set of aerosol products:

- 17 years from dual view ATSR-2 and AATSR (AOD, global, 1995 – 2012, 3 algorithms)
- 10 years from thermal IASI (Greater Sahara Region, 2007 – 2016, mineral dust AOD)
- 9 years from polarization / multi-angle / multi-spectral POLDER (selected land regions + 1 year Africa, 2005 – 2013, AOD and aerosol properties)
- 10 years from occultation GOMOS (global, 2003 -2012, extinction profile, stratospheric AOD, and a first dataset on size information and derived microphysical parameters (effective radius, surface area density, volume density)
- 10 years from a combination of nadir / multi-spectral AATSR and SCIAMACHY (AOD / aerosol type, global, 2003 – 2012)
- 1 year MERIS (AOD, global, 2008, 2 algorithms)
- SEVIRI hourly AOD for selected regions + Europe (+ adjacent regions), few years, regions agreed with users


During phase 1 also following datasets were produced / tested:

- a multi-spectral aerosol optical depth and aerosol type probability for MERIS
- a consistent UV absorbing aerosol index for OMI, SCIAMACHY and GOME together with averaging kernels for assimilation in models

1.1 Scope

The document identifies data access requirements for ESA and non-ESA mission data sets, ancillary data as well as higher-level EO data products that are needed for the generation and inter-comparison of the required Aerosol CCI products.

This document presents data access requirements, which were gathered via four methods:

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- 1) Data access overview from CCI EO Satellite Data Requirements document delivered after collocation meeting
- 2) a questionnaire to all EO partners, which asked about
 - a) overview about used ancillary data for each retrieval
 - b) detailed information about ancillary data access
- 3) discussion sessions.
- 4) ECMWF input for the ERA Interim data access

1.2 References

1.2.1 Applicable Documents

- [AD1] The Statement of Work, reference CCI-PRGM-EOPS-SW-12-0012, issue 1, revision 2, dated June 7th, 2013, and its specific annex C;
- [AD2] The Contractor's Proposal reference 3010317 revision 1.2 , dated 04 April 2014, s

1.2.2 Reference Documents

- [AD3] The ESA Climate Change Initiative – Description issue 1 revision 0 -30/09/09 EOP-SEP/TN/0030-09/SP Available online at:
http://earth.esa.int/workshops/esa_cci/ESA_CCI_Description.pdf
- [AD4] The ESA Climate Change Initiative – CCI EO Satellite Data Requirements, dated 27 October 2010
- [AD5] The ESA Climate Change Initiative – CCI Project Guidelines, ref EOP-DTEX-EOPS-SW-10-0002, Issue 1, revision 0, dated 05 November, 2010

1.2.3 Definitions of terms

The following terms have been used in this report with the meanings shown:

AAI	Absorbing Aerosol Index
AATSR	Advanced Along-Track Scanning Radiometer
ADEOS	ADvanced Earth Observing Satellite
ADV/ASV	AATSR Dual/Single View
AERGOM	Development of a GOMOS Aerosol Profile Information Retrieval Prototype Processor
AEROCOM	Aerosol Comparisons between Observations and Models
AERONET	Aerosol Robotic Network
AOD	Aerosol Optical Depth
ATBD	Algorithm Theoretical Basis Document
ATSR	Along Track Scanning Radiometer
AURA	NASA EOS satellite
AVHRR	Advanced Very High Resolution Radiometer
BADC	British Atmospheric Data Center
BAER	Bremen Aerosol Retrieval
BRDF	Bi-Directional Reflectance Function
CALIOP	Cloud-Aerosol Lidar with Orthogonal Polarization




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CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations
CCI	Climate Change Initiative
CLRTAP	Convention on Long Range Transboundary Air Pollution
CMIP5	Coupled Model Intercomparison Project Phase 5
DARD	Data Access Requirement Document
EARLINET	European Aerosol Research Lidar Network
ECV	Essential Climate Variable
EMEP	European Monitoring and Evaluation Programme
ENVISAT	ESA's Environmental Satellite
EOS	Earth Observing System
ERS-2	European Remote Sensing Satellite 2
EUCAARI	European integrated project on Aerosol Cloud Climate and Air Quality Interactions
EUSAAR	European Supersites for Atmospheric Aerosol Research
GAW	Global Atmosphere Watch
GBTR	Gridded Brightness Temperature and Reflectance
GCOS	Global Climate Observing System
GlobAerosol	ESA Data User Element project on aerosol retrieval
GMES	Global Monitoring for Environment and Security
GOME	Global Ozone Monitoring Experiment
GOME-2	Global Ozone Monitoring Experiment 2
GOMOS	Global Ozone Monitoring by Occultation of Stars
HTAP	Hemispheric Transport of Air Pollution
IASI	Infrared Atmospheric Sounding Interferometer
LOA	Laboratoire d'Optique Atmosphérique
LUT	Look-Up Table
L2 (3)	Level 2 (3)
MACC	Monitoring Atmospheric Composition and Climate
MERIS	Medium Resolution Imaging Spectrometer
METOP	European operational polar-orbiting meteorological satellite
MISR	Multiangle Imaging SpectroRadiometer
MODIS	Moderate Resolution Imaging Spectro-Radiometer
OMAERO	OMI Aerosol Optical Depth product
OMI	Ozone Monitoring Instrument
ORAC	Optimal Retrieval of Aerosols and Clouds
PARASOL	Polarization and Anisotropy of Reflectances for Atmospheric Sciences coupled with Observations from a Lidar
PFR	Precision Filter Radiometers
POLDER	POLarization and Directionality of the Earth's Reflectances
SCIAMACHY	Scanning Imaging Absorption spectroMeter for Atmospheric Cartography (also: SCIA)
SCIATRAN	radiative transfer model and retrieval algorithm developed for SCIAMACHY
SeaWIFS	Sea-viewing Wide Field-of-view Sensor
SENTINEL	GMES Satellite Programme
SEVIRI	Spinning Enhanced Visible and InfraRed Imager
SKYNET	Sky radiometer and radiation instruments network
SYNAER	Synergistic Aerosol Retrieval
TOMS	Total Ozone Mapping Spectrometer
WDCA	World Data Center for Aerosols

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2 REQUIRED LEVEL 1 PRODUCTS FROM ESA AND THIRD PARTY MISSIONS

2.1 Information about the originating system, information about data availability, estimates of the data quantity

The following Table gives an overview which satellite data are needed for the aerosol_cci ECV production.

Table 2.1-1: Satellite data for Aerosol_cci ECV production

Agency	Satellite	Sensor	Period	Product	Version*	Subset or complete needed	Volume (full dataset for ECV product)	When needed	Available from	Comments
ESA	ERS-2	ATSR-2	1995-2003	AT2_TOA_1P	STEP/1.4	all (a)	~28 TB	(a)	UK-MM-PAF	Distributed via shipped NAS system
ESA	Envisat	AATSR	2002-2012	ATS_TOA_1P	AATS/6.05	all (a)	~43 TB	(a)	UK-MM-PAF	Distributed via shipped NAS system
ESA	Envisat	MERIS	2008	RR_1P	IPF v5	Subset (a)	~3.5 TB	(d)	ESA	Lv 1 data available at DLR or from Brockmann
ESA	Envisat	SCIAMACHY	2003-2012	Level 1b	v8.01	all (a)	~35 TB	(a)	ESA	available at DLR
ESA	ERS	GOME	1995-2002	Level 1b	V5	all (a)	~32 TB	(a)	ESA	available at DLR
ESA	Envisat	GOMOS	2003-2012	Level 1b	V6	all (a)	~5 TB	(a)	ESA	L1 & L2 delivered
ESA	Sentinel-3	SLSTR	2016	Level 1b	TBD	Subset (a)	TBD	(c)	ESA	At time of writing, quality of L1b data is not yet suitable for aerosol processing
ESA	Sentinel-5P	TROPOMI	2015	Level 1b		Subset (a)	~26TB	(c)	ESA	postponed launch to June 2017
CNES	Parasol	POLDER	2005-2013	Level 1b	V1	Subset (a)	~7.5 TB	(a)	ICARE	available Mar 2005 - 2013
Eumetsat	MetOp	GOME-2	2006-2016	Level 1b	4.5	all (a)	~35 TB	(a)	Eumetsat	Available at KNMI
NASA	AURA	OMI	2006-2016	Level 1b	Version 3	all (a)	~25 TB	(a)	KNMI	Available at KNMI
Eumetsat	MetOP	IASI	2007-2016	Level 1c		Subset (b)	~57Tb	(a)	Eumetsat	Available at LMD
Eumetsat	MetOP	IASI	2007-2016	PCA or Level 1c		Subset (b)	~57Tb	(a)	Eumetsat	Available at BIRA
Eumetsat	MetOP	IASI	2007-2016	Level 1c		Subset (b)	~57Tb	(a)	Eumetsat	Available at ULB
Eumetsat	MetOP	IASI	2007-2016	Level 1c		Subset (b)	~57Tb	(a)	Eumetsat	Available at DLR

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EUMETSAT	MSG	SEVIRI	2008	Level1c		Selected regions	~7Tb	(a)	Eumetsat	Available at rayference
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- (a): with project start 2014
(b): greater Sahara; all years
(c): phase 3 of project in 2017
(d): phase 3; 1 year 2008

2.2 Specification of the sensor type and key technical characteristics

Table 2.2-1 provides an overview of algorithms and target sensors they shall be applied to.

Table 2.2-1: Algorithms and sensors targeted in Aerosol_cci

sensor	algorithm													
	ORAC	ADV/ASV	Swansea dual view	SYNAER	GRASP	AAI	Stratospheric extinction	BIRA-MAPIR	DLR-IMARS	ULB	LMD	XBAER	SEAWIFS4MERIS	CISAR
AATSR	x	x	x	x										
ATSR-2	x	x	x											
SCIAMACHY				x		x								
GOMOS							x							
GOME						x								
GOME-2						x								
OMI						x								
POLDER					x									
TROPOMI						x								
SLSTR	x	x	x											
IASI								x	x	x	x			
MERIS												x	x	
SEVIRI														x

2.3 Analysis of known Level-1 input data problems, their potential impact on the ECV product quality, and identify feasible actions necessary to minimise the impact

The analysis of known Level -1 input problems are presented in Table 2.33-1. The analysis in the table below is only for the stand-alone products of each sensor, not for the merged product. The products will be produced for 17 years (1995-2012) for ATSR-2 and AATSR algorithms, 10 years



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for a combination of nadir / multi-spectral AATSR and SCIAMACHY, 10 years for IASI, 10 years for GOMOS and 10 years for POLDER algorithms. GOMOS, ATSR-2, AATSR and combined AATSR/SCIAMACHY retrievals will be globally provided. The IASI algorithms will perform on a selected greater Sahara region, whereas POLDER will be distributed only over selected land regions and Africa.

Table 2.3-1: Analysis of known Level -1 input problems


Sensor	Nr	Level-1 input data problems	Potential impact on ECV product quality	Feasible action to minimise impact
(A)ATSR	A1	Forward/nadir geolocation	Algorithms using both views will provide less accurate results when the surface is inhomogeneous on the scale of the geo-location mismatch; see also A1: pixel to pixel variations will influence also the dual view, esp. when not exactly collocated	This will either be solved by L1 reprocessing or (if necessary) correction in prototype processor.
	A2	Error in visible /near-ir channel radiometric calibration	Bias/drift in accuracy of retrieved AOD and other parameters	Close interaction with (a) ongoing work of AATSR calibration scientist (D. Smith) at RAL (b) parallel activities within the cloud ECV programme (also involving RAL/Oxford teams) to ensure consistent, state-of-the-art calibration is used across the aerosol and cloud ECVs at the point of prototype ECV generation and efficient feed-back of relevant findings from CCI aerosol
PARASOL	P1	No known issues		
SCIAMACHY	S1	In the UV, an increasing degradation is visible which depends on wavelength, especially close to the channel edges and in channel 2.	Biased in the accuracy of AOD and aerosol type retrievals.	A degradation correction is required to assure the quality of the SCIAMACHY data products. Corrections are being worked.
GOME	G1	Channel-to-channel jumps are caused by inhomogeneities in the observed scene during the serial read-out	Inaccuracy problems by determining aerosol type in retrieval schema. Uncertainty in AOD for retrieved type of aerosol	Update in correction coefficients for the spectral bands is required.
GOME-2	GG1	Calibration issue in the GOME-2/MetOp level-1 spectra: significant dependence with the satellite scan angle	Inaccuracy problems by determining aerosol type in retrieval schema. Uncertainty in AOD for retrieved type of aerosol	Determine a bias between the relative differences for the west and east GOME-2 pixels. Make corrections for the calibration coefficients



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	GG2	Radiometric degradation of the instrument.	Reduction of the AAI data quality. Possible artificial trends in the AAI.	Problem is being worked by EUMETSAT. Possible remove trend by comparing to other instruments (OMI).
OMI	01	Relatively large pixel size results in cloud contamination.	Biased in the AOD retrievals.	Improve cloud screening. Include MODIS data for cloud screening.
	02	After 2008 about 1/3rd of the swath is blocked, see http://www.knmi.nl/omi/research/product/rowanomaly-background.php	AAI and AOD retrievals limited to a reduced swath.	Affected ground pixels need to be flagged
GOMOS	G01	Residual scintillation	Reduced accuracy of extinction profile	Use of a spectral/full spatial inversion scheme, using a full covariance matrix method (possible with the AerGom algorithm) would minimize the problem, but also incur long processing time. Complete removal of the scintillation is theoretically only possible for vertical occultation (obliquity = 0).
IASI	I1	PC Scores not ready at EUMETSAT, thus enormous data volume	Data transfer problems may cause delays in full mission reprocessing	Negotiate with EUMETSAT which subsets are available in PC scores

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3 ANCILLARY DATA

3.1 Ancillary Data use in ORAC

Listed are non-satellite and satellite data needed for ECV production:


Ancillary dataset	Source	Use in ORAC
Elevation model		Not used yet
Aerosol models	Algorithm intrinsic	See aerosol model workshop - no external dataset used
BRDF models / surface reflectance spectra	Algorithm intrinsic	See reflectance workshop. Land BRDF parameterisation of North et al., J. Geophys. Res., 107(D18), 2002. (no external data required). Ocean BRDF determined sea-surface reflectance model, making use of 10 m ECMWF winds and OceanColour_cci products
Cloud masks	Algorithm intrinsic	See cloud workshop - no external dataset used. Calculated directly from L1B radiances
Land sea mask	Algorithm intrinsic	Either (A)ATSR L1B land flag, or SADIST landflag used.
Ocean colour	OceanColour_cci	OceanColour_cci absorption and particulate backscatter products used in ocean BRDF modelling
Surface wind speed	ECMWF	ERA-Interim u/v 10 m wind components used in ocean BRDF modelling

a. Identification of the data class (EO, model)

- For Ocean BRDF model : Model
- For Land BRDF model : Model
- For Ocean colour : EO
- For surface wind speed : Model reanalysis
- For Land-sea mask: EO

b. Specification of the sensor type and key technical characteristics

- For Ocean colour : SeaWiFs, MERIS, MODIS
- For Land-sea mask: AATSR 1k resolution

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c. Information about data availability & coverage (times-scale, geographic, temporal)

For Ocean colour : Global, monthly mean fields (4x4 km) 1997 – present; use of a climatology based on OceanColour_cci for ATSR-2 retrievals pre-1997.

- For surface wind speed : 6 hourly fields at 0.75x0.75 degree
- For Land-sea mask: Global. Included in (A)ATSR L1b files

d. Source data product name & reference to product technical specification documents

- For Ocean BRDF model : Oxford sea surface reflectance model (Sayer A.M., G.E. Thomas and R.G. Grainger: A sea surface reflectance model for (A)ATSR and application to aerosol retrievals, Atmos. Meas. Tech. 3, 813-838, 2010)

For Ocean colour : OceanColour_cci Chlorophyll-a and Yellow-substance

- For surface wind speed : ECMWF operational reanalysis 10 m wind fields (gpas 10u and 10v)
- For Cloud mask: ATS_TOA_1P*.N1 (AATSR) AT2_TOA_1P (ATSR2)
- For Land-sea mask: ATS_TOA_1P*.N1 (AATSR) AT2_TOA_1P (ATSR2)

e. Estimates of the data quantity

- For Ocean colour : 34 GB per year
- For surface wind speed : 830 MB per year
- For Cloud mask: None (above L1b)
- For Land-sea mask: None (above L1b)

f. Indication of data quality and reliability

- For Ocean colour :
- Product Validation and Inter-Comparison Report available from <http://www.esa-oceancolour-cci.org/?q=documents>

g. Description of the ordering and delivery mechanism

- For Ocean colour: Freely available from <http://www.oceancolour.org>
- For surface wind speed: Accessible via the CEDA (BADC). Registration required

h. Identification of access conditions & pricing

3.2 Ancillary Data use in ESA MERIS Standard aerosol retrieval (ODESA MEGS®)

Listed are non-satellite and satellite data needed for ECV production:



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Ancillary dataset	Source	Use in ESA MEGS
Elevation model	Algorithm intrinsic	Present in L1 dataset (Tie point grid resolution)
Meteo data (surface pressure, wind speed)	Algorithm intrinsic	Present in L1 dataset (Tie point grid resolution)
Aerosol models	Algorithm intrinsic	See aerosol model workshop – no external dataset used
BRDF models / surface reflectance spectra	Algorithm intrinsic	See reflectance workshop – no external dataset used
Cloud masks	Algorithm intrinsic	See cloud workshop – no external dataset used
Land sea mask	Algorithm intrinsic	1 km, global, static, present in L1 dataset

All ancillary data needed to run ESA Standard aerosol is contained in the Level 1 MERIS file. The standard MERIS processing algorithm is provided by ACRI through the ODESA platform.

3.3 Ancillary Data use in SYNAER


Listed are non-satellite and satellite data needed for ECV production:

Ancillary dataset	Source	Use in SYNAER
Elevation model		Not used yet
Aerosol models	Algorithm intrinsic	36 mixtures of common Aerosol_cci defined 4 components
BRDF models / surface reflectance spectra	Algorithm intrinsic	See reflectance workshop – no external dataset used
BRDF dataset	Kriebel dataset	fixed types
Cloud masks	Algorithm intrinsic	APOLLO_NG
Land sea mask	Algorithm intrinsic	WDB2 implemented as part of APOLLO

Ancillary data in SYNAER for Land sea mask:

a. Identification of the data class (EO, model)

- EO, auxiliary

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b. Specification of the sensor type and key technical characteristics

- 1 km resolution

c. Information about data availability & coverage (times-scale, geographic, temporal)

- Global, static

d. Source data product name & reference to product technical specification documents

- Implicit in algorithm: WDB2

e. Estimates of the data quantity

- 60MB

3.4 Ancillary data overview for GRASP POLDER-3 / PARASOL


Listed are non-satellite and satellite data needed for ECV production:

Product	Source	Comment
Elevation model	Mean pixel altitude from the DEM in the pixel [m]	NOAA
Aerosol models	Algorithm intrinsic	
BRDF models / surface reflectance spectra	Algorithm intrinsic	Ross-Li sparse BRDF model or other models for land surface reflection. Cox and Munk model over ocean
BPDF models / surface reflectance spectra	Algorithm intrinsic	Maignan BRDF model or other models for land surface polarized reflection. Cox and Munk model over ocean
Cloud masks	Algorithm intrinsic	
Land sea mask	DEM	

Ancillary data in LOA for Land sea mask:

a. Identification of the data class (EO, model)

- Model

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b. Information about data availability & coverage (times-scale, geographic, temporal)


- Global March 2005-2013. 6 km resolution PARASOL time overpass

c. Source data product name & reference to product technical specification documents

- METEOFRACTANCE (documentation available)

d. Description of the ordering and delivery mechanism

- Embedded in the PARASOL data

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3.5 Ancillary data overview for AAI

Listed are non-satellite and satellite data needed for ECV production:

Ancillary dataset	Source	Use in AAI (OMI)
Elevation model	OMI L1B	Yes
Aerosol models		
BRDF models / surface reflectance spectra		
BRDF dataset		
Cloud masks		
Land sea mask	OMI L1B	Yes

Ancillary data in AAI for BRDF:

a. Identification of the data class (EO, model)

- EO

b. Specification of the sensor type and key technical characteristics

- OMI UV-VIS spectrometer; 13x24 km at nadir

c. Information about data availability & coverage (times-scale, geographic, temporal)

- Global daily

d. Source data product name & reference to product technical specification documents


- OMI OMAERO; OMI ATBD

e. Estimates of the data quantity

- 2,5 TB

f. Indication of data quality and reliability

- Collection 3 processing

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g. Description of the ordering and delivery mechanism

- FTP

h. Identification of access conditions & pricing

- Online

3.6 Ancillary data overview for AAI (TROPOMI)

Ancillary dataset	Source	Use in AAI (TROPOMI)
Elevation model	USGS	Yes
Land use model	USGS	Yes
Aerosol models	-	-
BRDF models / surface reflectance spectra	-	-
BRDF dataset	-	-
Cloud masks	-	-
Land sea mask	USGS	Yes
Ocean colour	-	-
Surface wind speed	-	-

a. Identification of the data class (EO, model)

Model

b. Specification of the sensor type and key technical characteristics

n/a

c. Information about data availability & coverage (times-scale, geographic, temporal)

Global coverage.

GMET2010 DEM:


J.J. Danielson and D.B. Gesch; Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010) (2011). URL http://topotools.cr.usgs.gov/gmted_viewer/.

Land Use Model:

USGS Global Land Cover Characteristics Data Base Version 2.0 (http://edc2.usgs.gov/glcc/globdoc2_0.php)

d. Estimates of the data quantity

Data is compiled into a single file of 1 Gbyte (compressed).

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e. Indication of data quality and reliability

For quality assessments see relevant websites.

f. Description of the ordering and delivery mechanism

Static data delivered with the algorithm.

g. Identification of access conditions & pricing

Free of charge.

3.7 Ancillary data overview for stratospheric extinction

a. Identification of the data class (EO, model)

- EO

b. Specification of the sensor type and key technical characteristics

- Spectrometer stellar occultation (profiling capabilities)

c. Information about data availability & coverage (times-scale, geographic, temporal)

- Global scale, high measurement rate (about 100.000 occultation per year). Data from 2002 to present

d. Source data product name & reference to product technical specification documents


- Official GOMOS aerosol product + Aerosol products delivered by ESA AERGOM project. Specifications: AERGOM ATBD, F. Vanhellemont and N. Matshvili, April 2010, BIRA-IASB; Aerosol_cci GOMOS-AERGOM ATBD, Filip Vnhellemont, Christine Bingen and Charles Robert, 29.06.2012

e. Estimates of the data quantity

- ~0.5 TB for the year 2008

f. Indication of data quality and reliability

- The data quality has been assessed by the User and validation team. This aspect is discussed in a paper "Stratospheric aerosol data records for the Climate Change Initiative: development, validation and application to Chemistry-Climate

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Modelling” by Bingen et al., to be published in Remote Sensing of Environment, Special issue on Earth Observation of Essential Climate Variables, 2016..



g. Description of the ordering and delivery mechanism

- Trough ESA

h. Identification of access conditions & pricing

- Scientific product. No cost

3.8 Ancillary data overview for ADV/ASV retrieval

a. Identification of the data class (EO, model)

- For Aerosol models: 2-modal log-normal distribution
- For Land-sea mask and sun glint flag: EO
- Cloud mask: Intrinsic algorithm modelling
- Chlorophyll concentration: EO
- Wind speed climatology: EO

b. Specification of the sensor type and key technical characteristics

- For Land-sea mask and sun glint flag: ATSR2/AATSR

c. Information about data availability & coverage (times-scale, geographic, temporal)


- For Aerosol models: Global
- Cloud mask: ATSR2/AATSR data
- Chlorophyll concentration: Global
- Wind speed climatology: Global

d. Source data product name & reference to product technical specification documents

- For Aerosol models: AERONET cluster analysis by Omar et al. MODIS 5 ATBD
- For Land-sea mask and sun glint flag: ATSR2/AATSR Level 1 GBTR data
- Cloud mask: AATSR Level 1 GBTR data, C.Robles-González, PhD thesis
- Chlorophyll concentration: CZCS Chlorophyll database

e. Estimates of the data quantity

- For Aerosol models: 12.5 Mb / aerosol model

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- Chlorophyll concentration: 6.5 Mb

f. Description of the ordering and delivery mechanism

- For Land-sea mask and sun glint flag: Comes with GBTR
- Cloud mask: Comes with GBTR

3.9 Ancillary data overview for SLSTR retrieval

For SLSTR each of the 3 AATSR algorithms is currently adopted. The ancillary data will be similar to the description in 3.1 for ORAC, 3.8 for ASV/ADV and 3.13 for the SU algorithm, as these algorithms are going to be used for SLSTR retrieval.

3.10 Ancillary data overview for BIRA/IASI retrieval

a. Identification of the data class (EO, model)

Aerosol parameters: model

Cloud mask: EO

Surface emissivity: EO (land) or model (sea)

Surface temperature a priori: EO or model (when no acceptable EO available)

Vertical profiles of temperature and water vapour: EO

Vertical profiles of other atmospheric gases (O₃, CO₂, N₂O, CH₄): model

Desert dust vertical profile a priori climatology: EO

b. Specification of the sensor type and key technical characteristics

Aerosol parameters: log-normal (1 mode) particle size distribution, refractive index

Cloud mask: IASI I2 operational


Surface emissivity: IASI for land, model of Newman et al. for sea

Surface temperature a priori: IASI I2 operational, last processing version available; if version previous than 5: use ECMWF model data instead

Vertical profiles of temperature and water vapour: IASI I2 operational, last processing version available

Vertical profiles of other atmospheric gases (O₃, CO₂, N₂O, CH₄): AFGL 1986 climatology

Desert dust vertical profile a priori climatology: CALIPSO (Amiridis et al)

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c. Information about data availability & coverage (times-scale, geographic, temporal)

Desert dust vertical profile climatology: covers the geographical range needed
, 8 years averaged
All others: global

d. Source data product name & reference to product technical specification documents

Aerosol parameters: refractive index from the GEISA database (dust-like)
Cloud mask: IASI I2 operational
Surface emissivity: land from Zhou et al., sea from Newman et al.
Surface temperature a priori: IASI I2 operational
Vertical profiles of temperature and water vapour: IASI I2 operational
Vertical profiles of other atmospheric gases (O3, CO2, N2O, CH4): AFGL 1986 climatology
Desert dust vertical profile a priori climatology: CALIPSO (Amiridis et al)

e. Estimates of the data quantity

IASI I2 operational ('tw' and 'clp' products): ~800Mb/year
Surface emissivity database: ~150Mb (zip archive) in total
Desert dust profiles climatology: ~1.2G (zip archive) in total
Others: a few Mb in total


f. Description of the ordering and delivery mechanism

IASI I2 operational: through the EUMETCAST system, specific arranged transfers for scientific reprocessings done by the EUMETSAT team upon demand (and if possible)
Surface emissivity and Desert dust vertical profile climatology: upon request to the author

3.11 Ancillary data overview for DLR/IASI retrieval

a. Identification of the data class (EO, model)

model:
digital elevation model
optical property model for dust with AAA (Asymptotic Approximation Approach)

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and ice clouds (parameterizations)
example surface emissivity spectra

b. Specification of the sensor type and key technical characteristics

-

c. Information about data availability & coverage (times-scale, geographic, temporal)

All input static, i.e. preproduced and without temporal changes
DEM: ETOPO-2 global remapped to 0.1° available at DLR (original dataset from NOAA-NGDC: www.ngdc.noaa.gov)
Surface emissivity spectra available at DLR (original dataset from MODIS UCSB Emissivity Library www.icesb.ucsb.edu/modis/EMIS/html/en.html)
Optical properties: calculated offline according to IMARS ATBD

d. Source data product name & reference to product technical specification documents

Auxiliary data are aggregated in one input data file as specified in IMARS ATBD.
Input file is static, i.e. once produced it does not undergo temporal changes.

e. Estimates of the data quantity


DEM global at 0.1° resolution: 50MB
Other ancillary data: 1MB

f. Description of the ordering and delivery mechanism

-

3.12 Ancillary data overview for ULB/IASI retrieval

Ancillary dataset	Source
Elevation model	NGDC TerrainBase Global DTM (http://projects.eri.ucsb.edu/mapcat/)
Aerosol Refraction Index	Volz, F. E. Infrared optical constants of ammonium

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	sulfate, Sahara dust; volcanic pumice and flyash <i>Appl. Opt.</i> , 1973 , <i>12</i> , 564-568
Land emissivity	Zhou, D.; Larar, A.; Liu, X.; Smith, W.; Strow, L.; Yang, P.; Schlüssel, P. & Calbet, X. Global Land Surface Emissivity Retrieved From Satellite Ultraspectral IR Measurements <i>IEEE T. Geosci. Remote.</i> , 2011, <i>49</i> , 1277-1290
Ocean emissivity	Nalli, N.; Minnett, P. & van Delst, P. Emissivity and reflection model for calculating unpolarized isotropic water surface-leaving radiance in the infrared. I: Theoretical development and calculations <i>Applied Optics</i> , 2008, <i>47</i> , 3701-3721
Cloud masks	Eumetsat IASI L2
Land sea mask	From the Elevation model
Desert dust altitude climatology	From global Calipso measurements 2007-2013
Atmospheric state (H2O/O3/T/P profiles)	Eumetsat IASI L2
Surface temperature	Eumetsat IASI L2/ECMWF

a. Identification of the data class (EO, model)

EO: Elevation, land emissivity, cloud masks, land/sea mask, desert dust altitude climatology, atmospheric state, surface temperature

Lab: refractive index, ocean emissivity

b. Specification of the sensor type and key technical characteristics

IASI: polar orbiting nadir infrared

c. Information about data availability & coverage (times-scale, geographic, temporal)


Climatologies, except for atmospheric state, cloud mask and surface temperature

d. Source data product name & reference to product technical specification documents

see table above

e. Estimates of the data quantity

Several TBs, most from the IASI L2

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f. Description of the ordering and delivery mechanism

IASI data from Eumetsat, CALIPSO from the Atmospheric Science Data Center (ASDC) at NASA Langley Research Center (LaRC)

3.13 Ancillary data overview for LMD/IASI retrieval

a. Identification of the data class (EO, model)

- For radiance IASI l1c: EO
- For elevation model and land-sea mask GTOPO30: model (DEM)
- For cloud mask: EO (Algorithm intrinsic) + surface temperature of ERA-I reanalyses from ECMWF model + AMSU radiances (EO)
- For surface emissivity: EO (IASI monthly surface emissivity - Capelle, et al., JAMC, 2012)

b. Specification of the sensor type and key technical characteristics


- IASI consists of a Fourier Transform Spectrometer based on a Michelson Interferometer, The instrument provides spectra of high radiometric quality at 0.5 cm⁻¹ resolution (apodized), with a spectral sampling of 0.5 cm⁻¹ from 645 to 2760 cm⁻¹. Data samples are taken at intervals of 25 km along and across track (nadir), each sample having a maximum diameter of about 12 km.
- AMSU is a cross-track scanning total-power radiometer that measures scene radiance in the microwave spectrum with 20 channels and a 48 or 16 km resolution.

c. Information about data availability & coverage (times-scale, geographic, temporal)

- IASI data are available since July 2007 and the instrument is still operational. Global coverage is obtained in ~6 days.
- GTOPO30 is a global data set with horizontal grid spacing of 30-arc seconds (0.0083333333333333 degrees). The horizontal coordinate system is decimal degree of latitude and longitude referenced to WGS84. The vertical units represent elevation in meters above mean sea level. The elevation values range from -407 to 8,752 meters.
- ECMWF ERA-I: surface temperature is available on a global scale, with a delay of one month (maximum).
- AMSU data are available since July 2007 for MetOp-A and is still operational. Global coverage is obtained in ~6 days.
- cloud mask and surface emissivity: cover all the IASI period for tropical and mid-latitude.

d. Source data product name & reference to product technical specification documents

- IASI: IASI Level-1c spectra.

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- GTOPO30 Digital Elevation Model
- ECMWF ERA-Interim - Berrisford, P., D. Dee, K. Fielding, M. Fuentes, P. Kallberg, S. Kobayashi and S. Uppala: The ERA-Interim archive, ERA report series, 1, ECMWF, August 2009 (<http://www.ecmwf.int/publications/library/do/references/show?id=89203>)
- AMSU Level-1b spectra.
- IASI-MSM surface emissivity: Capelle V., Chédin A., Péquignot E., Schuessel P., Newman S.M. and Scott N.A. Infrared continental surface emissivity spectra and skin temperature retrieved from IASI observations over the tropics. J. Appl. Meteor. Climatol., 51, 1164–1179 <http://dx.doi.org/10.1175/JAMC-D-11-0145.1> (2012)

e. Estimates of the data quantity

- IASI: ~14Go per day, global coverage.
- GTOPO30 : ~2Go total
- AMSU: ~2Mo per day
- Surface emissivity: 800Mo per year


f. Description of the ordering and delivery mechanism

- IASI level-1c is distributed in near real time via the EumetCast system of EUMETSAT. IASI data are also available from the EUMETSAT Data Centre (formerly known as the UMARF or Archive Services) upon request, which can be accessed through http://www.eumetsat.int/Home/Main/Access_to_Data/Data_Centre/index.htm?l=en. Access is through a Web interface, the Online Ordering Application, through which the users are able to browse and order products.
- GTOPO30 is available electronically through via FTP from the EROS Data Center (at no cost).
- AMSU level-1b are distributed via the CLASS website at <http://www.class.ncdc.noaa.gov/>

3.13 Ancillary data overview for SU AATSR retrieval

a. Identification of the data class (EO, model)

- For Aerosol models: models of four main aerosol components, specified within Aerosol CCI Aerosol Properties Technical Note (desert dust, sea salt, fine mode strong absorbing, fine mode weak absorbing). Prior compilation of radiative properties of 38 mixtures of these is contained in a Look-Up Table file.
- Model monthly climatology of aerosol component fractions (Kinne, Aerosol CCI Technical Note)
- For Land-sea mask and sun glint flag: EO
- Cloud mask: Intrinsic algorithm modelling

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b. Specification of the sensor type and key technical characteristics

- For Land-sea mask and sun glint flag: AATSR, data at 1km

c. Information about data availability & coverage (times-scale, geographic, temporal)

- For Aerosol models: Global, static
- Cloud mask: AATSR data

d. Source data product name & reference to product technical specification documents

- For Aerosol models and prior climatology: Aerosol CCI Aerosol Properties Technical Note
- For Land-sea mask and sun glint flag: AATSR Level 1 GBTR data
- Cloud mask: AATSR Level 1 GBTR data

e. Estimates of the data quantity


- For Aerosol models radiative properties (one file containing 38 mixtures): 550MB
- For prior climatology: 12MB

f. Description of the ordering and delivery mechanism

- For Land-sea mask and sun glint flag: Comes with GBTR
- Cloud mask: Comes with GBTR

3.14 Ancillary data overview for SEAWIFS4MERIS

Ancillary dataset	Source	Use in SeaWiFS4MERIS
Elevation model	-	-
Land use model	-	-
Aerosol models	RT code LibRadtran (CCI-mixtures)	Yes
BRDF models / surface reflectance spectra	-	-
BRDF dataset	-	-
Cloud masks	Algorithm intrinsic	-
Land sea mask	NGDC TerrainBase Global DTM (http://projects.eri.ucsb.edu/mapcat/)	yes
Ocean colour	-	-
Surface wind speed	-	-

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a. Identification of the data class (EO, model)

- For Aerosol models: models of four main aerosol components, specified within Aerosol CCI Aerosol Properties Technical Note (desert dust, sea salt, fine mode strong absorbing, fine mode weak absorbing). Prior compilation of radiative properties of 36 mixtures of these is contained in a Look-Up Table file.
- Cloud mask: Intrinsic algorithm modelling
- Model selection by algorithm

b. Specification of the sensor type and key technical characteristics

- MERIS, data at 1x1km resolution

c. Information about data availability & coverage (times-scale, geographic, temporal)

- Surface albedo database, global 0.05° resolution, every 10th day of 2008
- Cloud mask available for each orbit on pixel resolution

d. Source data product name & reference to product technical specification documents

- MERIS, lv1b data, reduced resolution (1km), P=parent product, processing stage is R=consolidated files

e. Estimates of the data quantity

- Surface albedo database: 1.5 Gb per global and daily file (0.05° resolution)
- Cloudmask: ~500 Mb per Orbit
- Final product: ~20 Mb per Orbit

f. Description of the ordering and delivery mechanism


Static data delivered via a preprocessor

g. Identification of access conditions & pricing

Free of charge.

3.15 Ancillary data overview for XBAER

Ancillary dataset	Source	Use in XBAER
Elevation model	-	-
Land use model	-	-
Aerosol models	- Algorithm intrinsic	-yes

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BRDF models / surface reflectance spectra	- Algorithm intrinsic	-yes
BRDF dataset	-	-
Cloud masks	- Algorithm intrinsic	-yes
Land sea mask	-	-
Ocean colour	-	-
Surface wind speed	-	-

a. Identification of the data class (EO, model)

- XBAER has its own cloud screening, aerosol type selection and surface parameterization
- XBAER cloud masking algorithm determines the presence of cloud by using i) the brightness of the scenes, ii) the homogeneity or variability of the radiance and iii) cloud height or altitude information
- XBAER uses MODIS Dark-Target assumptions and the expected aerosol type for a given region and season based on the analysis of Aerosol Robotic Network (AERONET) and Maritime Aerosol Network (MAN) observations for both land and ocean.
- XBAER algorithm has a generic one-parametric surface parameterization for both land and ocean.

b. Specification of the sensor type and key technical characteristics

- MERIS, data at 1x1km resolution
- Multi-spectral for cloud mask and surface parameterization

c. Information about data availability & coverage (times-scale, geographic, temporal)


- Daily Level 2 (10 km) and Level 3 (1 degree) Global four months (March, June, September and December, 2008)
- Monthly Level 3 (1 degree) Global four months (March, June, September and December, 2008)

d. Source data product name & reference to product technical specification documents

- MERIS Product Handbook
- Aerosol_cci_XBAER_ATBD_v0.9.pdf

e. Estimates of the data quantity

- about 5 M per day for Level 2 Daily
- 766 kb per day for Level 3 Daily/Monthly

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f. Description of the ordering and delivery mechanism

- The XBAER global dataset is available on ICARE Data and Services Center (www.icare.univ-lille1.fr) under “CCI/MERIS_XBAER”

g. Identification of access conditions & pricing

- Free of charge.

3.16 Ancillary data overview for CISAR / SEVIRI

Ancillary dataset	Source	Use in CISAR SEVIRI
Elevation model	MODIS 1km DTM	Yes
Land use model	-	No
Aerosol models	-	No
BRDF models / surface reflectance spectra	-	No
BRDF dataset	-	No
Cloud masks	Nowcasting SAF cloud mask from CMSAF archive	Yes
Land sea mask	MODIS 1km DTM	Yes
Ocean colour	-	No
Surface wind speed	ECMWF	Yes
Total Column Water Vapour	ECMWF	Yes
Total Column Ozone	ECMWF	Yes

a. Identification of the data class (EO, model)

- The CISAR algorithm retrieves the aerosol single scattering properties from a mixture of a fine mode absorbing and non-absorbing models and a coarse mode.

b. Specification of the sensor type and key technical characteristics


- MSG/SEVIRI with 3 spectral bands located at 0.6, 0.8 and 1.6µm. The sampling distance at the subsatellite point is 3km.

c. Information about data availability & coverage (times-scale, geographic, temporal)

- Data are available from EUMETSAT U-MARF. MSG2/SEVIRI level 1.5 data acquired in 2008 have been processed at native resolution when MSG2 was located at zero degree. The spatial coverage is therefore the MSG disk. The repeat acquisition cycle is 15min.

d. Source data product name & reference to product technical specification documents

- MSG/SEVIRI native Level 1.5 images from the U-MARF.

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e. Estimates of the data quantity


- 7 Tb for one year of uncompressed data with only the solar channels, including HRVIS from 2:30 to 21:30.

f. Description of the ordering and delivery mechanism

Manual ordering from EUMETSAT EO Portal
(<https://eoportal.eumetsat.int/userMgmt/login.faces>).

g. Identification of access conditions & pricing

Free access

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4 IN-SITU OBSERVATION DATA SOURCES AND HIGHER-LEVEL PRODUCTS NEEDED FOR PRODUCT INTER-COMPARISON

4.1 Information about the originating system, information product technical specification, estimates of the data quantity

Validation and inter-comparison of the Aerosol ECV products is done iteratively for all available datasets, listed in chapter 1 of this document. The validation of satellite retrievals of aerosol is addressed with complimentary data-sets (types 1 and 2), as there is no single ground level truth dataset, which satisfies all requirements with respect to quality and spatial coverage for all essential properties. The outliers are deeply analysed to understand the origins of the errors.

Type 1 data set (high quality, local): sun photometer data (AERONET, SKYnet, GAW-PFR):

- aerosol optical depth (AOD)
- Angstrom parameter (ANG)
- joint histogram (of AOD and ANG)

Ground-based remote sensing with sun-photometry provides a solid reference for amount and size (and its inter-relationship), because no (contaminating) assumptions to background signal and (chemical) composition are required.


Type 2 data set (detail, local): sky photometer data (AERONET, SKYnet, Marine Aerosol Network):

- absorption optical depth
- fine-mode AOD fraction
- fine-mode Angstrom parameter
- joint histograms (of above properties)

Ground-based remote sensing of sky radiances adds to the sun photometer data useful detail and aerosol composition. Sky data supply data on aerosol size (distribution for the accumulation and coarse size mode) and - if the sky signal is sufficiently strong - data on aerosol composition, including estimates for aerosol absorption, non-sphericity, water fraction and soot mass.

The ECV evaluation and assessment repeats annually the inter-comparison (between EO) and validation (with AERONET) for the prototype dataset (i.e. one full year for products selected after round robin analysis. The inter-comparison and validation steps with type 1 and 2 data sets face problems which can only be solved by adding additional information, which is called here type 3 data set:

Type 3 data set: (**complete**, assumption): **data from global modelling (AEROCOM median) active remote sensing (EARLINET, CALIPSO) and in-situ (GAW WDCA)**

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- less biased evaluation (all regions, all properties, all times)
- adding information on aerosol composition (testing retrieval model assumptions).

Following Table gives an overview about candidate in situ data sets for evaluation and validation of the Aerosol ECV products.

Table 4.1-1: Inter-comparison ground based data

Sensor/ Data set	Period	Source
Aeronet	1997-2016	AERONET
Ground-based LIDAR	2008	Earlinet/Gallion
In situ	2008	GAW WDCA (NILU)
Campaign data	2008	WAW WDCA (NILU)
Model output (ensemble mean and stdv)	2008	AEROCOM, MACC(-2)

This Table gives an overview about candidate satellite missions / data sets for evaluation and validation of the Aerosol ECV products.


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Table 4.1-2: Inter-comparison satellite data

Agency	Satellite	Sensor	Period	Product	Version	Subset or complete needed	Volume (complete data for ECV validation)	When needed	Available from	Comments
NASA	Calipso	CALIOP	2006-	L2	V3.01	all	~1080 GB	2015ff	NASA	
NASA	EOS-Aqua, Terra	MODIS	2000	L2/3	Col6 (incl. deep blue)	all	120 GB	2015ff	NASA	
NASA	EOS-TERRA	MISR	2000-	L2/3	V22	all	120 GB	2015ff	NASA	


4.2 Information about data availability & coverage (times-scale, geographic, temporal)

The in situ aerosol data are available from a wide variety of sites, as found in the World data Center for Aerosols. Dry in situ aerosol parameters are converted into ambient ones (at enhanced relative humidity compared to the measurement) using a Mie code and a variety of additional parameters (e.g., size distribution, chemistry, hygroscopic growth of aerosol particle diameter).

Validation data are available at the GAW World Data Centre for Aerosol (WDC-A) hosted by NILU, jointly also hosting the data archives of the EMEP and CLRTAP conventions; WDC-A contains extensive datasets on aerosol chemical composition, optical and microphysical properties. The GAW-WDC archive will include


- QA data of the GAW-PFR sun-photometer network (see <http://www.pmodwrc.ch/worcc/index.html>)
- AERONET (<http://aeronet.gsfc.nasa.gov/>), including the Marine Aerosol network (.../new_web/maritime_aerosol_network.html) and partly SKYNET data (<http://atmos.cr.chiba-u.ac.jp/>) which are publicly available
- EARLINET (www.earlinet.org) profiles of aerosol extinction and backscatter (data will be available for public use in spring 2010) and data from GALION (GAW Aerosol Lidar Observation Network) which are available for public access
- NDACC lidar network (<http://ndacc-lidar.org/>): Stratospheric aerosol profiles
- CALIPSO data (from the NASA Langley Atmospheric Science Data Center (ASCD) (<http://eosweb.larc.nasa.gov/>) of Tropospheric and stratospheric aerosol backscatter profiles

The AEROCOM data base, to be used as a basis for product evaluation and model result resource in Aerosol_cci, contains ca. 5 TB of model and observational data. The model output comprises AEROCOM phase I and II, as well as HTAP model simulations

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performed by ca. 20 modelling groups since 2002. Several data sets have been used for global and recently regional model evaluation in the scope of the aerosol model inter-comparison of AEROCOM. The data stored span historical periods and a variety of European and international measurement networks. The observational data base comprises sun photometer data from AERONET, Skynet and GAW (1996-2007); satellite AOD and fine fraction of AOD from MODIS / CERES, MISR and POLDER / PARASOL (1996-2006); EARLINET lidar data (2000-2007) and a large extract from the EBAS database, which contains surface aerosol observations from EMEP, EUCAARI and EUSAAR. The EBAS database hosts a large variety of aerosol data from different networks and campaigns. The surface data of concentrations, wet deposition and aerosol extinction refer to measurements made under EMEP, EUSAAR, CREATE, EUCAARI, HELCOM, GAW and several other national and international frameworks.

Fast automatic benchmarking of the AEROCOM models is achieved with the AEROCOM analysis and visualization tools. The AEROCOM tools are built on IDL and are basically a set of modular subroutines which first read in model and satellite results of different netCDF formats (AEROCOM, HTAP, CMIP5 and generic LMDZ-INCA), then read in different observational datasets, such as satellite data, AERONET data, lidar data and surface site data such as the EBAS extracts. In a third step these model and observation data are merged so that temporal and spatial structures are matched and can be compared in a coherent way. Finally, the merged data structures allow for statistical analysis and visualization of the comparison as fields, profiles, time series, scatter, histograms and scores. These model-data comparison documentation is constantly updated, and includes comparisons to new model versions and had been used also for an assessment of the ESA-GLOBAER products. These are accessible via the AEROCOM surfobs web interface (<http://nansen.ipsl.jussieu.fr/AEROCOM/surfobs.html>).

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5 AEROSOL_CCI REQUIREMENTS FOR ECMWF DATA

ECMWF ERA-interim reanalysis data are required by the AEROSOL_CCI project for use in both the AEROSOL retrieval and its interpretation. A document summarising the ERA-interim archive is available on the web at:

<http://www.ecmwf.int/sites/default/files/elibrary/2009/8173-era-interim-archive.pdf>

In summary, the ERA-interim atmospheric model outputs are available as analysis and forecast fields at:

- Four analyses at 0000, 0600, 1200 and 1800 UTC
- Two daily 10 day forecasts initialised at 0000 and 1200 UTC

Data are available at the full T255 resolution of the model or and the corresponding N128 reduced Gaussian grid (0.703125 degree). Most upper-air parameters are available on the 60 model levels and on 37 pressure levels.

A subset of the ERA-interim archive is available for direct download from the ECMWF Data Server. This data is at a reduced resolution of 1.5 degrees at all 37 pressure levels.

After reviewing the ERA-interim documentation, the AEROSOL_CCI project requires:

- Surface analysed parameters at 0000, 0600, 1200 and 1800 UTC on the N128 reduced Gaussian grid.

The AEROSOL_CCI project will need ERA-interim for the period from 01/01/1997 to 31/12/1997; 01/01/2008 to 31/12/2008 for the short-term AEROSOL ECV record available from 1 May 2011.


A summary of ERA-interim parameters required by the AEROSOL_CCI project is provided in Table 5.1.

Table 5.0-1: Summary of ERA-interim data required for AEROSOL_CCI project

ECMWF Code	Output field	Units	Analysis or Forecast	Model levels	Model Grid	Needed for
165	10m east wind component	m s ⁻¹	Analysis	Surface	GG (N128)	EO retrieval
166	10m north wind component	m s ⁻¹	Analysis	Surface	GG (N128)	EO retrieval

Note 1: All outputs requested at highest possible model spatial resolution (T255 or N128)

Note 2: All profiles required on model levels and not pressure levels in either Spherical Harmonics (SH) or Gridded Gaussian (GG) as indicated.

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Note 3: All data will be provided in GRIB format and interpolation will be done using the CDO tool <https://code.zmaw.de/projects/cdo>.

5.1 Summary of AEROSOL_CCI ECMWF requirements in ECMWF format

ECMWF asks for ECMWF ERA-interim requirements to be provided in a specific style. This section summarises the AEROSOL_CCI ECMWF data requirements in the requested ECMWF format.

Parameters from ERA Interim, Atmospheric model, Analysis

- Requested analysis times: 0000, 0600, 1200, 1800 UTC
- Dates: 01/01/1997 to 31/12/1997; 01/10/2008 to 31/12/2008
- Requested representation: Lat/long grid
- Requested representation: 0.7 degree
- Requested area: Global

Grib number	Grib Abbreviation	Units	Name
165	10U	m s ⁻¹	10m east wind component
166	10V	m s ⁻¹	10m north wind component




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6 IDENTIFICATION OF ACCESS CONDITIONS & PRICING

Most of the required datasets are already available to the participating teams and data centers or can be acquired at no cost.


Table 6-1 summarizes the data which is accessible through Aerosol CCI Cat-1.

Table 6.0-1: Summary of ESA data access and download speed through Cat1-1 required for AEROSOL_CCI project

Dataset	Product type	Typical size	Speed	Full archive download time	Server Address
SCIAMACHY level 1 consolidated products (off-line processing at D-PAC) - flagged U	SCI_NL_1P	217,536 MB	228103148 bytes received in 4 Min (912.98 Kbytes/s)	4.7 months	ftp://ftp-ops-dp.eo.esa.int
GOMOS level 2 consolidated products (off-line processing at D-PAC)	GOM_NL_2P	10,553 MB	11066418 bytes received in 12 seconds (899.53 Kbytes/s)	7.2 days	ftp://ftp-ops-dp.eo.esa.int
MERIS RR reprocessed dataset	MER_RR_1P	531 MB	531 MB received in 2 Min 23 seconds (896 Kbytes/s)	2.7 months	http://merci-srv.eo.esa.int/merci/
MERIS RR reprocessed dataset	MER_RR_2P	595 MB	595 MB received in 3 Min 49 seconds (890 Kbytes/s)	4.5 months	http://merci-srv.eo.esa.int/merci/
AATSR MERCI reprocessed dataset (HTTP access)	ATS_TOA_1P	327 MB	327 MB received in 15 Min 45 seconds (354 Kbytes/s)	18 months	http://ats-merci-uk.eo.esa.int:8080/merci
ATSR-2 MERCI reprocessed dataset (HTTP access)	AT2_TOA_1P	278 MB	278 MB received in 12 Min 28 seconds (380 Kbytes/s)	17 months	http://ats-merci-uk.eo.esa.int:8080/merci

ESA has distributed the full mission ATSR archive with latest re-processed dataset versions to Aerosol_cci partners via shipping a NAS system – this approach has allowed to overcome the issue of the bottleneck ftp interface.

For IASI Eumetsat and the 4 Aerosol_cci partners working with those data have agreed on direct data distribution – which was achieved by providing the full required dataset via LTO tapes. Rayference downloaded the SEVIRI dataset from

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EUMETSAT UMARF archive. All IASI datasets are made available to Aerosol_cci partners without any cost.

6.1 NASA/OMI data access in the frame of Aerosol CCI

Formally the ownership is with the Netherlands Space Office. Apart from NASA, KNMI also has a copy of the the Level 1B data. No agreements are needed for access to these data.


6.2 Data availability from ICARE in the frame of Aerosol CCI

ICARE will mainly provide data issued from two main native datasets:

- POLDER family (POLDER-1, POLDER-2, PARASOL). For native datasets, the data policy is: free access to Levels 1, 2 and 3 after registration and identification (which is the common ICARE data policy).
- MERIS/ENVISAT. For native dataset, the data policy is much more restrictive: data access is only granted to participants to the EU project GEOMON.

For details, ICARE date policy (and registration foorm) is available here :
<http://www.icare.univ-lille1.fr/register>

All ICARE data are available on-line from ftp and ftp protocols (ssh protocol is also available for some users). ICARE public data catalogue is available here :
<http://www.icare.univ-lille1.fr/catalogue/>


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Below is a table that resume all those informations.

Table 6.2-1: Data availability from ICARE

<i>Agency</i>	<i>Satellite</i>	<i>Sensor</i>	<i>Period</i>	<i>Products</i>	<i>Versions</i>	<i>Data access</i>	<i>Data policy</i>
CNES	PARASOL	POLDER-3	Mar2005-2013...	Level 1B	L1_B v02.04	ftp: ftp://ftp.icare.univ-lille1.fr/SPACEBORNE/PARASOL http : http://www.icare.univ-lille1.fr/catalogue/	Free access after registration and identification (cf. ICARE Data Policy)
ESA	ENVISAT	MERIS	May2002-Jul2006 Mar2008-2011...	L1_B (RR_1P) L2 (RR_2P)	RR_1P v5.06 RR_2P v5.06	ftp: ftp://ftp.icare.univ-lille1.fr/SPACEBORNE/MERIS http : http://www.icare.univ-lille1.fr/catalogue/	Restricted access to GEOMON participants

In case of delays or problems with data access solution with USB-storage memory disk will be initiated. The partners will receive the data on storage device per post.

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7 CONCLUSIONS

This document presents the results of an exercise to gather data access requirements for the aerosol products to be developed by the Aerosol_cci project.

Data access requirements were gathered through an email questionnaire, discussion sessions, from reference documents and from lessons learned from other projects.

The data access requirements document that have been expressed belong to provide detailed requirements for resolving any known data access, validation and performance issues specific to the satellite ground segment processing enabling the regeneration of improved and most accurate input products required for the Aerosol_cci ECV.

End of the document