

Summary of CCI colocation and CMUG integration meeting 2023 7-9 November 2023

This document reviews the key points and actions arising. Presentation slides can be access [here](#). **Actions in RED**

Session 1 – Welcome and opening

Session 1 focussed on updating the CCI community on new developments since the last colocation meeting in autumn 2022 in ESA and beyond.

[Susanne Mecklenburg] provided an overview on the status of the CCI programme. Note, the brand name of Climate Change Initiative will remain. Current activities focus on finalising the expenditure under CCI+. The extension of existing ECV contracts is ongoing and several new ECVs and cross-ECVs activities have been added, including Sea Level Budget Closure-2, river discharge, anthropogenic water use, long-lived green-house-gases and research fellowships. The new climate initiative CLIMATE-SPACE was (over) subscribed to by the ESA Ministerial Council in 2022. The implementation and procurement plans are now approved by ESA member states and finance committees since February and May 2023 respectively. The release of the first procurements under CLIMATE-SPACE has started with the release of the open competitive call on GHG emissions. An overview on further upcoming calls was provided.

[Anna Maria Trofaier] summarised the recent appointments of the CCI research fellows, including an overview on the updated call and the terms and conditions. This was followed by brief presentations from three recently appointed fellows outlining their research projects [Links to Research fellow presentations: [Beth Harris](#) (CEH); [Luisa von Albedyll](#) (AWI); [Francisco José Cuesta-Valero](#) (UFZ)]. The discussion revolved around how to connect individual research fellows to the CCI project to integrate their research better in the overall portfolio. **Science Leads and research fellows alike were encouraged to discuss possible connections (Action: ESA to follow up).**

[Ed Pechorro] provided a summary of the recent update to the CCI Data Policy, which was last updated in 2013 and needed alignment to the ESA Earth Observation Data Policy and its underlying principles, including the [FAIR principles](#), UN regulations and ESA policy for data curation, as well as the development of the CCI Open Data Portal and hence changes in the day-to-day handling of CCI data access and distribution. The terms and conditions for individual projects will not change in terms of retention of IPR and use and distribution of data. **Science leads will have the opportunity to comment on the CCI Data Policy in November 2023.** In addition an overview on the future plans for the upcoming open competitive call for the Knowledge Exchange contract was given, which will need to address the growing number and variety of activities being covered under CCI and discover new ways of communicating their results and achievements further.

The CCI community welcomed the overview on [new long-time series of datasets and Fundamental Data Records](#) given by **[Mirko Albani]** provided as part of the Heritage Space programme. Historic data sets will have great potential to extend the existing climate data records developed by the individual ECV projects. Some data have already been requested, e.g. SAR data for the Snow_ECV project. **Science leads where encouraged to investigate whether existing and further data sets could be requested through the Heritage Space programme to be used in the individual ECV projects, including reprocessing and harmonisation activities (Action: ESA to follow up with CCI science leads).** Through Heritage Space also campaign data are available which provide a valuable tool for validation activities.

The WCRP CMIP-IPO has been collocated with the ESA Climate Office since March 2022. Which provides an excellent opportunity to enhance the link between the climate observation and modelling communities. Following the closure of the 6th IPCC assessment cycle, the planning for CMIP's contribution to its 7th cycle has started. **[Eleanor O'Rourke]** provided an update on [recent CMIP activities](#), including the planning and schedule for CMIP-7 preparatory activities and the interaction with other WCRP projects such as the Earth Systems Observation and Modelling (ESMO) project. **CCI science leads are invited to engage with the CMIP Data Request realm variables development and consultation. Further information will be emerging in the next few months and projects will be made aware.** This process will develop the CMIP-7 data request and thus help increase the opportunity for model output variables having a high quality (hopefully CCI) "twin" for evaluation and benchmarking. Another potential collaboration area could be the support to the tool development for CORDEX ensemble selection, so that the CMIP to CORDEX information chain could be optimised.

The presentation did not the [new lighthouse activity, Climate Interventions](#), but could be a good topic for next year's collocation meeting.

Following on from the CMIP-7 planning, **[Claire MacIntosh]** summarised ESA's plans to contribute to the [systematic provision of forcing data sets](#), as promised in the hosting agreement for CMIP-IPO to WCRP. The initial contribution will focus on the provision of ozone and green-house gas concentrations, sea surface temperature and volcanic aerosol concentrations (AOP) and emissions (SO₂), with data sets being currently developed.

One novel aspect of the new climate initiative CLIMATE-SPACE is to address the UNFCCC Paris Agreement reporting requirements through dedicated R&D activities. **[Clément Albergel]** presented the [plans for a campaign in the Amazon](#), which should commence in autumn 2024 and will combine efforts from several space agencies, and research institutes such as INPE and NASA, in addition to ESA's lead on this activity. This campaign plan responds directly to a recommendation from the Committee of Earth Observation Satellite (CEOS) strategy paper on the UNFCCC 1st Global Stocktake (https://ceos.org/observations/documents/GST_Strategy_Paper_V3.1.pdf), asking for large-scale field experiment to bring together a complete suite of observations and models in specific critical zones currently regarded as tipping points of terrestrial emissions. **CCI science leads were invited to comment to the definition of the science plan and requirements to be addressed by the campaign.**

ESA, through the Climate Office, became an observer to IPCC in 2019. At this point the 6th assessment cycle was well underway. At the start of the planning for the 7th assessment cycle ESA intends to intensify its contribution to and interaction with IPCC. **[Sarah Connors]**, who recently joined the ESA Climate Office from the IPCC WG I science team, provided a detailed summary of the [opportunities to interact with IPCC at distinct points in the assessment process](#). **CCI science leads were encouraged to contribute actively to the IPCC assessment process. A first opportunity for CCI science leads arises through the call for "Nomination of Experts to participate in the Scoping Meeting for the IPCC Special Report on Climate Change and Cities", with a deadline on the 17th of November 2023 through national focal points** (<https://www.ipcc.ch/focal-points/>). The IPCC news webpage will post most announcements: <https://www.ipcc.ch/news/>. The ESA Climate Office will provide email reminders for key events to CCI science leads and is also exploring more organisational and institutional links with the IPCC Working Groups.

Session 2 - Cross-ECVs

Session 2 focussed on a specific recommendation from the GCOS updated implementation plan (<https://gcos.wmo.int/en/publications/gcos-implementation-plan2022>), asking for an increased focus on combining individual ECVs and thus addressing open issues in the carbon, water and energy cycles. The former GCOS chairman **[Han Dolman]** (NIOZ) provided a summary of and feedback from the joint

GCOS-WCRP Workshop on the Energy, Carbon and Water cycle to set the scene, which took place in June 2023. The workshop identified main issues to be addressed in the respective cycles, with a report being currently prepared. This assessment will form part of the basis of the CCI open competitive call for cross-ECV projects (which will also be open for further proposals not covered by the workshop report), which will be launched in November 2023. The Technical Officer for the [cross-ECV call](#), **[Anna Maria Trofaier]**, re-iterated the information about the call which was already provided at the information day in May 2023 (<https://climate.esa.int/en/news-events/esas-new-climate-programme-information-day-10-may/>). Given that the call is currently under way no further information was given.

CCI science leaders had expressed interest to include a dedicated discussion on their cross-ECV ideas amongst themselves on the agenda. Science leaders provided a summary presentation of their ideas before breaking into group discussions, to which ESA did not contribute.

Session 3: Emerging topics

Session 3 started with a summary of recent developments from the Space Summit in Seville on 6-7 November (with “Green & sustainable future” being one of the three main themes) and an update on the ESA accelerator “Space for a Green Future” (<https://vision.esa.int/space-for-a-green-future/>), given by **[Rune Floberghagen]**. CCI Science Leaders welcomed this overview, linking CCI activities to a wider European development in the climate area. The presentation elaborated on the new strategic collaboration between the EC and ESA, in particular on the agreement with DG-CLIMA [[view the brochure](#)].

ESA is currently revising its EO science strategy. **[Malcolm Davidson]** [summarised the process, schedule and current status](#). **ESA would welcome further engagement from the CCI community in the process in the upcoming milestones, including:**

- Review version 2.0 of Candidate Science Questions (Jan 2024) which includes results of feedback from the EO community from the 2023 Science Strategy workshop
- Reflect on role and priorities of Candidate Science Questions within current and future CCI activities
- Review of ESA draft EO strategy document when published
- Participate and table your views/feedback at the 2nd science strategy workshop in May 2024

CCI science leads welcomed the increased inclusion of climate science in the candidate science questions.

Session 3 continued with a focus on a new topic for the CCI programme, namely on adaptation activities under the UNFCCC Paris Agreement, as an introduction to future activities in this area, which sparked interest from CCI science leads. **[Richard Dawson]** (University of Newcastle) provided a [keynote on adaptation actions, on the basis of IPCC reporting but also giving a national \(UK\) perspective of how planning, implementation and assessment of their success are being done](#). Based on his work in the UK’s Climate Change Committee he identified as the most pressing issues or areas for adaptation to a changing climate food and water security, including supporting ecosystems, maintaining living standards in terms of infrastructure services and buildings and low-lying coastal systems. The uptake of remote sensing data is well established in many sectors for hazard and risk mapping but less so for assessing the effectiveness of adaptation measures. CCI data could possibly support such assessments, depending on the adequate spatial and temporal resolution and modelling outputs.

[Antonio Bombelli] (GCOS secretariat) gave an [overview on the GCOS adaptation task team](#). GCOS intends to organize workshop(s) involving major adaptation implementers and thematic experts, to identify ECVs, global datasets and climate information, including spatial and temporal specifications,

needed for adaptation. GCOS will also lead the preparation of a paper on improving the accuracy and reliability of reanalysis and climate models to be used for tailoring adaptation to the expected regional and local changes. When asked about requirements from satellite data to address adaptation GCOS promoted the use of high-resolution space-based observations ($\approx 10\text{m}$) for monitoring changes at local level and planning adaptation measures.

Elaborating more on ESA's plans for adaptation, **[Rochelle Schneider]** provided an overview on the variety of [use of satellite data for health adaptation](#), emphasising the skill and availability of such information. When asked to identify shortfalls of using space data for adaption, she commented that the link to and understanding of the data by policy makers needs to be improved (i.e. provide ready to use data) and that the resolution of data, both spatial (for very local applications) and temporal, are of essence for successful adaptation measures. The Climate Office is currently conducting a R&D requirements collation with the intention to release a call for pilot projects in 2024 focussing on health adaptation, in particular for infectious diseases and heat waves.

A specific example of adaptation relevant climate data was given by **[Darren Ghent]** focussing on [heat resilience](#). The objective of the project was to develop a prototype dataset in customised end-user formats for monitoring heat risk vulnerability, based on the exploitation and distribution of thermal infrared satellite data. Potential customers are national and local decision makers addressing issues of Heat Risk, Vulnerability, Urbanisation and understanding the natural environment (Green Space assessment).

The presentation about adaption was followed by an update on the [Copernicus Climate Change Service \(C3S\) activities](#) by **[Joaquin Munoz]** (ECMWF). The presentation covered the current portfolio of ECVs and the uptake of CCI R&D and projects by C3S in the past, as well as future plans for new open calls for atmospheric physics and composition, oceans, hydrosphere, cryosphere and land biosphere. It also covered changes to the Climate Data Store which is now going to be combined with the Atmospheric Data Store to CADS and tools for climate intelligence, including setting up climate indicators. This sparked a discussion by the audience on whether the release of climate indicators and state of the climate reports from various organisations (e.g. WMO, C3S, BAMS etc) with similar messages should be harmonised to streamline a common message towards policy makers and implementers. When asked which new ECVs would benefit the C3S portfolio the discussion turned to the fact that ESA and C3S should enter a discussion on this point given that both will release open calls for new ECVs (with an CCI R&D and C3S operational remit). **Action: ESA to follow up with C3S.**

The last presentation of this session provided an overview and [status on the TRUTHS mission](#) given by [Andrea Marini, ESA and Nigel Fox, NPL]. TRUTHS stands for "Traceable Radiometry Underpinning Terrestrial- and Helio-Studies" and will operate as a calibration and validation mission for other space-based measurements with a climate application background. The TRUTHS team in fact gave some indication which observations underpinning ECV project might benefit from its measurements, including ocean colour, aerosol and green-house gases. This was the first exposure of the TRUTHS mission to the CCI community, and it became clear that more discussion is needed to firm up clear cooperation plans. **A TRUTHS workshop is planned for June 2024 at ECSAT, CCI science leads are invited to participate.**

Session 4: Joint CCI/CMUG Session on Observations/Model Intercomparison

Session 4 began with a presentation from **[Axel Lauer]** (DLR-IPA) on the latest status of the main European climate model evaluation tool [ESMValTool](#). He highlighted work already performed by CMUG to integrate about half of the CCI ECV data sets into ESMValTool. He also discussed the plans

to continue and extend this work in the next 3-year phase of CMUG, including new work to integrate observational uncertainty estimates. He highlighted how the CCI ECVs have successfully been used with ESMValTool for the evaluation of CMIP model results in IPCC's Sixth Assessment Report.

[Simon Pinnock] (ESA Climate Office) presented the [WCRP's obs4MIPs initiative](#), which is a community effort to strengthen the uptake of satellite observations in climate model evaluation. He outlined in practical terms how the CCI projects are required to contribute their data to obs4MIPs.

[Amy Doherty] (UK Met Office) discussed CMUG's workpackage to support the [future evolution of obs4MIPs](#) with a survey of user community requirements and a gap analysis, investigating the required evolution of obs4MIPs to ensure it best supports the emerging approaches being developed for climate model evaluation, looking towards CMIP7.

The outlook for satellite data exploitation in the [evaluation of future CMIP7 climate models](#) was presented by **[Phil Kershaw]** (CEDA). He presented the "platform" approach, illustrated with a decade of CEDA's experience developing and using the UK's JASMIN environmental data analysis infrastructure. He also covered the use of such platforms in the EC's DestinE project, CMIP's ESGF data infrastructure, and the UK's new EO Data Hub.

WCRP's CORDEX project on downscaled regional climate modelling was presented by **[Irene Lake and Grisha Nikulin]** (SMHI) and **[Chris Lennard]** (CSAG, S. Africa), with the aim of building stronger links between the CCI ECV data providers and the CORDEX user community. Potential exploitation of CCI ECVs in Africa was discussed, with in particular the relatively high spatial resolution of most CCI ECV data sets making them particularly suitable for use with CORDEX models.

Given their relevance to the topic of this session, plans for [ESA's 2024 CLIMATE-SPACE Theme 3 procurement](#) focussed on linking observations and models were briefly outlined by **[Simon Pinnock]** (ESA Climate Office).

POSTER SESSION

With the aim of stimulating cross-project collaborations, a poster session was held so that all CCI projects had an opportunity to present a poster highlighting their latest achievements.

Session 5: CMUG Integration

The CMUG Integration session began with an [overview of the new 3 year phase of CMUG](#) by its Science Leader **[Richard Jones]** (UK Met Office). He presented the consortium partners and the project's main workpackages. This was followed by [eight one-slide summaries of the planned CMUG science studies](#) making use of CCI ECV data in the context of climate models.

The introductory presentation was followed by kick-off meetings for six of the eight CMUG science studies in breakout discussion groups. These provided a valuable opportunity for CMUG to liaise with the CCI ECV projects providing data to each of the studies.