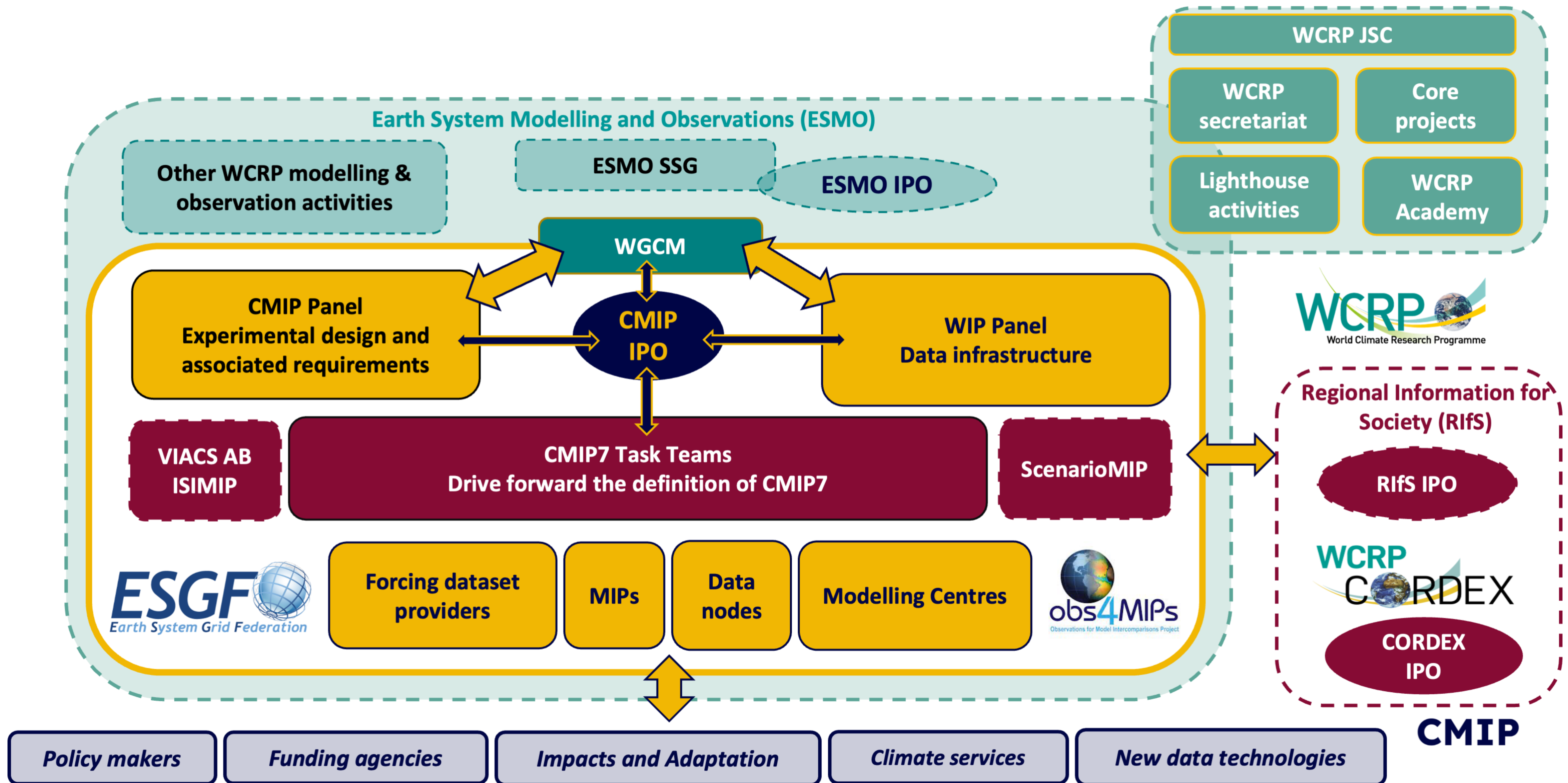


**Pathway to regular and sustained delivery of climate forcing datasets workshop: 28-31 October 2024, ECMWF Reading**

# **Plenary 2: What is happening now? – the CMIP7 experience**

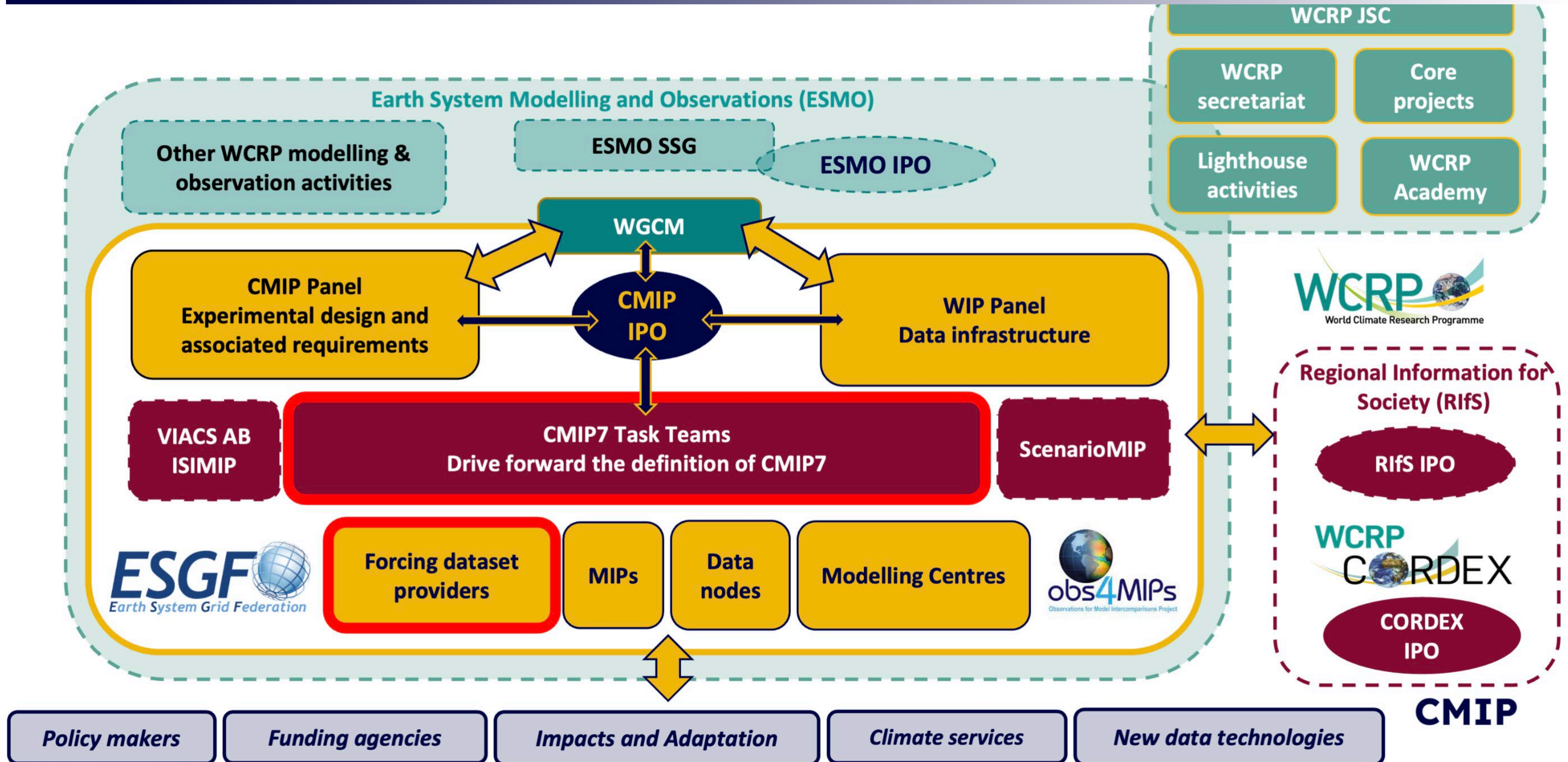
**Chairs: Eleanor O'Rourke**

# Organizational structure - where CMIP and the Forcing Task Team (TT) fits





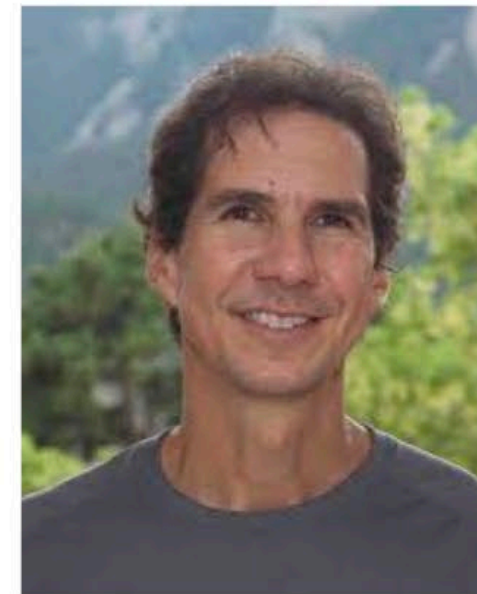
# Organizational structure - where CMIP and the Forcing Task Team (TT) fits





# The CMIP Forcings Task Team members

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# Map of TT members and stakeholders



**CMIP**

<b>Forcing Dataset</b>	<b>Leads</b>	<b>Funding Status</b>
Anthropogenic SLCF emissions + CO <sub>2</sub> emissions	Steve Smith, Rachel Hoesly	Funded (DoE)
Open Biomass Burning emissions	Margreet van Marle, Guido van der Werf	Unknown
Land use	Louise Chini	NASA/base funding
GHG concentrations	Zeb Nicholls, Malte Meinshausen	IPO bridging funding
Stratospheric volcanic SO <sub>2</sub> emissions and aerosol properties	Thomas Aubry, Anja Schmidt	IPO bridging funding
AMIP Boundary Forcing	Paul Durack	Funded (DoE)
Ozone, nitrogen deposition	Michaela Hegglin, Douglas Kinnison, David Plummer	ESA
Solar	Bernd Funke	Horizon Europe
Aerosol optical properties/MACv2-SP	Stephanie Fiedler	Horizon Europe
<sup>13</sup> CO <sub>2</sub> and <sup>14</sup> CO <sub>2</sub>	Heather Graven	Unknown

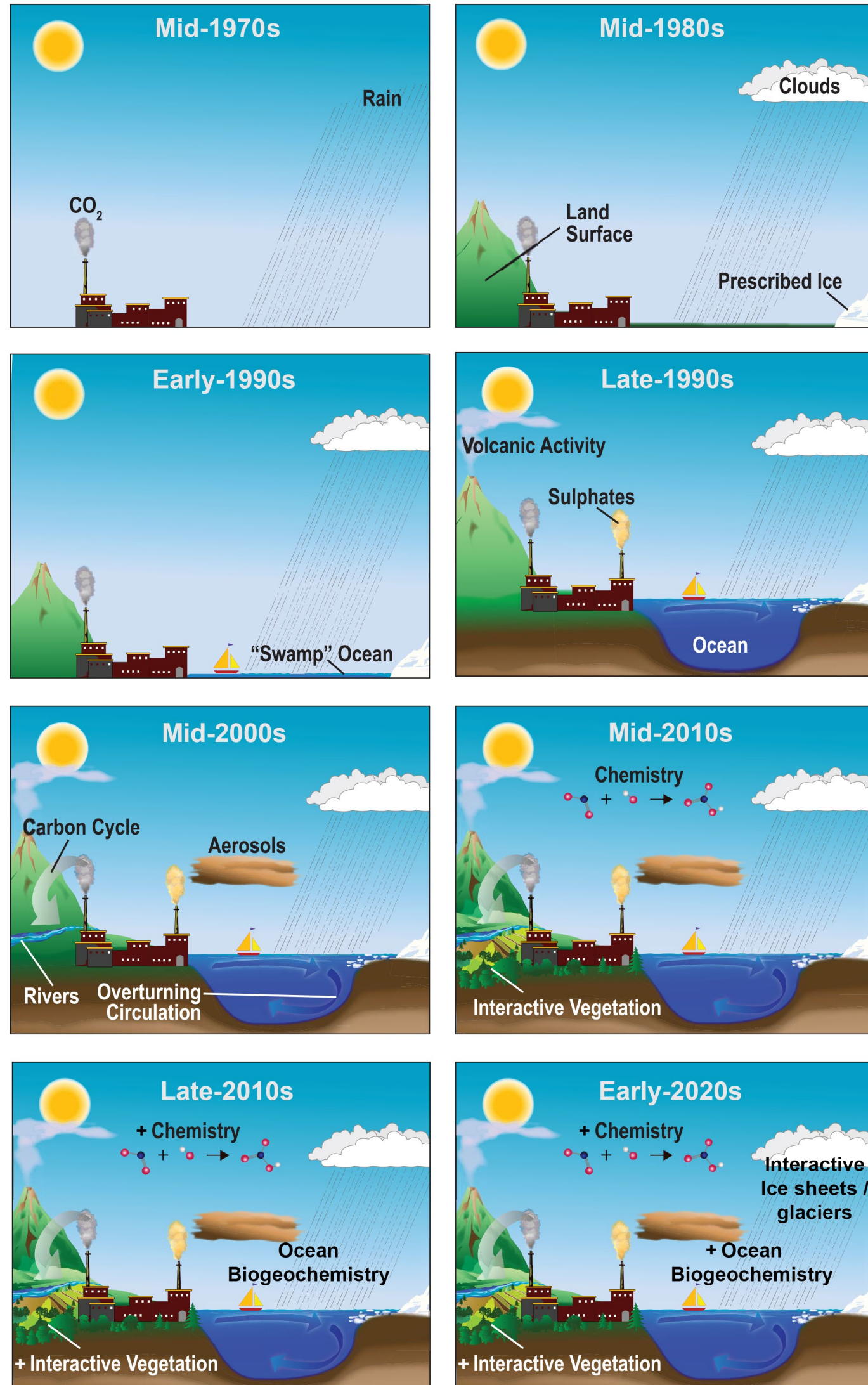


## Forcings Task Team Goals

1. Evaluate and document the CMIP6-era forcing collection and identify issues, coverage gaps, or omissions through an open community survey.
2. Identify forcings for current and next generation climate models in support of CMIPs.
3. Work with teams to identify, develop, document and deliver an updated and expanded forcing collection to near real time.
4. Coordinate with modelling groups to define and perform routine experiments for evaluation, generate simulations and gather feedback with these new forcing collections.



# Forcing has responded to experiment and model complexity



Durack et al.: MIP forcing: Review and future

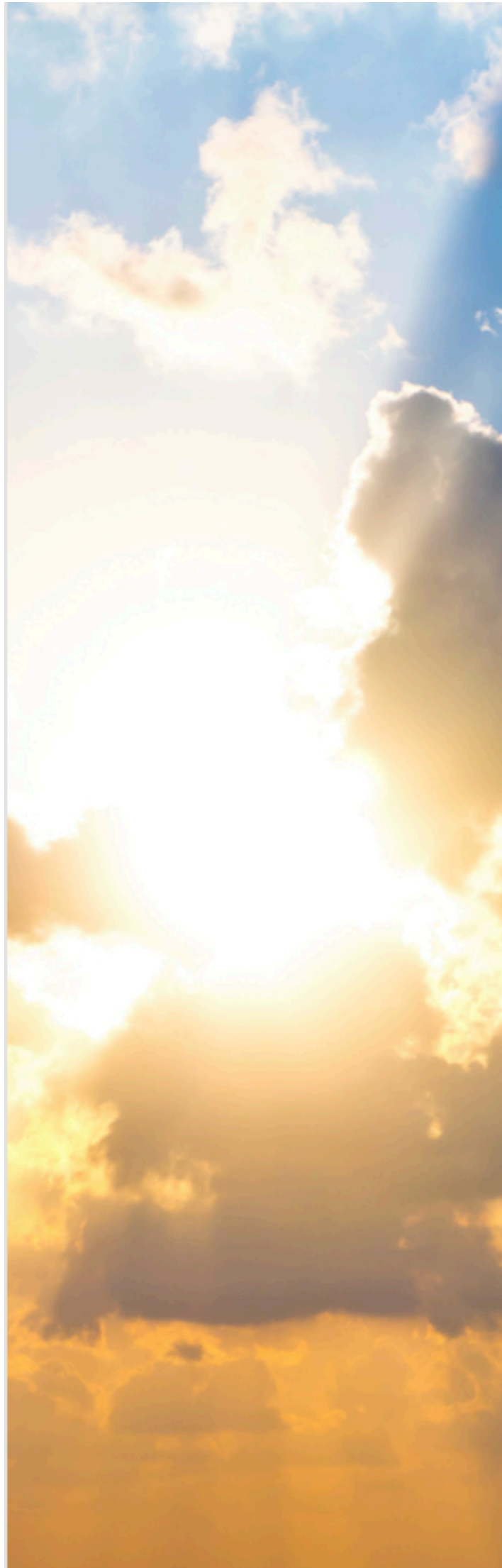
Table 1. Climate forcing across the Model Intercomparison Project (MIPs) phases, through time

Forcing/MIP era	AMIP1	AMIP2	CMIP1	CMIP2	CMIP3	CMIP5	CMIP6	CMIP7
SSTs and sea ice (amip exp.)	1979-1988	1979-1996	-	-	1979-2002	1979-2008	1979-2014	1979-2021
Greenhouse gases	CO <sub>2</sub> 345 ppm (fixed)	CO <sub>2</sub> 345 ppm, CH <sub>4</sub> 1650 ppbv, N <sub>2</sub> O 306 ppbv (fixed)	fixed	fixed and 1% idealized	Y, 5 species	Y, 9 species	Y, 46 species	Y, 46 species
Ozone	-	climatology	-	fixed	Y, 1/2 groups	Y	Y	Y
Sulphate aerosols (in/direct)	-	climatology	-	-	Y, 1/2 groups	Y, 2/5 groups	Y	Y
Black/organic carbon	-	-	-	-	Y, 1/2 groups	Y, 4/5 groups	Y	Y
Land use change	-	active model component	-	-	Y, 1/3 groups	Y, 3/4 groups	4 states	?
Solar irradiance	1365 Wm <sup>-2</sup> (fixed)	1365 Wm <sup>-2</sup> (fixed)	fixed	fixed	Y, 1/2 groups	Y, 9/10 groups	Y	Y
Volcanic aerosols	-	-	-	-	Y, 1/2 groups	3 variants, 9/10 groups	Y	Y
Nitrogen deposition	-	-	-	-	-	-	4 species	?
Total varying forcings	2	2	0	1 (idealized)	~15	~24	~63	?
Data delivery	FTP	FTP	FTP, unspecified	FTP, unspecified	unspecified	unspecified	input4MIPs ESGF	input4MIPs ESGF

Note: estimates for CMIP3 and CMIP5 modelling group forcing data usage reproduced from Santer et al. (2007), and Santer et al. (2013) respectively



# Where we were – June 2023 – 1st Forcings Drop-in



## CMIP7 timeline update

Discussion continues on the CMIP7 timeline development. In terms of aspects aligning with IPCC, there can be no clear definition until engagement with the new IPCC leadership has taken place and their timeline is confirmed. In terms of community readiness we estimate:

- **Historical forcings:** update expected mid 2024 and revised in 2026
- **Scenario forcings:** unlikely before early 2026
- **Data request:** expected early to mid 2025
- **Modelling centres:** consulting on expectations for when new models will be ready.
- **ESGF nodes:** ESGF or other platforms needed to serve the data. Ongoing discussions.
- **CMIP7 description paper:** submission in early 2024.



# Where we are - October 2024 - 2nd Forcings Drop-in

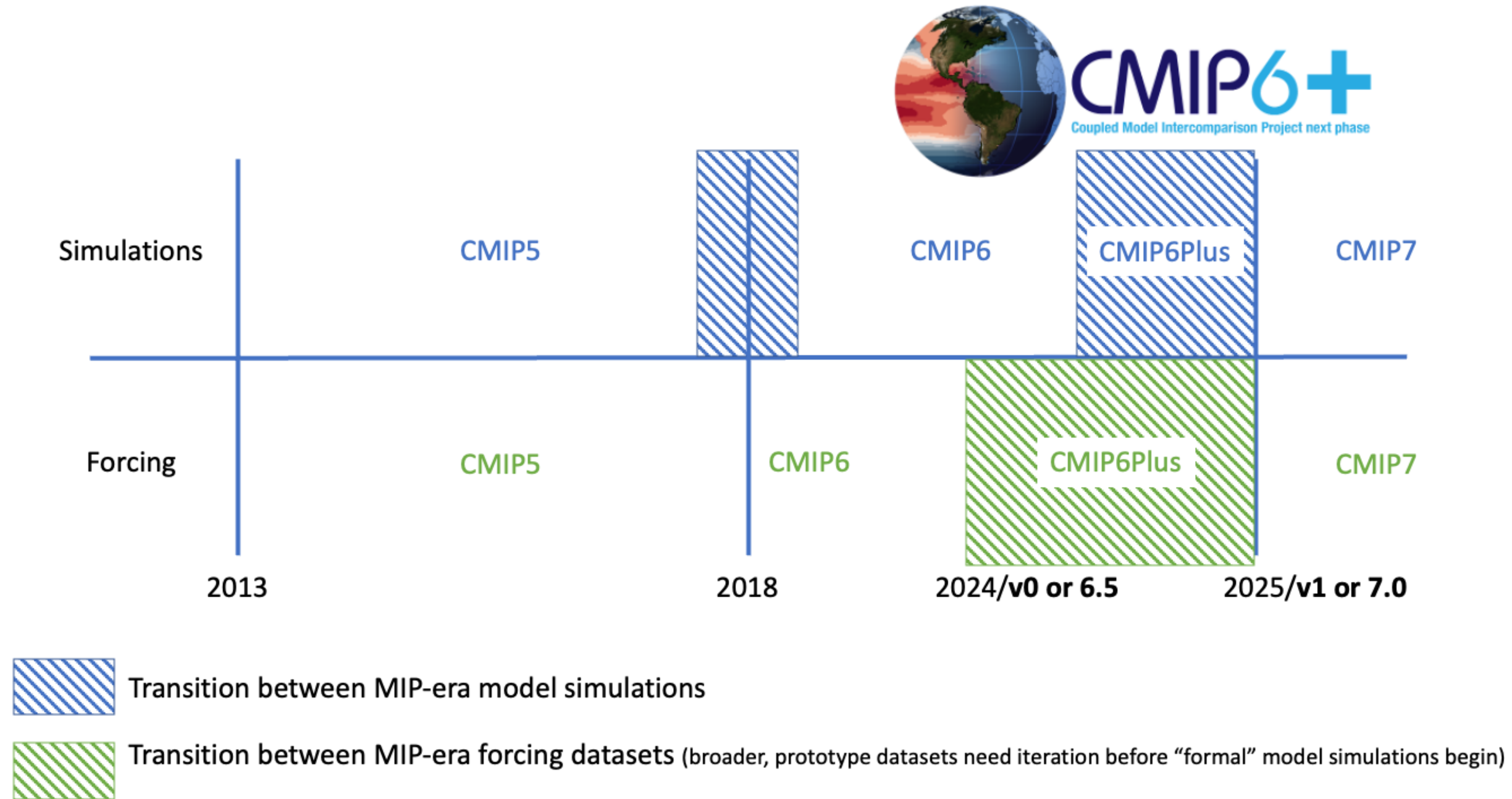
Discussion continues on the CMIP7 timeline development. In terms of aspects aligning with IPCC, there can be no clear definition until engagement with the new IPCC leadership has taken place and their timeline is confirmed. In terms of community readiness we estimate:

- **Historical forcings:** ~~update expected mid 2024 and revised in 2026~~  
6 (almost 7) of 10 “v0” datasets available Oct ‘24, revised “v1” ~March 2025
- **Scenario forcings:** ~~unlikely before early 2026~~  
planned availability ~June 2025
- **Data request:** expected early to mid 2025
- **Modelling centres:** consulting on expectations for when new models will be ready.
- **ESGF nodes:** ESGF or other platforms needed to serve the data. Ongoing discussions.
- **CMIP7 description paper:** submission in early 2024.



# The grand plan - build forcings, test, implement CMIP7

A forcing evolution following the continuous CMIP DECK paradigm



**v0/CMIP6Plus** - datasets available for testing and evaluation

**v1 /CMIP7** - updates in early 2025 for use in CMIP7 piControl and historical experiments



## Metadata and File Standardization

github.com/PCMDI/input4MIPs\_CVs

input4MIPs\_CVs

15 Pull requests 2 Discussions Actions Projects Wiki Security Insights Settings

input4MIPs\_CVs Public Edit Pins Unwatch 8

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main 6 Branches 18 Tags Go to file Add file Code

znichollscr Merge pull request #148 from PCMDI/update-ceds-delivery d943540 · 17 hours ago 456 Commits

.github	Add job to CI	yesterday
CVs	Update HTML	last week
Database	running after esgf-input4MIPs.json updated	last week
changelog	Flx up CHANGELOG	18 hours ago
docs	Update expected delivery date	18 hours ago

## Forcing Dataset Documentation

### Dataset overviews

Here we provide an overview of the datasets provided within input4MIPs. These overviews do not replace or duplicate the papers and documentation provided by the dataset providers elsewhere. Instead, they are intended to supplement these sources of information with information that is targeted at users of input4MIPs data (who can be very different from users who get this data via other means), in particular models participating in CMIP.

1. [Anthropogenic short-lived climate forcer \(SLCF\) and CO<sub>2</sub> emissions](#)
2. [Open biomass burning emissions](#)
3. [Land use](#)
4. [Greenhouse gas concentrations](#)
5. [CO<sub>2</sub> isotopes](#)
6. [Stratospheric volcanic SO<sub>2</sub> emissions and aerosol optical properties](#)
7. [Ozone concentrations](#)
8. [Nitrogen deposition](#)

## Data validation #

## Data Validation

This is not strictly a step that you, as a data producer, have to perform. However, it will be performed, so you will have to pass validation eventually (the iteration time is just slower if you don't run the validation yourself).

For validating the data, we use [input4mips-validation](#). This checks the data's metadata against the CVs, makes sure that the data can be loaded with the common python tools [xarray](#) and [iris](#) and also runs the data through the [cfchecker](#). Any issues that are found will be reported in the data upload issue that you made previously.

If you wish to run this yourself, please follow [the how-to guide for preparing files for publication on ESGF](#). If you have any issues, please [raise them in the input4MIPs validation repository](#).

## Get your data to PCMDI

The first step here is to [create a new issue in this repository](#) and tag [@durack1](#) and [@znichollscr](#) so that they know that the data is being uploaded.

In terms of actually uploading the data, there isn't a strict process for this right now. There are a few different options, which we list below in order of preference:

## Feedback, iteration, updates

[https://github.com/PCMDI/input4MIPs\\_CVs/discussions](https://github.com/PCMDI/input4MIPs_CVs/discussions)

nput4MIPs\_CVs

15 Pull requests 2 Discussions Actions Projects Wiki Security Insights Settings

Welcome to input4MIPs Discussions!  
Announcements · durack1

is:open Sort by: Latest activity Label Filter: Open New discussion

Categories: View all discussions, Announcements, General, Ideas, Polls, Q&A, Show and tell

Discussions:

- UofMD-landState-3-0: land use data set (slm7826 started last week in General) 11 replies
- DRES-CMIP-BB4CMIP7-1-0: biomass burning emissions (armanpouyaei started last week in General) 6 replies
- CEDS Anthropogenic ("SLCF") Emissions (ssmithClimate started 19 hours ago in General) 0 replies
- CR-CMIP-0-3-0: greenhouse gas concentrations - feedback, observations and issues (znichollscr started 2 days ago in General) 1 reply



## **Work in progress – all pretty much in parallel**

- Testing and evaluation of datasets, iteration to address issues and update data
- Coordination on datasets identified as modeling center needs for CMIP7
- Data documentation
- Finalize CMIP7 piControl protocol
  
- ScenarioMIP Harmonization
- Production of Scenario Forcing Datasets



# Thank You



# TT Timeline in April 2024

- **June 2024:** v0 historical datasets finalized 1850–2021, ESGF input4MIPs published and v6.5 “collection” (serving all DECK experiments) defined; Ozone/nitrogen WACCM? simulations begin, data in ~3 months
- **July 2024:** forcings drop-in right after full collection available (communicate to modelling groups)
- **July – December 2024:** modelling group feedback and iterations on v0 historical datasets
  - Peculiar/unexplained dataset issues identified, including problems in units, spatial and temporal distribution
  - Modelling groups obtain and begin testing (most likely in AMIP-mode; quantify ERF, tune, etc)
  - FEOC evaluate the data; compare to previous CMIP forcing datasets
  - External community invited to access and evaluate datasets (FireMIP community, VolMIP, PMIP, etc)
  - Temporal extensions past December 2021 if available/possible
- **January 2025:** revised v1 historical datasets updated and published into input4MIPs; v7.0 “collection” frozen for CMIP7 AR7 FastTrack
- **February 2025:** piControl climatologies/state files (volcanic, solar, [and ozone which has a solar dependency], ?) generated and published in input4MIPs

15 • **March 2025:** v7.0 “collection” piControl datasets available for use

• **May 2025:** ScenarioMIP harmonization process begins



# Steps involved in forcing data provision in support of CMIP

