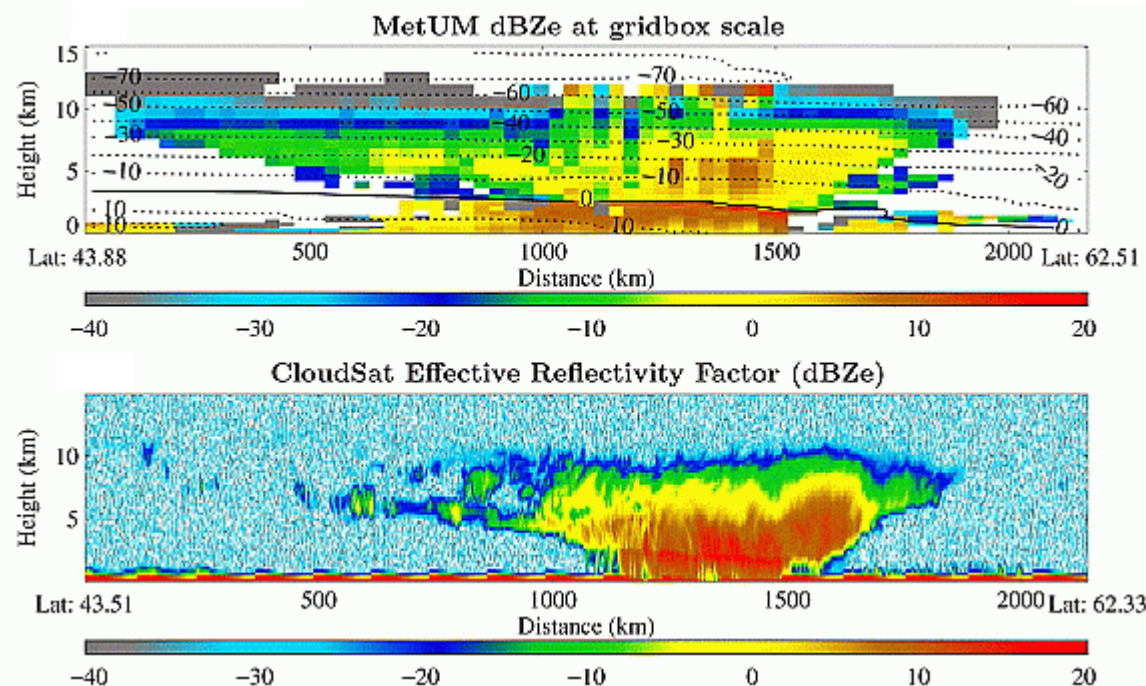# → CLIMATE CHANGE INITIATIVE

[CMUG] CCI Newsletter
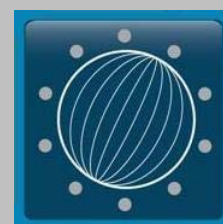
Assessment of climate model cloud fields (upper panel) with satellite observations (lower panel).

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Background to CMUG

The European Space Agency (ESA) has established the "Climate Modelling User Group" (CMUG), to ensure a climate system perspective at the centre of its Climate Change Initiative (CCI) programme, and to provide a dedicated forum through which the Earth Observation Data Community and Climate Modelling Community can work closely together. Visit the CMUG website at: http://www.cci-cmug.org/ for the latest news.

The CMUG consists of a consortium of European climate modelling and reanalysis centres which are the Met Office Hadley Centre, ECMWF, Max Planck Institute for Meteorology and MétéoFrance. The main purpose is to provide a bridge between the satellite dataset producers and the climate modelling community. To facilitate this the CMUG are advertising the CCI project at meetings relevant to climate modelling, organising workshops and engaging with many of the climate modelling centres to gather their detailed requirements for the 10 ECVs of the CCI project. Another activity will be to assess the datasets generated by the CCI projects for climate research applications by using them for model validation, assimilation and long term trend analysis. Finally the CMUG will play the role of highlighting the benefits of the new CCI datasets to the climate modelling community to ensure they are exploited as soon as possible once they are considered suitable for release. The CMUG web site is given above and you can also contact the group by emailing cmug@metoffice.gov.uk.

Project Overview

The CMUG partners and their respective models are given above together with the external interactions of the group. The CMUG has six main areas of activity and a brief description of each is given below:
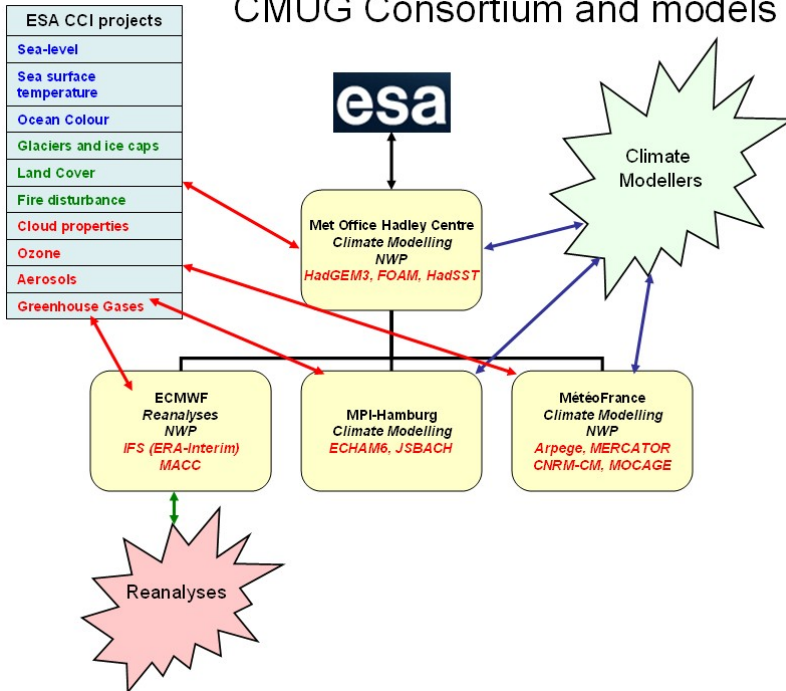
1. **Refining of scientific requirements derived from GCOS for climate modellers**
This activity is well underway and is described in more detail in the section below.

2. **Provide technical feedback to CCI projects**
Once the individual CCI projects are providing their own user requirements and product specifications the CMUG will provide feedback to ESA on the proposed products from the point of view of climate modelling applications. One important requirement will be the inclusion of error characteristics with the products which should be well defined and consistent for all ECVs. In addition ECMWF will make available to the CCI projects their reanalysis datasets as required.

3. **Assess the global satellite climate data records (CDRs) produced from the 10 CCI consortia**
The climate data records produced by the CCI projects will be assessed in terms of their suitability for climate modelling applications. For some datasets observation simulators will need to be developed to optimally compare the satellite product with the model equivalent variable. These will be developed either by the CCI projects or the CMUG depending on the ECV. Pre-cursor datasets for some ECVs will be used to develop the methodology by the CMUG before the CCI datasets become available.

4. **Look specifically at required consistencies _across_ ECVs from a user viewpoint**
There are several ways in which the CMUG will work with the CCI projects to ensure consistency. Firstly through ensuring common input datasets are used for CDR creation and in some cases common pre-processing (e.g. geolocation, land/sea mask, cloud detection). Secondly through comparisons of CDRs for different ECVs (e.g. SST, sea-level, sea-ice and ocean colour) to make sure major phenomena (e.g. El-Nino, polar vortex, etc) are consistent between ECV datasets. Thirdly through comparisons of CDRs with model fields (e.g. GHG and Ozone CDRs and MACC model profiles/total column amounts). Fourthly through studying teleconnections (e.g. El-Nino SST shows

consistent impact on cloud fields, fires, etc) and finally through assimilation of CDRs and assessment of their impact on the model analyses and predictions (e.g. SST in ERA-Interim).

5. **Interact with related climate modelling and reanalysis initiatives**
There are a number of important activities the CMUG aims to provide input to, for example the CMIP5 model intercomparisons which can be assessed with these satellite datasets to inform future IPCC reports. Metrics for climate model predictions are being developed and the observations will have an important role to play in this. The next generation reanalysis (ERA-CLIM) is now underway at ECMWF and these new datasets will provide an important input for assimilation or specification of the model boundary conditions.

6. **Promote and report on the use of the CCI datasets by climate modellers**
Once the new satellite datasets are available the CMUG will promote their use to the climate modelling community through demonstrating their superior quality, ease of use and initial successes. A workshop is planned at the end of the initial 3 year phase of the CCI projects to increase awareness of the datasets to the climate modelling community.

Requirements of the climate modelling community

One of the initial tasks of the CMUG was to consult the climate modelling community to gather their requirements. An on-line questionnaire was set up and experts opinions gathered at various meetings including the EGU General Assembly in Vienna. Having gathered some input tables of requirements have been prepared which compare the GCOS requirements with those from the climate modelling community for the 11 ESA CCI ECVs. One important finding was that the majority of modellers want to use the CCI datasets for model validation and development and only a few are engaged in climate monitoring activities. It became clear at an early stage that the requirements were dependent on the application the dataset was used for. Table 1 below shows the requirements for the sea surface temperature ECV.

For SST five different applications of the ECV for climate modelling were found with correspondingly different requirements.

All users want the datasets to include uncertainty estimates for the products. Slightly more users want level 2 products as provided by the CCI projects as compared with the raw level 1 product. Another clear message was that the CCI datasets should be provided in NetCDF–CF format with parameter naming following the convention developed in the CMIP5 project. Requirements for map projections, metadata and easy data access were also specified.

Some ECVs also require "observation simulators" where the exact geophysical variable being provided by the satellite datasets has to be computed from the model variables. One example of this is cloud top pressure and cover which has to be simulated from the model 3D fields of temperature and humidity

Application	Horizontal resolution	Temporal sampling	Precision	Accuracy	Stability
Trend monitoring	10km	1 month	0.05K	0.1K	0.05K/ decade
Seasonal forecast initialisation	100km	24h	0.1K	0.1K	0.1K/ decade
Decadal forecast initialisation	50km	1 month	0.1K	0.1K	0.1K/ decade
Climate quality analysis	50km	1 month	0.1K	0.1K	0.1K/ decade
Reanalysis	1km	3h	0.2K	0.2K	0.1K/ decade

Table 1. Requirements for SST (foundation temperature)

Meet the CMUG Team

The CMUG project office can be contacted at: cmug@metoffice.gov.uk

Met Office Hadley Centre

Dr. Roger Saunders (Head of Satellite Imagery Applications Group) has more than 25 years experience in processing satellite data for imagery, climate and NWP applications and has worked at ESOC, ECMWF and the Met Office on satellite related projects.

Paul van der Linden has extensive experience in the management of science projects. He has a sound knowledge of the subject area and has worked successfully in a complex programme management environment with a range of international partners. He currently works on the AVOID programme which is a policy-oriented research programme and was the Director of the EC FP6 ENSEMBLES project. Paul is also the co-editor of two IPCC Assessment reports.

Dr. Mark Ringer is Manager of the Climate Sensitivity and Feedbacks Group at the Met Office Hadley Centre, Exeter, U.K. His research interests centre around the use of satellite data for understanding the climate and for developing and testing climate models. His principal areas of work focus on the role of clouds and cloud radiative effects in the present-day climate and under climate change; the representation of clouds, water vapour and radiation and associated feedback processes in climate models; climate model development and evaluation, with particular emphasis on the application of new sources of observations to improve the representation of physical processes. He has been involved in the development of Hadley Centre climate models throughout his career at the Met Office.

MPI-Meteorology

Dr. Alexander Loew is Head of the Terrestrial Remote sensing group at the Max-Planck-Institute for Meteorology. His research interests are the derivation of quantitative land surface parameters from remote sensing data and the assimilation of remote sensing data into climate and land surface process models. The focus of the research is on the combination of different remote sensing data sets for the monitoring of land surface energy and water fluxes at long timescales.

Dr. Silvia Kloster is a Klaus Hasselmann fellow at the Max Planck Research Institute for Meteorology. Her research interests are Earth System processes. Her current research focuses on the role of fire in the Earth System. For this she utilizes global vegetation models to simulate fire disturbance and related trace gas and aerosol emissions in conjunction with recently developed burned area satellite retrievals.

Dr. Stefan Kinne (scientist in the atmospheric observation and process study group at the MPI-M) will assist the issues regarding the ECV aerosol and its links to other ECVs, in particular the cloud ECV. He is currently a member of GEWEX assessment groups for aerosol, radiation and clouds.

Dr. Iryna Khlystova has a degree in Physics and Electronics and her work is in atmospheric radiative transfer, inverse retrieval techniques and interpretation of satellites measurements, measuring equipment and measurement principles of different atmospheric parameters as well as chemical composition of the atmosphere. She has worked on several international remote sensing projects and worked on scientific software development.

ECMWF

Dick Dee, PhD, Head of the Reanalysis Section at ECMWF, will coordinate the ECMWF contributions to CMUG. He has more than 25 years experience in data assimilation, with a strong background in Kalman filtering theory and applications, and observational quality control and bias correction techniques. As a principal support scientist at NASA, he has made significant contributions to the GMAO data assimilation system. He joined ECMWF in 2005 in the reanalysis team and played a pivotal role in the design and production of ERA-Interim.

David Tan, has a PhD in remote sensing algorithms and currently works in the Reanalysis Section at ECMWF, before which he worked at the Met Office Hadley Centre in the development and validation of HadGEM-1 climate model. David has also worked as a lecturer in atmospheric sciences at the University of Otago, New Zealand and as a researcher in atmospheric tracer transport/chemistry at the Centre for Atmospheric Science, University of Cambridge, UK.

Météo France

Serge Planton, senior scientist, is the head of the climate division since 1995. His main research activities concerned the development of physical parameterization for climate models, the study of ocean-air interaction and the study of climate change and its impacts. His main present research topic concerns the detection and attribution of climate change at the regional scale. He was involved in the preparation of the 4th Assessment Report of IPCC as review editor of the chapter "Understanding and Attributing Climate Change".

Thierry Phulpin has worked extensively in remote sensing for meteorology and climate research. Currently he is in charge of missions on Meteorology, Atmospheric Chemistry and Climate and also responsible for the Ether (Thematic Expertise Center for Atmospheric Chemistry) project and Coordinator of Scientific software development for CNES missions. He was strongly involved in the definition of the TRAQ mission submitted and selected by ESA as Earth Explorer mission studied in phase 0. He is a expert member of Eumetsat Science team for Meteosat Third generation and Post EPS mission. He is the mission scientist for IASI-NG, the infrared spectrometer for the Post EPS and Sentinel 5 mission.