The Climate Modelling Users Group (CMUG) in the ESA Climate Change Initiative: role and activities

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and the CMUG : Roger Saunders, Mark Ringer, Paul Van der Linden, (Met Office Hadley Centre)

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ABSTRACT :The European Space Agency (ESA) has established the Climate Modelling User Group (CMUG), to ensure that a climate system perspective is at the centre of its Climate Change Initiative (CCI) programme, and to provide a dedicated forum through which the Earth Observation and Climate Modelling Communities can work closely together. The CMUG is a consortium of European climate modelling and reanalysis centres whose main purpose is to provide a bridge between the satellite dataset producers and the climate modelling community. The CMUG is actively promoting awareness of the CCI within the climate modelling community and gathering their detailed requirements for the 13 Essential Climate Variables (ECVs) being generated by the programme. The CMUG is assessing the user requirements, data access and product specification established by each team and is also ensuring cross-team coordination to establish consistent data sets and the inclusion uncertainty estimates across the programme. In addition, the CMUG will provide an independent assessment of the datasets for climate research applications by using them for model validation, assimilation and long term trend analysis: this will highlight the benefits of the new CCI datasets to the climate modelling community and ensure they are exploited as soon as possible once they are considered suitable for release.

ESA CCI project

CCI objectives (esa)

Realize the full potential of the long-term global EO archives that ESA, together with its Member states, has established over the last thirty years.....

..... as a significant and timely contribution to the ECV databases required by the United Nations Framework Convention on Climate Change

6 Years / 75 M

Phase 1: (3y)
- **Scientific user consultation, detailed specifications**

Phase 2: (3y)
- **Operational Systems implementation, production**

Phase 3: (6y !)
- **User assessment, assimilation**

ECVs

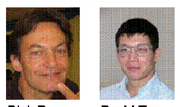
ECV	Science Leader
cloud_cc	*DWD*
ozone_cci	*BIRA*
aerosol_cci	*DLR/FMI*
ghg_cci	*U. Bremen*
sea_ice_cci	*NERSC*
sst_cci	*U. Edinburgh*
land_cover_cci	*UCL*
sea_level_cc	*CLS*
ocean_colour_cci	*PML*
glaciers_cci	*U. Zurich*
fire _cci	*U.Alcala*
ice_sheet_cci	*DTU Space*
soil_moisture_cci	*TU Wien*
Climate Modelling User Group	*UKMetO - Hadley Centre*

CMUG Composition

Met Office Hadley Centre — HadGEM, FOAM, HadISST

Roger Saunders, Mark Ringer, Paul Van Der Linden

ECMWF — IFS, ERA, MACC



Dick Dee, David Tan

MPI-Meteorology — ECHAM, JSBACH

Alex Loew, Silvia Kloster, Stefan Kinne

MétéoFrance — Arpege, NOCAGE, CNRM-CM, Mercator

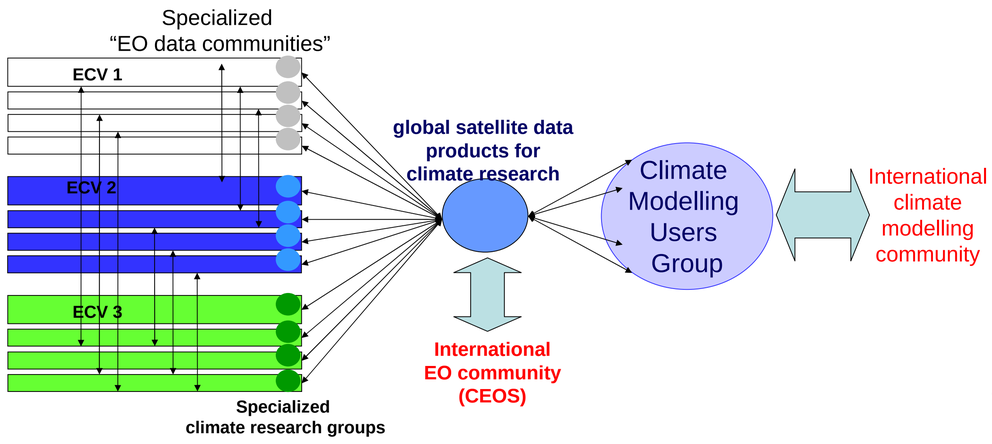
Serge Planton, Thierry Phulpin

Iryna Khlystova

CMUG Mandate

- Refining of scientific requirements from GCOS
- Provide technical feedback to CCI projects
- Provide reanalysis data to CCI projects
- Assess the global satellite climate data records (CDRs) produced from the 13 CCI consortia
- Look specifically at required consistencies *across* ECVs from a user viewpoint.
- Promote and report on the use of the CCI datasets by modellers
- Interact with related climate modelling and reanalysis initiatives.

Role of CMUG in the CCI



User Requirements

- CMUG collected the needs of the modelling community
- Express specific requirements as a function of applications
- Emphasised the need for uncertainties
- Provide feedback to GCOS

Uses of satellite data for climate

- To ascertain decadal and longer term changes in the climate
- Detection & attribution of observed variations to natural and anthropogenic forcings
- Evaluate the physical processes most relevant to reducing uncertainty in climate prediction
- To develop, constrain and validate climate models thus gaining confidence in projections of future change
- Input or comparison to reanalyses (e.g. ERA-CLIM, EURO4M)
- Seasonal and decadal model initialisation (ocean, land surface, stratosphere)
- To identify biases in current and past *in situ* measurements (e.g. radiosondes, buoys)

2010-2012 => CCI phase 1 Cardinal Requirements (esa)

- Develop and validate algorithms to meet GCOS ECV requirements for (consistent, stable, error-characterized) global satellite data products from multi-sensor data archives
- Optimize impact of ESA EO missions data on climate data records
- Produce, within R&D context, most complete and consistent possible multi-sensor global satellite data products for climate research and modelling
- Generate complete specifications for an operational production system
- Strengthen inter-disciplinary cooperation between international earth observation, climate research and modelling communities, in pursuit of scientific excellence

User requirements

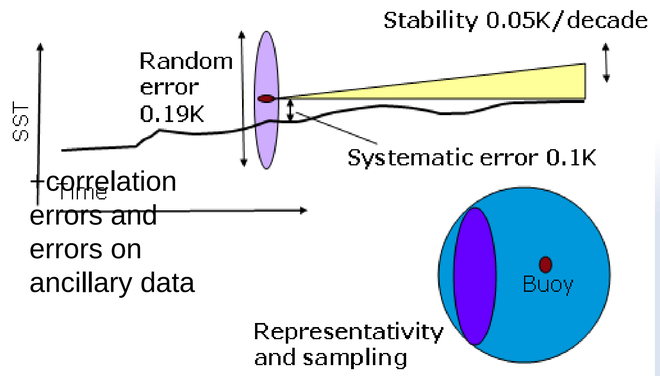
Each ECV consortium collected the needs of its community (Climate scientists) and produced:

- Users requirements
- Products specification document
- Data access requirement document

SST URD vs PSD

Application		Horizontal resolution	Temporal sampling	Accuracy	Stability	Source
All		0.05° (~5.6 km)	1 day	0.1 K	0.1 K/decade	SST CCI PSD
All	Target	1 km	1 hour	0.1 K	0.1 K/decade	GCOS
	Breakthrough	8 km	3 hour	0.126 K		
	Threshold	500 km	1 day	0.2 K		
Trend monitoring		10 km	1 month	0.1 K	0.05 K/decade	CMUG
Seasonal forecasting		100 km	1 day	0.1 K	0.1 K/decade	CMUG
Decadal forecasting		50 km	1 month	0.1 K	0.1 K/decade	CMUG
Climate quality analysis		50 km	1 month	0.1 K	0.1 K/decade	CMUG
Reanalysis		1 km	3 hour	0.2 K	0.1 K/decade	CMUG

Different sources of uncertainties



Algorithms and validation

- **Round Robin to select best algorithm (in 2012)**
- **Estimation of uncertainties**
- **Netcdf-cf compliant format**
- **Easy access via Earth System Grid**

Will deliver in 2012 precursor datasets

Added-value

Time series proposed

ECV	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SST												
Sea level												
Ocean color												
Clouds												
GHG												
Aerosol												
Ozone												
Fire												
Landcover												
Glaciers												

Golden year?

Assessment of TCDR

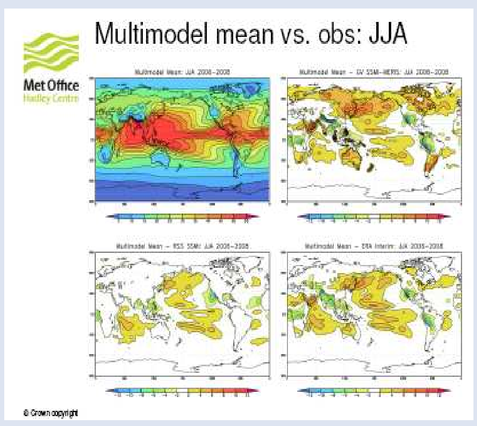
- Select a golden year
- Check inter ECV consistency
- Comparison with multimodel ensemble
- Write together with ECV teams a summary paper for the modelling community

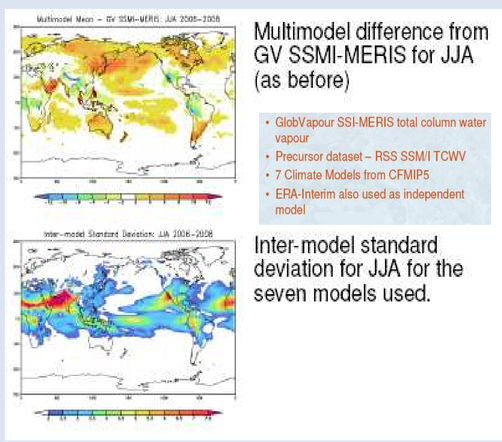
The importance of consistency

- Issues with inconsistent observations that happen
  - Soil moisture increase without precipitation
  - Fire without albedo change
  - Fire without biomass
  - Fire without landcover change
- Consistency check of ECV products should be envisaged (e.g. CCI landcover plans consistency check with cci_fire and ancillary vegetation products)
- Non consistent data products can produce
  - Ambiguities in data analysis
  - Less fun in scientifically work with the data → less acceptance

Opportunity: currently no consistent suite of products existing

Example of assesment : TCW from Globvapour project





Multimodel difference from GV SSMI-MERIS for JJA (as before)

- GlobVapour SSI-MERIS total column water vapour
- Precursor dataset – RSS SSM/I TCWV
- 7 Climate Models from CFMIP5
- ERA-Interim also used as independent model

Inter-model standard deviation for JJA for the seven models used.

http://www.cci-cmug.org/ cmug@metoffice.gov.uk