Exploitation – A Fellowship View

Exploitation 3 Questions

1. **As we move from CCI to CCI+ what mechanisms would you suggest are put in place to ensure the teams who generated the CCI datasets have the opportunity to exploit these data to answer scientific questions. This should consider existing ECV projects and those potentially in CCI+.**

2. **Since one of the proposed CCI+ themes is dedicated to Cross-ECV activities can you please provide suggestions (ideally specific) of the types of projects that should be supported here - typical examples include CMUG, Sea Level Budget Closure, and a potential activity in support of RECCAP-2 (regional carbon cycle budgets). Such projects/suggestions should be multi-ECV, linked to a major international exercise or international research programme and/or aimed at tackling a key scientific question on climate/ climate change**

3. **During CCI an additional mechanism for exploitation was developed through the CCI Living Planet Fellowship scheme. It is intended that this scheme will form part of CCI+ so please can you consider what changes if any you would like to see in how this scheme works (required funding, project types, call frequency, length of contract).**

Mechanisms to ensure the teams exploit the CCI data to answer scientific questions.

This was a big deal and was done too well in CCI. Data providers need the chance to exploit the data or we end up as co-authors on a large number of papers using our data but rarely had the chance/time to do that exploitation ourselves.

Mechanisms

- Climate data provider group (CDPG) (similar to CMUG) to orient funding to current and future CCI groups to explore or improve CCI datasets and future cross-cutting CCI projects
- Encourage Cross-ECV exchange – ideally atmosphere-ocean-land-cryosphere interactions in context of CCI+, model-data interfaces, National/EU funding opportunities outside CCI+.
- Exchange between these projects by a separate CCI data exploitation meeting
- Producer driven ideas (generators of data sets know best the product quality)
    - 1) the generators of the data sets identify a scientific question to be addressed (GCOS reports or IPCC or WCRP challenges)
      2) the generators reach out to those colleagues who can contribute to the scientific reasoning.

Mechanisms to ensure the teams exploit the CCI data to answer scientific questions.

- Annual CRDPs WAS a good thing and drove improvements to the data (as did the competitive round-robin).
- Fellows attached (embedded in) CCI teams is a huge bonus and allows some data exploitation. Consider more of this.
- More emphasis on publications as a driver rather than documentation would encourage exploitation.

Funding

- Allow the data providers to propose exploitation projects which they then undertake themselves or propose to any interested researcher
- Funding of exploitation projects of the teams in addition to the Living Planet Fellowship projects.
- Funding for these studies should be applied from outside ESA, like EU. If the products are good enough, this shouldn't be a problem.
- Long-term, stable, dedicated funding for a) continuous generation of state-of-the-art ECVs product; b) for climate science and exploration of the CCI and CCI + variables/products – the latter funding would allow research time to work with the ECVs that have been generated and would drive some of the science generated by the research community.
- Some funding/time for "science", separated from the data production but involving the same teams would be ideal (maybe under the "optional work packages" framework).

Proposed Cross-ECV activities

Thematic studies - Carbon

Global carbon cycle re-analysis cross-CCI

- Need consistent data-based quantification of the global carbon cycle (Fig. 6.1 of IPCC AR5 is mostly based on models!).
  Both stocks and fluxes
- Data driven using empirical modelling or model-data integration approaches, and process models only where necessary (in case of un-observables).
- This relies on several existing CCI datasets as predictors for C fluxes:

  Ocean: SST, ocean colour, ice sheets, sea ice, sea level
  Land: land cover, soil moisture, fire, clouds (for radiation), (biomass, FAPAR)

  GHG as atmospheric constraint
- Includes inverse modelling e.g. use of the fire, land cover and ocean data to constrain/inform inversions.
- Outputs also for CMUG as benchmark datasets and for IPCC to improve the physical science basis

GCP RECCAP focus

Proposed Cross-ECV activities

Hotspots of Change

Intensive analysis in response to hotspot of change identification – regional and smaller taking multiple ECV datasets to understand processes e.g.

1. Dramatic loss of sea ice – wind, SST, circulation and impacts in atmosphere through feedback
2. Soil moisture anomalies – long term changes and relation to other ECVs – air temperature, human influences (LCLU, water use), circulation patterns (El Nino/La Nina)

Process Understanding - Interactions between ECVs

1. Focus on process understanding and potentially on tele-connections (space-time analysis). e.g. how is atmospheric CO2 related/responding to soil moisture and vice versa (Water-Carbon Cycle interactions) or ECVs which vary across seasonal time-scales, hence SSTs, sea-ice, soil moisture, sea-level, clouds.
2. Cross-ECV studies should probably expand the horizon of CCI. E.g. to study the soil-moisture precipitation feedback (which includes clouds) or the links of soil-moisture and snow on the Indian monsoon onset.
3. Permafrost would be a great one where we can also feed in CH4 data and actually perform some important studies that have climate relevance (comment not from Anna Maria!!).
4. Separation of the anthropogenic and biogenic effects on climate change

Proposed Cross-ECV activities

Targeted Satellite-In situ Efforts

Need for focus on in-situ measurements.

- In situ useful for validation of long-term data set generation and needs support
- Also in situ offer insights for local-to-regional chemical and physical processes and offer new ways to further exploit the data sets. Example of a past successful initiative has been the VOCALS-Rex (https://www.eol.ucar.edu/projects/vocals/rex.html)

Product Tailoring and Exploitation

- Use of CCI datasets to support other ESA (and non-ESA programmes) e.g. Support to Science or Value Added programmes (inc World Bank)
- Joint Collocation/ESA meeting to coordinate ESA Programmes
- Include tailoring of CCI datasets for specific more policy oriented uses e.g. formatting of data in appropriate manner (e.g sea level coastline protection responsibility – but are we close enough to the coast?)
- Data maturity is a big issue for exploitation. Need to ensure all datasets are available before cross-ECV started (and ideally all data to same resolution in space and time).
- Dedicated projects (or dedicated cross-ECV fellows) on specific themes it might make the joining-up of the data easier would help.
- Need to encourage C3S/CAMS data inclusion not limit to CCI ECVs.

Proposed Cross-ECV activities

CMUG Role

- Dedicated person in CMUG to get to grips with specific data and more useful engagement between CMUG and the ECVs would definitely help things.
- Having data in OBS4MIPS was always pushed as a massive deal from the CCI side BUT many ESM/climate modelling people, only seemed vaguely aware of what OBS4MIPS was and pretty much had no intention to use it if it wasn't something automatic in their analysis tools. Need more dedicated work and meetings to make sure that climate modellers want our data and are aware of it's value, etc would be good.
- Publishing the data better (citable DOI datasets, etc) rather than "projects". Need for a "CCI4CMIP6" or similar beyond Obs4MIPs would be very useful.

CCI Living Planet Fellowship scheme approach

LPF has worked really well.

Funding/Contract

- Fellowships should be 100% funded in order to allow focus on the fellowship (difficult to achieve across member states – different costs). Co-funding implies that other projects are followed concurrently BUT 'full-funding' does not necessarily alleviate this
- Funding in line with National Programmes e.g. NERC (3 years) but at same time also 2-year and 2-year call (shorter but more frequent)
- Opportunities for Fellowship extension associated to other project opportunities.
- More fellowships if possible to increase the number and network/mailing to continue links with past fellows (ELP Fellowship Alumni?).
- More money or longer time would both be great but it was enough time to dedicate to doing some science and the reporting/meetings weren't too onerous.
- Current conditions are quite difficult and the travel budget is too small to fund participation in all meetings. For travel, do not receive a fixed travel budget, but receive travel money for the mandatory meetings, and may apply for travel money for at least? one additional scientific meeting each year.
- Reporting shouldn't be done for the sake of reporting but to guide the project to the best possible outcome.

CCI Living Planet Fellowship scheme approach

Cross-ECV/collaborative aspects

- Encourage tandem-fellowships to improve collaboration (i.e. 2 fellows working on a common project in two countries/preferably also from central-eastern European countries to activate human resources).
- Multiple science locations with sufficient support (was in last time BUT no take up BUT should be continued).
- Design of co-funding mechanism, perhaps together with local host institutions and their needs (-> closer cooperation with universities and research centres toward a consolidated network of researchers -> Is a "ESA-sponsored professorship" a realistic and feasible concept in the future?)
- Encourage cross-ECVs fellowship projects.