ESA's Climate Change Initiative

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Overview

- ESA and ESA's EO missions
- The ESA Climate Change Initiative (CCI) programme
- The cloud_cci project

ESA

- The European Space Agency is an intergovernmental organization founded in 1975, currently with 18 member states
  - Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Luxemburg, Norway, the Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom, and Canada (associate)
- Total annual budget of circa €3.6B
  - Core and voluntary programmes (agreed at ministerial level)
  - Geo-return to members states
- The main role of the agency is fostering space industry in the member states

Europe's expanding EO capacity

1991 → **ERS 1**

1995 → **ERS 2**

2002 → **ENVISAT**

- Oceans
- Sea Ice
- Cryosphere
- Land Surface
- Climatology

+ *Global Ozone*
+ *Terrestrial biosphere*

+ *Ocean colour*
+ *Atmospheric chemistry*

ESA's Living Planet Programme

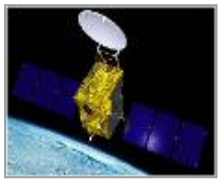
Earth Explorer

Research driven

Core Missions

GOCE
March 17th
2009

ADM-Aeolus



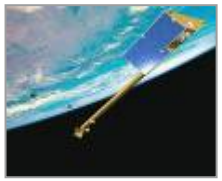
EarthCARE

Biomass/
CoReH2O
/PREMIER

Opportunity Missions

CryoSat-2
April 8th
2010

SMOS
November 2nd
2009



Swarm

Call for
proposals
for EE8

Earth Watch

Operational Service driven

Operational Meteorology

- Meteosat
- MSG
- EPS (MetOp)
- MTG
- Post EPS

GMES

- Sentinel 1
- Sentinel 2
- Sentinel 3
- Sentinel 4
- Sentinel 5 precursor
- Sentinel 5

CCI programme overview

- The ESA Climate Change Initiative (CCI)
  - Six year programme, began in January 2009
  - Initial budget of €75m
- Addresses GCOS requirements directly
- International aspect
  - Independent Climate Science Advisory Board (CSAB)
  - Cooperation with stakeholders (beginning with the evaluation process)
  - Participation of stakeholders/experts in meetings and reviews
- Strengthen European EO competences

CCI is based on…

- A decade of ESA Data User Element (DUE) programme projects (www.esa.int/due) building Global EO datasets
- Sea Surface Temperature… GHRSST
- GlobColour... Merging of NASA and ESA ocean colour datasets
- World Fire Atlas back to 1991
- GlobSnow… 30 year record of Snow Water Equivalent
- …

CCI: key issues

- Uncertainty estimation, error-characterization
  - At each measurement node
  - Through validation and inter-comparison
  - Dedicated deliverable document for each project
- Openness, traceability
  - General issue for climate data
  - Unrestricted free and open access
  - All documents, data, products, algorithm specifications, S/W
- Fostering scientific cooperation in Europe and Globally
  - Independent scientific peer review: mandatory
  - Funding exchanges and workshops
- Reprocessing

CMUG: Climate Modeling Users Group

- Gateway to International Climate Modeling Communities and related climate research networks
  - Questionnaire recently sent out by S. Kinne
- Ensures Integrated Climate System view for CCI
  - Focal point for all CCI project teams
  - Detailed Climate Modeler User requirements
  - ECV data products assessment & error characterization
- Coordinating partners
  - UKMO Hadley Centre, Meteo-France, MPI-meteorology, ECMWF (re-analysis)

CCI: phase 1

- Phase 1 is 3 years
- Focus is on 11 ECVs
  - Cloud, ozone, aerosols, GHG, SST, land cover, sea level, ocean colour, glaciers, sea ice and fire disturbances
- Driven by scientists and involving cal/val teams and modelers
- Build-in feedback requirements to the processing teams
- Invitation to tender (ITT) closed 5 March 2010, contracts currently under negotiation

The cloud_cci targets

- Attempt to address the GCOS ECV (product A-4, GCOS-107):

	Accuracy	*Spatial resolution*	*Temporal resolution*
Cloud cover	10%	100km	3h
Cloud top height	500m	100km	3h
Cloud top temperature	0.3K	100km	3h
Cloud ice profile	n/a	100km	3h
Cloud water profile	n/a	100km	3h

Primary objectives of cloud_cci

- Development of inter-calibrated radiance data sets for ESA and non ESA instruments in an international collaboration
  - Taking advantage of existing activities such as SCOPE-CM and GSICS
- Development of a coherent physical retrieval framework for the GCOS cloud property ECVs that can be considered as an open community retrieval framework that will be publicly available and usable by all scientists
- Development and processing of two multi-annual global data sets for the GCOS cloud property ECVs including uncertainty estimates:
  - AVHRR - (A)ATSR – MODIS – MERIS (lowest common den. approach)
  - AATSR and MERIS (synergy retrieval)

Primary objectives of cloud_cci (II)

- Validation (and inter-comparison) of the cloud property products against ground based and other satellite based measurements taking into account the individual error structures of the individual observations as far as possible

- Providing a common data base and the necessary assessment of cloud data sets in the framework of GEWEX

- Development of a complete processing system distributed over Europe that can further strengthen operational production of cloud property data sets

AVHRR-(A)ATSR-MODIS-MERIS cloud properties

Expected product specification of AVHRR – (A)ATSR – MODIS – MERIS cloud data set. For the column flags in the table the following abbreviations are used: U (Uncertainty), t (time of measurement), q (quality indicator), n (number of measurement), g (surface type), a (additional flags defined by users).

ECV Parameter	Format	Spatial Sampling	Temporal Sampling*	Flags
Cloud Cover	Netcdf, Netcdf CF data and metadata convention will be implemented	(a) Global equal area grid with a resolution of 10 km x 10 km (b) Global equal angle grid with a resolution of 0.05 or 0.1 degree	Monthly mean at four local observation times: 0, 6, 12 and 18. Level 2 data set with the same 6-hourly resolution.	U, q, t, n, g, a
Cloud Top Height, Temperature and Pressure				
Optical Depth (VIS), Effective Radius				
LWP (computed)				

AATSR-MERIS cloud properties

Expected product specification of AATSR – MERIS cloud data set. For the column flags in the table the following abbreviation are used: U (Uncertainty), q (quality indicator), t (time of measurement), n (number of measurement), g (surface type), a (additional flags defined by users).

ECV Parameter	Format	Spatial Sampling	Temporal Sampling	Flags
Cloud Cover	Netcdf, Netcdf CF data and metadata convention is used	(a) Global equal area grid with a resolution of 10 km x 10 km. (b) Global equal angle grid with a resolution of 0.05 or 0.1 degree.	Monthly mean at 10:00 local time. Daily mean and monthly mean approximated with SEVIRI diurnal cycle information. Level 2 data set 10:00.	U, q, t, n, g, a
Cloud Top Height, Temperature and Pressure				
Optical Depth (VIS), Effective Radius				
LWP (computed)				

The cloud_cci consortium

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University of Oxford (UO)
Free University of Berlin - Institute for Space Sciences (FUB)
Swedish Meteorological and Hydrological Institute (SMHI)
Koninklijk Nederlands Meteorologisch Instituut (KNMI)
Laboratoire Météorologie Dynamique (LMD)
German Aerospace Centre (DLR)
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