CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

Climate Modelling User Group

Report on Fourth CCI Project Integration Meeting, 2-4 June 2014, Met Office, UK

Centres providing input: MOHC, MPI-M, ECMWF, MétéoFrance

Version nr.	Date	Status
0.1	15 July 2014	First draft for input by CMUG partners
0.2	1 August 2014	Including comments from CMUG
0.3	20 August 2014	ESA and participants comments addressed
1.0	22 August 2014	Final submission to ESA
1.1	2 Sept 2014	Updated info on Aerosol CCI.

CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

Report on Fourth CCI Project Integration Meeting

Met Office, Exeter, UK,

2-4 June 2014

Contents

CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

Report on Fourth CCI Project Integration Meeting
Met Office, Exeter, UK,
2-4 June 2014

This document summarises the scientific content of the meeting from presentations and discussions, and captures key points noted by delegates.

1. Overview

This meeting organised by the CMUG and hosted by the UK Met Office allowed CCI projects to show their Phase 1 results, and CMUG to demonstrate its assessment of these datasets. The audience comprised a broad spectrum of the climate research community, including many climate modellers, who engaged in discussion of the results shown and the potential for future CCI development in the context of the challenges that climate science faces. The meeting was also an opportunity for CCI researchers to scope out in detail their plans for meeting Phase 2 objectives. The aims for the meeting, prescribed in advance, were as follows:

1. *Foster the use of CCI datasets in the climate modelling and research community,*
2. *Demonstrate ECV and CMUG Phase 1 results and examine the lessons learned,*
3. *Inform about ECV and CMUG Phase 2 planned activities,*
4. *Gain external perspective from experts,*
5. *Strengthen links between CCI and relevant climate projects/initiatives/coordinating bodies*

The meeting was structured around six themes:

1. *Remote climate observations and their application (key note presentations)*
2. *Demonstration of ECV Phase 1 research results (presentations with Q+A)*
3. *Demonstration of CMUG Phase 1 research results (presentations with Q+A)*
4. *Initiatives and projects relevant to CCI development (key note presentations)*
5. *Expert perspective on CCI links to relevant projects/initiatives (discussion in break out groups)*
6. *CCI Phase 2 plans (discussion in break out groups)*

This report summarises the key points, outcomes, and actions from the meeting (Section 2) and describes the salient points from the presentations and groups interactions (Sections 3 to 8). Other meeting information (programme and attendees) is provided in appendices

All the presentations from the meeting are available on the CMUG web site at:
http://dialspace.dial.pipex.com/prod/dialspace/town/estate/gtp89/cmug/integration4.html
or http://bit.ly/1kt7vKB

1.1 Overall conclusions

This meeting marked a key stage in ESA's CCI programme – the end of Phase 1 and the start of Phase 2. All but one of the ECV projects had substantively delivered their Phase 1 data by the time of this meeting, and the scientific highlights of these datasets were displayed through presentations and discussion. The CMUG assessment of the CCI datasets was shown, where the results were from the assimilation of CCI data in to climate models or reanalysis, confronting models with ECV observations, or from the Climate Monitoring Facility at ECMWF. This CMUG work on CCI datasets provided an independent, scientifically robust assessment of the Phase 1 data. The CMUG assessment, using methodologies developed on precursor datasets, showed the strengths and weaknesses in many of the datasets which were discussed in a forum of experts (from the climate modelling, climate research, reanalyses, FP7, Copernicus, and international community). Another strand to the meeting was the participation of key experts from precursor projects to the Copernicus Climate Change Services, other FP7 projects and international initiatives, as this was a forum which allowed the CCI scientists to examine the possibilities and benefits of future interactions with these key user groups, and the user expectations of the data (with uncertainty characterisation for example). The final value of the meeting was in allowing the CCI Climate Research Groups and Science Leads to examine options for addressing the issues highlighted in the discussions, to discuss plans for further data production, and future developments and interactions with key users.

2. List of key actions or notes arising

The key remarks (yellow boxes) from following sections are collated here.

Climate Services

1. A good demonstration of the practical application of climate data for "climate services" was given using the IRI Data Library: http://iridl.ldeo.columbia.edu/
2. High quality, long term, SST, sea-ice and soil moisture observation datasets are an essential pre-requisite for seasonal forecasting

Research opportunities for the CCI

3. New high resolution satellite information (TanDEM-X) for elevation gives new opportunities for studying elevation changes in glaciers
4. Modelled carbon uptake for aerosols, chemistry, and ecosystems are not as well validated as for other variables due to less well developed observational datasets
5. Some projects still have complex issues on observation measurements and/or processing to resolve before being able to produce CDRs
6. CMUG evaluations of Phase 1 CCI datasets have found areas to investigate for improvement

CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

7. CMUG results on all datasets examined demonstrated a utility in their application to climate models and reanalyses
8. It was stressed that not only the parameter but its associated uncertainty should be assessed
9. Comparison of CRG and CMUG results could enhance the utility of their research, but needs to start at an early stage.
10. Contact with external projects working in CCI areas (of data and regions) is important for independent verification of results
11. Work still needs to be done to achieve consistency and synergies between datasets that have commonalities

Obs4MIPs and engaging with users

12. CCI teams should be willing to provide their data on Obs4MIPS, and for other MIP projects.
13. Uptake of CCI datasets by climate modellers will be facilitated if the CCI datasets are included in the Obs4MIPS for CMIP6
14. There are other specialist MIP projects which CCI data producers could support
15. There are other EC research projects which CCI research teams and data producers should engage with to ensure CCI data reaches the intended audiences
16. When CCI data is used by other activities, then the scientific integrity of the data (e.g. uncertainty, statistical info) must be checked and maintained, especially when used in combination with other data.
17. Does CMUG and the CRGs know who all the data users are, including the MIPs projects?
18. A CRG/CMUG/expert only workshop would be useful

Actions from Science Leads Meeting

1. T. Holzer-Popp to update the table of consistency analyses proposed in the phase 2 projects
2. R. Hollmann to give feedback to ESA on issues with level 1 data at next colocation meeting
3. E. Chuvieco to provide coordinated response from SL's on ITTs to ESA (Marie-Claire)
4. E. Chuvieco to inform Science Leads about his work on coordinating a series of books on Earth Observation and that he requests reviewers

3. Summary of keynote presentations

Key remarks from the key note presentations

1. A good demonstration of the practical application of climate data for "climate services" was given using the IRI Data Library: http://iridl.ldeo.columbia.edu/
2. New high resolution satellite information (TanDEM-X) for elevation gives new opportunities for studying elevation changes in glaciers
3. High quality, long term, SST, sea-ice and soil moisture observation datasets are an essential pre-requisite for seasonal forecasting
4. Modelled carbon uptake for aerosols, chemistry, and ecosystems are not as well validated as for other variables due to less well developed observational datasets

The meeting was opened by Dame **Julia Slingo**, **Met Office** Chief Scientist, who described the role of observations in climate research, then **Roger Saunders** (**Met Office** and CMUG Lead Scientist) described the meeting aims and objectives. **Mark Doherty (ESA)** gave a short presentation of the programmatic context for the meeting and the opportunities it gave for advancing the CCI in Phase 2.

Pietro Ceccato (IRI) talked about **climate prediction and environmental monitoring for societal benefit** in the areas of: drought, health, pests, fire, floods and hurricanes, and climate monitoring of seasonal and decadal variation was shown to be important for this area of work. The IRI Data Library - http://iridl.ldeo.columbia.edu/ - was demonstrated as a source of climate information for users (with a practical demonstration offered later in the meeting), and also its ability to use in multiple data sets in combination to support enhanced analyses. Most of this work is applied in developing countries and used for societal benefit there.

Michael Zemp (University of Zurich) is Director of **World Glacial Monitoring Centre which models glaciers and how they respond to climate change**. There are about 200,000 glaciers globally being measured, and in datasets such as the Randolph Glacier inventory this includes the glacier area and volume data from the CCI glaciers project. Data from the TanDEM-X satellite presents an opportunity to improve estimates of changes in volume. The link between mass balance reduction in glaciers and sea level rise was also demonstrated.

Francisco Doblas-Reyes (iC3) presented on **satellite datasets for climate prediction and services**, covering the transition for observations from initial conditions (weather forecasting) to forced boundary conditions (climate predictions). Dr Reyes heads the EU funded SPECS project for improving European climate models over seasonal timescales. SST, sea-ice and soil moisture were singled out as datasets which are useful for modellers working in this timeframe. The utility of soil moisture observations in EC-

Earth simulations was demonstrated, and the low correlation between wind observations and model forecasts was noted. A user interface for climate predictions is being developed in the EUPORIAS project (a sister project to SPECS).

Chris Jones presented (Met Office Hadley Centre) on **observational needs for carbon cycle modelling and the application of observations to reduce uncertainties in carbon fluxes**. Over ocean carbon uptake is modelled more consistently than land, but with aerosols, chemistry, and ecosystems less well validated than traditional variables. In the CMIP5 biogeochemistry evaluation there are large uncertainties in soil carbon. For carbon cycle modellers the EO requirements include LC, GHG, Fire and OC, amongst others.

4. Summary of ECV datasets

Key remarks from the CCI ECV presentations

1. Many of these products have now delivered data sets which have sufficient temporal extent of use for modelling studies, although some are still limited to a few years
2. Many different validation results of on these datasets were shown
3. Some projects still have complex issues on observation measurements and/or processing to resolve before being able to produce CDRs

This part of the meeting allowed the ECV projects to show their Phase 1 data and validation, including modelling applications, and describe their Phase 2 aims and work plans. Presentations were limited to twenty minutes including questions.

Soil Moisture - Eva Haas (GeoVille) Version 1.2 (daily data at 25-150 km resolution for 1978-2013) will be available in August 2014, with improved coverage spatially and temporally (WindSat and AMSR-2 introduced to fill data gaps) and better merging between active and passive data. Data extends from 1978 to 2013, with GCOS requirements met after 2002. Applications: Soil moisture temperature coupling, studying water cycle, coupling with climate modes. For Phase 2 they will add SMOS and have an operational system.

Land Cover - Andy Hartley (Met Office) Land Cover products are convertible to Plant Functional Types for use in land surface models and for validation of model projections. The project is looking at effects on atmospheric CO_2 and extreme temperatures and precipitation. High-resolution (300m) maps for three epochs (2000, 2005 and 2010) are available, as well as a map for the period 1998-2012. For phase 2 there will be an annual cycle of upgrades going back to the 1980s. A one year dataset of Africa is 72TB in size.

Burned Area - Emilio Chuvieco (UAH) This project has yet to finish Phase 1. The results shown were a comparison with MODIS for 2008. The dataset is high-resolution (1 km), global, with one-to-five day mean data available for several years. These datasets, which come along with some uncertainty estimates, have a lower quality than other similar products. The Phase 2 aim is to increase the quality and temporal extent.

Aerosol - Thomas Holzer-Popp (DLR) Demonstrated that AATSR measurements have significantly improved and are now similar in quality to MODIS for producing aerosol optical depth. Datasets are available globally for 2008 and from one algorithm for 1995 - 2012. IASI data will be added in phase 2 with 4 competing algorithms, and a consistency analysis will be conducted with other ECVs.

GHG - Michael Buchwitz (Bremen University) This project produced datasets for CO2 and CH4 for global Level 2 (single ground pixel) data sets at a resolution of 10 km (GOSAT) - 60 km (SCIAMACHY) during 2002-2012 (to be extended in Phase 2). One data experiment used inverse modelling and suggested that Europe is a carbon sink. In future CARBONSAT will give better coverage than OCO-2. Twenty eight peer reviewed papers published to date by this project.

Clouds - Rainer Hollmann (DWD) The cloud project has generated two data sets spanning 2007-2009. Several variables at 5-10 day mean frequencies and 50 km horizontal resolution are available. There is an underestimation of global cloud clover mainly due to lack of cirrus. In Phase 2 the data will go back to 1982, will be validated with surface stations, and multi-decadal datasets will be produced with updated algorithms. IASI will be used as a validation source and for developing cloud simulator packages.

Ozone - Melanie Coldewey-Egbers (DLR) Total ozone, nadir and limb profiles are available for different periods, the longest being 1996-2011. The data are 1-6 day means at resolutions of around 200 km. Some of these data will be used in SPECS with EC-Earth by KNMI. Validation, along with for the greenhouse gases products, is being made by ECMWF in close cooperation with the MACC project. As part of the modelling research the chemistry climate model EMAC was used to estimate the return date of ozone to climate historical values. Winter eddy heat flux related to total ozone is seen both in models and data. By 2020 there may be a reliable estimate of ozone trend.

Glaciers - Liss Andreassen (NVE) Glacier area is available from 1984-2011 at 30 m resolution, and these data have been validated with *in-situ* observations in Norway and elsewhere. The data are used from monitoring for public warnings (flood potential, glacier lake outburst floods- *Jøkulhlaups*) to climate change studies. Sentinel-2 will provide imagery every 3 days, an improvement over current sampling. End of season snow-line is of interest with more frequent imagery, as are ice dynamics and ice velocities.

Ice Sheets - Rene Forsberg (DMI) For Greenland, surface elevation change has been produced at 5 km resolution four times a year for 1991-2012, and ice velocity is also available. Validation and uncertainty estimates have also been produced, as too have estimates of mass balance, contributing to the knowledge that Greenland contributes 0.7mm/yr to sea level rise. The Antarctic ice sheet CCI project led by Andy Shepherd (Leeds) will start in Jan 2015.

SST - Nick Rayner (Met Office) SST data is available daily at 0.05º resolution from 1991-2010 with full uncertainty assessment from level 1 to level 4. Model simulations were compared with OSTIA, Reynolds and the CCI, with the latter being closest to model. The increased feature resolution in this new CCI product is providing improvements to the climate research community. The project will run 2 dedicated simulations at 25km resolution and look at high resolution features. The Met Office is organising a related workshop on needs for and presentation of SST uncertainties in November 2014. In phase 2 Argo data might start being used for validation.

Sea Ice - Stein Sandven (NERSC) Data include daily concentration over the Arctic and Antarctic at 25 km resolution for the period 1997-2012. Thickness calculation is problematic because of the limited penetration of the radar into the snow cover on ice. In phase 2 sea-ice thickness might be available from 1991, and sea-ice drift might be included. The data are available from the Integrated Climate Data Centre.

Ocean Colour - Shubha Sathyendranath (PML) Daily ocean colour data is available over 1997-2012 at a resolution of 4 km. This data can be used to validate the characteristics of phytoplankton dynamics, among other aspects of the bio-geochemistry of the models and predictions. Band shifting MERIS and MODIS to common wavelengths removed a jump in 2003 when MERIS was introduced. www.oceancolour.org shows different ways to get the data. There is a project to look at data in the Arabian Sea.

Sea Surface Height - Gilles Larnicol (CLS) Data is available for the period 1993-2010. Regional sea-level data is available monthly at 0.25º resolution, and a global-mean product is made every 10 days. Error and confidence estimates are provided. Altika and Sentinel-3 will provide better estimates in coastal regions. Regional MSL trends have been improved by this CCI, but it is hard to measure the research impact of assimilating SL products.

5. Summary of CMUG assessments of ECV data

Key remarks from the CMUG assessments of ECV data

1. CMUG evaluations of Phase 1 CCI datasets have found areas to investigate for improvement
2. CMUG results on all datasets examined demonstrated a utility in their application to climate models

3. It was stressed that not only the parameter but its associated uncertainty should be assessed
4. CMUG assessments of CCI datasets are available on the CMUG website: http://bit.ly/1unawDd

Introduction

In this session CMUG researchers presented the results of their work on Phase 1 CCI datasets. Most of these results are presented in CMUG deliverables published in 2014 (available on the CMUG website) but the results shown at this meeting allowed updates and more recent conclusions to be aired. The results confirmed the independent perspective which CMUG brings to the CCI, the integrated nature of its assessment, and demonstrated the utility of the CCI data to the climate research community. CMUG plans for Phase 2 covering an integrated approach to assessing multiple ECVs, and developing or enhancing existing links with international initiatives (Obs4MIPS, Copernicus, H2020 research, Cordex) were also presented.

SST - Roger Saunders (Met Office) This presentation described the data gaps, changes in retrievals and uncertainties examined in the CMUG evaluation. CMUG looked at the validation against drifting buoys and made comparisons with precursor ARC dataset retrieval methods. The three way error analysis was especially useful for data validation. ARC's uncertainty assignment is in general better than CCI's uncertainty, although not for all uncertainty values or validation criteria. 2 channel biases in SST are significantly higher than for ARC, while 3 channel bias in SST slightly higher than ARC. Uncertainties of CCI product suggest they are reasonable but fewer matchups for night time cases than for ARC. Feedback suggests AVHRR SST dataset is an improvement over the pathfinder SST dataset. It is good for climate research applications to extend the time series back before 1995. CMUG should also consider the interface with MACC and MyOcean (as they plan reanalyses) in addition to the Copernicus Climate Change Service.

Ocean Colour - David Ford (Met Office) the OC-CCI data and GlobColour chlorophyll were assimilated into the FOAM-HadOCC model, which improved model results, OC-CCI and GlobColour give broadly similar results, but with interesting differences at small regional scales. More detailed validation will be conducted with an exploration of seasonal and inter-annual variability. the effect on vertical profile assimilation could be considered in Phase 2.

SSH and Ozone - Serge Planton (Météo France). The SSH product has been demonstrated for the Mediterranean as suitable for regional climate studies. Confrontation of SSH data with the model raises some questions about the way to compare models with the observations, implying the need for an "SSH observation simulator", either at the global or at the regional scale. There is an opportunity to evaluate consistency with other CCI products over the Mediterranean region taking advantage of the development of regional climate system models, of the MedCORDEX model intercomparison project and of the HyMEX experiment.

Some assessment of the ozone IASI product was made, taking advantage of a confrontation with the NIWA products that include in-situ observations. Inclusion of IASI data in the CCI-products construction could be an added value. The uncertainty range attributed to the CCI MERGED_LP product seems underestimated at upper level at least in some regions like near the 3hPa level. The confrontation with model simulations confirms that the CCI ozone products are suitable for model intercomparison.

Ozone, GHG and Aerosol - Rossana Dragani (ECMWF) The first part of the presentation introduced the Climate Monitoring Facility (CMF) at ECMWF which is an interactive interface to visualize and facilitate model-observation confrontation for L3 products with a focus on multi-year variability of statistical averages (monthly/regional means). The CMF Database includes pre-calculated statistical averages of 100+ distinct variables defined over 32 different geographical regions, 12-18 layers (if applicable), several data streams (various reanalyses and several CCI datasets). Uncertainty is characterised through an ensemble of data assimilation runs (when available).
CCI Ozone – TCO3 shows good agreement with ERA-Interim, but is higher when the latter is constrained by vertically resolved O3 data. Profiles: retrievals show lower values than the reanalyses. In the region of the O3 maximum (10hPa), the differences from ERA-Interim are consistent with the reanalysis validation. Further investigation of the region below the O3 maximum (30hPa) is needed for NPO3. L3 uncertainties generally well comparable with O-A residuals (Observation minus analysis) and Ensemble Spread.
CCI Aerosol – Residuals from MACC are within the observation errors. The differences can largely be explained by the positive bias in the MODIS data (especially in summer). SU 4.0-4.2: Residuals from MACC increased in the latest versions, but they are consistent with MACC-Aeronet comparisons and likely due to shortcomings in the sea-salt model. SU4.1 and ADV1.42 retrievals globally show good long-term stability and land/ocean differences.
CCI GHGs – Generally good agreement between retrievals and the MACC Fc runs with optimized fluxes. CO2 shows about 2ppm mean growth rate (consistent with e.g. NOAA ESRL data). In the tropics, the SRFP GOSAT product appears lagged compared with the other datasets. The SCIA CH4 datasets show small differences in the long-term variability between algorithms. A sudden change was seen in the IMAP SCIA product in 2010 (in the tropics and northern mid-latitudes).

Clouds - Mark Ringer (Met Office) Cloud amount underestimated over global oceans, high-level cloud underestimated over land in tropics and mid-latitudes, low-level cloud underestimated over sub-tropical oceanic stratocumulus areas (e.g. California, Peru), and large underestimate of thin cirrus cloud. Climate and modelling study considerations for CCI Cloud Phase 2 include production of long-term record suitable for identifying trends in cloud, and/or a focus on interannual variability & model evaluation/development. Specific model-oriented products may be required, but merged products unlikely to be of use to modellers.

Alex Loew (MPI-M) presented results on Soil Moisture, Land Cover and Fire.

Soil Moisture: Unique first multidecadal data record, which is a good proxy for precursor dynamics, although a record of the caveats in using this data is needed. Findings were published in a peer-reviewed paper (Loew et al., 2013; doi: 10.5194/hess-17-3523-2013) together with the CCI SM team.
Land Cover: slightly improves global 2m air temperature estimates, however changes are very small. compared with the forcing uncertainty, higher resolution data are needed for better process understanding.
Fire: Large potential for joint fire and LC data usage for improvement of global fire emission estimates. CCI fire record available so far is not suitable for use in climate models.

6. Summary of breakout groups on ECV data

Key remarks of breakout groups on ECV data
1. Comparison of CRG and CMUG results could enhance the utility of their research, but needs to start at an early stage.
2. Contact with external projects working in CCI areas (of data and regions) is important for independent verification of results
3. CCI teams should be willing to provide their data on Obs4MIPS, and for other MIP projects.

Introduction
This session was an open discussion for all attendees, structured around the themes of Phase 1 Outcomes and Phase 2 & CCI-2 plans. Key points from the discussion are as follows:

Phase 1 Outcomes:

1. **What additional value / problems compared to the CMUG results were identified in climate research groups of the different ECV teams?**
    - GHG: CRG inverse modelling for surface fluxes – can CMUG do something complementary?
    - SM: Data assimilation aspects – compare CCI products with other assimilated products – e.g. as done with SURFEX.
    - Aerosol: complementary work in CRG on AOD. Fire / cloud complementary studies. Can aerosols be divided in two types, as this is useful for modellers. In MACC there will be an across ECV assessment mode.
    - SSH: CRG has global perspective, but CMUG was regional.
    - LC: more use of ancillary variables in models, use other ECVs (SM). Examine regional and local scale improvements to the model.
    - OC: examine the effect of OC on heat uptake – MetO is working on this in a different project - this can be linked to CMUG Phase 2 assessment

- SI: ice thickness product quality and usefulness – will be discussed at workshop in Q3. LC input to open water dataset – could this be of use? Also need to look at outside projects.
- Cloud: P1 was a short (3 yr) time period for evaluation.
- Cloud/aerosol: ensure same masks, where possible, esp with common instrument retrievals. See: (i) Glob cloud mask project, (ii) consistency work in aerosol CCI. Cloud clearing round robin 16th June in Reading (led by Glob Temp, Stephen Plummer).
- SST: different approaches were taken to give independent views.

Phase 2 and CCI-2 plans

2. **How will phase-2 address limitations of phase-1 data identified by CMUG/CRG's ?**
   - Other users already engaged by CRGs can help answer this.
   - Documentation (System Maturity Matrix, Obs4MIPs) on the application of datasets by modellers (will cover sampling etc)
   - Obs4MIPs – all ECVs should be in it for Phase 2. One of many data channels
3. **What should be the new variables/products in a potential CCI-2? (e.g. Snow, Lakes, Salinity, Albedo, …….)**
   - Don't duplicate other well produced variables.

7. Summary of Applications for ECV data

Key remarks of presentations on applications for ECV data

1. Uptake of CCI datasets by climate modellers will be facilitated if the CCI datasets are included in the Obs4MIPS for CMIP6
2. There are other specialist MIP projects which CCI data producers could support
3. There are other EC research projects which CCI research teams and data producers should engage with to ensure CCI data reaches the intended audiences
4. When CCI data is used by other activities, then the scientific integrity of the data (e.g. uncertainty, statistical info) must be checked and maintained, especially when used in combination with other data.

Introduction

A series of talks described several applications for the ECVs produced as part of the CCI and from other initiatives. These talks included examples of applications from Obs4MIPs, CMIP6, QA4ECV (quality assurance for land and atmosphere climate variables), UERRA (based on EURO4M) and CORDEX. It is important that the climate modelling community is kept engaged with this group of applications. CMUG is working with the climate modelling community by demonstrating its validation of the CCI ECVs. The data of

interest to the climate modelling community are mostly in soil moisture, sea ice, atmospheric composition (GHG, ozone, aerosols) and SST, plus some others.

Obs4MIPS – Robert Ferraro (JPL) Planning now for CMIP6 with >50 variables stored. ARC SST and AVISO SSH are there but the majority are NASA datasets. The WDAC task team is asked to provide oversight for future activity of this project. The challenge is to sort through competing interests to get CCI data on to Obs4MIPs. Criteria for including data in Obs4MIPs is evolving. Major elements of ESMs are now considered for Obs4MIPs. There is an interest in higher-frequency and –resolution by some members of the community, but this is still a point of discussion. Off-line simulators are proposed as modellers don't want to deal with more in-line simulators because of resource constraints on execution time and code validation. Uncertainties structure may need to be expanded to cover multiple uncertainties as proposed by SST CCI.

CMIP6 – Cath Senior (Met Office) This is now being considered as a more distributed activity. DECK experiments are performed continuously as models are developed. 5 experiments proposed to characterise the model and feedback is currently being sought from modellers. ESMVal and PCMDI metrics package are planned (which are concurrent with CMUG research).

QA4ECV – Folkert Boermsa (KNMI) This is an EC FP7 project for Quality Assurance on newly generated terrestrial and atmospheric ECVs. Spectral albedo, LAI and FAPAR are ECVs to be addressed for land, and NO_2, HCHO & CO for atmosphere. Traceability of uncertainties through retrieval process will be a useful outcome, as will the new ECVs, and outcome of the QA development process will be interesting.

UERRA – Richard Renshaw (Met Office) An EC FP7 project (successor to Euro4M) creating ensembles of reanalyses. Validation using CMSAF CLARA cloud and precipitation and ATOVS water vapour was shown although accuracy of the latter were questioned . The project will run an ensemble to get uncertainties but not by perturbing observations.

CORDEX - Grigory Nikulin (SMHI) (CO-ordinated Regional Downscaling EXperiment). Most modelling groups have done the downscaling for continental regions around the globe but they still need to make their data available, still some quality checking before release to users. Main focus is on the ESGF now to distribute data and since October the number of users has steadily increased. Impact modellers are interested in the outputs, for example Minimum temperature is a popular variable for agriculture studies.

8. Summary of breakout groups on Applications

Key remarks from breakout groups on applications

1. Obs4MIPs for CMIP6 will be a significant user platform for many CCI datasets
2. Data included in Obs4MIPs must be well validated and peer reviewed
3. Current data assimilation systems have unique issues related to uncertainty (e.g. correlation structure of observational uncertainties, observation discontinuities, ...)
4. Different users need different levels of information on uncertainties
5. The salient feature of Climate Change Services is in combining different data sources in to a package that is compatible with user needs. CCI datasets are a precursor to that
6. Quality Assurance, data maturity (especially in post processing and product creation), accessibility and 'tools' are essential for data uptake by users of Climate Change Service

Introduction

Three breakout groups were formed to address the issues associated with the following three topics. Much of the discussions were based on the presentations seen to date:

1. Input of CCI datasets to CMIP6 and Obs4MIPs
2. Use of uncertainties
3. Provision of data to Copernicus

The following text are the notes of the chairs and rapporteurs summarising the key points from the discussions.

Obs4MIPs breakout group

Chair: Robert Ferraro, Rapporteur: Mark Ringer

- Purpose of obs4MIPs is to provide observational data sets for evaluating climate models and their projections (see https://www.earthsystemcog.org/projects/obs4mips)
- ESA confirmed that all CCI ECV data sets of sufficient maturity a required to be submitted to obs4MIPs in order to maximise uptake by the CMIP community, and hence maximise their eventual impact on IPCC AR6. Some CCI data sets (e.g. glaciers) may not be relevant.
- obs4MIPs data sets are made available in the same format as CMIP model output, and hosted on the same archive (ESGF).
- Requirements for obs4MIPs data are:
    - netCDF, CF conventions, nominally on a monthly 1degree or 0.5 degree lat-lon grid, and compliant with CMIP Climate Model Output Re-writer (CMOR) metadata format;
    - a 5-8 page technical note written at grad-student level describing the data set and recommendations for its use.
    - it is not necessary to use CMOR to ensure compliance with the format; this can also be done manually using common netCDF-writing tools.
    - length of data set required for obs4MIPs depends on application – assessing climatology, processes, interannual variability.

- data sets submitted to obs4MIPs should be generally accepted as mature established data sets with a peer-reviewed publication record, rather than novel "research-level" data sets.

- With AR6 in ~7 years from now, it is now time to reassess what can be improved w.r.t. CMIP5. The CMIP (and obs4MIPs) data format is being reconsidered and will evolve for CMIP6, e.g. to include new geophysical variables and higher spatial and temporal resolution. The inclusion of observation simulators and averaging kernels is under consideration, e.g. for cases such as xCO2.
- Apart from SST and Precipitation, obs4MIPs does not contain multiple data sets for the same parameter. There is some discussion on whether this is a good idea or not, and the WDAC Task Team has been asked to provide guidance.
- As the purpose is for climate model evaluation, it is not expected to perform regular incremental updates of data sets on obs4MIPs (i.e., monthly updates). The appropriate time scale for a dataset update is annually at best, and perhaps only when a new version (reprocessed) is released.

Review of CCI data sets that are expected to be ready for submission to obs4MIPs during the next 3 years (not all CCI projects were represented)

- Land cover: Phase 1 products are already sufficiently mature, further updates to extend the time series into the past will be provided in Phase 2. Available parameters are PFTs, land cover, LAI, snow cover, NDVI.
- Aerosol: 17yr ATSR-2 and AATSR data set is ready. Updated/improved version to be provided in Phase 2.
- Ozone: Could be provided during the coming year.
- Soil Moisture: Long time series will be available in Summer 2015
- SST: ARC is already on obs4MIPs. CCI SST is an improvement based on more satellite data.
- Sea Level: AVISO is already on obs4MIPs. CCI Sea Level is an incremental improvement.
- Cloud: Long time series (1982-2014) will be provided in obs4MIPs format towards the end of Phase 2.

Uncertainties breakout group
Chair: Nick Rayner, Rapporteur: Roger Saunders

How do users use information on observational uncertainties? Some examples discussed were:

- As a means of weighting information when averaging;
- As a means of weighting information in data assimilation;
- As a means of weighting information when producing merged data sets;
- As a means of determining whether or not model simulations are significantly different from observations;
- As a means of generating ensembles in data assimilation;
- As a means of determining uncertainty in long term trends;
- As a means of correcting errors in observations, e.g. by subtracting biases.

What are some of the barriers to using information on observational uncertainties? Some examples discussed were:

- When uncertainties depend on the size of the variable, this can lead to damping of the impact when observations are inverse-weighted according to their uncertainty;
- If uncertainty estimates of different data sets of the same quantity are not harmonised, then any blend created from them will be adversely affected;

- Users often don't like the idea of "bottom up" retrievals-based uncertainties and prefer the idea of uncertainties based on comparison to validation data (e.g. global data assimilation). When validation data are not available everywhere, this leads to estimates being extrapolated;
- If modelling errors are large compared to observational uncertainties, then the accuracy of the latter can be less stringent
- Most current data assimilation systems are not set up to use information on the correlation structure of observational uncertainties;
- Data assimilation, e.g. in a reanalysis, needs to be conservative to protect the result from discontinuities introduced by changing observational systems which are not allowed for in the bias correction. Therefore, observational uncertainties are inflated to ensure this;
- Different users need different levels of information on uncertainties – the needs are to be user-friendly and, in some cases, visually appealing;
- Split of uncertainties into components doesn't currently facilitate the estimation of uncertainties in long term trends, because there is inadequate information provided on the exact nature of their correlation structure.

What can be put in place to overcome some these barriers? Some examples discussed were:

- More complete documentation to include, e.g. how the uncertainty estimates have been made, their correlation structure and how to use this information;
- Provision of lower-resolution products where uncertainties have been propagated appropriately by the data providers;
- Provision of averaging kernels;
- Work with users in a continuous process to explore how uncertainties are practically useful, e.g. host user workshops;
- Expert evaluation of the uncertainties.

Further suggested actions:

- Keep estimating uncertainty information – it's useful, even if not used to its full potential currently;
- Workshop or dedicated half-day session at a CCI co-location meeting to share our different approaches to estimation and provision of uncertainties: how they are estimated; what the components are; how they are validated;
- Users should test whether or not uncertainty estimates provided are consistent with their own results and feedback this analysis;
- Need to work together to understand how uncertainty estimates can be validated.

Provision of data to Copernicus Climate Change Service (CCS) breakout group
Chair: Victoria Bennett, Rapporteur: Paul van der Linden

1. Copernicus Status Update & CCI links

- Services
  - Climate Change: Climate Data Store: Distributed infrastructure, Content: past present and future ECV datasets, Expert User Workshops
  - Atmosphere, Land, Ocean
- CLIPC – forerunner project for climate change service
  - Climate Information Portal, integration of different datasets and some aspects of Sectoral Information System for different end users
  - expect to interact with CCI portal

2. Needs

- We are producing scientific datasets - not ready for commercial use
  - Integrated chain – scientists, service providers, end users

- Users want more than the scientific information, they want information about the future
- E.g. IRI demonstration example
  - Serving the end users with a number of datasets
- Difference between scientific datasets coming out of CCI and tailored datasets for the users
- Who should fill the gap between science data producers and the service providers, across ECVs, tailored products
  - Opportunity for Copernicus
  - Projects and people dedicated to that middle ground
  - Can Copernicus climate service funding help do that bridging?
  - Combining information, paring it down

3. Opportunities

- Users:
  - Science – scientists
  - Societal benefits
  - Who are the end users: EEA, Governmental use, Institutional use, & Commercial world
- Bring together all the raw data, which can all feed in to the higher level product, all within the same infrastructure
  - Puts a lot of strain on the infrastructure
- Importance on regional information
  - Much data is global – downscaling issues – take it to the level where the local authorities really need it

4. Opportunities: What will CCI get out

- Updated user requirements: what data is needed for my application, feedback on the data quality
- Quality tool – improve datasets
- Outreach – bring all the ECVs together and non-scientists can communicate about them

5. Opportunities: sentinels

- Sustained observing from sentinel satellites – wealth of new data – to be embraced by CCI
- Evolve it beyond the science

6. Process

- CCI activity becoming a side-by-side activity of a sustained Copernicus (timings work well)
- Who will do the operational part?
- Institutions, universities, companies..
- Mechanism: how will the data be processed and served/distributed?
- Priority ECVs
- ITTs – this ECV with this timeliness and this quality.. Open calls.
- Ramp-up phase with proof of concept 18 months – 2 years
- Atmosphere service: also via procurement

7. Issues

- Copernicus will not do everything – national activities have to supplement – make use of national expertise
- Also still need H2020 activities to fund R&D
- Role of the reanalysis system in the service
  - Not the vision that everything will become reanalysis!
- Data Standards and Documentation
- Climate indicators to be derived from ECVs, which are provided to Copernicus
  - Maturity, quality, documentation
- Sustained production
  - CCI is a research activity for the next 3 years
  - Things that are mature enough will transfer to an operational activity with operational funding
  - Ongoing need for R&D to improve the data
- Is the service open to datasets that they are not paying for?

  - e.g. H2020
- Quality
  - take on board feedback from user groups
  - Sentinel data
  - Continuity
- e.g. for atmosphere:
  - Complementarity between CCI and MACC
    - Timeliness/operational mode
    - Research mode – innovative, development
- International aspects:
  - GCOS / ECVs
  - In some cases the international (not just Europe) data is the better one
  - Users should know where the data come from
- CCI dataset comes as a "package" – which feeds into modelling, have already had feedback, in the models that will be used for projections. Isn't that an opportunity for the CCI dataset?
- Maturity index – one element of the quality problem but not the whole story

9. Summary notes from Science Leads breakout group

Actions from Science Leads BOG

1. T. Holzer-Popp to update the table of consistency analyses proposed in the phase 2 projects
2. R. Hollmann to give feedback to ESA on issues with level 1 data at next colocation meeting
3. E. Chuvieco to provide coordinated response from SL's on ITTs to ESA (Marie-Claire)
4. E. Chuvieco to inform Science Leads about his work on coordinating a series of books on Earth Observation and that he requests reviewers

1. Update status RSE special issue

- Some papers have already been accepted for over a year but there are still 2 papers in the review. Need a strict deadline of 1st July or withdraw papers. One is to be resubmitted. The other has comments which are difficult to address and will probably be withdrawn. Aim for publication in Autumn.

2. Joint paper on uncertainty

- There was a breakout session on this at this Integration meeting which will provide more input.
- Feedback on uncertainty is to continue the discussion until after the two workshops in Autumn and CCI colocation.
- After colocation meeting prepare something for user workshop.
- Draft of paper to be considered by end of year
- A single paper that tries to cover all ECVs will be unwieldy but there is a case to have 3 or 4 linked papers to allow the different approaches to be compared.

3. CMUG assessments and plans for Phase 2

- CMUG are in the process of finalizing their phase 2 proposal with a core and options proposal.
- They will be doing a range of cross-ECV assessments.

Cross-ECV dataset assessments:
  - Cross-Assessment of marine ECVs (SST, OC, SSH, SI) (Met Office)
  - Integrated assessment of the aerosol, GHG, and ozone datasets (ECMWF)
  - Integrated exploitation of CCI terrestrial ECVs (LC, Fire, SM) (MPI-M/IPSL)
  - Cross-Assessment of ECVs from sea-ice with atmospheric ECVs (MPI-M/DLR)
  - Cross-Assessment of Aerosols, Cloud and Radiation CCI ECVs (DLR)
  - Cross assessment of clouds, radiation, aerosol, GHG, soil moisture, SST (SMHI/MF)
- Exploiting CCI products in CMIP like experiments
  - Assessing CCI datasets as boundary conditions in CMIP5-like atmosphere simulations (MF/IPSL)
- Adaption of community climate evaluation tools
  - Benchmarking models with ESA CCI data in the era of CMIP6 (DLR/MPI-M)
  - Development of community climate dataset evaluation tools (ECMWF)
- Interface to climate services

4. Joint ECV science in Phase 2

- Thomas H-P showed a table of consistency analyses proposed in the phase 2 projects (Action T. Holzer-Popp to update)
- This now needs to be defined as some were in options.
- Some of the later ECVs will need to be added.
- Need to be complimentary activities to those in CMUG.
- CMUG should be added to the table in July.
- PDRA opportunity is another mechanism
- There is a case for a simple land/water/ice mask for CCI teams and other users. Need to define target resolution.
- Uncertainty analysis across ECVs is also an example of this

5. After Phase 2

- Soil moisture met to discuss phase 2 plans but also after phase 2. How will it be funded?
- What will Copernicus Climate Service fund? Some ECVs for MyOcean, MACC etc
- Austria setting up a centre targeted for Sentinel-1 but may also help assure continuity of soil moisture
- If funding opportunities become more diverse in future will lose CCI umbrella which has been valuable to bring groups together.
- R&D will likely be still partly funded by CCI as CCI-2. Member states need to provide support
- Continuity of level 1 reprocessing needs to be supported by space agencies
- Need to give feedback to ESA on issues with level 1 data at next colocation meeting (Action R. Hollmann)

6. Project funding opportunities

- Shubha reminded the group there is an ESA call on Ocean Virtual Labs
- Ice sheets and SSH (ECMWF) will respond to the ESA STSE post doc program
- H2020 space call in November has an EO topic

7. Other cross-cutting issues (computation, management, data storage/access)

- In CCI separate ITTs for a CCI portal, toolbox and communication are in draft form and is open for feedback. This may impact the delivery of CCI products and so the CCI teams should have an

overview. Need to decide how to interface with CCI. Marie-Claire Greening is PoC at ESA. Call will be open in Autumn. This needs to be linked with the other EU funded portal being developed. (Action: Emilio to provide coordinated response from SL's on ITTs to ESA (Marie-Claire))

- Agree a single portal for CCI datasets is needed. Will need to be able to monitor users accessing the data.
- For MyOcean there is discussion on a portal for delivery of CCI ocean products.
- For data storage no coordinated approach at present but will Copernicus Climate Service provide this in the future?
- Meta information browser is used for Glaciers.

8. Obs4MIPS/Copernicus/CoreClimax/SAF

- Robert Ferraro reported on the Obs4MIPS in the meeting.
- For GHGs want 10deg lat/long grid for monthly means but the data could just be replicated on the 1deg grid to make life easy for the users.
- Review process still being agreed.
- Note care is needed to collapse the uncertainties onto a 1deg grid.
- For EUMETSAT SAF CDOP-3 proposals need to be set by spring next year.

9. Maturity Index updates

- Latest version of matrix and guidelines has recently been distributed by Thomas Holzer-Popp with an example for aerosols.
- It is a system maturity index not a data quality measure.
- Deadline for submission of matrices to Core-Climax project is end of June 14.
- CMUG could provide a role reviewing the CCI maturity matrices.

10. Upcoming events/conferences

- Should Coloc-5 be co-incident with Climate Symposium?

11. Varia

- Options? What is process for getting approval? Update from ESA appreciated.
- Need decision on options by Dec 14 to implement mid 2015.
- Emilio coordinating a series of books on Earth Observation and made a request for reviewers (Action Emilio to inform SLs).

10. Summary notes from CRG breakout group

Key remarks from CRG BOG

1. Quality, robust CCI data, with sufficient temporal extent is now becoming available for climate modelling and other studies
2. Work still needs to be done to achieve consistency and synergies between datasets that have commonalities
3. Does CMUG and the CRGs know who all the data users are, including the MIPs projects?
4. A CRG/CMUG/expert only workshop would be useful

CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

1. Phase 1 - exploitation

Issues from user perspective after phase-1?

- SL: robust and usable dataset; link between model diagnostics and SL observations (apples & oranges)
- LC: land/sea mask (inland water); consistent L/S mask?
- SST: good dataset; regridding everything ambitious (slowdown; why?)
- Aerosols: recommendation to have a better MERIS product
- SM: nice long term records with known caveats
- Cloud: more data (years) needed; work on simulators planned
- Fire: 3 years dataset analysed; indirect validation of MODIS BA
- Ozone: use in WMO ozone assessment

2. Phase 1 - collections

- Who is doing exactly what? Synergies?
- Do you know the status of the ECV datasets which you are *not* involved?
  - Overview about existing datasets usefull
  - Overview table of planned phase2 deliverables would be usefull (Ulrika); including reference to data repository

3. CCI greatest hits

Technical

- Round robin experience & new products
- Quality assessment/control

Scientific impact

- Climate community forum; procedure for user interaction; user engagement
- Randolph glacier inventory contribution (IPCC)
- WMO ozone assessment
- Science impact? Added merit?
  - Ozone: impact on reanalysis (??)
  - GHG: Europe carbon uptake?
- How many users do we have??
- (consistency ???)

4. CCI Dissemination

- Are there any CRG‘s engaged in MIP activities?
  - Some active engagement needed?
  - AI: Veronika Eyring: which MIP‘s are already planned? What observations are needed? Foster CCI exploitation top-down?
  - CMUG to gather information on relationship of CRG‘s with MIP‘s (overview)
- CRG engagement with individual MIP‘s and beyond

5. Phase 2

- Do you expect new scientific insights from revised datasets in phase-2? Why?
  - Hope for more linkages
  - More discussion of CRG cross-cutting science
  - Showcases needed? How to define?
- Examples for cross-cutting showcases
  - e.g. carbon cycle as guidance
  - Temperature hiatus (!!)
- Do you feel well informed about what others are doing in CRG‘s ?
- Is a CRG only workshop (with all participants) useful?
  - open also to wider workshop (climate workshop?)
  - Use collocation meeting as CRG melting pot?
    - Session proposal needed for collocation agenda (result session + cross-cutting science questions [external rec.??] + plenty of discussion time)
    - Breakout questions to be formulated (e.g. CCIMIP)

6. Future

- Joint publications?
  - Special issue to be organized by CMUG in phase-2
  - Special issue in journal where individual papers can be appended when they come in.
    - Initiate it now!
    - Focus on data exploitation

CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

Annex A Programme

CCI CMUG Fourth Integration Meeting

Met Office, Exeter, 2-4 June 2014

Version: 13 - 28 May 2014 **PROGRAMME**

The CCI Fourth Integration meeting aims to:

1. Foster the use of CCI datasets in the climate modelling and research community,
2. Demonstrate ECV and CMUG Phase 1 results and examine the lessons learned,
3. Inform about ECV and CMUG Phase 2 planned activities,
4. Gain external perspective from experts,
5. Strengthen links between CCI and relevant climate projects/initiatives/coordinating bodies

Day One - Monday 2 June 10:00-18:10

09:00 Registration

10:00 – 12:10 WELCOME and KEYNOTES plenary session [Room CONF 2]

10:00 Welcome: Julia Slingo, Chief Scientist of the Met Office
ESA representative
Roger Saunders, Met Office, CCI CMUG

10:20 Keynote 1: *Integration of Remote Sensing in IRI's Climate and Environmental Monitoring Activities for Food Security, Human Health and Disaster Management*
Pietro Ceccato, Environmental Monitoring Program, IRI

10:40 Keynote 2: *The importance of observations for understanding the role of glaciers in the Earth climate system*
Michael Zemp, Director World Glacier Monitoring Service, University of Zurich

11:00 – 11:30 Tea and coffee

11:30 Keynote 3: *Satellite data sets for climate prediction and services (SPECS)*
Francisco Doblas-Reyes, Head of Climate Forecasting Unit, IC3

11:50 Keynote 4: *Observational needs for global carbon cycle modelling*
Chris Jones, Head of Earth System and Mitigation Science, Met Office

12:10 – 13:10 Buffet Lunch on the balcony
Lunch event: *Visualisations of CCI ECVs* Philip Eales, Planetary Visions [Room CONF 1]

13:10 – 18:10 CCI ECV PHASE 1 RESULTS & PHASE 2 PLANS plenary session [Room CONF 2]

13:10	*Introduction and context*	Roger Saunders, Met Office
	[Each project to describe Phase 1 results and Phase 2 plans for climate research, 5 mins Q+A]	
13:20	*Soil Moisture*	Eva Haas
13:40	*Land Cover*	Pierre Defourney
14:00	*Fire*	Emilio Chuvieco
14:20	*Aerosol*	Thomas Holzer-Popp / Gerrit de Leeuw
14:40	*GHG*	Michael Buchwitz
15:00	*Cloud*	Rainer Hollmann
15:20 – 15:50	Tea and coffee	
15:50	*Ozone*	Martin Dameris
16:10	*Glaciers*	Liss Andreassen
16:30	*Ice Sheets*	Rene Forsburg
16:50	*SST*	Nick Rayner
17:10	*Sea Ice*	Stein Sandven
17:30	*Ocean Colour*	Shubha Sathyendranath
17:50	*Sea Level*	Michael Ablain

18:10 – 20:00 Ice breaker reception in the Met Office "street"

CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

Day Two - Tuesday 3 June 09:00-17:30

09:00 – 10:30 **CMUG ASSESSMENT OF ECVs plenary session [Room CONF 2]**

09:00 *Introduction to CMUG assessments, SST Assessment, plans for phase 2*
Roger Saunders, Met Office

09:15 *Ocean colour assessment*
David Ford, Met Office

09:25 *Ozone and SSH assessments*
Serge Planton, Météo France

09:40 *Ozone, GHG and aerosol assessments*
Rossana Dragani, ECMWF

10:00 Cloud assessments
Mark Ringer, Met Office

10:10 *Land cover, Fire and Soil moisture*
Alex Löw, MPI-M

10:30 – 11:00 Tea and coffee

11:00 – 12:00 **DISCUSSION OF ECVs plenary session [Room CONF 2]**
Discussion of Phase 1 results, Phase 2 plans and the development of research
Roger Saunders, Met Office

12:00 – 13:00 Buffet Lunch on the balcony

13:00 – 15:00 **APPLICATIONS FOR ECVs plenary session [Room CONF 2]**

13:00 *Datasets for evaluating climate models and their projections: Obs4MIPs*
Robert Ferraro, NASA-JPL

13:25 *How observations will inform CMIP6*
Cath Senior, Met Office, WGCM Chair

13:50 *The QA4ECV project – better climate information for research*
Folkert Boersma, KNMI

14:15 *Using satellite data to understand uncertainties in reanalyses: UERRA*
Richard Renshaw, Met Office

14:40 *CORDEX progress and the need of high-resolution observational datasets*
Grigory Nikulin, SMHI

15:00 – 15:30 Tea and coffee

15:30 **APPLICATIONS FOR ECVs in break out groups [Rooms CONFs 1, 2 and 3]**
1. Input of CCI datasets to CMIP6 and Obs4MIPs
2. Use of uncertainties
3. Provision of data to Copernicus

17:00 – 17:30 **SUMMARY OF BREAKOUT DISCUSSIONS plenary session [Room CONF 2]**

19:00 – 21:30 **Conference Dinner (Self-funded) at El Bocado restaurant, 36 South Street, Exeter, EX1 1ED**

Day Three - Wednesday 4 June 09:00-12:00 **– only for CCI researchers**

09:00 – 11:00 **BREAKOUT GROUPS FOR SCIENCE LEADS & CRGs [Rooms CONFs 1 and 3]**
Science Leads Breakout Group chair: Frank Paul
To cover: Phase 2, Copernicus, data issues, …
CRG Breakout Group chair: Alex Löw
To cover: Application, Phase 2, uncertainty, x-cutting issues, CMUG plans…

11:00 – 11:30 Tea and coffee

11:30 – 12:00 **Plenary, Report back from Break out group chairs, meeting close,** CMUG and ESA representatives

Annex B Participant list

Meeting registrants

Name	Project	Institute
Michael Ablain	CCI Sea Level	CLS
Gudfinna Adalgeirsdottir	CCI Ice Sheets	University of Iceland
Liss Andreassen	CCI Glaciers	NVE
Magdalena Balmaseda	CCI Sea Level	ECMWF
Victoria Bennett		STFC
Alejandro Bodas-Salcedo	IS-ENES2	Met Office
Folkert Boersma	QA4ECV	KNMI
Michael Buchwitz	CCI GHG	Bremen University
Carlo Buontempo	EUPORIAS	Met Office
Pietro Ceccato		IRI
Anne Chadwick	CCI	ESA
Emilio Chuvieco	CCI Fire	University of Alcalá
Melanie Coldewey-Egbers	CCI Ozone	DLR
Gerrit de Leeuw	CCI Aerosol	FMI
Dick Dee	CCI CMUG + ERA-CLIM2	ECMWF
Francisco Doblas-Reyes	SPECS	IC3
Mark Doherty	CCI	ESA
Rossana Dragani	CCI CMUG	ECMWF
Philip Eales	CCI	Planetary Visions
Pete Falloon		Met Office
Liang Feng	CCI GHG	Edinburgh University
Robert Ferraro	Obs4MIPs	NASA-JPL
René Forsberg	CCI Ice Sheets	DTU Space
Marie-Claire Greening	CCI	ESA
Eva Haas	CCI Soil Moisture	Geoville
Andrew Hartley	CCI Land Cover	Met Office
Angelika Heil	CCI Fire	Jùlich Forschunszentrum
Martin Hirsch	CCI Soil Moisture	University of Zurich
Rainer Hollmannn	CCI Cloud	DWD
Thomas Holzer-Popp	CCI Aerosol	DLR
Chris Jones		Met Office
Martin Juckes	CLIP-C	BADC
John Kennedy	CCI SST	Met Office
Stefan Kinne	CCI Aerosol	ZMAW
William Lahoz	CCI Soil Moisture	NILU
Gilles Larnicol	CCI Sea Level	CLS
Pascal Lecomte	CCI	ESA
Alex Löw	CCI CMUG	MPI-M
Pierre-Philippe Mathieu	CCI CMUG	ESA
Angelique Melet	CCI Sea Level	LEGOS

CMUG Meeting Report

Name:	Report on Fourth CCI Project Integration Meeting, 2-4 June 2014
Due date:	15 July 2014
Submission date:	2 Sept 2014
Version:	1.1

Grigory Nikulin	Cordex	SMHI
Fiona O'Connor		Met Office
Alan O'Neil	CHARMe	Reading University
Frank Paul	CCI Glaciers	University of Zurich
Simon Pinnock	CCI Aerosol + CCI Clouds	ESA
Serge Planton	CCI CMUG	Météo France
Nick Rayner	CCI SST	Met Office
Richard Renshaw	UERRA	Met Office
Jeff Ridley		Met Office
Mark Ringer	CCI CMUG	Met Office
Shovonlal Roy	CCI Ocean Colour	Reading University
Stein Sandven	CCI Sea Ice	NERSC
Shubha Sathyendranath	CCI Ocean Colour	PML
Roger Saunders	CCI CMUG	Met Office
Cath Senior	WGCM	Met Office
Adrian Simmons	GCOS	ECMWF
Julia Slingo		Met Office
Andreas Sterl		KNMI
Jean-Noel Thepaut	Copernicus	ECMWF
Yoko Tsushima		Met Office
Paul van der Linden	CCI CMUG	Met Office
Sabrina Wenzel	CCI CMUG	DLR
Ulrika Willen	CCI Clouds + CCI CMUG	SMHI
Michael Zemp	CCI Glaciers	University of Zurich