



**CMUG Deliverable**

**Number:** D6.1  
**Due date:** 30 June 2021  
**Submission date:**  
**Version:** 2.0

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# Climate Modelling User Group

## Deliverable 6.1 v2

### Scientific Exploitation Report

Centres providing input: MOHC

Version	Date	Comment



Max-Planck-Institut  
für Meteorologie





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---

Contents

<b>Executive Summary .....</b>	<b>3</b>
<b>1. Introduction .....</b>	<b>4</b>
<b>2. Engagement and Exploitation .....</b>	<b>5</b>
<b>2.1 Key engagement and exploitation activities.....</b>	<b>5</b>
<b>2.2 CMUG website.....</b>	<b>6</b>
<b>2.3 CMUG Data Forum.....</b>	<b>8</b>
<b>2.4 Meetings .....</b>	<b>9</b>
<b>2.6 Other reports .....</b>	<b>11</b>
<b>Annex A.....</b>	<b>13</b>
<b>A1 Meetings and workshops attended by CMUG .....</b>	<b>14</b>
<b>A2 CSWG Newsletters.....</b>	<b>15</b>
<b>A3 CMUG peer-reviewed publications October 2020 – June 2021.....</b>	<b>17</b>
<b>A4 All CMUG peer-reviewed publications up to June 2021 .....</b>	<b>18</b>



**CMUG Deliverable**

**Number:** D6.1  
**Due date:** 30 June 2021  
**Submission date:**  
**Version:** 2.0

---

## CMUG D6.1 Scientific Exploitation Report

### Executive Summary

The Climate Modelling User Group (CMUG) project has been running since 2012. Phase 3 began in October 2018, coincident with the start of Phase 1 of CCI+ . The Scientific Exploitation Report (SER) describes the scientific engagement and outreach activities of CMUG. This version (v2) of the SER covers the period October 2020 – June 2021. Highlights include:

- Development of the CMUG website. The old CCI CMUG website has been transferred to a [new location](#) on an [ESA web server](#). See section 2.2 for more details.
- Reformat of the CMUG Data Forum from a [separate page](#) on the old webpages to being incorporated into the new website as a whole. See section 2.3 for more details.
- Participation in meetings and workshops. Meetings include CMUG Progress Meetings in Oct 2020 and Mar 2021, Climate Science Working Group meetings in Oct 2020, Jan 2021 and May 2021. Workshops include ECV workshops and external collaboration such as with Plymouth Marine Laboratory in May 2021. See sections 2.4, 2.5 and Annex A1 for more details.
- There is a total of 30 CMUG peer-reviewed publications from all three phases. Some have an impressive number and increase of citations, with many reaching over 50 and in particular mention Hollman *et al.* (2013), reaching 303 as of June 2021, an increase of 48 since October 2020. See Annexes A3 and A4.



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**Version:** 2.0

---

## 1. Introduction

The Climate Modelling User Group (CMUG) project has been running since 2012 and Phase 3 of CMUG has been running since October 2018 when Phase 1 of CCI+ began. CMUG includes outreach and engagement activities for an audience including the climate research community (including reanalysis, climate impact studies and climate modelling), international coordinating bodies, scientific press, the general public and others with a general interest in the Earth climate system.

This report documents the scientific engagement, and exploitation activities and their outcomes/successes for Phase 3 of the CMUG project from October 2020 to June 2021. It is important to note the impact COVID-19 has had on the timeframe of some CMUG activities during this period. There have also been significant changes to CMUG staff, including a recent change to the project manager and team science member changes before and during this time. As a result, less progress has been made than would otherwise be expected.

During October 2020 to June 2021, CMUG has been delivering the following engagement and exploitation activities:

1. Presentations on experiments involving ESA CCI datasets at forums such as the Climate Science Working Group (CSWG) and CCI project Progress Meetings.
2. Continued development of the CMUG website to make the community aware of the CCI datasets, content, quality and availability.
3. High level awareness of CMUG activities at CMUG partner institutes.
4. Working level interactions with key scientists in climate modelling and reanalysis centres through the scientists in CMUG institutes and CCI/CMUG meetings.
5. Work towards including selected ECV datasets on the Obs4MIPs database.
6. Link with relevant EU projects which require CCI data as input. The CMUG has a wide involvement with such projects (e.g. H2020 project APPLICATE, INTAROS and CONFESS; see section 2.1)
7. Give inputs to the relevant WCRP as appropriate.
8. Coordinate outreach with CCI projects to ensure consistent message is given.
9. Advertise early use of CCI datasets in CMUG partner institutes.
10. By working with the CCI projects ensure that the CDRs (and associated observation operators) are easy to access and ingest in commonly used formats.



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**Submission date:**  
**Version:** 2.0

---

## 2. Engagement and Exploitation

### 2.1 Key engagement and exploitation activities

CMUG has continued its outreach and engagement activities to the climate modelling community (CMC), climate research community (CRC) and others (international bodies, scientific press, and the general public).

Various engagement and outreach activities are being carried out to publicise the CCI datasets to encourage their use and exploitation. Such external data exploitation to date includes the use of CCI data for climate model initialisation, prescribing boundary conditions, assimilation, reanalysis, climate monitoring, and in-situ quality control. An example of research uptake of CMUG promoted CCI data is the H2020 [APPLICATE](#) project (Advanced Prediction in Polar regions and beyond: modelling, observing system design and Linkages associated with a Changing Arctic climaTE) which uses the Sea Ice ECV dataset. [INTAROS](#) (Integrated Arctic Observation System) is another example where data from Sea Ice CCI has been used. Furthermore, data from Fire CCI will be used in H2020 [CONFESS](#) project (CONSistent representation of temporal variations of boundary Forcings in reanalysES and Seasonal forecasts) which aims to improve the reliability and usability of information provided by the [Copernicus Climate Change](#) service.

The main means of communication to audiences outside the CCI is the CMUG project website (see Section 2.2 for full details), which provides a wide range of information from News and Case Studies to Deliverables and Publications (<https://climate.esa.int/en/projects/cmug/>).

CMUG attendance at national and international climate research events (conferences, unions, symposia, etc.) is another key channel through which information about the CCI reaches the scientific community and a wider set of stakeholders (scientific press, policymakers and 'interested' public). This work is supported by a range of media such as oral presentations, poster sessions, flyers, news bulletins, etc. A summary of meetings recently attended is given in Annex A1.

CMUG research results are also disseminated via peer-reviewed journals (see Annexes A3 and A4), and articles in programme bulletins. This is a specialist route to the climate science community and the scientific press.

Formal communication on CMUG outreach and engagement activities has been recorded in monthly and quarterly management reports and presented at CMUG management meetings and CMUG quarterly and annual progress meetings with ESA.



## CMUG Deliverable

Number: D6.1  
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Submission date:  
Version: 2.0

---

## 2.2 CMUG website

The [new CMUG website](#), hosted on [ESA's web server](#), is now fully functional and updated. Since the transfer from the old website, regular website management has resumed. A website training session was held on 9 November 2020 which taught CMUG members how to use the website editor tool, [Wagtail](#), to directly manage their team's respective webpage. The new CMUG website (Figures 1-3) consists of:

- A Home page with a brief introduction about the project and highlights of recent news and events
- An 'About' tab with detailed information on the project, its structure, objectives, aims and main activities
- A 'News' tab with news items relevant to CMUG
- A 'Case Studies & Data' tab with links to Obs4MIPs, Obs4MIPs training material, information on ECV datasets and how they are used in climate modelling applications and reanalysis, a showcase of recent CMUG case studies, and, at the bottom, a list of partners with links to respective partner websites
- A 'Deliverables & Documents' tab which lists all CMUG deliverables and documents Phases 1-3
- A 'Team' tab showcasing partner members and individual biographies
- A 'Publications & Presentations' tab which lists and links to all publications (e.g., newsletters, posters, scientific papers) and presentations (e.g., presentations from each CMUG Integration meeting since March 2011)
- A 'Related Links' tab with links to GCOS, WCRP and C3S webpages
- A 'Contacts & FAQ' tab with information on how to contact CMUG for further information or with any questions, as well as a comprehensive FAQ section



**CMUG Deliverable**

**Number:** D6.1  
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**Submission date:**  
**Version:** 2.0

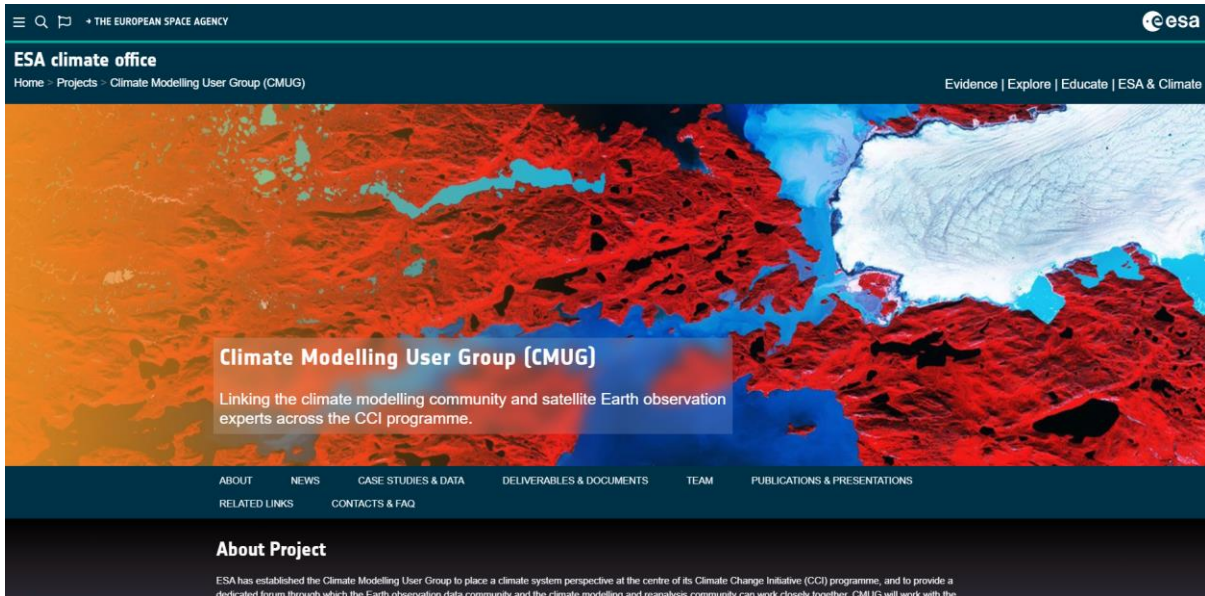


Figure 1: CCI CMUG new website screenshot (June 2021).



[Twitter](#)
[Facebook](#)
[More](#)

**Key documents**

[Phase 3 Deliverables](#)
[Phase 3 Documents](#)

Document name	Version	Issue date	Download
D1.1 User Requirement Document   Meeting the needs of the Climate Community - Requirements	2.2	Jan 12, 2021	<a href="#">Download</a>
D2.3 Suitability of CCI ECVs for Climate Science and Services	1.4	Jan 11, 2021	<a href="#">Download</a>
D3.1 Quality Assessment Report	1.3	Aug 1, 2020	<a href="#">Download</a>
D4.1 Exploiting CCI products in MIP experiments	1.3	April 30, 2021	<a href="#">Download</a>
D6.1 Scientific Exploitation Report v1	1.0	Nov 1, 2020	<a href="#">Download</a>
D6.2 Promotion Package Report v1	1.0	Nov 1, 2020	<a href="#">Download</a>
D7.1 Climate Services Interface	1.1	April 30, 2021	<a href="#">Download</a>
D8.0 Project Management Plan	1.3	Nov 2, 2020	<a href="#">Download</a>

[Phase 2 Deliverables](#)
[Phase 2 Documents](#)

Figure 2: CCI CMUG new website's tab 'Deliverables & Documents' screenshot (June 2021).



## CMUG Deliverable

Number: D6.1  
Due date: 30 June 2021  
Submission date:  
Version: 2.0



### CMUG Publications & Presentations

The links below provide access to a collection of publications, presentations, posters and more published by the project, as well as by third party scientific organisations.

#### CMUG Integration & CCI Colocation Meetings

- [CCI Colocation Meeting October 2011](#)
- [CMUG Integration Meeting #9 November 2019](#)
- [CMUG Integration Meeting #8 October 2018](#)
- [CMUG Integration Meeting #7 February 2017](#)
- [CMUG Integration Meeting #6 March 2016](#)
- [CMUG Integration Meeting #5 May 2015](#)
- [CMUG Integration Meeting #4 June 2014](#)

Figure 3: CCI CMUG new website's tab 'Publications & Presentations' screenshot (June 2021).

## 2.3 CMUG Data Forum

The CMUG Data Forum, originally a separate webpage on the old website, has now been fully implemented into the new website. The information once showcased on the old CMUG Data Forum was found to be a repeat or obsolete regarding the new website content. For example:

- The CMUG Data Forum had a Home page, highlighting recent CMUG case studies – this now sits within the 'Case Studies & Data' tab on the new website (Figure 5).
- The CMUG Data Forum had a 'Why, what, who' section, which is now covered in the 'About' tab on the new website (Figure 6).
- The CMUG Data Forum had a 'CCI data portal' link, which is now linked to by the main ESA website menu and is therefore unnecessary on the new website (Figure 7).
- The CMUG Data Forum had a 'Get in touch' section as well as an FAQ page, which are both now covered in the 'Contacts & FAQ' tab on the new website (Figure 8).

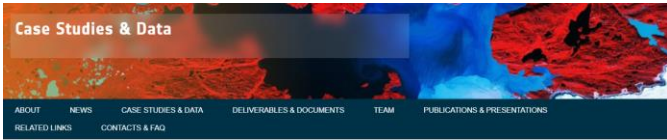
There CMUG Data Forum as a separate webpage, therefore, does not exist anymore. The relevant content can be found within the new website itself with ease.





**CMUG Deliverable**

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**Version:** 2.0



**Data provision and application:**

- [Obs4MIPs](#)
- [Obs4MIPs training material \(CMUG deliverable 5.7a\)](#)
- [ECV datasets used in climate modelling applications and reanalysis](#)

**Recent CMUG Case Studies:**

**Use of ocean CCI data in Met Office model**



Figure 5: CCI CMUG new website’s tab ‘Case Studies & Data’ screenshot (June 2021).



ESA has established the Climate Modelling User Group (CMUG) to place a climate system perspective at the centre of its Climate Change Initiative (CCI) programme, and to provide a dedicated forum through which the Earth observation data community and the climate modelling and reanalysis community can work closely together. CMUG will work with the Essential Climate Variable CCI projects to achieve this goal.

CMUG is a consortium comprising the Met Office Hadley Centre, DLR, ECMWF, IPSL, the Max Planck Institute for Meteorology, Météo-France, SMHI and BSC. See CMUG’s ‘partner’ page [here](#).

**Why CMUG?**

Our climate system is continuously changing, so we need to measure its changes globally and regionally, and to model the system to understand the causes of the changes. Given its global and temporal coverage and spatial resolution, satellite data – which now spans up to 30 years – can be used for both climate monitoring and model initialisation and evaluation.

We need to confront models with observations with the following aims:

- to interpret the observations and explain the causes of observed variability and change;
- to interpret the observations and explain the causes of observed variability and predictions of future change;
- to initialise models for seasonal and inter-annual timescale reforecastability.

Figure 6: CCI CMUG new website’s tab ‘About’ screenshot (June 2021).

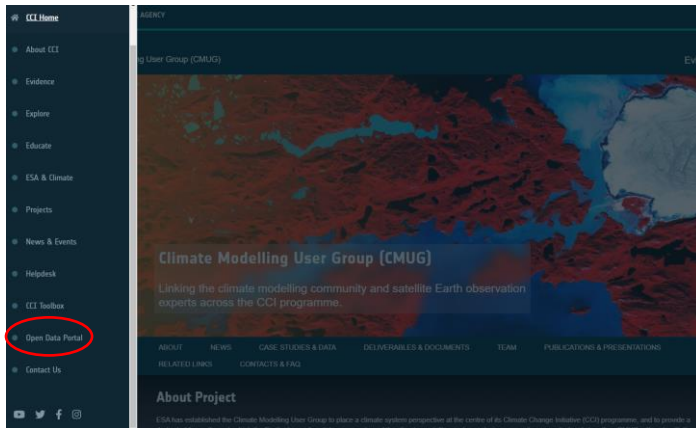
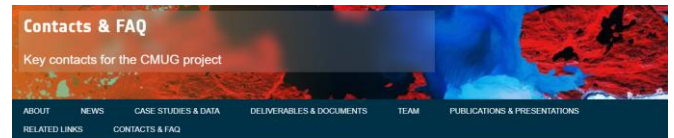


Figure 7: CCI new website main menu link to ‘Open Data Portal’ screenshot (June 2021).



**Contact Info**

Contact the CMUG project office by [email](#) if you require further information. An email group for distributing news, information and material to the ECV projects is maintained. Please [contact the CMUG project office](#) if you want to subscribe to the group.

**FAQ**

**Can I feed back my experience using CCI data?**

Yes please! We welcome contributors from modellers, scientists, and anybody else.

To send us your ideas or suggestions, to feed back your experience or for other enquiries, please use the contact information at the top of this page.

Figure 8: CCI new website main menu link to ‘Contacts & FAQ’ screenshot (June 2021).

**2.4 Meetings**

Between October 2020 and June 2021, CMUG has organised and participated in a number of significant meetings, which are also listed in chronological order in Annex A1.

There have been no CMUG Integration meetings or CCI Colocation Meetings to report as none have occurred during this time period. The 10<sup>th</sup> Integration meeting was originally planned for March 2021, to be in conjunction with the Colocation meeting. However, both meetings were postponed due to COVID-19 pandemic complications. Both meetings are now planned for 4 – 8 October 2021 as an online meeting.



## CMUG Deliverable

**Number:** D6.1  
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**Submission date:**  
**Version:** 2.0

---

There have been two CMUG Progress Meetings in this time period; 27 October 2020 and 25 March 2021. The next CMUG Progress Meeting is planned for 5 July 2021. These meetings include CMUG members with project partners and ESA. ESA CCI Technical Officers have now also been invited to CMUG Progress Meetings. Each Work Package lead provides updates via a presentation with time for questions and a short discussion. The discussions provide a valuable space for cross-partner collaboration and identify needs which partner experts can contribute to. For example, the March 2021 progress meeting identified a Land Surface Temperature (LST) CCI contact for Meteo France, and it was recommended to BSC to get in contact with the LST team to discuss matters of their work. The meetings also produce 'Action' outputs, which are tasks assigned to relevant people or partners. These are especially relevant for inspiring external collaboration e.g., one action at the October 2020 progress meeting was for Lakes CCI to contact [Plymouth Marine Laboratory](#) (PML) for a discussion around the Lakes CCI work.

There have been three Climate Science Working Group (CSWG) meetings in this time period; October 2020, January 2021, and May 2021. The next CSWG meeting is planned for December 2021 / January 2022, to not be so close to the Integration and Colocation meetings planned for October 2021. The CSWG mainly works to examine the climate quality and consistency of CCI ECV CDRs, redefining scientific requirements of climate data users, provide feedback between ECV projects on common issues, and coordinate outreach plans to the climate research community. Each CSWG meeting focuses on a subset of ECVs.

- The 8<sup>th</sup> CSWG meeting was held on 23 October 2020 and focused on Sea Ice, Sea Surface Temperature (SST), and Salinity ECVs.
- The 9<sup>th</sup> CSWG meeting was held on 18 January 2021 CSWG and focused on Fire, Land Cover (LC), High Resolution Land Cover (HRLC), and Biomass ECVs.
- The 10<sup>th</sup> CSWG meeting was held on 7 May 2021 CSWG and focused on Lakes, Snow, and Permafrost ECVs.

The Data Engineering Working Group (DEWG) comprises one representative from each CCI project, a representative from ESA who is Chair of the working group, plus two members from ESA involved in ESA Climate Office Knowledge Exchange activities. Additional people are invited to attend meetings at the Chair's request. The objective of the DEWG is to ensure maximum usability of the datasets produced within CCI, and cultivate tools for their access, discovery and manipulation, through common CCI data standards. There have not been any DEWG meetings during this period, but discussions have taken place with the DEWG Lead and it is hoped CMUG will be more involved soon.

CMUG has continued monthly internal management meetings and monthly meetings between CMUG and ESA. These meetings discuss any outstanding points, such as due deliverables or upcoming events. Alongside these, CMUG members organise ad-hoc meetings where needed, such as to discuss an ongoing deliverable or upcoming events (e.g., Integration and CSWG meetings).



## CMUG Deliverable

Number: D6.1  
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Version: 2.0

---

## 2.5 Workshops

Between October 2020 and June 2021, CMUG has participated in some workshops, which are also listed in chronological order in Annex A1.

CMUG attended a Biomass Change Workshop on 20 October 2020, hosted by Aberystwyth University as an online only event. This was a virtual technical workshop on forest biomass change mapping. This technical workshop provided the opportunity for scientists, across the globe, charged with generating biomass change maps to formulate the principles that underlie forest biomass change estimation, the problems in doing so and develop meaningful estimates of the accuracy of such change measures. There was also a 'Discuss' forum available throughout the workshop for further discussion. CMUG attended sessions and provided comments regarding model evaluation at this workshop. An events page for this workshop is available [here](#).

There was an Ozone CCI workshop held 16 – 17 March 2021, where ECMWF chaired the modelling session with [KNMI](#). The 2<sup>nd</sup> Snow CCI User Workshop was held as a virtual meeting on 25 May 2021. The workshop's objectives included to engage the snow-climate research community to facilitate collaboration and networking and to intensify the collaboration between different CCI projects, initiate discussion on homogenisation of products across ECVs, and identify snow data requirements as a contribution to potential cross-ECV analyses. Further information on this workshop is available [here](#).

There was also a Water Vapour CCI User Workshop held 14 – 16 June 2021. The aim of this workshop was to bring together the broader water vapour community, including those interested in the generation of water vapour CDRs and data users (such as climate modellers and NWP researchers) in order to discuss the most recent scientific applications and challenges in processing and using water vapour CDRs. Further information on this workshop is available [here](#).

Furthermore, the Met Office gave a seminar at [PML](#) on 13 May 2021, covering work on marine biogeochemical data assimilation, which included CMUG work.

## 2.6 Other reports

CMUG has continued to produce monthly and quarterly reports to ESA. These reports summarise the previous month or quarter's progress within CMUG, including management, Work Package progress, contract / finances, deliverables status, meetings, ongoing actions, and an up-to-date journal paper publications list. The monthly reports are more in-depth summaries whereas the quarterly reports are more concise and condensed versions of the previous few months' worth of reports.



**CMUG Deliverable**

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**Submission date:**  
**Version:** 2.0

---

Each CSWG meeting has been accompanied by a newsletter, produced and circulated to the CSWG a couple of weeks ahead of each meeting. The purpose of the newsletter is to advertise the upcoming CSWG meeting, with details and agenda outlined, as well as to highlight any relevant CMUG news, scientific or otherwise. The newsletters can be found in Annex A2 (and the associated webpage [here](#)).

The four CMUG journal papers October 2020 – June 2021 are listed in Annex A3 and all 30 CMUG journal papers up until June 2021 in Annex A4. Furthermore, both lists include the number of citations each paper has had. Some publications in Annex A4, were included in the previous SER, show a comparison of the number of citations between now and then.



**CMUG Deliverable**

**Number:** D6.1  
**Due date:** 30 June 2021  
**Submission date:**  
**Version:** 2.0

---

## Annex A

### Contents

- A1 Meetings and workshops attended by CMUG
- A2 CSWG Newsletters October 2020 – June 2021
- A3 CMUG peer-reviewed publications since October 2018
- A4 All CMUG peer-reviewed publications between October 2020 – June 2021
- A5 Updated CMUG peer-reviewed publications with citation numbers from last SER

**CMUG Deliverable**

Number: D6.1  
 Due date: 30 June 2021  
 Submission date:  
 Version: 2.0

**A1 Meetings and workshops attended by CMUG**

Annex A1 table below describes the CCI programme and external science meetings between October 2020 and June 2021 to which there was a contribution by the CMUG team. Workshops with CMUG attendance or participation are also included. It excludes CCI ECV project meetings which are part of the CCI and are also attended by CMUG team members as they are concerned more with science research than outreach.

Date	Meeting	Location	CMUG role
<b>2020</b>			
20 Oct	Biomass Change Workshop	Online, hosted by Aberystwyth University	Attended sessions and provided comments regarding model evaluation
23 Oct	8 <sup>th</sup> CSWG Meeting	Online, WebEx	Focus on Sea Ice, SST, and Salinity ECVs
27 Oct	CMUG Progress Meeting	Online, WebEx	Progress update meeting
<b>2021</b>			
18 Jan	9 <sup>th</sup> CSWG Meeting	Online, WebEx	Focus on Fire, LC, HRLC, and Biomass ECVs
16-17 Mar	Ozone CCI Workshop	Online	ECMWF chaired a modelling session with KNMI
25 Mar	CMUG Progress Meeting	Online, WebEx	Progress update meeting
7 May	10 <sup>th</sup> CSWG meeting	Online, WebEx	Focus on Lakes, Snow, and Permafrost ECVs
13 May	PML Seminar	Online	Gave seminar covering work on biogeochemical data assimilation, including CMUG work
25 May	2 <sup>nd</sup> Snow CCI User Workshop	Online	Engage snow-climate research community and intensify collaboration between different CCI projects
14-16 June	Water Vapour CCI User Workshop	Online	Bring together broader water vapour community to discuss most recent scientific applications and challenges in processing and using water vapour CDRs



**CMUG Deliverable**

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**Version:** 2.0

**A2 CSWG Newsletters**

Annex A2 showcases the CSWG newsletters, in order, for October 2020, January 2021, and May 2021. All newsletters can also be found on CMUG’s website page [here](#).



**CMUG Deliverable**

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**Version: 2.0**

climate change initiative

**→ CMUG NEWSLETTER**

**CMUG Recent News**

- CMUG held its seventh Quarterly Progress Meeting on 27<sup>th</sup> October 2020, where partners presented recent progress. The meeting minutes can be accessed [here](#).
- A published paper has been added to CMUG's list of publications. The paper is on the model evaluation tool, into which CMUG is implementing CCI datasets for wider exploitation by the CIMP modelling community. See Publications for full citation.
- Deliverable 1.1, "The User Requirement Document" was approved in December 2020.
- Deliverable 2.3, "Suitability of CCI ECVs for Climate Science and Services", was approved in January 2021.
- D1.1, D2.3, as well as previous approved deliverables will be available on the [CMUG website](#).
- CMUG continues work on setting up a SharePoint site and a Teams site. Both sites have been set up and CMUG is now working to integrate members over the coming weeks.

**CMUG Recent Scientific Research**

- BSC has made substantial scientific progress on the use of CCI data for seasonal prediction skill assessments, for which a scientific article is in preparation, and continued technical developments and preparatory works required for their dust reanalysis experiments.
- David Ford (Met Office) has been finalizing setup of experiments for studying biophysical ocean feedbacks, including performing low-resolution test runs.
- MPI-M have finished work on test cases applying Fractions Skill Scores for Sea-Ice Concentration (SIC) simulations and refined the handling of land for the score. The score of MPI-GE simulations compared to sea-ice concentration data has been derived.

**In this issue:**

- Upcoming CSWG Meeting 18<sup>th</sup> Jan
- CMUG Recent News
- CMUG Recent Scientific Research
- Previous CSWG Meeting 23<sup>rd</sup> October 2020
- CSWG Jan 2021 Agenda
- CMUG ECV Data Use
- CMUG Key Contacts
- Publications

**Upcoming: CSWG January 2021**

CMUG is organizing its ninth Climate Science Working Group (CSWG) meeting on 18<sup>th</sup> January, 9:00 – 12:00 (UK time) / 10:00 – 13:00 (Central European Time). This CSWG meeting will focus on four ECVs: Fire, Land Cover, High Resolution Land Cover, and Biomass.

The invitation is extended to all CCI project members and CMUG partners. The agenda is presented on the following page.

**Previous: CSWG October 2020**

CMUG's eighth CSWG meeting was held on 23<sup>rd</sup> October 2020 and focused on the three ECVs Sea Surface Temperature (SST), Sea Surface Salinity (SSS) and Sea Ice. The previous CSWG Newsletter for Oct 2020 can be found [here](#) and the minutes from this CSWG meeting can be found [here](#).

→ CLIMATE CHANGE INITIATIVE

CMUG Newsletter | January 2021

**CSWG January 2021, Focus on Fire, Land Cover (LC) and Biomass**

Monday 18<sup>th</sup> January, 9-12 UK Time / 10-13 Central European Time (9-12 UTC).

**Agenda:**

1. Introduction – Amy Doherty (Met Office) 10 mins (9:05-9:15)
2. Meteo France use of LC and Biomass – Jean-Christophe Calvet 15 mins (9:15-9:30)
3. BSC use of Fire, LC, HRLC and Biomass – Etienne Tournigny 15 mins (9:30-9:45)
4. Discussion of CMUG work and plans 10 mins (9:45-9:55)
5. Coffee break – join our wonder me discussion room on Firefox browser 30 mins (9:55-10:25)
6. Fire\_cci presentation, including input from CRG – Emilio Chuvieco / Lucrecia Pettinari 20 mins (10:25-10:45)
7. Land cover\_cci presentation, including input from CRG – Céline Lamarche 20 mins (10:45-11:05)
8. High Resolution Land Cover, including input from CRG – Lorenzo Bruzzone 20 mins (11:05-11:25)
9. Biomass\_cci presentation, including input from CRG – Richard Lucas 20 mins (11:25-11:45)
10. Final discussions including plans for the next meeting 15 mins (11:45-12:00)

**CMUG ECV Data Use**

Follow this [link](#) to a document which shows which ECVs are used in which WPs with detailed WP descriptions.

**CMUG Key Contacts per CMUG Partner**

<p><b>Met Office</b></p> <ul style="list-style-type: none"> <li>• richard.jones@metoffice.gov.uk</li> <li>• amy.doherty@metoffice.gov.uk</li> <li>• david.ford@metoffice.gov.uk</li> <li>• debbie.hemming@metoffice.gov.uk</li> <li>• rob.king@metoffice.gov.uk</li> </ul> <p><b>DLR</b></p> <ul style="list-style-type: none"> <li>• Axel.Lauer@dlr.de</li> <li>• Malin.Roth@dlr.de</li> <li>• Bjoern.Broetz@dlr.de</li> </ul> <p><b>MPI</b></p> <ul style="list-style-type: none"> <li>• dirk.notz@mpimet.mpg.de</li> <li>• andreas.wernecke@mpimet.mpg.de</li> </ul> <p><b>ECMWF</b></p> <ul style="list-style-type: none"> <li>• angela.benedetti@ecmwf.int</li> </ul>	<p><b>BSC</b></p> <ul style="list-style-type: none"> <li>• portega@bsc.es</li> <li>• francisco.doblas-reyes@bsc.es</li> <li>• louis-phillipe.caron@bsc.es</li> <li>• eva.doblas@bsc.es</li> <li>• mar.rodriguez@bsc.es</li> </ul> <p><b>IPSL</b></p> <ul style="list-style-type: none"> <li>• Frederique.Cheryu@imj.jussieu.fr</li> <li>• jean-louis.dufresne@imj.jussieu.fr</li> <li>• yanfeng.zhao@imj.jussieu.fr</li> </ul> <p><b>Météo France</b></p> <ul style="list-style-type: none"> <li>• Jean-Christophe.Calvet@meteo.fr</li> </ul> <p><b>SMHI</b></p> <ul style="list-style-type: none"> <li>• Ulrika.Willen@smhi.se</li> </ul>
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**Publications**

The below publication has been added to CMUG's list of publications as some authors are members of CMUG. The article was published in July 2020, with CMUG acknowledged. There have been no CMUG publications since October 2020.

1. Eyring, V., Bock, L., Lauer, A., Righi, M., Schlund, M., Andrea, B., Amone, E., Belprati, O., Brotz, B., Caron, L.-P., Carnvalhais, N., Corni, I., Cortesi, N., Cronee, B., Davin, E., Davini, P., Dobeles, K., de Mora, L., Deser, C., Docquier, D., Earnshaw, P., Ebrecht, C., Gier, B. K., Gonzalez-Reviriego, N., Goodman, P., Hagemann, S., Hardiman, S., Hassler, B., Hunter, A., Kadov, C., Kindermann, S., Koralas, S., Koldunov, N., Lejeune, Q., Lembo, V., Lovato, T., Lucarini, V., Massonnet, F., Müller, B., Pandde, A., Perez-Zanón, N., Phillips, A., Predoi, V., Russell, J., Sellar, J., Serra, F., Stacke, T., Swaminathan, R., Torraza, V., Vegas-Reich, J., von Hardenberg, J., Weigel, K., and Zimmermann, K.: Earth System Model Evaluation Tool (ESMValTool) v2.0 – an extended set of large-scale diagnostics for quasi-operational and comprehensive evaluation of Earth system models in CIMP. *Geosci. Model Dev.*, 13, 3383-3438, doi: 10.5194/gmd-13-3383-2020, 2020.

climate change initiative

**→ CMUG NEWSLETTER**

**CMUG Recent News**

- CMUG held its eighth Quarterly Progress Meeting on 25<sup>th</sup> March 2021. The meeting minutes can be accessed [here](#).
- New papers added to CMUG's list of publications, see Publications section for full citations:
  - Bilbao et al. 2021, "Assessment of a full-field initialized decadal climate prediction system with the CIMP6 version of EC-Earth".
  - Peano et al. (accepted 2021) "Plant phenology evaluation of CRESCENDO land surface models – Part 1: start and end of growing season".
- CMUG Data Forum content has been transferred to the new CMUG [website](#) under the ["Case Studies & Data" tab](#).
- The CCI Sea Surface Temperature dataset has been published on [Obs4MIPs](#) and the CCI Cloud dataset is close to completion.
- Implementation of the Water Vapour, GHG (XCH4), Sea Surface Salinity, Land Surface Temperature and Ocean Colour ECVs into the ESMValTool are completed and will now go through a technical and scientific review. The new diagnostics will be combined into a single recipe to be used for evaluation of CIMP6 models.
- The ESMValTool work completed has been submitted in deliverable report D5.3 v1.

**CMUG Recent Scientific Research**

- BSC has made substantial scientific progress on the use of CCI data for seasonal prediction skill assessments, for which a scientific article is in preparation, and continued technical developments and preparatory works required for their dust reanalysis experiments.
- David Ford (Met Office) has been finalizing setup of experiments for studying biophysical ocean feedbacks, including performing low-resolution test runs.
- MPI-M have finished work on test cases applying Fractions Skill Scores for Sea-Ice Concentration (SIC) simulations and refined the handling of land for the score. The score of MPI-GE simulations compared to sea-ice concentration data has been derived.

**In this issue:**

- Upcoming CSWG Meeting 7<sup>th</sup> May
- CMUG Recent News
- Previous CSWG Meeting 18<sup>th</sup> January 2021
- CSWG May 2021 Agenda
- CMUG ECV Data Use
- CMUG Key Contacts
- New CMUG Publications

**Upcoming: CSWG May 2021**

CMUG is organizing its tenth Climate Science Working Group (CSWG) meeting on 7<sup>th</sup> May, 13:00 – 16:00 (UK time) / 14:00 – 17:00 (Central European Time). This CSWG meeting will focus on three ECVs: Lakes, Snow, and Permafrost.

The invitation is extended to all CCI project members and CMUG partners. The agenda is presented on the following page and can also be accessed directly [here](#).

**Previous: CSWG January 2021**

CMUG's ninth CSWG meeting was held on 18<sup>th</sup> January 2021 and focused on the four ECVs Fire, Land Cover, High Resolution Land Cover, and Biomass. The previous CSWG Newsletter for January 2021 can be found [here](#) and the minutes from this CSWG meeting can be found [here](#).

→ CLIMATE CHANGE INITIATIVE

CMUG Newsletter | January 2021

**CSWG May 2021, Focus on Lakes, Snow and Permafrost ECVs**

Friday 7<sup>th</sup> May, 13-16 UK Time / 14-17 Central European Time

**Agenda:**

1. Introduction – Amy Doherty (MO) 10 mins (13:05-13:15)
2. CMUG work on Lakes – Grace Redmond (MO) 15 mins (13:15-13:30)
3. CCI Lakes presentation, including input from CRG – Jean-Francois Créteaux 20 mins (13:30-13:50)
4. Coffee break – 20 mins (13:50-14:10)
5. Use of Snow and Permafrost ECVs – Jean-Christophe Calvet (MF) 15 mins (14:10-14:25)
6. CMUG work on Snow – Frederique Cheryu (TBC) 15 mins (14:25-14:40)
7. CCI Snow presentation, including input from CRG – Thomas Nagler / Chris Derksen 20 mins (14:40-15:00)
8. CCI Permafrost presentation including input from CRG – Annett Bartsch / Heidrun Mathes 20 mins (15:00-15:20)
9. Coffee break – 20 mins (15:20-15:40)
10. Final discussions including plans for the next meeting 20 mins (15:40-16:00)

**CMUG ECV Data Use**

Follow this [link](#) to a document which shows which ECVs are used in which WPs with detailed WP descriptions.

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**Publications**

The below publications have been added to CMUG's list of publications as some authors are members of CMUG.

1. Bilbao, R., Wild, S., Ortega, P., Acosta-Navarro, J., Arsouze, T., Bretonnière, P.-A., Caron, L.-P., Castillo, M., Cruz-García, R., Cvijanovic, I., Doblas-Reyes, F. J., Donat, M., Dutra, E., Echevarria, P., Ho, A.-C., Loosveldt-Tomas, S., Moreno-Chamorro, E., Pérez-Zanón, N., Ramos, A., Ruprich-Robert, Y., Sicardi, V., Tourigny, P., and Vegas-Regidor, J.: Assessment of a full-field initialized decadal climate prediction system with the CIMP6 version of EC-Earth. *Earth Syst. Dynam.*, 12, 173–196, <https://doi.org/10.5194/esd-12-173-2021>, 2021.

2. Peano, D., Hemming, D., Matera, S., Delire, C., Fan, Y., Joetzier, E., Lee, H., Nabel, J.E.M.S., Park, T., Peylin, P., Warland, D., Wilshire, A., Zaehele, S. (accepted 2021 preprint) Plant phenology evaluation of CRESCENDO land surface models – Part 1: start and end of growing season. *Biogeosciences Discuss.* Preprint available at <https://bg.copernicus.org/preprints/bg-2020-319/>.



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**A3 CMUG peer-reviewed publications October 2020 – June 2021**

Annex A3 table lists CMUG peer-reviewed publications for the time period October 2020 – June 2021. References are given as well as the number of citations, as sourced from Google Scholar (as of June 2021).

Paper	Citations*
<b>Bilbao, R.</b> , Wild, S., Ortega, P., Acosta-Navarro, J., Arsouze, T., Bretonnière, P.-A., Caron, L.-P., Castrillo, M., Cruz-García, R., Cvijanovic, I., Doblas-Reyes, F. J., Donat, M., Dutra, E., Echevarría, P., Ho, A.-C., Loosveldt-Tomas, S., Moreno-Chamarro, E., Pérez-Zanon, N., Ramos, A., Ruprich-Robert, Y., Sicardi, V., Tourigny, E., and Vegas-Regidor, J.: Assessment of a full-field initialized decadal climate prediction system with the CMIP6 version of EC-Earth, <i>Earth Syst. Dynam.</i> , 12, 173–196, <a href="https://doi.org/10.5194/esd-12-173-2021">https://doi.org/10.5194/esd-12-173-2021</a> , 2021.	1
Bock, L., <b>A. Lauer</b> , M. Schlund, M. Barreiro, N. Bellouin, C. Jones, G. A. Meehl, V. Predoi, M. J. Roberts, V. Eyring: Quantifying Progress Across Different CMIP Phases With the ESMValTool, <i>J. Geophys. Res.</i> , 125, e2019JD032321, doi: <a href="https://doi.org/10.1029/2019JD032321">10.1029/2019JD032321</a> , 2020.	3
<b>Eyring, V.</b> , Bock, L., Lauer, A., Righi, M., Schlund, M., Andela, B., Arnone, E., Bellprat, O., Brötz, B., Caron, L.-P., Carvalhais, N., Cionni, I., Cortesi, N., Crezee, B., Davin, E., Davini, P., Debeire, K., de Mora, L., Deser, C., Docquier, D., Earnshaw, P., Ehbrecht, C., Gier, B. K., Gonzalez-Reviriego, N., Goodman, P., Hagemann, S., Hardiman, S., Hassler, B., Hunter, A., Kadow, C., Kindermann, S., Koirala, S., Koldunov, N., Lejeune, Q., Lembo, V., Lovato, T., Lucarini, V., Massonnet, F., Müller, B., Pandde, A., Pérez-Zanón, N., Phillips, A., Predoi, V., Russell, J., Sellar, A., Serva, F., Stacke, T., Swaminathan, R., Torralba, V., Vegas-Regidor, J., von Hardenberg, J., Weigel, K., and Zimmermann, K.: Earth System Model Evaluation Tool (ESMValTool) v2.0 - an extended set of large-scale diagnostics for quasi-operational and comprehensive evaluation of Earth system models in CMIP, <i>Geosci. Model Dev.</i> , 13, 3383-3438, doi: <a href="https://doi.org/10.5194/gmd-13-3383-2020">10.5194/gmd-13-3383-2020</a> , 2020.	9
Peano, D., <b>Hemming, D.</b> , Materia, S., Delire, C., Fan, Y., Joetzjer, E., Lee, H., Nabel, J.E.M.S., Park, T., Peylin, P., Warland, D., Wiltshire, A., Zaehle, S. (accepted 2021 preprint) Plant phenology evaluation of CRESCENDO land surface models – Part 1: start and end of growing season. <i>Biogeosciences Discuss.</i> Preprint available at <a href="https://bg.copernicus.org/preprints/bg-2020-319">https://bg.copernicus.org/preprints/bg-2020-319</a>	-

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**A4 All CMUG peer-reviewed publications up to June 2021**

Annex A4 table lists all CMUG peer-reviewed publications up until June 2021. References are given as well as the number of citations, as sourced from Google Scholar (as of June 2021). Some publications include citation numbers from the previous SER in brackets, with the updated citation number as of June 2021 to the right of the bracket.

Paper	Citations*
<b>Adloff F.</b> , G. Jordà, S. Somot, F. Sevault, T. Arsouze, B. Meyssignac, L. Li, <b>S. Planton</b> (2017), Improving sea level simulation in Mediterranean regional climate models, <i>Climate Dynamics</i> , doi:10.1007/s00382-017-3842-3 <a href="https://link.springer.com/article/10.1007/s00382-017-3842-3">https://link.springer.com/article/10.1007/s00382-017-3842-3</a>	24
<b>Albergel, C.</b> , Zheng, Y., Bonan, B., Dutra, E., Rodríguez-Fernández, N., Munier, S., Draper, C., de Rosnay, P., Muñoz-Sabater, J., Balsamo, G., Fairbairn, D., Meurey, C., and Calvet, J.-C.: Data assimilation for continuous global assessment of severe conditions over terrestrial surfaces, <i>Hydrol. Earth Syst. Sci.</i> , 24, 4291–4316, <a href="https://hess.copernicus.org/articles/24/4291/2020/">https://hess.copernicus.org/articles/24/4291/2020/</a> , 2020.	4
<b>Bellprat, O.</b> , F. Massonnet, S. Siegert, C. Prodhomme, D. Macias-Gómez, <b>V. Guemas, F. Doblas-Reyes</b> (2017) Uncertainty propagation in observational references to climate model scales. <i>Remote Sensing of Environment</i> . Volume 203, 15 December 2017, Pages 101-108. <a href="https://doi.org/10.1016/j.rse.2017.06.034">https://doi.org/10.1016/j.rse.2017.06.034</a>	12
<b>Bilbao, R.</b> , Wild, S., Otega, B., Acosta-Navarro, J., Arsouze, T., Bretonniere, P-A., Caron, L-P., Castrillo, M., Cruz-Gracia, R., Cvijanovic, I., Doblas-Reyes, F.J., Donat, M., Dura, E., Echevarría, P., Ho, A-C., Loosveldt-Tomas, S., Moreno-Chamarro, E., Pérez-Zanon, N., Ramos, A., Ruprich-Robert, Y., Sicardi, V., Tourigny, E., Vegas-Regidor, J.: Assessment of a full-Field initialised decadal climate prediction system with the CMIP6 version of EC-Earth, <a href="https://esd.copernicus.org/preprints/esd-2020-66/">https://esd.copernicus.org/preprints/esd-2020-66/</a> 2020	2
Bock, L., <b>A. Lauer</b> , M. Schlund, M. Barreiro, N. Bellouin, C. Jones, G. A. Meehl, V. Predoi, M. J. Roberts, <b>V. Eyring</b> : Quantifying Progress Across Different CMIP Phases With the ESMValTool, <i>J. Geophys. Res.</i> , 125, e2019JD032321, doi: 10.1029/2019JD032321, 2020.	3
<b>Cheruy, F.</b> , Ducharne, A., Hourdin, F., Musat, I., Vignon, E., et al.: Improved near surface continental climate in IPSL-CM6A-LR by combined evolutions of atmospheric and land surface physics, <i>Journal of Advances in Modeling Earth Systems</i> , <a href="https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019MS002005">https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019MS002005</a> , 2020.	15
<b>Dragani, R.</b> : (2016) A comparative analysis of UV nadir-backscatter and infrared limb-emission ozone data assimilation, <i>Atmos. Chem. Phys. Discuss.</i> , doi:10.5194/acp-2016-96.	(5) 5
<b>Eyring, V., Righi, M.</b> , Evaldsson, M., Lauer, A., Wenzel, S., Jones, C., Anav, A., Andrews, O., Cionni, I., Davin, E. L., Deser, C., Ehbrecht, C., Friedlingstein, P., Gleckler, P., Gottschaldt, K.-D., Hagemann, S., Juckes, M., Kindermann, S., Krasting, J., Kunert, D., Levine, R., Loew, A., Mäkelä, J., Martin, G., Mason, E., Phillips, A., Read, S., Rio, C., Roehrig, R., Senftleben, D., Sterl, A., van Uffl, L. H., Walton, J., Wang, S., and	(54)



## CMUG Deliverable

Number: D6.1  
 Due date: 30 June 2021  
 Submission date:  
 Version: 2.0

Williams, K. D. 2015: ESMValTool (v1.0) - a community diagnostic and performance metrics tool for routine evaluation of Earth System Models in CMIP, <i>Geosci. Model Dev.</i> , 9, 1747-1802, doi:10.5194/gmd-9-1747-2016, 2016.	
<b>Eyring, V.</b> , Cox, P. M., Flato, G. M., Gleckler, P. J., Abramowitz, G., Caldwell, P., Collins, W. D., Gier, B. K., Hall, A. D., Hoffman, F. M., Hurtt, G. C., Jahn, A., Jones, C. D., Klein, S. A., Krasting, J. P., Kwiatkowski, L., Lorenz, R., Maloney, E., Meehl, G. A., Pendergrass, A. G., Pincus, R., Ruane, A. C., Russell, J. L., Sanderson, B. M., Santer, B. D., Sherwood, S. C., Simpson, I. R., Stouffer, R. J. & Williamson, M. S. (2019) Taking climate model evaluation to the next level. <i>Nature Climate Change</i> . doi:10.1038/s41558-018-0355-y. <a href="https://www.nature.com/articles/s41558-018-0355-y">https://www.nature.com/articles/s41558-018-0355-y</a>	-
<b>Eyring, V.</b> , Bock, L., Lauer, A., Righi, M., Schlund, M., Andela, B., Arnone, E., Bellprat, O., Brötz, B., Caron, L.-P., Carvalhais, N., Cionni, I., Cortesi, N., Crezee, B., Davin, E., Davini, P., Debeire, K., de Mora, L., Deser, C., Docquier, D., Earnshaw, P., Ehbrecht, C., Gier, B. K., Gonzalez-Reviriego, N., Goodman, P., Hagemann, S., Hardiman, S., Hassler, B., Hunter, A., Kadow, C., Kindermann, S., Koirala, S., Koldunov, N., Lejeune, Q., Lembo, V., Lovato, T., Lucarini, V., Massonnet, F., Müller, B., Pandde, A., Pérez-Zanón, N., Phillips, A., Predoi, V., Russell, J., Sellar, A., Serva, F., Stacke, T., Swaminathan, R., Torralba, V., Vegas-Regidor, J., von Hardenberg, J., Weigel, K., and Zimmermann, K.: Earth System Model Evaluation Tool (ESMValTool) v2.0 - an extended set of large-scale diagnostics for quasi-operational and comprehensive evaluation of Earth system models in CMIP, <i>Geosci. Model Dev.</i> , 13, 3383-3438, doi: 10.5194/gmd-13-3383-2020, 2020.	9
<b>Ford, D. A.</b> (2020), Assessing the role and consistency of satellite observation products in global physical-biogeochemical ocean reanalysis. <a href="https://os.copernicus.org/articles/16/875/2020/">https://os.copernicus.org/articles/16/875/2020/</a>	2
<b>Ford, D. A.</b> , K. P. Edwards, D. Lea, <b>R. M. Barciela</b> , M. J. Martin, and J. Demaria (2012): Assimilating GlobColour ocean colour data into a pre-operational physical-biogeochemical model <i>Ocean Sci. Discuss.</i> , 9, 687-744, 2012. doi:10.5194/os-8-751/2012/	(51) 58
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<b>Guemas, V.</b> , <b>M. Chevallier</b> , <b>M. Déqué</b> , <b>O. Bellprat</b> and <b>F.J. Doblas-Reyes</b> (2016). Impact of sea ice initialization on sea ice and atmosphere prediction skill on seasonal timescales. <i>Geophysical Research Letters</i> , 43, 3889-3896, doi:10.1002/2015GL066626.	31
Hollmann, R., Merchant, C. J., <b>Saunders, R.</b> , Downy, C., Buchwitz, M., Cazenave, A., ... Wagner, W. (2013). The ESA Climate Change Initiative: satellite data records for essential climate variables. <i>Bulletin of the American Meteorological Society</i> , 130313072241002. doi:10.1175/BAMS-D-11-00254.1	(255) 303
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Lauer, A., Eyring, V., Bellprat, O., Bock, L., Gier, B. K., Hunter, A., Lorenz, R., Pérez-Zanón, N., Righi, M., Schlund, M., Senftleben, D., Weigel, K.,	12



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and Zechlau, S.: Earth System Model Evaluation Tool (ESMValTool) v2.0 - diagnostics for emergent constraints and future projections from Earth system models in CMIP, <i>Geosci. Model. Dev.</i> , 13, 4205-4228, <a href="https://gmd.copernicus.org/articles/13/4205/2020/">https://gmd.copernicus.org/articles/13/4205/2020/</a> , 2020.	
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