



CCI



CMUG

Report of CMUG Integration Meeting 8

Met Office, Exeter, UK, and by videoconference, 29-31 October 2018

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Max-Planck-Institut für Meteorologie



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1. Introduction

This was the eighth Integration Meeting organised by the Climate Modelling User Group (CMUG) of ESA's Climate Change Initiative (CCI). It was the first Integration Meeting of the CCI+ phase which sees nine new ECVs added to the initiative. The programme was co-developed by CMUG and ESA with input from the Science Leads and CSWG members of the CCI ECV projects.

The meeting was attended by a Science Lead and a Climate Researcher from each of the nine new ECV projects, and researchers from many of the existing CCI ECV projects attended as well. Experts from other relevant ESA projects attended as well (RECCAP2, SL Budget, CCI Data Projects) as did one of the CCI Fellowship scientists. All CMUG partners attended in person (except for one who attended remotely) as did several ESA Technical Officers, and some external experts who gave presentations relevant to promoting and support interactions and discussions. There were 63 attendees in total over the three days of the meeting. The venue was at the Met Office HQ building in Exeter, UK.

The programme, link to presentations and attendee list are given in the Annexes to this report.

2. Aims of the meeting

The aims of the meeting were agreed with ESA in advance and were broadly similar to previous CMUG Integration Meetings. The format for the meeting allowed experts to present results relevant to the work and aims of the CCI, for CMUG to present and discuss their plans for modelling experiments and for CCI+ ECV teams to describe their plans. The meeting provided forums (either discursive or brainstorming) for the new CCI+ ECV projects to explore the scope of their work and to agree common goals and actions with ESA and the CMUG. The meeting aims were as follows:

1. Look at the plans of the new ECVs with regard to the needs of the Climate Research Community, CMUG and GCOS requirements
2. Allow CMUG to show their plans to the CCI ECV projects to discuss links and potential synergies
3. Allow the ECV teams and CMUG to explain how their work might address the integrated perspective for consistency between ECVs
4. Discuss how to deal with uncertainties in products (how to capture and describe them for product users)
5. Develop ECV projects' data needs for ECMWF reanalysis data
6. Allow CMUG and the existing ECV teams to demonstrate 'best practice' to the new ECV teams
7. Maintain oversight of the position within the international framework in which CMUG/CCI is operating

3. Actions, Agreements and Issues

This section records the 'items of note', actions, agreements and issues arising from the meeting.

#	Type	Description	Owner
1	Action	Error characterisation in ECV datasets needs to be correlated in both space and time	CCI teams
2	Note	Noted in the SL Budget project that not all common data sets are completely congruent.	
3	Note	Noted in the SL Budget project the issues around combining different uncertainty descriptions when combining data products.	

4	Note	The three key features for ECV CCI datasets are “quality” “uncertainty” and “consistency”	CCI teams
5	Note	Alignment of data delivery schedules across CCI projects would be beneficial to users and CMUG.	CCI teams
6	Note	Faster re-formatting of CCI data for Obs4MIPs would help it be taken up more quickly by users	CCI teams
7	Issue	In CMUG WP3.2 the experiment design means there could be issues for the study over differences between snow shown in reanalysis but not shown in obs data	CMUG WP3.2
8	Note	In CMUG WP3.7 on Lakes, there are direct links with the work being done in CORDEX.	CMUG WP3.7
9	Issue	CMUG WP3.12 will need daily wave height data, will this be produced?	CMUG WP3.12
10	Note	CMUG WP3.4 propagation of uncertainties at climate model scales can give rise to lost skill due to observational uncertainties	CMUG WP3.4
11	Note	CMUG WP4.2 has potential links to the ESMValTool.	CMUG WP4.2
12	Action	CMUG WP4.3 would like to create an obs operator for Sea Ice, and would need help from the teams	CMUG WP4.3
13	Issue	How easily can uncertainties be scaled (between the different resolutions for obs and models)?	
14	Note	For CCI ECV projects working on in ECVs involved in components of the Carbon cycle (SM, AGB, LC, Fire...) note the different parametrisations between models, and the interactions between these variables (consistency)	CCI teams
15	Issue	How will Snow, Permafrost, and Lakes be treated in the HRLC project?	CCI HRLC
16	Issue	How will ground based measurements be used in the HRLC project?	CCI HRLC
17	Issue	What, if any, will be the urban categories in the HRLC project?	CCI HRLC
18	Note	LST will include lake surface temperatures	CCI LST
19	Note	Snow user requirements focused on climate (not avalanche, hydrology)	CCI Snow
20	Note	Snow will provide data to ECMWF for ERA5	CCI Snow
21	Note	Snow will provide data to CCI Permafrost	CCI Snow
22	Note	LST needs Snow cover data	Snow / LST
23	Note	Interactions between LC/HRLC and Snow	CCI Snow
24	Action	Snow needs reanalysis data from ECMWF	CCI Snow
25	Note	Permafrost needs data from: LST, SM, Fire, Snow, LC, Glaciers, Ice Sheets, ERA-interim	CCI PF
26	Note	No target or threshold in GCOS requirements for permafrost	CCI PF
27	Note	Links between CCI PF and Polar CORDEX	CCI PF
28	Note	Uncertainty characterisation is complex for this ECV (and others)	CCI AGB
29	Note	There is a seasonality dimension to the data which might not be clear in annual maps.	CCI AGB
30	Note	Lakes will include: extent, level, ice cover, temp (see LST) and reflectance	CCI Lakes
31	Note	Lessons learned (from CCI SM): 1. Test new data releases; 2. Modularise processing software; 3. Assess the impact of algorithm changes; 4 Communicate with users	CCI teams
32	Action	Seek agreement with ESA about a which version/time-step/resolution ERA5 for CCI use. ESA should endorse or approve this.	CCI teams / ESA
33	Note	Existing CCI projects used ERA-interim (which will be discontinued soon)	

34	Action	CMUG researchers at ECMWF can help with ERA questions (if the ERA help desk cannot).	ECMWF
35	Action	Gather in one place a list of all ECVs (or point to existing list more clearly) to provide summary information	CMUG
36	Action	Gather in one place a list of all tools with a quick explanation of what they can be used for and links to each	CMUG
37	Action	Try to get a sense of which ECV datasets are used with which tool and what they are used for	CMUG
38	Action	CCI CSWG people to join Slack at: http://bit.ly/cmug-cci-slack	CCI CSWG
39	Note	http://cmug-cci.slack.com = CCI CSWG website	
40	Action	Remind all and share with new ECVs the lessons learned in "Uncertainty" from CCI Phases 1 and 2	CMUG
41	Action	IPCC chapter outlines and author lists will be circulated	D. Ghent
42	Action	Hold a CCI session at a future GCOS Conference, with the aims being to feed back to GCOS and have visibility in the wider community	Science Leads
43	Action	compile a "CCI slide pack" as a resource for all to use as appropriate when attending relevant meetings/conferences/workshops.	TBD
44	Action	ECV inventory needs to be updated and that this includes a linked gap analysis	TBD
45	Action	To help generate more cross-ECV work, CMUG to circulate its CCI+ cross-ECV table and previous work on ECVs with physical links from a process perspective.	CMUG
46	Agree	Golden year: Keep 2008 as a reference given the work done on this in CCI	CCI
47	Agree	Golden year: Agreed to having an 18-month period (October 201x to March 201(x+2)) so set of full seasons were included in both hemispheres	CCI
48	Agree	Golden year: To help generate consensus on which 18 months to choose, each ECV project to provide information on which recent years it would have a problem with.	CCI ECVs

4. Output from Climate Science Working Group Session

4.1 Output from the UNCERTAINTY session of the CSWG

Uncertainty – general points

1. The same language should be used to describe uncertainties across all ECVs
 - a. The uncertainty characterisation needed depends on the applications
2. Not all information is statistical
 - a. Radar info for AGB, view angle for LST
3. Good documentation is a pre-requisite to successful outcomes
 - a. Measurement equations and their different components should be made, even if not all parts can be understood. See how the uncertainty arises
 - b. Breakdown of the uncertainties as well as overall value, e.g. LST errors split to cloud and emissivity components
 - c. What ground/site data will be used as validation? So it can be seen if in a dense or sparse sampled region
4. How to work with the uncertainties
 - a. Document how to propagate the information
 - b. Including spatial correlations, e.g. Cloud fraction, land cover...
5. Communicate what we don't know about the uncertainties, e.g. aerosol clear sky vs cloud, LST = canopy or ground?
6. Users and ECV teams must work together to get the right information
7. Uncertainty information must add value to the product
8. Feedback and lessons learnt from Phases 1 and 2
 - a. Remind existing ECVs
 - b. Share with new ECVs

See the CCI uncertainty paper for information from Phases 1 and 2 of the CCI:

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Uncertainty information in climate data records from Earth observation

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4.2 Output from the CONSISTENCY session of the CSWG

The table below shows the dependencies between the new CCI ECV projects and all the CCI ECV projects. These dependencies (whether for data, common retrieval, common mask, etc) need to be met to help achieve consistency between the ECV data products. The projects named on the top row are the data producers and have a dependency from the projects names in the vertical left column.

	New ECVs								
	Water Vapour	Sea Salinity	Sea State	Lakes	Snow	Perma-frost	LST	HRLC	AGB
WV	Black	Green					Green		
S. Sal		Black							
S. Stat		Green	Black	Green					
Lakes				Black	Green	Green	Green	Green	Green
Snow				Green	Black	Green	Green	Green	Green
PF					Green	Black	Green	Green	Green
LST	Green			Green	Green	Green	Black		Green
HRLC				Green	Green	Green	Green	Black	Green
AGB					Green	Green			Black
SST	Green	Green	Green				Green		
OC		Green		Green					
SSH		Green	Green						Green
SI		Green	Green					Green	
O3									
Aero					Green				
Clds	Green	Green			Green	Green		Green	
GHG						Green			
Fire						Green	Green	Green	Green
LC				Green	Green	Green	Green	Green	Green
SM					Green	Green			Green
IS - G							Green		
IS - Ant							Green		
Glac				Green		Green		Green	

Consistency – general points

1. CCI Land Sea mask,
 - As provided by the Land Cover project,
 - Higher resolution version needed by some
 - Other masks needed
2. Standards for Data
 - DEWG have defined the agreed data standards to be used by all ECV projects in CCI
 - Ed Pechorro can provide more info (through the DEWG)
3. Common retrievals of satellite data
 - Possibility of sharing downloads and processing
4. CCI Data delivery times – plans have been shared and projects are aware, in case they have dependencies – summary in CMUG report
5. Most of the new CCI+ ECV projects have a requirement for reanalysis data to support the development of their CCI data – and this will be ERA5
6. Projects have a clear understanding of what ERA5 data they need
7. Seek agreement with ESA about a which version/time-step/resolution for CCI use. ESA should endorse or approve this
8. Noted that existing CCI projects used ERA-interim (which will be discontinued soon)
9. CMUG researchers at ECMWF can help with ERA questions (if the ERA help desk cannot).

CMUG partner and researchers for CCI ECV projects

The CMUG institutional leads for the new CCI ECVs.

ECV	METO	MPI-M	ECMWF	MF	IPSL	BSC	Name
Water Vapour			X				A. Benedetti
Sea Salinity		X					D. Notz
Sea State	X						D. Ford
Lakes	X						R. Jones
Snow					X		F. Cheruy
Permafrost				X			J-C Calvet
LST		X					D. Notz
HRLC						X	L-P Caron
AGB	X						D. Hemming

The CMUG institutional leads for the existing CCI ECVs.

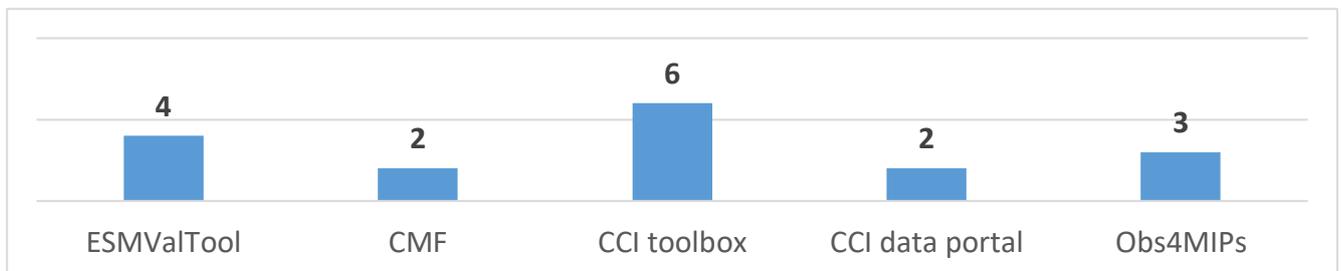
ECV	METO	MPI-M	ECMWF	MF	IPSL	DLR	SMHI	Name
SST	X							D. Ford
OC	X							D. Ford
SSH	X							D. Ford
SI		X						D. Notz
Ozone			X					R. Dragani
Aerosol						X		M. Righi
Clouds							X	U. Willen
GHG			X					R. Dragani
Fire								PVDL
Land Cover					X			F. Cheruy
Soil Moist.								D. Hemming
Ice Sheets	X							PVDL
Glacier	X							PVDL

WP	New ECVs									Existing ECVs													
	Water Vapour	Sea Salinity	Sea State	Lakes	Snow	Perma-frost	LST	HRLC	AGB	SST	OC	SSH	SI	O3	Aero	Clds	GHG	Fire	LC	SM	IS - Green	IS - Ant	Glac
3.1																							
3.2																							
3.3																							
3.4																							
3.5																							
3.6																							
3.7																							
3.8																							
3.9																							
3.10																							
3.11																							
3.12																							
4.1																							
4.2																							
4.3																							
4.4																							
4.5																							
4.6																							
4.7																							
4.8																							
4.9																							
4.10																							
4.11																							
5.3																							
5.5																							
Options																							

Summary of the CCI ECV datasets being used in CMUG climate model experiments for WP3 and WP4 and evaluation in WP5, with differentiation of the type of application: Red = primary interest, Yellow = other. The ECVs covered in the CMUG Options are shown on the bottom row in grey.

4.3 Output from the TOOLS session of the CSWG

The table below shows the number of group members who were aware of each tool (total number in the group was 22.)



ESMValTool

- Useful for comparison of climate model outputs with observations
- New version coming soon, will handle more spatial projections thanks to Iris Python library (+ further capabilities)

CMF

- Useful for looking a time series and slow variability and cross-ECV analysis
- Easy to use

Data portal

- Single point of access to CCI data – it has all the existing CCI ECVs
- Dataset final version (working versions exchanged differently between researchers)
- Sometimes information mismatch between ECV project websites and data portal

CCI toolbox

- Useful for visualising and analysing CCI ECVs, 30 to 40 operations currently available (e.g. regridding, blending)
- Not cloud based right now – must be installed on platform where data are located (which can be an issue)

Obs4MIPs

- Another way to get the CCI data
- Regridded for model comparison (caution: units changed!)
- Retrieval through web interface or your own scripts

Other comments

- All CCI data in a big data cube (e.g. Digital Earth Australia)
- Link to Google Earth Engine Tool?
- earthsystemdatacube.net already has CCI data (some on the cloud, can use Python to carry out analysis directly there)
- Could be useful if researchers shared some of their scripts (e.g. calculating ocean current)

4.4 Output from the COMMUNICATIONS session of the CSWG

Use of social media for CSWG internal communications:

- CMUG proposal to use a social media comms tool, in addition to email and other existing tools (email, wiki, video-conf.).
- Slack was chosen, needs to be approved by ESA (security and data sharing concerns)
- <http://bit.ly/cmug-cci-slack> = for CCI people to join Slack
- Assuming it is approved, we will know within a year whether it is useful
- <http://cmug-cci.slack.com> = website

CSWG engagement and interactions with external groups – see Annex 4:

A full list of all the projects and initiatives that members of the CSWG are working on was compiled and annotated with useful information. It is given in Annex 4.

Next CMUG meeting – Autumn 2019, place TBD.

5. Output from Science Leads Session

5.1 CCI sessions at international conferences

- Living Planet Symposium
- Tuesday will include a session “Observations for supporting the UNFCCC Paris Agreement” which comprises a high-level panel discussion (UNFCCC, GCOS etc) and an open session for talks etc
- Single CCI overview talk in the latter with an overall storyline taking contributions from the science leads - Discuss specifics of the content at the next Colocation Meeting.
- Projects are encouraged to submit to the symposium and their contributions will go into the relevant disciplinary sessions
- Discussion on having a CCI session at a future GCOS Conference, with the aims being to feed back to GCOS and have visibility in the wider community
- Suggestion to compile a “CCI slide pack” as a resource for all to use as appropriate when attending relevant meetings/conferences/workshops.

5.2 Interactions with GCOS / ECV inventory

- Discussion about how to feed in to GCOS requirements/discussions:
 - Through direct input into the panels: TOPC/AOPC/OOPC
 - Proposal to update the ESA response to GCOS with current status of existing ECVs and adding entries for new ECVs
- Currently much interest/activities in GCOS to generate “Climate Indicators” relevant to adaptation and mitigation
 - Suggestion to take note of what IPCC requires to provide policy relevant assessments that could include such indicators and use this as a way of making a contribution
- ECV inventory needs to be updated and that this includes a linked gap analysis

5.3 CCI paper on consistency

- Thomas/Rainer/Michaela leading a paper on consistency across ECVs
- The status of the paper was presented:
 - Drafts of framing sections are evolving
 - To be circulated in the coming weeks for science leads to provide examples as input

5.4 Maximising input into IPCC

- Grey literature is relevant and a good way to make a contribution is to identify relevant chapters and authors and provide them with papers, project reports along with a brief summary of their relevance
- Deadlines for WG-I are December 2019 for paper submission, September 2020 for acceptance but, importantly, the WG-II and WG-III deadlines are later
- Suggestion of two focus areas for possible CCI input into AR6:

- Closing budgets
- Multiple lines of evidence to underpin statements on observed changes
- ESA mentioned that a specific proposal on cross-ECV work relevant to AR6 could be favourably received if attached to an existing contract
- IPCC chapter outlines and author lists will be circulated

5.5 Cross ECV studies including consistency

- There was a lack of clarity on how much cross-ECV consistency work had been undertaken previously with existing ECVs:
 - Some bilaterally between ECV projects rather than by CMUG
 - Feeling that such activities should continue for the new ECVs in addition to the work done by CMUG
- To help generate more cross-ECV work, CMUG to circulate its CCI+ cross-ECV table and previous work on ECVs with physical links from a process perspective

5.6 Golden Year

- Particularly relevant for new ECVs when generating their very first datasets
- Keep 2008 as a reference given the work done on this in CCI
- Agreed to having an 18-month period (October 201x to March 201(x+2)) so set of full seasons were included in both hemispheres
- There was support for 2018 given the hot summer in the northern hemisphere:
 - Would mean starting now to generate data for October 2017-September 2018
 - Extending to March 2019 over the coming months
- To help generate consensus on which 18 months to choose, each ECV project to provide information on which recent years it would have a problem with

Annex 1: Programme

CMUG ref. IM8-programme v5_26-10-2018



CCI - CMUG Integration Meeting
Met Office, Fitzroy Road, Exeter, UK, 29-31 October 2018

Programme

A. Aims of the meeting are to:

1. Look at the User Requirements of the new ECVs with regard to the needs of the Climate Research Community, CMUG and GCOS requirements
 2. Discuss the emerging product specifications for the new ECVs
 3. Allow the new ECV teams to explain how their projects might address the integrated perspective for consistency between ECVs
 4. Discuss how to deal with uncertainties in products (how to capture and describe them for product users)
 5. Develop ECV projects' data needs for ECMWF reanalysis data
 6. Allow CMUG and the existing ECV teams to demonstrate 'best practice' to the new ECV teams
 7. Maintain oversight of the position within the international framework in which CMUG/CCI is operating
- Success in fulfilling these aims will be evidenced by the subsequent direction of the CCI projects.*

B. Inputs of the meeting are:

1. Relevant CMUG reports from previous phase
2. URDs for the new ECV projects, where developed
3. DARDs for the new ECV projects, where developed
4. ESA CCI Project Guidelines [http://cci.esa.int/sites/default/files/ESA_CCI_Project_Guidelines_V1.pdf]
5. GCOS requirements [see: <https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables>]
6. CMUG Uncertainty guidance note

C. Outputs of the meeting will be a meeting report with the following content informed by the meeting:

1. Actions agreed by ECV projects, and by CMUG
2. Strategic position of the CMUG, within CCI, in the international arena
3. Material to inform CMUG Deliverables D1.2, D2.1 and D2.2
4. Input to CMUG D3.1
5. Clarity on requests for ECMWF reanalysis data

CMUG ref. IM8-programme v5_26-10-2018

D. Meeting Programme:**Monday 29 October**

12:00 – 13:00 Registration at Met Office Reception – please bring photo ID.

*Conference Room 1 Plenary session*13:00 – 13:20 Welcome from: *Richard Jones, CMUG Science Lead, Met Office*
*Pascal Lecomte, ESA, ECSAT, Harwell, UK*13:20 – 13:40 Keynote presentation on using observations to understand the Earth climate system
*Martin Horwath, Technische Universität Dresden, Science Lead of the CCI Sea Level Budget Closure project*13:40 – 14:00 Why CMUG is important for the CCI project: *Roger Saunders, Science Fellow, Met Office*

14:00 – 17:00 CMUG Plans for working with ECV data

15:00 – 15:30 refreshment break

Each CMUG WP (or groups of similar WPs) will give a presentation demonstrating how it will address the following questions:

1. What are your experiment plans for working with CCI+ ECV data?
2. How will you interact with the relevant teams?
3. How will you address the integrated perspective for consistency between the ECVs, including identification of gaps?
4. How will you use uncertainties in products?
5. What mechanisms will you use to provide feedback to the ECV teams

Each presentation will be followed by brief plenary Q+A.

17:30 – 19:00 Reception on the balcony

Tuesday 30 October*Conference Room 2*09:00 – 09:20 Keynote presentation on new prospects for measuring forest biomass from space
*Shaun Quegan, Sheffield University*09:20 – 09:40 Keynote presentation on the use of satellite data in climate model evaluation
*Alejandro Bodas-Salcedo, Met Office*09:40 – 09:50 RECCAP2 – Perspective of a CCI data user
Johannes Winckler, IPSL

09:50 – 12:30 CCI+ ECVs present their plans in parallel breakout groups

*Conference Room 2**Terrestrial**Chair: Paul van der Linden*LST, Snow, PF, AGB, Lakes, HRLC,
SM, Fire, LC, Glac*Conference Room 3+4**Ocean and Atmosphere**Chair: Richard Jones*

SSSal, SSState, WV

SST, OC, SSH, SI, O3, Aero, Clds, GHG

10:30 – 11:00 Refreshments

CMUG ref. IM8-programme v5_26-10-2018

Each ECV project to give a 10 minute presentation demonstrating how it will address the following:

1. Feedback from CMUG session (on the Monday)
2. Will your User Requirements be consistent with the needs of the Climate Research Groups (CRGs), CMUG needs, and GCOS requirements, including source traceability?
3. How will your product specifications develop to meet the needs of your individual Climate Research Group, how will the CRGs use the proposed products in their applications?
4. How will you address the integrated perspective for consistency between the ECVs, including identification of gaps?
5. How will you deal with uncertainties in products?
6. What data are you producing, and when?
7. What are your data needs for ECMWF reanalysis data?
8. How will you know if your CRG work is complementary with CMUG research?
9. What meetings do you plan to attend over the next 12 months? Colocation, Living Planet, EGU.....

Each presentation will be followed by 5 minutes plenary Q+A.

12:30 – 13:30 Lunch

13:30 – 17:00

Conference Rooms 2 and 3+4 parallel sessions

<p>C SWG Conference Room 2</p> <p>Chairs: D. Hemming and Emilie Vanvyve Rapporteur: P. van der Linden</p> <ol style="list-style-type: none"> 1. Collaboration between CMUG Tasks 3 and 4 and ECV project CRGs (via CSWG) 2. maximise CCI results in IPCC AR6 (and other reports) 3. Treatment of uncertainty 4. Addressing consistency between ECVs 5. Data visualisation / CMF / ESMVal Tool 6. CCI Data portal / Obs4MIPs 7. Use of <i>Slack</i> and cloud software 	<p>Science Leads Conference Room 3+4</p> <p>Chair: Darren Ghent Rapporteur: R. Jones</p> <ol style="list-style-type: none"> 1. CCI paper on consistency in Earth system monitoring 2. CCI sessions at international conferences <ol style="list-style-type: none"> a. Living Planet b. EGU/AGU c. Future GCOS Conferences 3. Expectations for the next tranche of cross-ECV activities 4. Maximise CCI results in IPCC AR6 (and other reports) 5. Process for updating GCOS requirements
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14:45 – 15:15 refreshment break

19:30 Conference dinner: Cosy Club Restaurant, Dean Clarke House, 1 Southernhay Gardens, Exeter

Wednesday 31 October

Conference Room 2 Plenary session

09:00 – 09:30 CCI+ Knowledge Exchange Vision. *Paul Fisher and Ed Pechorro, ESA*

09:30 – 09:50 CCI+ Knowledge Exchange Tools - CCI Visualisation Corner. *Philip Eales, Planetary Visions*

09:50 – 10:10 CCI+ Knowledge Exchange Tools - CCI ODP. *Ed Pechorro, ESA; Victoria Bennett, CEDA*

10:10 – 10:30 CCI+ Knowledge Exchange Tools - CCI Toolbox. *Ed Pechorro ESA; Carsten Brockmann BC*

10:30 – 10:45 Refreshments

10:45 – 11:15 Feedback from CSWG and discussion of key points

11:15 – 11:45 Feedback from Science Leads and discussion of key points

11:45 – 12:00 Final words from Richard and Simon

Annex 2: Presentations

Are available online at: http://ensembles-eu.metoffice.com/cmug/files/CMUG_Integration_Meeting.zip

Annex 3: Attendees

1. CMUG:

Richard Jones, Paul van der Linden, Emilie Vanvyve, Rob King, Debbie Hemming, David Ford (Met Office)
 Clement Albergel, Jean-Christophe Calvet (MétéoFrance / CNRS)
 Angela Benedetti, Rossanan Dragani (ECMWF)
 Axel Lauer (DLR)
 Frederique Cheruy (IPSL)
 Dirk Notz (MPI-M) (via webex)
 Enza Di Tomaso, Pablo Ortega (BSC)
 Ulrika Willen (SMHI)

2. ESA:

Pascal Lecomte, Simon Pinnock, Paul Fisher, Ed Pechorro, Stephen Plummer, Paolo Cipollini,
 Anna Maria Trofaier

3. New CCI projects:

<i>ECV</i>	<i>Science Lead</i>	<i>CRG</i>
AGB	Sean Quegan	Richard Lucas
HRLC	Francesca Bovolo, Lorenzo Bruzzone	Catherine Otle
Lakes	Stefan Simis	Claudia Giardino
LST	Darren Ghent	Lizzie Good
Permafrost	Anett Bartsch	Heidrun Matthes, Tazio Strozzi, S. Westerman
Sea Salinity	Detlef Stammer (via webex)	Rafael Catany
Sea State	Fabrice Ardhuin	Jean Bidlot
Snow	Thomas Nagler	Richard Essery
Water Vapour	Michaela Hegglin	Marc Schröder, Alexandra Laeng

Existing CCI projects:

<i>ECV</i>	<i>Science Lead</i>	<i>CRG</i>
Fire	Lucrecia Pettinari	
Landcover		Andy Hartley
SM	Wouter Dorigo	
Glaciers	Thomas Nagler (for Frank Paul)	
IS – Greenland		
IS – Antarctica		
SI		
SL		
SST		Nick Rayner
Ocean colour	Shubha Sathyendranath	Thomas Jackson, Jozef Skakala
Aerosol	Thomas Popp	
Ozone		Michiel van Weele
Clouds	Rainer Hollmann	
GHG		Robert Parker
SL Budget	Martin Horwath	
RECCAP2	Johannes Winckler	Mike O'Sullivan

CCI Data projects Victoria Bennett, Carsten Brockmann, Philip Eales, Alison Waterfall

CCI Fellowships Mathias Forkel (Soil Moisture)

4. Experts (Presentations and discussion):

Roger Saunders (Met Office)
 Robert Parker (UKESM and GHG)
 Alejandro Bodas-Salcedo (Met Office)

Annex 4: CSWG Interactions with external projects/initiatives

Project, programme, etc.	Description	Further detail from CMUG proposal and integration meeting Oct 2018
ACTRIS	Aerosols, Clouds, and Trace gases Research InfraStructure Network	<ul style="list-style-type: none"> • CMUG will continue contact with this group • IPSL involved (ACTRIS-France at least) • SMHI will run a cloud radar in Sweden to be part of ACTRIS [Ulrika Willén] • ECMWF/CMUG is partner in ACTRIS
APPLICATE	Advanced Prediction in Polar regions and beyond	<ul style="list-style-type: none"> • BSC participates with several experiments looking at the impact of sea ice initialization (using ESA Data) on the predictive skill over the Arctic and the mid latitudes
CCMI	Chemistry-Climate Model Initiative	<ul style="list-style-type: none"> • DLR is contributing model output and is represented in the SOC • Météo-France contributes to model results in this project • DLR: new CCMI model experiments might be coming in the future, possibly coordinated with CMIP activities (AerChem-MIP) [Axel Lauer]
CEOS	Committee of Earth Observation Satellites	<ul style="list-style-type: none"> • CMUG will continue liaison established • Think LST CCI science lead is on this group
CFMIP	Cloud Feedback Model Intercomparison Project	<ul style="list-style-type: none"> • CMUG will continue link established • IPSL has involvement in this project • SMHI has involvement in this project • Met Office has involvement in this project [PvdL]
CIRCLE-2	Climate Impact Research response Coordination for a Large Europe	<ul style="list-style-type: none"> • CMUG will initiate contact with this group
CLIVAR	Variability and predictability of the ocean-atmosphere system	<ul style="list-style-type: none"> • ECMWF participates to this project • Météo-France participates to the MedCLIVAR SSG • UHAM (Detlef Stammer): CCI+SSS
CMIP	Coupled Model Intercomparison Project	<ul style="list-style-type: none"> • DLR CMUG member is Chair of the CMIP Panel • Met Office has contributed model results to this project • MPI-M has contributed model results to this project • IPSL has contributed model results to this project • SMHI has contributed model results to this project • BSC has contributed model results to this project • Météo-France has contributed model results to this

		<p>project</p> <ul style="list-style-type: none"> • LS3MIP and SnowMIP: IPSL involved • KNMI contributes model results (EC Earth) [Michiel van Weele Ozone CCI CRG]
CORDEX	Coordinated Regional climate Downscaling Experiment	<ul style="list-style-type: none"> • SMHI coordinates the regional modelling activities • Partners include IPSL • Météo-France contributes to model results in this projects and coordinates Med-CORDEX • AWI (Heidrun Matthes): in CCI+ Permafrost, we contribute to Polar CORDEX • KNMI is partner [Michiel van Weele Ozone CCI CRG]
COWCLIP	Coordinated Ocean Wave Climate Project	<ul style="list-style-type: none"> • Ocean waves climate simulation: ECMWF to provide ERA5 and ERA5 forced wave model data and will interact on the use of CCI sea state data
CRECP	Copernicus Roadmap for European Climate Projections	<ul style="list-style-type: none"> • Met Office leads this project • IPSL is a partner
CRESCENDO	H2020 project for improving climate model processes	<ul style="list-style-type: none"> • Met Office is a partner • SMHI is a partner • IPSL is a partner • MPI-M is a partner • KNMI is partner [Michiel van Weele] • DLR is also contributing to CRESCENDO (ESMValTool) [Axel Lauer]
Climate-ADAPT	Climate information and data portal for the EEA and EC	<ul style="list-style-type: none"> • Met Office works on the EEA ETC which has a WP supporting ClimateADAPT
Cryoland	Copernicus Service Snow and Land Ice	<ul style="list-style-type: none"> • CMUG will continue contact with this group
DAMOCLES	EU Cost Action on compound extreme events	<ul style="list-style-type: none"> • Coordinated by Jakob Zscheischler → Matthias Forkel
EC-EARTH	European climate model development project	<ul style="list-style-type: none"> • CMUG will continue links established • SMHI is a partner in this project • BSC is a partner in this project • KNMI is partner in EC-EARTH and ozone CCI/CRG [Michiel van Weele]

ECA&D	European Climate Assessment & Dataset project	<ul style="list-style-type: none"> • Météo-France provides datasets for this project • KNMI is (lead) partner [Michiel van Weele] • Good links between Met Office CMA group (LST CCI links) and ECA&D
ECOMS	European Climate Observations, Modelling & Services	<ul style="list-style-type: none"> • CMUG will continue contact with this group
ESGF	Earth System Grid Federation	<ul style="list-style-type: none"> • CMUG will continue links established • CEDA is publishing CCI datasets to ESGF as part of the CCI Open Data Portal [Alison Waterfall, CEDA STFC, CCI Open Data Portal]
EUCP	European Climate Projections for Climate Services	<ul style="list-style-type: none"> • Met Office is lead partner in this project • BSC is actively involved in several work packages
EUMETSAT CMSAF	European Meteorological Satellite climate monitoring satellite application facility	<ul style="list-style-type: none"> • Met Office is a partner of the CMSAF • KNMI is partner in CMSAF (and ACSAF) [Michiel van Weele] • CMSAF LST producer member of LST CCI CRG • DWD is hosting CMSAF [Anonymous 6] • SMHI is a partner of CMSAF [Ulrika Willén]
EUPHEME	European project for evaluating methodologies for C3S, funded by ERA4CS	<ul style="list-style-type: none"> • Met Office is the lead partner in this project
EUSTACE	European project for surface temperature	<ul style="list-style-type: none"> • Met Office is the lead partner in this project • CEDA is a partner: will archive and distribute the final products [Alison Waterfall, CEDA STFC, CCI Open Data Portal] • Vol? (leading LS CCI) produced LST datasets for EUSTACE
Ex-Arch	G8 initiative for Exa scale data archives	<ul style="list-style-type: none"> • DLR collaborates with GFDL for the ESMValTool development • IPSL has involvement in this project
FIDUCEO	EC project for quality in FCDRs	<ul style="list-style-type: none"> • Met Office is a partner • CEDA is a partner: will be archiving the final products [Alison Waterfall, CEDA STFC, CCI Open Data Portal]
FireMIP	Fire Model Intercomparison Project	<ul style="list-style-type: none"> • Collaboration between Fire CCI, FireMIP and Matthias Forkel (former Living Planet Fellow)

GCOS	Global Climate Observing System	<ul style="list-style-type: none"> • CMUG will work with this group
GEO AquaWatch	To improve the coordination, delivery and utilization of water quality information for the benefit of society.	<ul style="list-style-type: none"> • Lakes ECVs partners are member of the group
GEOSS	Group on Earth Observations	<ul style="list-style-type: none"> • CMUG will initiate contact with this group • Data on the CCI Open Data Portal are also made available to the GEOSS Portal [Alison Waterfall, CEDA STFC, CCI Open Data Portal]
GEWEX	Global Energy & Water Exchanges Project	<ul style="list-style-type: none"> • Interactions with the GEWEX project team at various meetings • SMHI will has contributed to GVAP [Ulrika Willén] • DWD is co-chairing G-VAP and regularly participates in GDAP meetings. IPWG/GDAP started a precipitation assessment with DWD contributing.
GPCP	Global Precipitation Climatology Project	<ul style="list-style-type: none"> • CMUG will initiate contact with this group • This should be the International Precipitation Working Group (IPWG)
Global Mangrove Watch	Japan Aerospace Exploration Agency (JAXA) Led by Aberystwyth University and SoloEO; links with Mangrove Capital Africa (Wetlands International).	<ul style="list-style-type: none"> • Global mangrove and change maps integrated into CCI Biomass with relevance to CCI Sea Level
ICAP	International Cooperation for Aerosol Prediction	<ul style="list-style-type: none"> • ECMWF/CMUG is co-chair
IPCC	Intergovernmental Panel on Climate Change	<ul style="list-style-type: none"> • Met Office is involved in this initiative • DLR is involved in this initiative • MPI-M is involved in this initiative • SMHI is involved in this initiative • BSC is involved in this initiative • IPSL is involved in this initiative • NOC: CCI+SSS contribute in AR5 and he might be contribution to AR6 • Met Office: I expect SST CCI will notify relevant authors of Version 2 overview paper [Nick Rayner] • KNMI is involved [Michiel van Weele]

IS-ENES3	Infrastructure for the European Network of Earth System Modelling	<ul style="list-style-type: none"> • CMUG will continue link established • Met Office is a partner • IPSL is a partner • Météo-France is a partner • DLR is a partner • SMHI is a partner • Project will be funded [Axel Lauer]
ISIMIP	Intersectoral Model Intercomparison Project	<ul style="list-style-type: none"> • → PIK Potsdam
JPI Climate	Joint Programming Initiative on Climate	<ul style="list-style-type: none"> • CMUG will continue link established
JRA	Japanese Reanalysis Project	<ul style="list-style-type: none"> • ECMWF and JRA have long working relationships that include a visiting scientist programme
KIC	Knowledge Innovation Communities	<ul style="list-style-type: none"> • IPSL is a partner in this project • Météo-France is partner in the KIC-Climate
LPJmL	Land surface model (PIK)	<ul style="list-style-type: none"> • Collaboration between TU Wien (soil moisture CCI) and PIK Potsdam → Matthias Forkel
Living Wales	Development of globally applicable land cover mapping and evidence-based change monitoring through integration of environmental variables.	<ul style="list-style-type: none"> • Aberystwyth University leading and CCI products (including Biomass) can be integrated • Designed for application across sites globally and partner projects with several countries (e.g. Australia)
MIKLIP	German model system for decadal forecasts on climate and weather, including extreme events	<ul style="list-style-type: none"> • MPI-M is leading the MIKLIP coordinating the MIKLIP consortium • MPI-M CMUG scientist are also directly involved in MIKLIP • DLR/CMUG scientist are also directly involved in MIKLIP • DWD is involved as well
Obs4MIPs	Observations for Model Intercomparison Project	<ul style="list-style-type: none"> • DLR is part of the WCRP Data Advisory Council's (WDAC) Observations for Model Evaluation Task • Met Office: SST CCI will submit data to Obs4MIPs [Nick Rayner] • CEDA has published data to Obs4MIPs for the CCI Open Data Portal [Alison Waterfall, CEDA STFC, CCI Open Data Portal]

PRIMAVERA	H2020 project for high resolution global modelling	<ul style="list-style-type: none"> • Met Office is a partner • SMHI is a partner • IPSL is a partner • BSC is a partner • MPI-M is a partner • Met Office: SST CCI data is being used to drive high-resolution AGCM simulations [Nick Rayner] • ECMWF is also a partner • KNMI is partner [Michiel van Weele]
PROVIA	UNEP initiative for Programme Research on Climate Change Vulnerability, Impact and Adaptation	<ul style="list-style-type: none"> • CMUG will maintain contact with this group
PROVIA	UNEP Programme on Research on Climate Change Vulnerability, Impacts and Adaptation	<ul style="list-style-type: none"> • CMUG will maintain contact with this group • ECMWF is also a partner
RCMES	Regional Climate Model Evaluation System	<ul style="list-style-type: none"> • CMUG will maintain contact with this group
RECCAP-2	Regional Carbon Cycle Assessment and Processes - 2	<ul style="list-style-type: none"> • ESA backed project focusing on regional land carbon budgets • Multiple groups, University of Exeter, LSCE (Paris) + MPI-Jena • Contact: U. Exeter (Mike O'Sullivan, m.osullivan@exeter.ac.uk), LSCE (Johannes Winckler, johannes.winckler@lsce.ipsl.fr), project lead (Ana Bastos, ana.bastos@lmu.de) • Links to CCI: Benchmarking land surface models with CCI data (soil moisture, burnt area, land cover) -- Lead: U. Exeter
REDDAF	Reducing Emissions from Deforestation and Degradation in Africa	<ul style="list-style-type: none"> • CMUG will maintain contact with this group
S-RIP	SPARC Reanalysis Intercomparison Project (SPARC: Stratosphere-troposphere Processes And their Role in Climate)	<ul style="list-style-type: none"> • ECMWF/CMUG is involved
SEIS	Shared Environmental Information System	<ul style="list-style-type: none"> • CMUG will maintain contact with this group

SOOS	Southern Ocean Observing System	€ CMUG will continue link established
SPARC TUMER	Towards Unified Error Reporting (SPARC: Stratosphere-troposphere Processes And their Role in Climate)	€ DLR
SPARC WAVAS	Water Vapour Assessment (SPARC: Stratosphere-troposphere Processes And their Role in Climate)	€ DLR
TRENDY	Trends in net land carbon exchange over the period 1980-2010	<ul style="list-style-type: none"> • University of Exeter (with MetO collaboration)
WCRP	World Climate Research Programme	€ CMUG will continue link established
WGCM	Working Group on Coupled Modelling	<ul style="list-style-type: none"> • DLR CMUG member is on WGCM • IPSL is a partner in this project
WMO	GAW / SDS-WAS etc.	<ul style="list-style-type: none"> • ECMWF/CMUG is involved