Colocation Day 3: Feedbacks from the BOGs

Land domain

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What are the main strengths of the CCI?

Céline

Scientific credibility

- **Large availability of data records** characterising a wide range of Earth System components, with centralised access, open source and transparent documentation, and peer-reviewed publications aligned with GCOS
- **Validated products with uncertainty information** (relatively unique at programme level)
- **High standards** in algorithm development, remaining **independent** from validation activities
- **Strong international visibility:** high-quality outreach (e.g. LPS, COP)
- **Institutional commitment** to independent and robust climate science

Continuity and flexibility

- **Long-term programme continuity**: ECV production, funding, and project partners developing common understanding
- **Capacity to adapt to emerging needs** and new opportunities (cross-ECV projects and actionable knowledge)
- Maximised value of **long-term** satellite archives combined with **state-of-the-art** algorithms

What are the main strengths of the CCI?

Strong interactions among various communities

- Feedback loop between climate users and data providers → R&D ensures datasets are fit for purpose. Data producers can better explain their dataset
- Cross-ECV projects, scientific data turned into action, closer link to policymaking
- Positive impact on collaboration and career development

Efficient programme organisation

- Manageable number of partners ensures the right expertise while maintaining lower administrative burden than many programmes.
- Strong ESA project management and good communication.

"CCI is a brand that is internationally recognised as the best programme for producing climate data records of the highest quality and consistency" Darren

What are the emerging wider policy drivers?

Climate & Environmental Pressures

- Biodiversity loss and ecosystem degradation, transgressing the nine planetary boundaries/tipping points
- Carbon neutrality targets
- Extreme events (flooding, heat) leading to uninhabitable areas and climate-driven migration
- Food and energy security
- Constant global population increase

Societal evolution

- Climate-driven migration and loss of opportunities
- Rising costs (research, adaptation) and budget constraints
- Urban vulnerability (megacities under climate stress)

Policy evolution / Geopolitics

- Global Goal on Adaptation indices: which ECVs are needed and how can CCI respond?
- Enhanced national / European self-sustainability and self-sufficiency, and resource independence policies
- Proper flow-down from policymakers to policy implementers
- Need for long-term coordination and continuity of climate-oriented programmes
- Information needs (demand for better data) to support policymaking in the Global South
- Changing international trade relations (carbon, biodiversity, ecosystem services)
- Broader geopolitical instability

Technology evolution

- Rapid technological transformation (e.g. AI)
- Growth of dual-use missions and satellite product development
- Traceable measurements

What scientific and technical challenges should be prioritised in CCI?

Scientific rigour

- To be maintained
- Improve the characterization and communication of uncertainty
- Standardise uncertainty measurements to enable their integration into error-propagation processes

Consistency, processing and data access

- Improve temporal and spatial consistency across ECVs
- Provide means for more homogeneous pre-processing of datasets (when possible due to ECV requirements)
- Set a simpler, unified and more user-friendly access to data
- Bridge the gap between users and data providers

Validation and observational support

- Improve the validation of some ECVs still lacking strong validation methods or datasets.
- Make better use of in-situ measurements retrieved using public funding for dataset validation.
- Harmonise validation data across different contracts where useful.
- Improve budget-closure studies.

What scientific and technical challenges should be prioritised in CCI?

Scientific scope and cross-ECV activities

- Add further ECVs, even if they are not yet part of GCOS (because the process of GCOS is very long and slow).
- Strengthen cross-ECV and cross-domain activities with Earth Intelligence tools (e.g. carbon budget, forest resilience, future projections).

User uptake and community outreach

- Expand outreach to modelling communities beyond CMUG and climate research (e.g. hydrodynamic studies, biodiversity modelling, social sciences).

What are the opportunities for improving?

Patrick

Data access, processing and infrastructure

- Enable **simpler and unified access to all CCI data**, instead of multiple portals
- Develop more **higher-level ARD products (L2/L3)** that are pre-processed, harmonised, fused and gap-filled for major missions (e.g. Sentinel-1, Sentinel-2, Sentinel-3)
- Explore the balance between **systematic processing and on-demand processing**, considering storage costs and user demand
- Allow **reprocessing requests also for non-ESA mission data**, when relevant

Scientific innovation and new datasets

- Support **high-resolution ECV development** using current observational capabilities
- Recognise that **innovative products not directly leading to CDRs** can still have strong user value (e.g. biomass at 10 m)
- Explore the **added value of AI** in climate R&D, including fusion of innovative products with CDRs
- **Hyperspectral missions –** what can they add ?

What are the opportunities for improving?

Product quality, validation and consistency

- Develop clearer **quality metrics, benchmarks and lists of known issues** to better inform users about product quality
- Strengthen **quality assurance**, involving the scientific community, organisations and possibly a dedicated QA service
- Ensure **temporal consistency of ECV products**, especially when integrating new mission data, and improve **consistency across ECVs**
- Agree on **best practices for ancillary datasets** (e.g. cloud masks) and define **common temporal and spatial grids** for ECVs
- Provide **on-demand tools to re-grid datasets and handle uncertainty propagation**

How can we smooth links to transfer ECVs to operational services?

Paul

Coordination and planning

- GCOS requirements as a strong starting point for product definition is valued
- **Better coordination of contracting (timing and specifications)**
- **Establish regular programme-level bilateral exchanges to identify and prioritise ECV quantities and new R&D needs (agree shared common priorities - as an input to CMIN and MFF)**
- Is there a specific role/job for facilitating the transfer process ?

Lessons learned

- Understand requirements of operational users from day 1
- Share lessons learned from previous transfers to avoid repeating pitfalls

How can we smooth links to transfer ECVs to operational services?

Technical readiness and workflow transfer

- Ensure gap filling - rigorous QA on the CCI side prior to transfer
- Develop a strategy to deal with artefacts and gaps in NRT data
- Optimisation of the code and QC takes too much time
- Provide support for code operationalisation, including specifications and pre-built / common environments
- Improve transferability of workflows through common guidelines and clearly defined applicable cardinal requirements)

Infrastructure and efficiency challenges

- Consider the use of consistent codebases or shared platforms (while recognising potential costs)
- Address the significant effort required for code optimisation and quality control

How can CCI improve the exploitation of our ECV data?

- Clearer, improved and more user-driven access to data, including better handling of different data formats
- Provide quicklooks for datasets to facilitate rapid visual understanding
- Include “quick start” information with transparent details on resolution and product generation, making key characteristics easier to identify
- Develop a consortium of practical examples demonstrating real applications and use of ECV datasets
- Show how ECVs are used in practice, across different domains
- Provide beginner-friendly decision trees or questionnaires to guide users towards the most appropriate datasets based on their needs

How can we make the ECV data more consistent between each other?

Sophie

- **L1 data: ESA should clarify its position on harmonisation**, including whether multi-mission FDR production will include additional missions (e.g. MERIS within FDR4VEG). **More frequent and complete reprocessing of L1 data is strongly needed**, covering full time series to ensure usability (e.g. SLSTR). **FDR uncertainty should include higher-order statistics** to support applications such as resilience assessment.
- **Mission intercalibration** should take place **earlier in the mission timeline**
- Within CCI, **greater comparison of ECV algorithms and more cross-ECV activities would improve methodological and physical consistency** (e.g. vegetation, snow, LSWT/ice cover, SST/sea ice), particularly for change detection
- **Historical consistency of validation data must be considered**, as improvements in auxiliary datasets (e.g. cloud masks) may introduce non-climatic trends. **Clear documentation of such artefacts and stronger use of in-situ data are needed**
- From a user perspective, **clearer guidance on dataset consistency is required** (e.g. “quick-start” sections in PUGs. LST is a good example). **A CCI event database and more tools for resampling and uncertainty propagation would help address space–time inconsistencies**

How can we make the CCI programme more effective?

Clément

- **Input data availability:** Making input data available on the cloud
- **Common L1 access:** Make Level-1 data available to all teams in a consistent way
- **External communication:** Discussion on communicating beyond the programme
- **Uncertainty:** Characterising and communicating uncertainty
- **Education:** Some activities exist, but none specifically targeting PhD students
- **User requirements:** Addressed in all projects; outcomes are rarely unexpected
- **Community engagement:** Need for a more open community, including stronger links with the policy sector