

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

# **Session 1: CMIP7 DECK**

**Chairs: Paul J. Durack, Vaishali Naik**

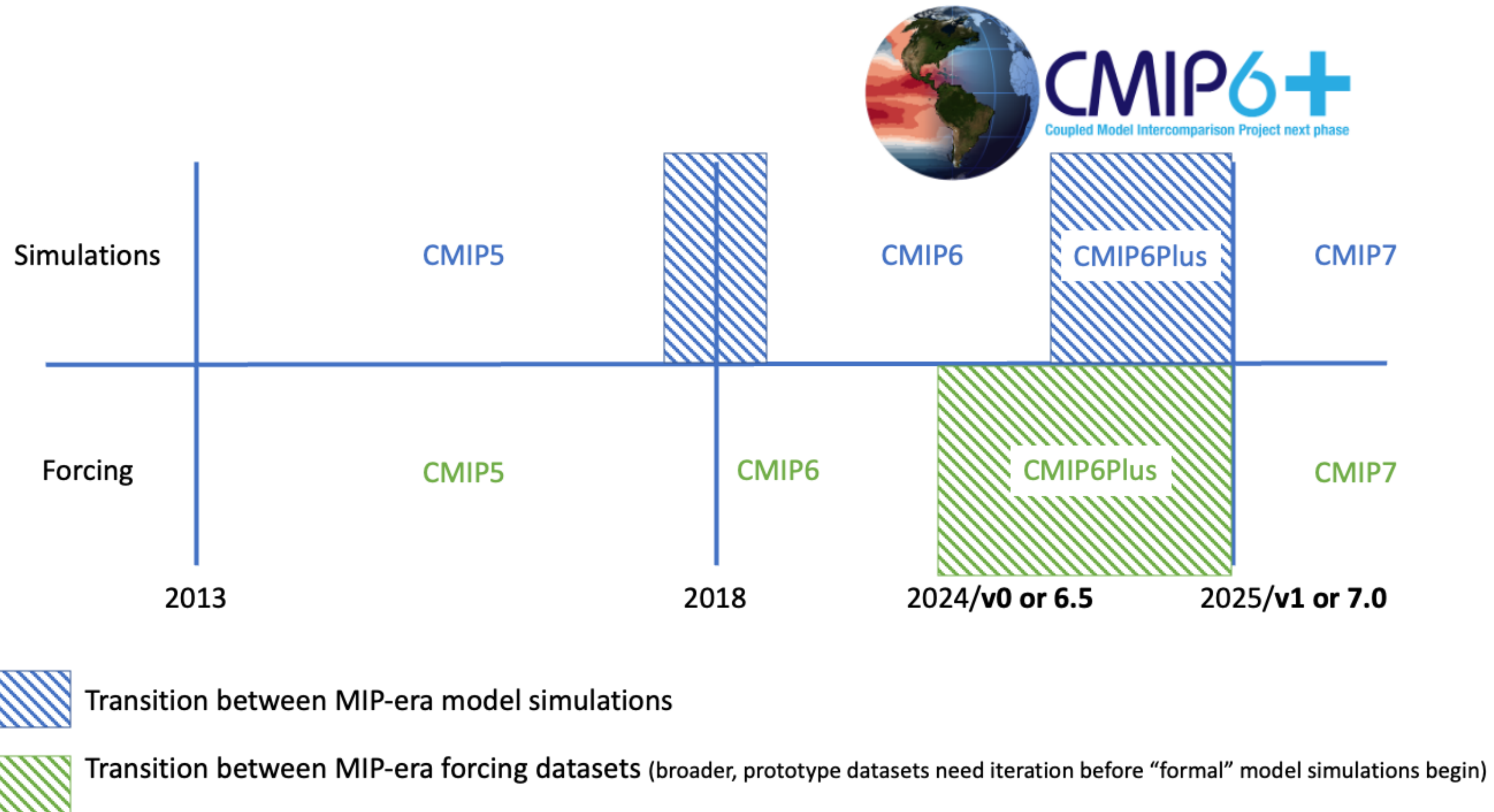
**THANK YOU!**

# Workshop goals

- Part 1 (Mon, Tues) – CMIP7 where we're at
  - Status of current v0 data
    - Feedback
    - Known issues
  - Plans for v1 data
    - Temporal extensions
    - Respond to feedback (GitHub discussions)
    - Documentation
  - Harmonization with ScenarioMIP/IAMs
- Part 2 (Wed, Thu) – Beyond CMIP7
  - Moving toward regular forcing updates
  - Ascertaining dependencies
  - Ascertaining future needs and who
  - Identifying funding pathways

# The grand plan

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

# Where we are (as of 22 Oct 2024)

## Forcing datasets availability

The Climate Forcings TT is working to update the following CMIP DECK forcing suite:

| Data set | Forcing dataset   | Status   | Expected ESGF publication                                  |
|----------|---|--|--|
| 1        | <a href="#">Anthropogenic short-lived climate forcer (SLCF) and CO2 emissions</a> | Bugs being fixed, data in preparation                                | Expected: October 2024                                     |
| 2        | <a href="#">Open biomass burning emissions</a>                                    | Preliminary dataset available  | <a href="#">Available: v1.0 (1750-01 to 2022-12)</a>       |
| 3        | <a href="#">Land use</a>  | Preliminary dataset available  | <a href="#">Available: v3.0 (0850 to 2024)</a>             |
| 4        | Greenhouse gas historical concentrations  | Preliminary dataset available  | <a href="#">v0.3.0 (0001-01 to 2022-12) available</a>      |
| 5        | Stratospheric volcanic SO2 emissions and aerosol optical properties               | Preliminary dataset available  | <a href="#">v1.1.3 available (1750-01 to 2023-12)</a>      |
| 6        | Ozone concentrations  | Depends on 1, 2, 4, 5 and 8  | ~January 2025; 3 months after dependent datasets           |
| 7        | Nitrogen deposition   | Depends on 1, 2, 4, 5 and 8  | ~January 2025; 3 months after dependent datasets           |
| 8        | <a href="#">Solar</a>   | Preliminary dataset available  | <a href="#">Available: v4.4 (1850-01-01 to 2023-12-31)</a> |
| 9        | <a href="#">AMIP sea-surface temperature and sea-ice boundary forcing</a>         | Final v1 dataset available. v2 dataset awaiting HadISST v2.4 release | <a href="#">v1.1.9 (1870-01 to 2022-12) available</a>      |
| 10       | Aerosol optical properties/MACv2-SP   | Depends on 1, test dataset being produced in the meantime            | ~November 2024; Expected a month after dependent datasets  |

Please check the table above for the availability of datasets or on [input4MIPs ESGF Project](#). Once datasets become available, this website will be updated with the latest information, documentation, and download links. When available, the future CMIP7 version 1 data will be identified for modelling groups to begin their CMIP7 AR7 Fast Track simulations.

### Issues to-date:

#### *Published, fixed and replaced*

SOLARIS-HEPPA-CMIP-4-2 (retracted)  
SOLARIS-HEPPA-CMIP-4-3 (retracted)

#### *Issues caught before publication*

CEDS-CMIP-2024-07-08  
CR-CMIP-0-2-0  
DRES-CMIP-BB4CMIP7-1-0 (pre-release)  
SOLARIS-HEPPA-CMIP-4-1  
UofMD-landState-3-0 (pre-release)  
UOEXETER-CMIP-0-1-0  
UOEXETER-CMIP-1-1-2

#### *Plus much iteration before getting anywhere near publishing on input4MIPs ESGF project*

[https://input4mips-controlled-vocabularies-cvs.readthedocs.io/en/latest/database-views/input4MIPs\\_source-id\\_CMIP6Plus.html](https://input4mips-controlled-vocabularies-cvs.readthedocs.io/en/latest/database-views/input4MIPs_source-id_CMIP6Plus.html)

[https://input4mips-controlled-vocabularies-cvs.readthedocs.io/en/latest/database-views/input4MIPs\\_delivery-summary\\_CMIP6Plus.html](https://input4mips-controlled-vocabularies-cvs.readthedocs.io/en/latest/database-views/input4MIPs_delivery-summary_CMIP6Plus.html)

# Where

## Forcing datasets

The Climate Forcings TT is working

- 1 **Anthropogenic short-lived forcer (SLCF) and CO2 en**
- 2 **Open biomass burning en**
- 3 **Land use**
- 4 Greenhouse gas historical concentrations
- 5 Stratospheric volcanic SO and aerosol optical proper
- 6 Ozone concentrations
- 7 Nitrogen deposition
- 8 **Solar**
- 9 **AMIP sea-surface temper sea-ice boundary forcing**
- 10 Aerosol optical properties

Home

9 results found for input4MIPs

Query String: (mip\_era = CMIP6Plus) AND (institution\_id = SOLARIS-HEPPA)

CMIP6Plus x SOLARIS-HEPPA x Clear All

| Cart                     | Dataset ID   | Files | Total Size | Version  | Download Options                      | Globus Ready                        |
|--------------------------|--|-------|------------|----------|---------------------------------------|-------------------------------------|
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-2.atmos.fx.multiple.gn<br><b>IMPORTANT! This dataset has been retracted and is no longer available for download.</b>  | 1     | 233.94 KB  | 20240718 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-2.atmos.day.multiple.gn<br><b>IMPORTANT! This dataset has been retracted and is no longer available for download.</b> | 1     | 2.33 GB    | 20240718 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-2.atmos.mon.multiple.gn<br><b>IMPORTANT! This dataset has been retracted and is no longer available for download.</b> | 1     | 31.5 MB    | 20240718 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-4.atmos.day.multiple.gn   | 1     | 2.33 GB    | 20241018 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-4.atmos.fx.multiple.gn  | 1     | 236.11 KB  | 20241018 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-4.atmos.mon.multiple.gn   | 1     | 31.46 MB   | 20241018 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-3.atmos.fx.multiple.gn<br><b>IMPORTANT! This dataset has been retracted and is no longer available for download.</b>  | 1     | 234.6 KB   | 20240730 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-3.atmos.day.multiple.gn<br><b>IMPORTANT! This dataset has been retracted and is no longer available for download.</b> | 1     | 2.33 GB    | 20240730 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> | input4MIPs.CMIP6Plus.CMIP.SOLARIS-HEPPA.SOLARIS-HEPPA-CMIP-4-3.atmos.mon.multiple.gn<br><b>IMPORTANT! This dataset has been retracted and is no longer available for download.</b> | 1     | 31.46 MB   | 20240730 | wget <input type="button" value="↓"/> | <input checked="" type="checkbox"/> |

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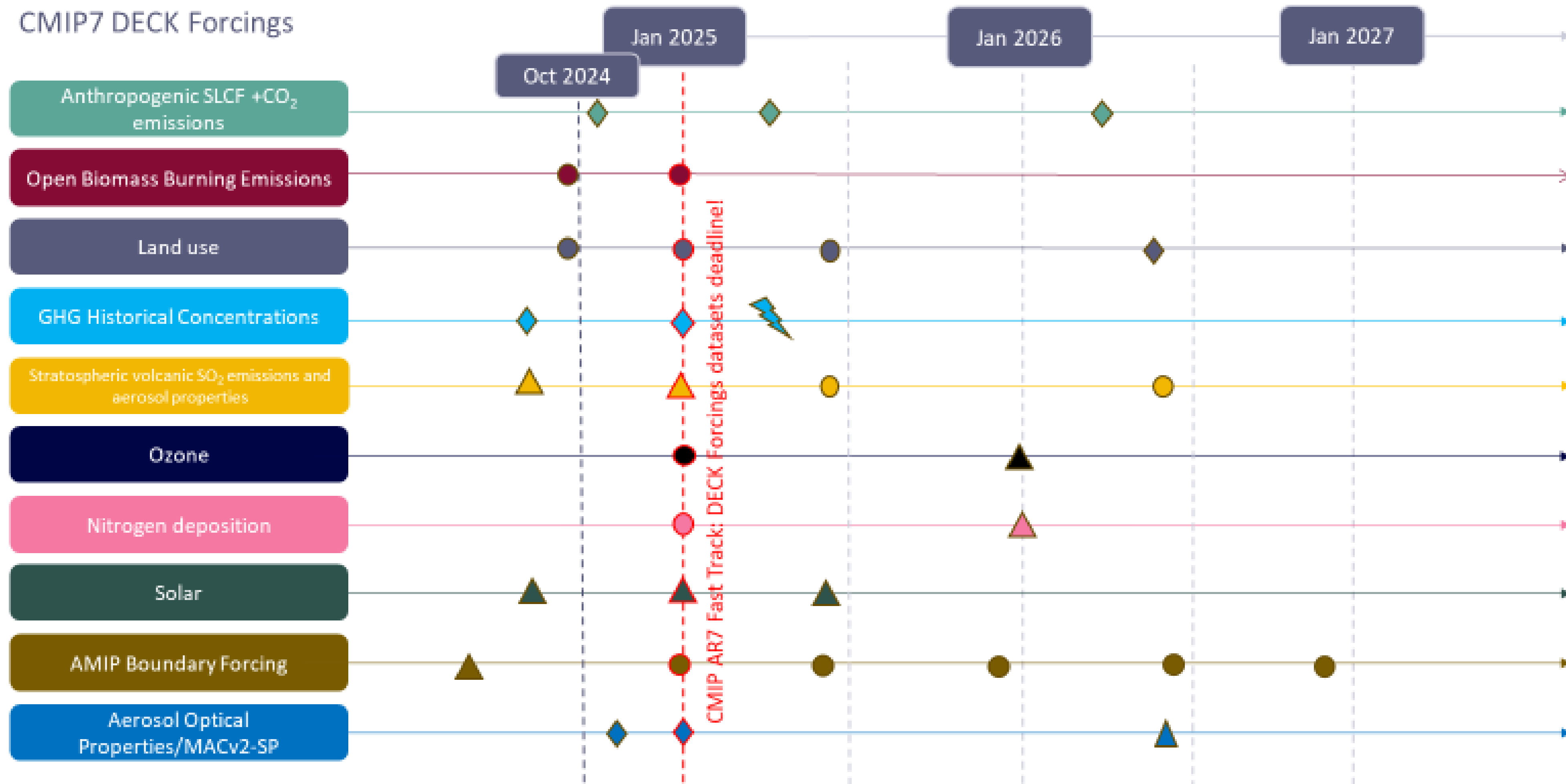
Please check the table above for the datasets that will be updated with the version 1 data will be identified for modelling groups to begin their CMIP7 AR7 Fast Track simulations.

[https://input4mips.euro.earthdata.nasa.gov/en/latest/database-views/input4MIPs\\_delivery-summary\\_CMIP6Plus.html](https://input4mips.euro.earthdata.nasa.gov/en/latest/database-views/input4MIPs_delivery-summary_CMIP6Plus.html)

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# Where we are

## CMIP7 DECK Forcings



◆ Update = full timeseries is updated; ● Extension = updates from 2014 (or latest release) are appended;  
▲ New = the full timeseries is based on a new methodology ⚡ Operational available

# Identifying observational network dependencies relevant for Session 6

Example for GHGs/ODS

## Raw observations used









- AGAGE network– Sponsored by NASA but with participation from multiple institutes around the world
  - We have links with some key people, but we could definitely do a better job of explaining what we need and giving AGAGE visibility in our outputs
  - Participating institutes <https://tolnet.larc.nasa.gov/missions/agage/about/participating-institutions>
- NOAA global monitoring laboratory – NOAA
  - We have links with some key people, but we could definitely do a better job of explaining what we need and giving NOAA visibility in our outputs
  - Monitoring sites all over the world, unclear how exactly they're funded
- HadCRUT5 (or other temperature observations) – UK Met Office
  - No link (would be surprised if [HadCRUT](#) team knew we used their data apart from our citations). We could definitely give better visibility in our outputs.
  - Ice core projects (less relevant for live updates)
- Ice core projects (less relevant for extensions)
  - CSIRO Law Dome Ice Core
  - European project for ice coring in Antarctica
  - NEEM ice coring project (now finished, not sure if there is a follow up)


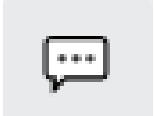


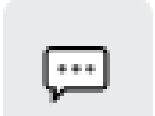









# Additional Information and Recommendations: Feedback on Forcings

 **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
-  1  **UOEXETER-CMIP-1-1-3: Volcanic optical properties and SO2 emissions**  
[shipengzhang](#) started 4 days ago in [General](#)  0
  -  1  **UofMD-landState-3-0: land use data set**  
[slm7826](#) started 4 days ago in [General](#)  2
  -  1  **DRES-CMIP-BB4CMIP7-1-0: biomass burning emissions**  
[armanpouyaei](#) started last week in [General](#)  2
  -  1  **Ice sheet freshwater forcing data products**  
[mankoff](#) started on Jul 11 in [Show and tell](#)  1

# Additional Information and Recommendations: Documentation

## Template for documenting CMIP7 Forcing

Based on [discussions](#) and [Input4MIPs Summary](#)

Data providers could document their forcings following this template. Each of these documents could either be placed in a git repo or zenodo and updated towards a final CMIP7 version. A main landing document can then collate links for these individual forcing documents, which could then be made available on cmip7 website (e.g. <https://wcrp-cmip.org/cmip7/>).

Forcing documentation is needed for modelers to correctly interpret the dataset and implement it in the model.

Note that this is technical documentation; peer-reviewed journal articles will provide information on the scientific aspects of the dataset (see [GMD/ESSD special issue](#)).

### Revision history

Current Version number {should be consistent with [this](#)} - this is an UPDATE/NEW dataset, updated from the previous version to address XXX

Link to previous version

### Dataset info

Brief outline of the datasets and common features of the files - consistent with [https://github.com/PCMDI/input4MIPs\\_CVs/blob/main/CVs/input4MIPs\\_source\\_id.json](https://github.com/PCMDI/input4MIPs_CVs/blob/main/CVs/input4MIPs_source_id.json)

Contact person(s):

DOI

Link to documentation (e.g., peer-reviewed paper, technical note, white paper, weblinks, etc)

### Key update/differences from the previous version

[Identifier and link to previous data version](#)

Short description of updates/changes

Plots of fundamental differences relative to the previous version

Links to any further analysis

Link to documentation of update if different/additional to the core dataset documentation.

### Quick look

Link to any evaluation. E.g., [https://github.com/JGCRI/CEDS/blob/master/documentation/Version\\_comparison\\_figures\\_v\\_2024\\_04\\_01\\_vs\\_v\\_20121\\_04\\_20.pdf](https://github.com/JGCRI/CEDS/blob/master/documentation/Version_comparison_figures_v_2024_04_01_vs_v_20121_04_20.pdf), <https://github.com/climate-resource/CMIP6-vs-CMIP7-GHG-Concentrations/tree/main>

| Dataset | Forcing dataset  | Required Information   |
|---------|--|--|
| 1       | <a href="#"><u>Anthropogenic short-lived climate forcer (SLCF) and CO2 emissions</u></a> | Molecular weights of individual and aggregated species, species included in the aggregates, any identified issues in the CMIP7 v0 version of the dataset |
| 2       | <a href="#"><u>Open biomass burning emissions</u></a>                                    | Molecular weights of individual and aggregated species, species included in the aggregates, any identified issues in the CMIP7 v0 version of the dataset |
| 3       | <a href="#"><u>Land use</u></a>  | Any updates to <a href="https://luh.umd.edu/">https://luh.umd.edu/</a>   |
| 4       | Greenhouse gas historical concentrations   | Species included in the aggregated species   |
| 5       | Stratospheric volcanic SO2 emissions and aerosol optical properties                      | Assumed tropopause level, script for modelers to convert optical properties to their spectral bands with instructions                                    |
| 6       | Ozone concentrations   |  |
| 7       | Nitrogen deposition  |  |
| 8       | <a href="#"><u>Solar</u></a>   | <a href="#"><u>Script for regridding solar spectral irradiances</u></a>  |
| 9       | <a href="#"><u>AMIP sea-surface temperature and sea-ice boundary forcing</u></a>         |  |

<https://office.wcrp-cmip.org/Products/Files/DocEditor.aspx?fileid=10146>

## Harmonization plans with ScenarioMIP

### Model simulation identities – take 6

All experiments require the full forcing collection to begin a simulation



**CMIP7 defined experiments:**

DECK/CMIP historical (or esm-hist) 1850-2021

ScenarioMIP scenario-? 2022-2125



Observed period forcing datasets extended beyond 2021 have larger uncertainties - considered “unstable”

These additional extension forcing datasets (non-CMIP7) can be used to extend historical simulations

(historical-ext or esm-hist-ext)

# **First look at the v0 forcing collection**

# Thank You