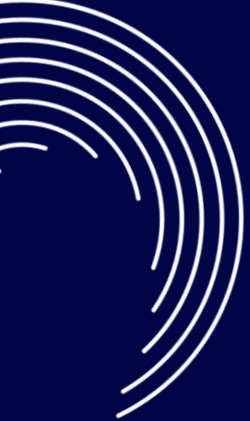


Future of CMIP and CMIP7

Helene Hewitt, Met Office (in-person) and John Dunne, GFDL (online) – CMIP Panel Co-chairs
Eleanor O'Rourke (in-person) – CMIP IPO Director

44th Session of the WCRP Joint Scientific Committee

Monday 8th May 2023, Climate Centre, Brussels

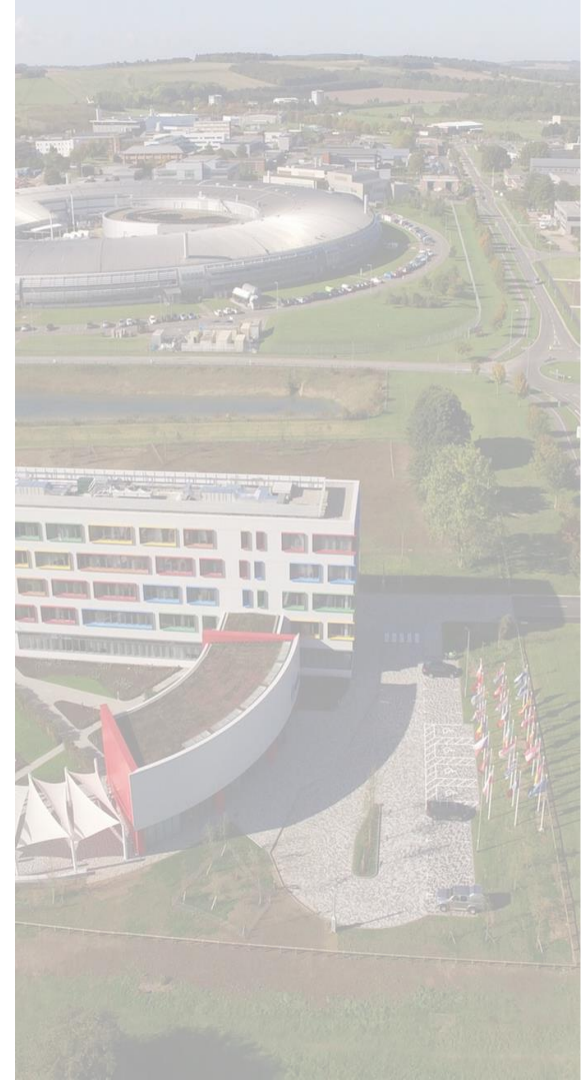


Progress and achievements over the last year



The CMIP International Project Office

- The CMIP IPO is now fully established.
- The IPO team consists of:
 - Director (Eleanor O'Rourke)
 - Programme Manager (Briony Turner)
 - Science & Communications Officer (Beth Dingley)
 - Technical Officer/Software Engineer (Daniel Ellis)
- A new CMIP website is now available at wcrp-cmip.org



New CMIP Panel structure and membership

CMIP Panel Co-Chairs

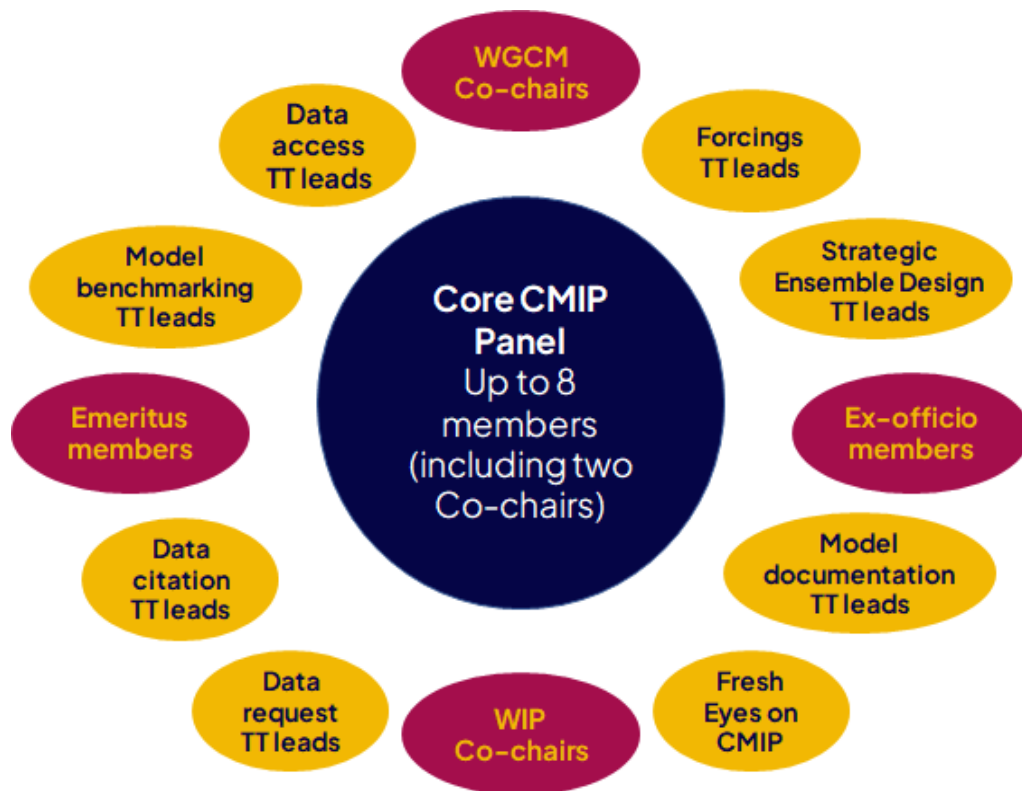


Helene Hewitt
Met Office, UK



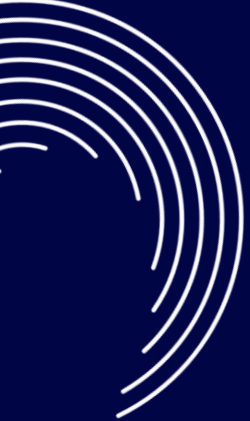
John Dunne
GFDL, USA

Two Panel spaces remain open to be filled by representatives of the global South



Progress in last year

- **Task Teams** – successful open call and establishment of seven task teams with a total of 72 members.
- **Future CMIP** – building the case and “offering” for continuation and evolution of CMIP and delivering against WCRP science objectives.
- **CMIP7 experimental design** – initial proposals developed and discussed with community.
- **Forcings update** – TT is establishing timeline for update of datasets with target of spring 2024.
- **Ensemble design** – TT is developing recommendation on experiment selection, emissions driven scenarios and ensemble size/selection.
- **Extensive community engagement** – drop in sessions, forcings and data planning surveys, EGU/AGU town halls and new website.

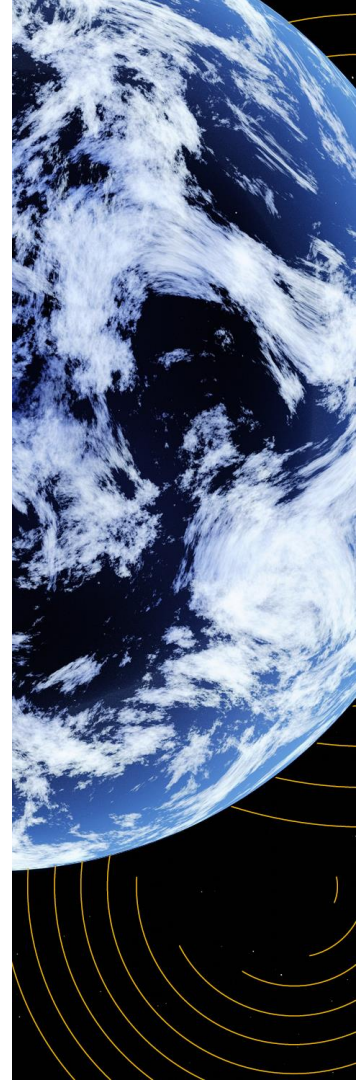


Future plans: CMIP7



The need for multi-model ensembles beyond CMIP6

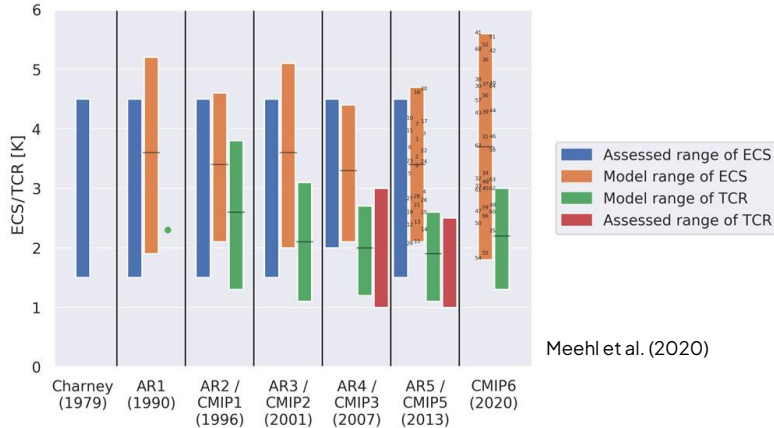
- CMIP provides a proven method for testing and validating climate models.
- Enhanced process understanding enabled by model fidelity improvements and increased complexity and resolution (e.g. emergent properties).
- Testing new hypotheses relating to climate change and projections based on new, updated, and extended scenarios. CMIP infrastructure enables this.
- New opportunities for observational comparison have emerged that motivate new diagnostics and MIPs (e.g. SWOT, EMIT, BGC Argo).
- CMIP is a key international climate service.
- An extended 'gap' in CMIP delivery could result in poorer quality climate information being used by the policy and downstream user community.



CMIP7 can address WCRP objectives

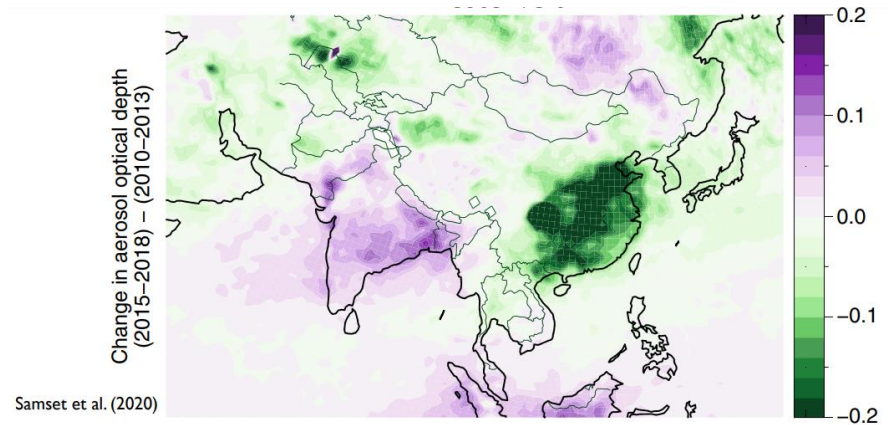
1 Fundamental understanding of the climate system

Equilibrium climate sensitivity (gregory method) and transient climate response



Help reconcile the observational refutation of high ECS models and their continued prevalence in the ensemble.

2 Prediction of the near-term evolution of the climate system



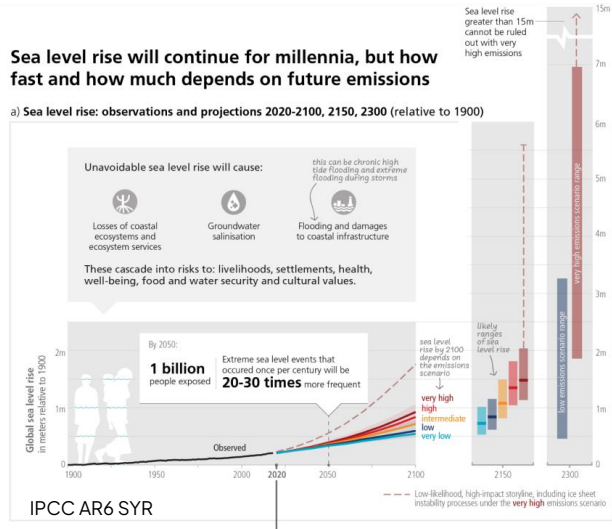
Assessing forcing uncertainty e.g., the potential to explore sensitivity to high aerosol forcing.

CMIP7 can address WCRP objectives

3 Long-term response of the climate system

Sea level rise will continue for millennia, but how fast and how much depends on future emissions

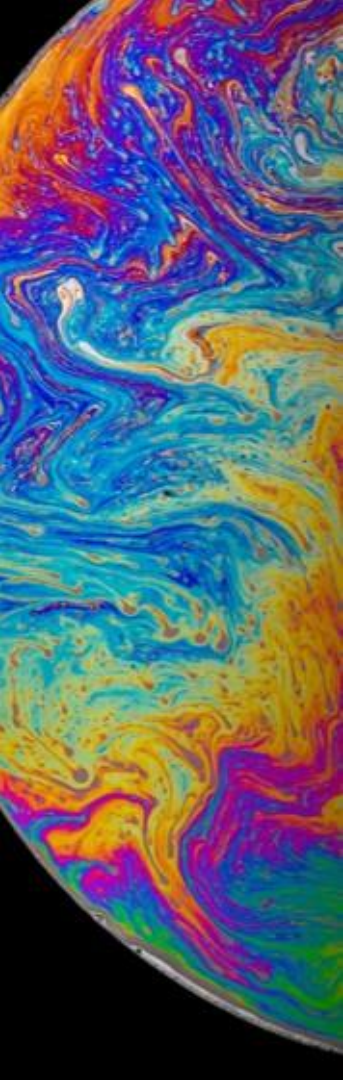
a) Sea level rise: observations and projections 2020-2100, 2150, 2300 (relative to 1900)



4 Bridging climate science and society



Focus beyond 2100 including overshoots and e.g., how to better constrain the “deep uncertainty” associated with sea level rise under $>3^{\circ}\text{C}$ warming.



Fundamental understanding of the climate system

CMIP7 can.....

- Help reconcile the observational refutation of high ECS models and their continued prevalence in the ensemble.
- Represent the evolution of the energy and carbon cycles from 1750.
- Given structural uncertainty, multi-model approaches are needed for robust understanding of phenomena as seen in new observations
- Emphasize larger ensembles that support detection and attribution of mitigation efforts such as energy efficiency and source transition.
- Help understand regional processes in the context of global projection.

Prediction of near term evolution of the climate system

CMIP7 can.....

- Continue to work on the signal to noise paradox.
- Assess forcing uncertainty – for example what is the range in aerosol versus GHG forcing uncertainty to achieve the same overall radiative forcing (e.g. $4.5\text{W}/\text{m}^2$) at 2100 and how does that impact the model spread?
- Potentially look to annual as well as multiannual timescales.





Long term response of the climate system

CMIP7 can.....

- Help determine how permafrost carbon and associated CO₂ and CH₄ emissions evolve over the coming centuries.
- Support understanding into likelihood of wider range of tipping points.
- Focus beyond 2100 including overshoots and in particular, for example how we better constrain the “deep uncertainty” associated with sea level rise under >3°C warming.

Bridging climate science and society

CMIP7 can.....

- Provide a bridge to climate services through a targeted experiment stream
- Aim to deliver seamlessly across IPCC WGI, WGII and WGIII.
- Deliver new experiments to resolve the viability and implications of proposed approaches for climate modification and Carbon Dioxide Removal.
- Provide information to support global adaptation and mitigation decisions through delivery of open access and standardised format data to a wide range of users.



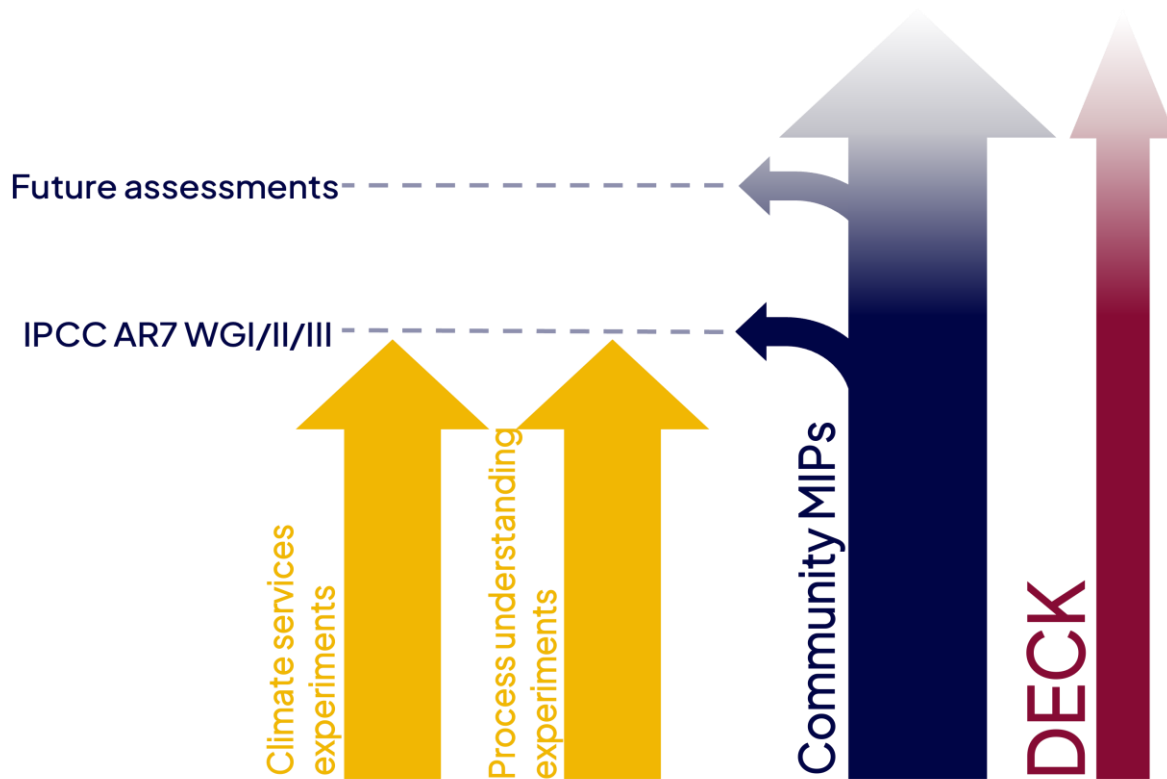


Planning for CMIP7

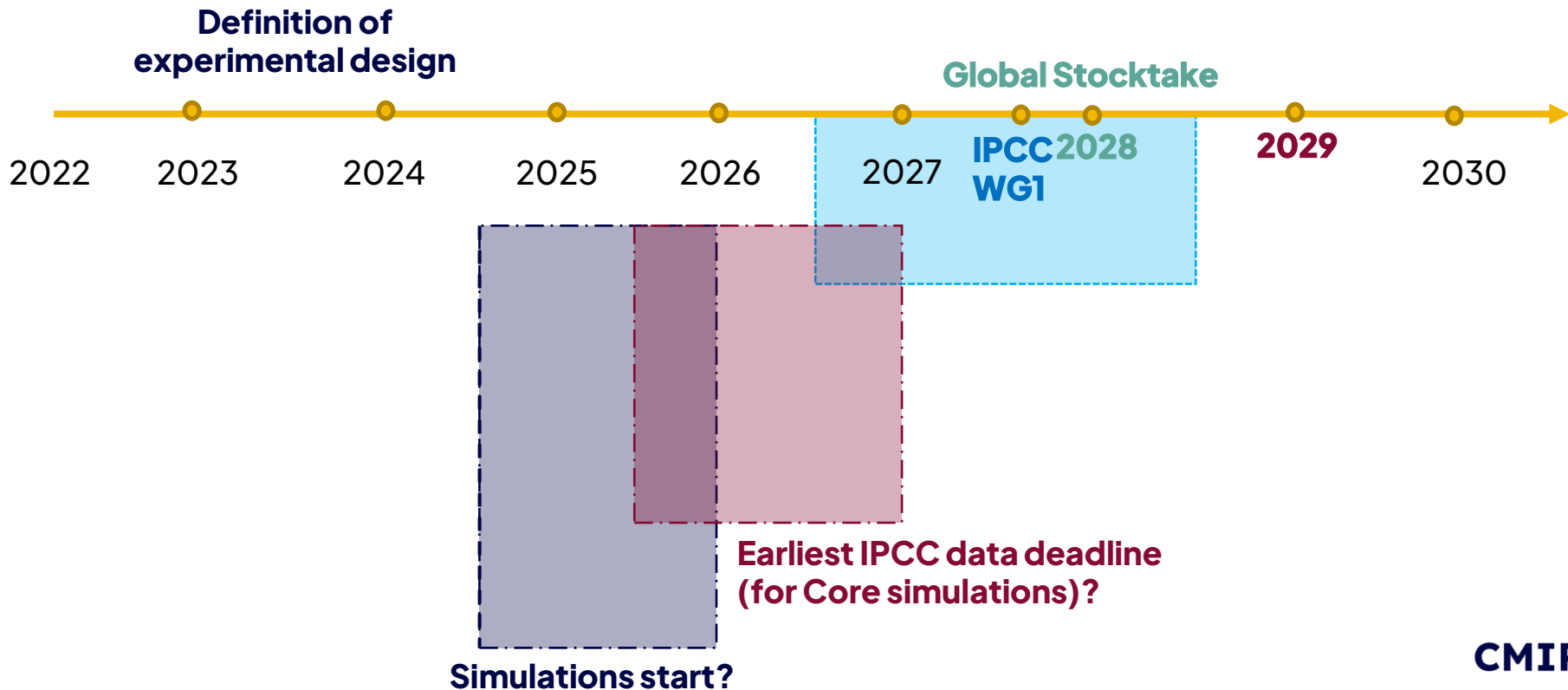
Work in progress!



Evolving CMIP7 structure



Building the CMIP7 timeline (not final!)

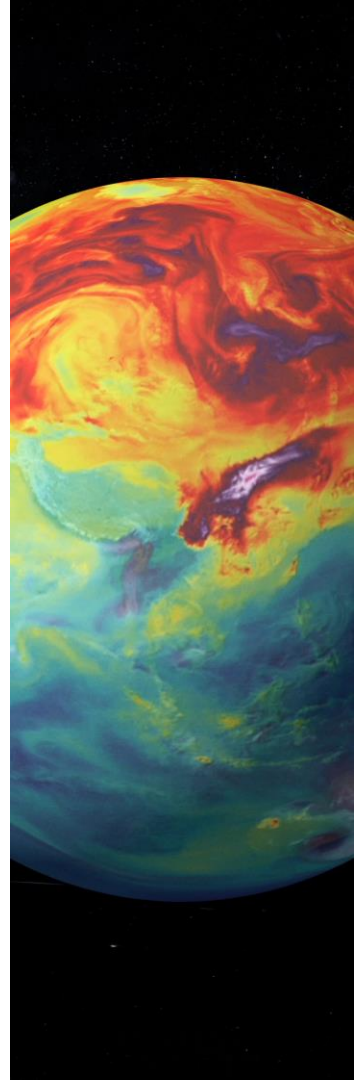


Addressing community concerns

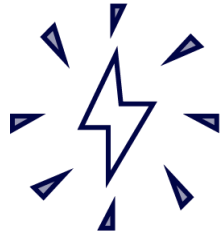
They said....	We have/are.....
CMIP6 = burden on modelling centres	Reducing numbers of experiments.
IPCC timelines causes pressure	Proposing streamlined experiments on IPCC timeline. Freeing up community driven MIPs
Need for greater focus on climate impacts and adaptation relevant experiments	Seamless delivery across WGI, WGII and WGIII via updated scenarios tailored for mitigation and impacts policy applications with timely delivery to facilitate downscaling
Need for operationalisation of critical elements	Established Task Team to deliver recommendations for sustainable delivery of near real time forcings.
Need sustainable funding of infrastructure to support improved, and more user friendly, data access.	Established task teams to deliver recommendations on requirements for future infrastructure and engaging with funders.
Continue and enhance active community input to the experimental design process.	Expanded CMIP Panel and established task teams through open calls plus rolling out extensive community engagement.
Nurture the future CMIP community and promote young and global South scientists.	Launched ECR group (Fresh Eyes on CMIP) and planning for CMIP Panel members from the global South.

Next steps

- Refining vision, goals and structure of CMIP7.
- Ongoing MIP engagement and registration.
- ScenarioMIP workshop: Pathway to next generation scenarios for CMIP7 and AR7
- Promoting global collaborative funding for CMIP science and infrastructure.
- Continuing and enhancing community engagement
- Enhancing global South and early career scientist engagement
- Work on carbon footprint of CMIP6/7



Fresh eyes on CMIP



New working group comprised of scientists, researchers and practitioners early in their career to sit alongside CMIP7 Task Teams.



Directly integrate the voices of ECRs into CMIP through participation in CMIP Panel, WIP, and Task Team meetings



Provide invaluable insight into the generation, access, and analysis of CMIP data

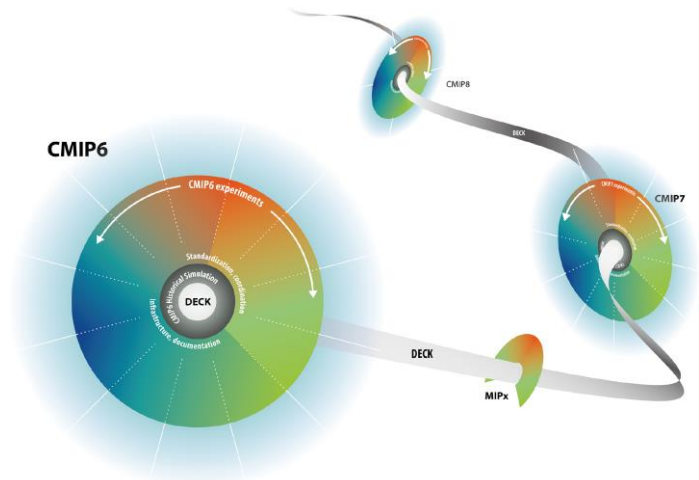
Watch the Fresh eyes on CMIP video [here](#)



Linkages with other WCRP activities



CMIP Infrastructure



- Leveraging the CMIP6 infrastructure that can benefit wider WCRP activities.
- New and ongoing MIP activities can request guidance and limited support.
- Enable responsive activities (e.g., CovidMIP).
- Support CMIP and wider activities' evolution and potential operationalisation of components (e.g., testing next generation forcings)
- Determining a sustainable funding model for CMIP infrastructure.

Joint activities



Joint sessions planned for ICRC-CORDEX 2023 and Open Science Conference.



The CMIP IPO provides secretariat support for the obs4MIPs steering group.



Active engagement with Lighthouse Activities (e.g., CMIP TT membership and community MIPs)

Top requests for WCRP Academy

- Close interaction with our new “Fresh eyes on CMIP” activity.
- Utilise the CMIP community! How can we help?



ClimateMatch
Academy

Fundamentals

- Python pre-course
- Climate System Overview

Climate data

- Ocean and Atmosphere Reanalysis
- Remote Sensing
- Paleoclimate

Climate future

- Climate Modelling
- IPCC I: physical basis
- IPCC II & III: socioeconomic basis

Climate response

- Good Research Practices
- Extremes and Vulnerability
- Adaptation and Impact

17-28
July
2023

APPLY NOW

All information on our website

academy.climatematch.io



Partnerships outside WCRP



Partnership activities



All the modelling centres (nearly 50), data nodes (more than 30), and funders who contribute to CMIP and the ESGF!



is-enes
INFRASTRUCTURE FOR THE EUROPEAN NETWORK
FOR EARTH SYSTEM MODELLING



Engagement with IPCC AR6 WG TSUs regarding author surveys and other CMIP relevant feedback with early interaction with incoming Chairs and TSUs in planning.



ESA is hosting the CMIP IPO, developing and providing systematic observation-based forcing datasets specifically tailored to CMIP requirements relevant to their current and future CCI projects, and CMIP focused Research Fellows.



Emerging issues and requests for JSC input



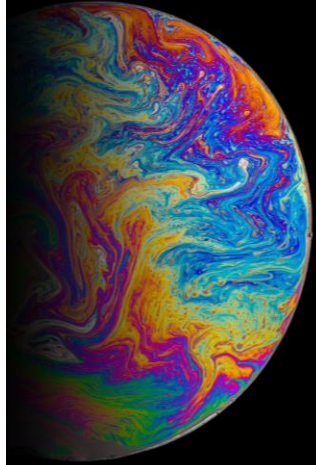


Recommendations/proposals

- Open discussion regarding ESMO governance to reduce duplication of effort and maximise synergies.
- Particular consideration to be given to role/scope of the WGCM Infrastructure Panel.
- High level WCRP support for promoting sustainable collaborative global funding for the infrastructure.
- Establishment of a WCRP Code of Conduct and complaints protocol providing a consistent approach across all WCRP activities.

CMIP evolution

- There remains considerable enthusiasm and interest from the community for CMIP.
- Focusing on the questions/challenges where the multi-model approach is essential.
- Working closely and proactively with the other parts of the model hierarchy/multiverse.
- Working towards a structure of sustainably funding and resource provision for CMIP infrastructure and activities for wider WCRP benefit.
- Responding to increasing demand from an ever wider and more diverse set of stakeholders and end users.





JSC requests

- Input on key scientific questions for CMIP7?
- How can we best interact with the other model hierarchy communities for maximum benefit?
- Ideas for developing global collaboration towards sustainable funding for CMIP infrastructure that can be rolled out across WCRP?
- Suggestions for new core CMIP Panel members from global South?
- Suggestions for key partners to engage with?



Questions?

Please contact cmip-ipo@esa.int with any questions or feedback
and more information can be found at wcrp-cmip.org

