

AerChemMIP2 for CMIP7: Assessing the role of short-lived climate forcers (SLCFs) in air quality and climate

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Outline

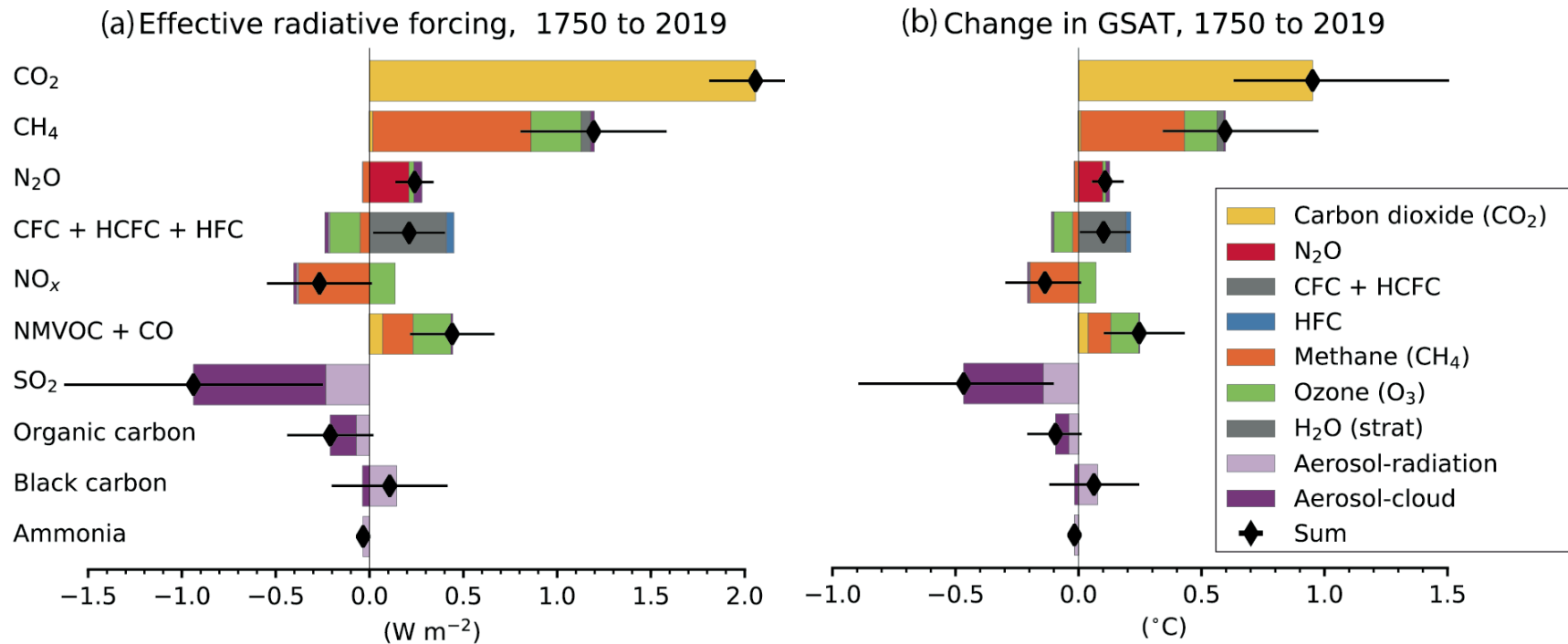
- AerChemMIP in CMIP6: Goals & Achievements
- Current Status of AerChemMIP2
- Future Plans

AerChemMIP in CMIP6: Goals & Achievements

- How have anthropogenic emissions contributed to global radiative forcing and affected regional climate over the historical period?
- How might future policies (on climate, air quality and land use) affect the abundances of NTICFs and their climate impacts?
- How do uncertainties in historical NTICF emissions affect radiative forcing estimates?
- How important are climate feedbacks to natural NTICF emissions, atmospheric composition, and radiative effects?

[Collins et al., GMD \(2017\)](#)

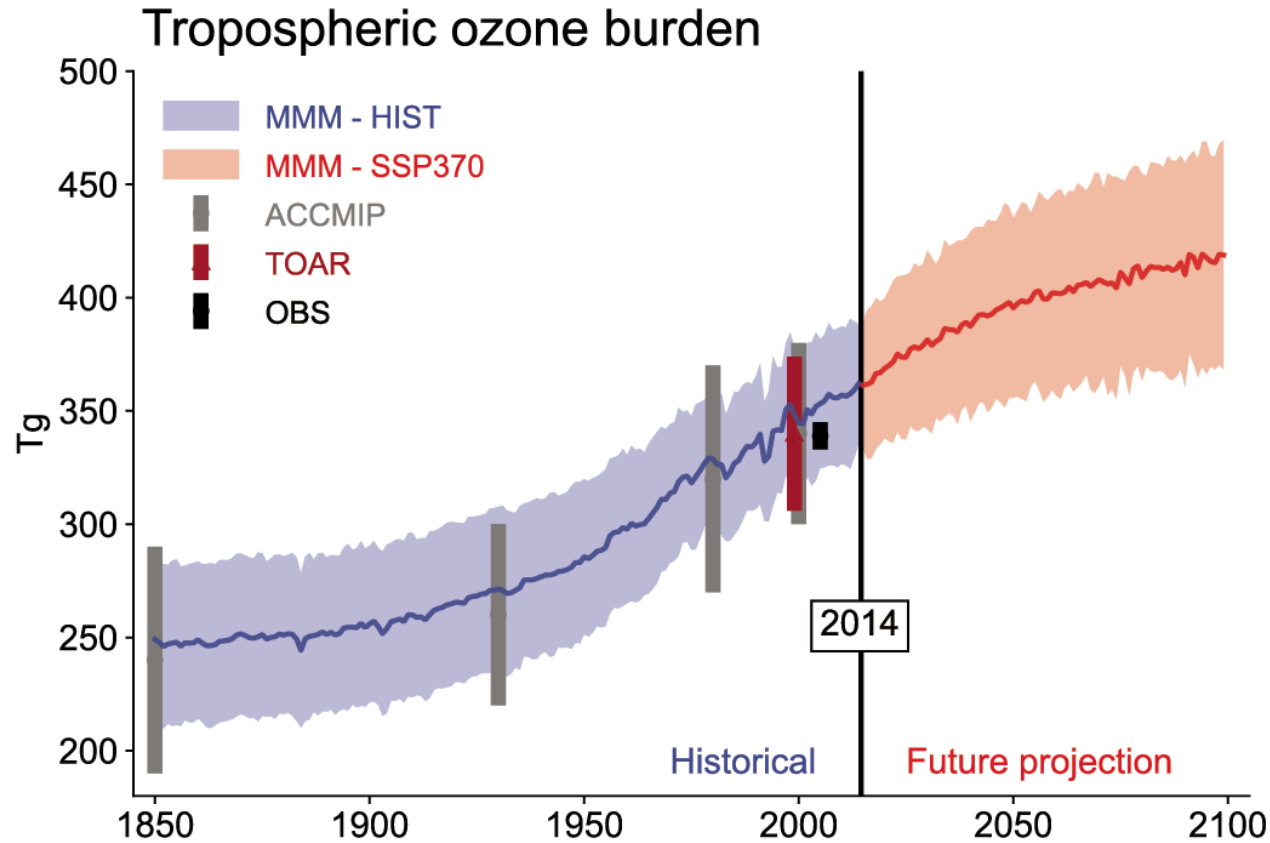
AerChemMIP in CMIP6: Goals & Achievements



Contribution of component emissions to present-day climate forcing and historical surface temperature change (From Ch. 6 of IPCC AR6)

Based on results from [Thornhill et al. ACP \(2021\)](#) and [Smith et al. ACP \(2020\)](#)

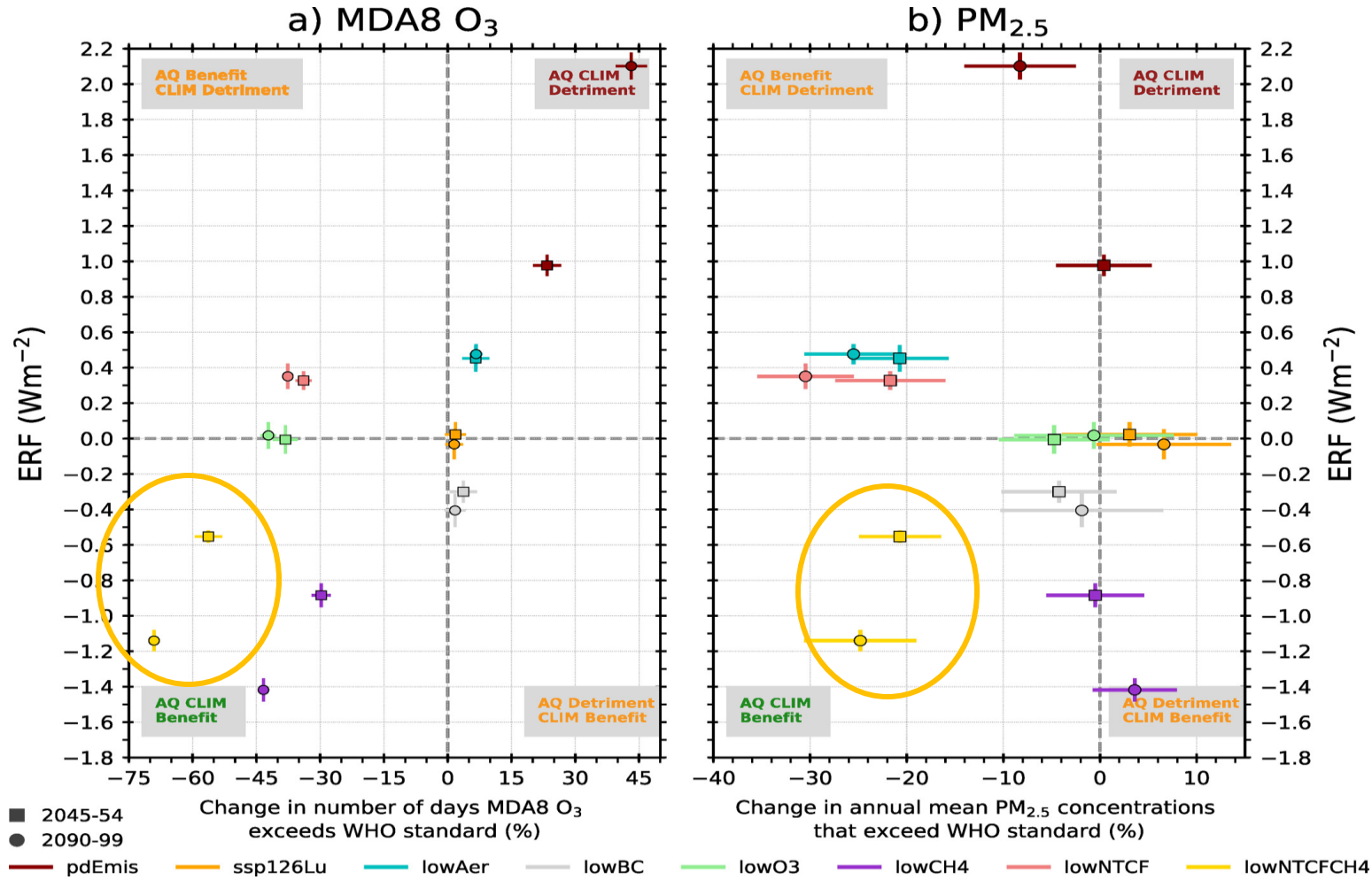
AerChemMIP in CMIP6: Goals & Achievements



Time evolution of global annual mean tropospheric ozone burden (in Tg) from 1850 to 2100 (From Chapter 6 of IPCC AR6)

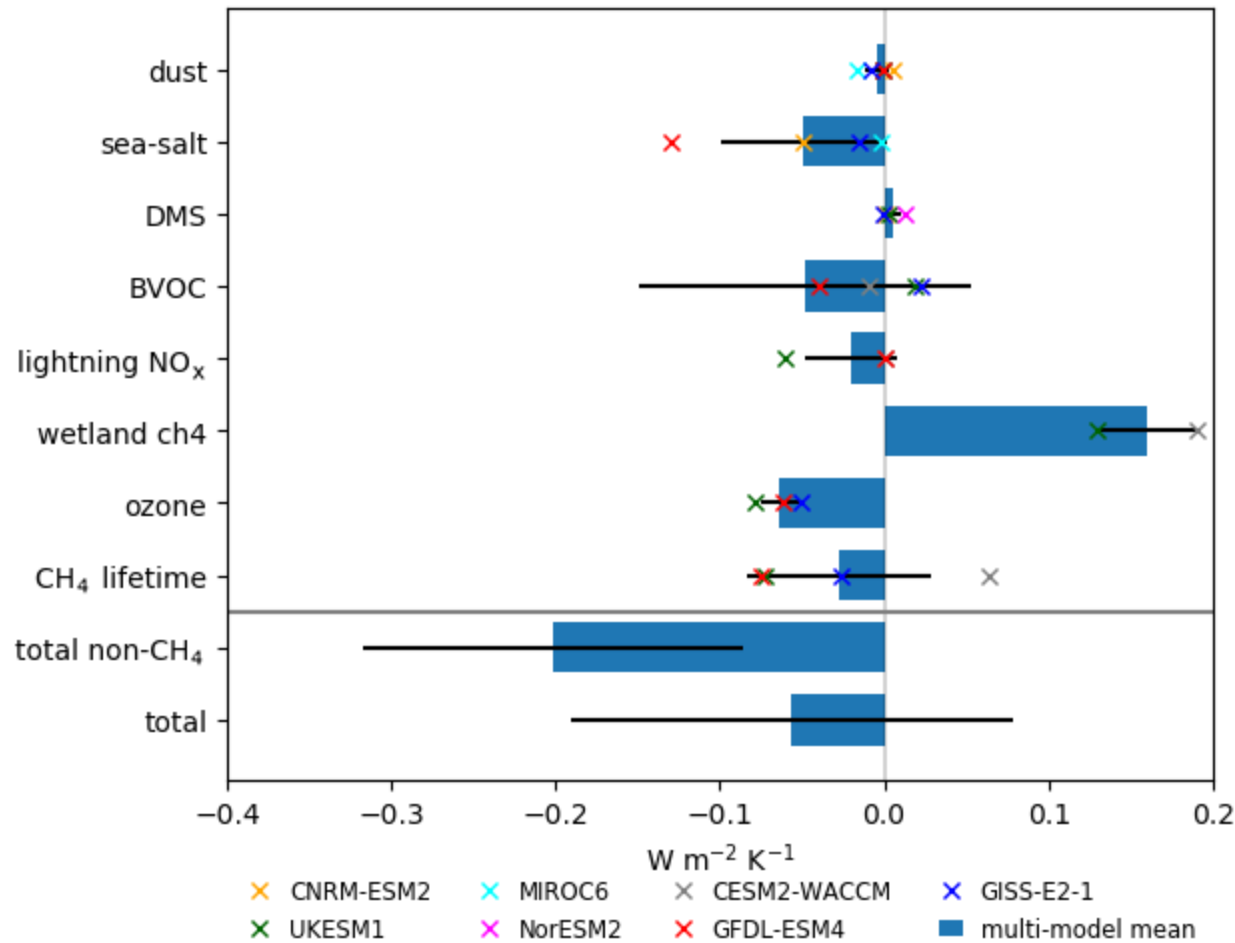
Based on results from [Griffiths, Murray, et al., ACP \(2021\)](#)

AerChemMIP in CMIP6: Goals & Achievements



Quantification of climate & air quality co-benefits/tradeoffs from different future pathways parallel to ssp3-7.0

AerChemMIP in CMIP6: Goals & Achievements

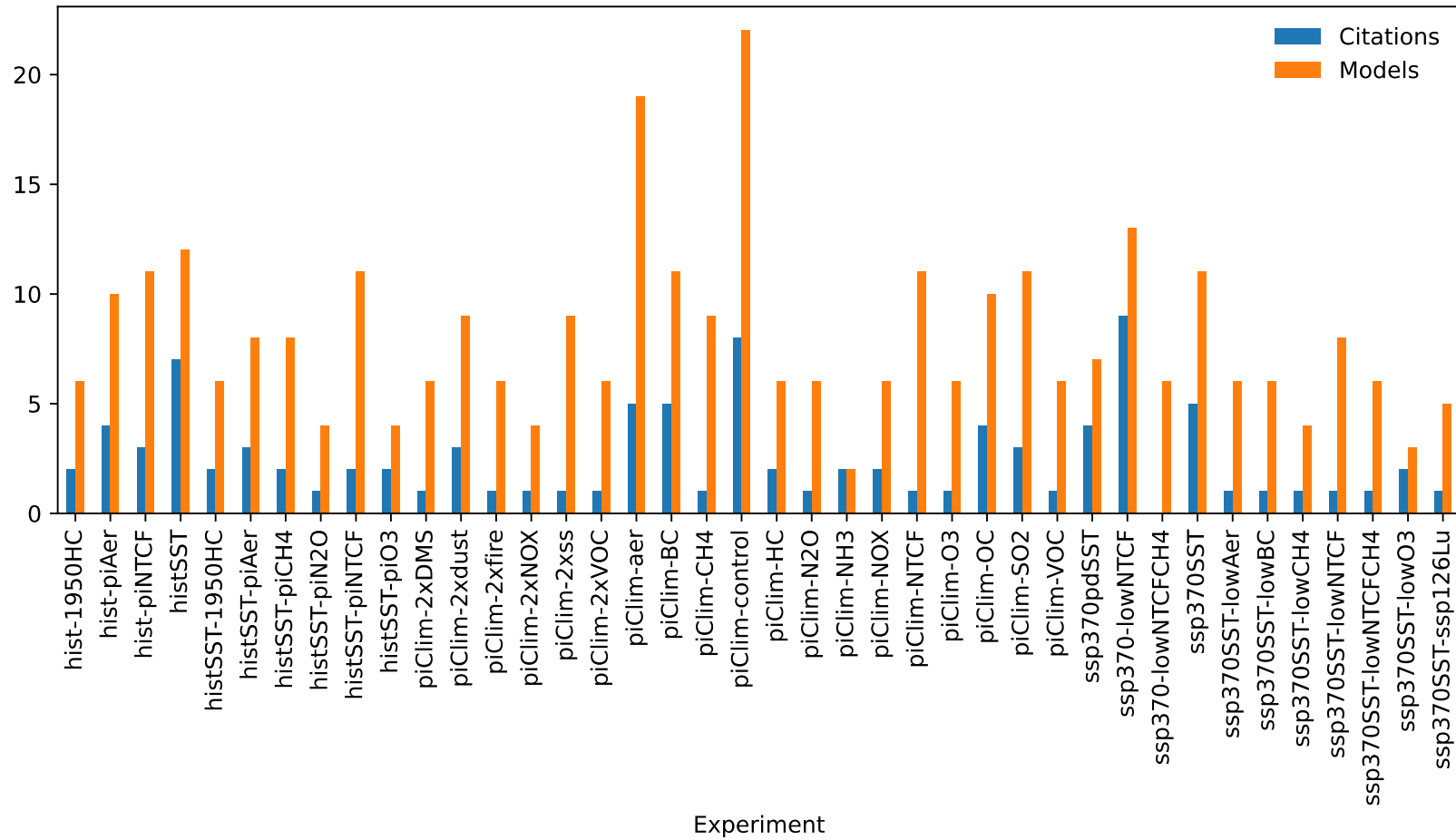


Quantification of different non-CO₂ biogeochemical feedbacks:

These feedbacks are potentially important, but are poorly understood and constrained

[Thornhill et al., ACP \(2021\)](#)

AerChemMIP in CMIP6: Goals & Achievements



AerChemMIP2: Current Status

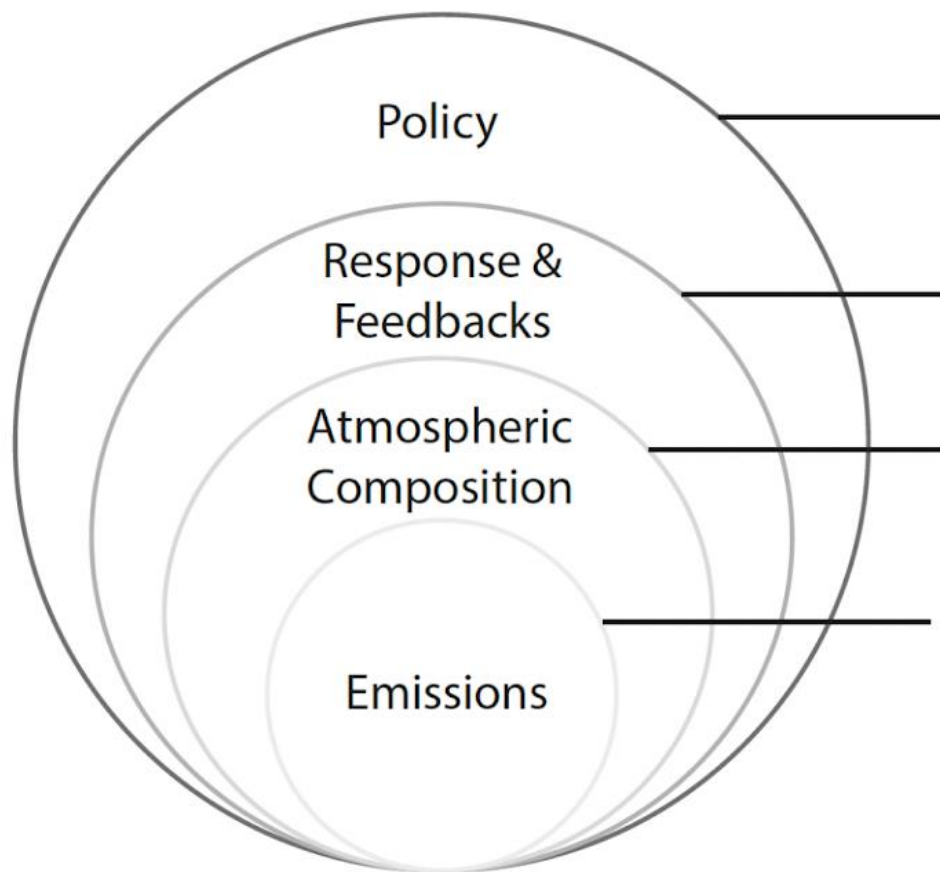
- Registered as a new model intercomparison project for CMIP7
- New co-chairs: Stephanie Fiedler, Fiona O'Connor and Duncan Watson-Parris
- Currently scoping out scientific goals → inform experimental protocol
- Actively liaising with other MIPs (identify synergies, overlaps, etc.)



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AerChemMIP2: Current Status

AerChemMIP2



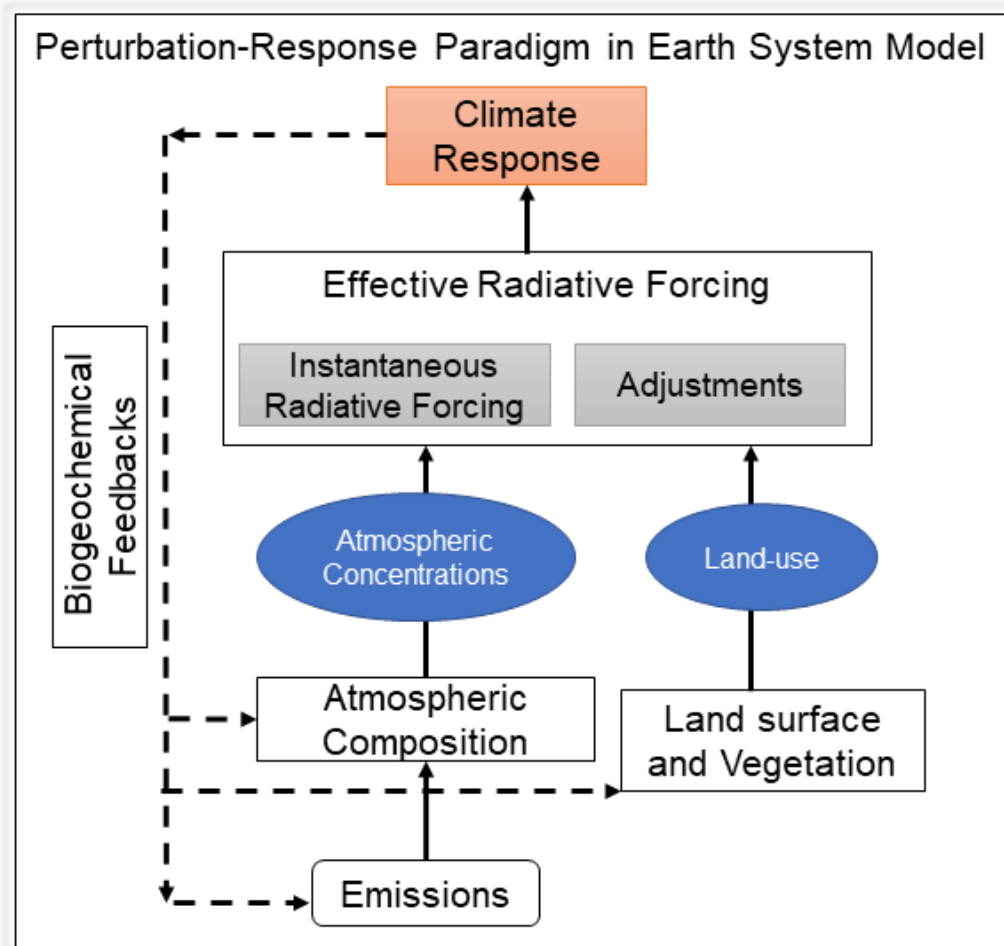
What future climate penalties are expected from improving air quality and what are the tradeoffs for climate benefits arising from policies for improved sustainability?

How important are climate feedbacks to natural NTCF emissions, atmospheric composition, and radiative effects?

What is the relative importance of climate change and emissions of NTCFs for the atmospheric composition and air quality?

How has our process understanding advanced on anthropogenic emissions contributing to global and regional atmospheric composition changes, radiative forcing, and climate responses over the historical period?

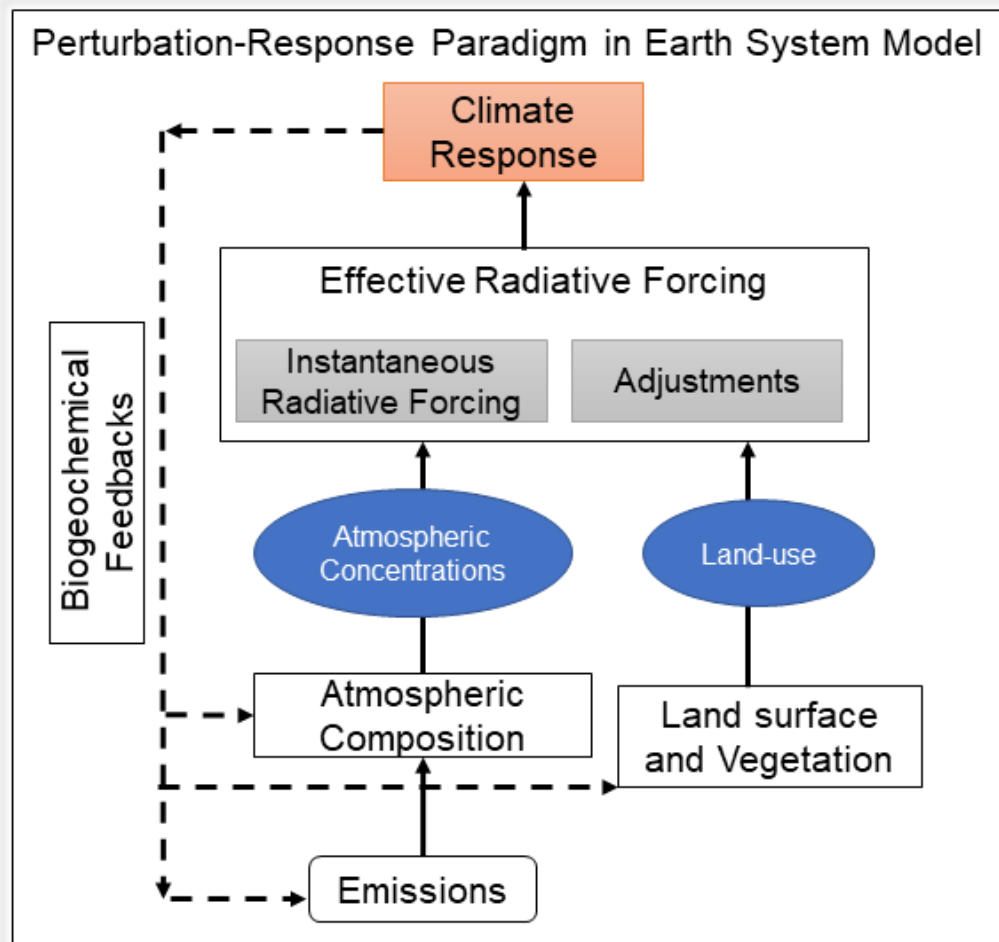
AerChemMIP2: Current Status



Current Proposed Scientific Goals:

- Role of historical emissions in atmospheric composition changes, radiative forcing, and climate
- Future changes in atmospheric composition, air quality and climate from different socioeconomic pathways
- How has improved process understanding contributed to updates in our understanding of composition, forcing, and climate response?
- Improved understanding of biogeochemical climate feedbacks to natural emissions

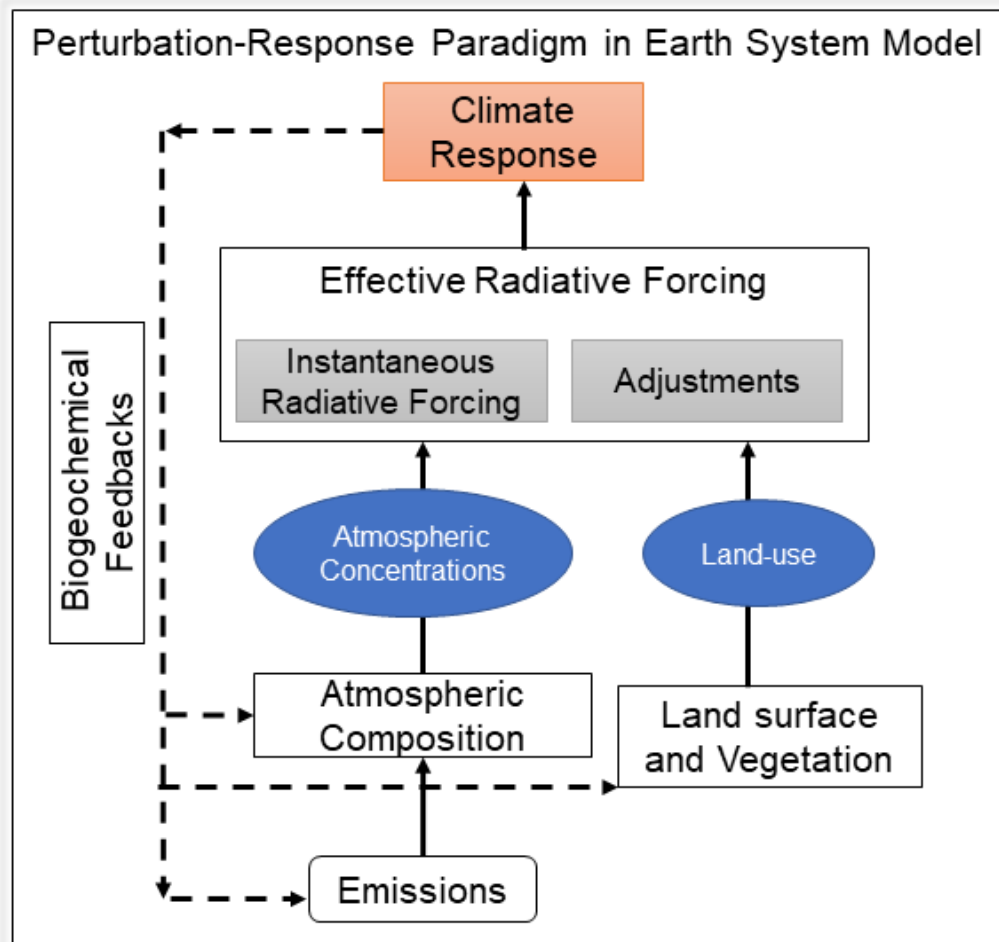
AerChemMIP2: Current Status



Fast-track simulations:

- Fully coupled historical simulations:
 - *hist-piAer and hist-piSLCF*
- Fully coupled future projection:
 - *sspYYY-SLCF*
- 12 fixed SST experiments to quantify forcings, e.g.:
 - *piClim-SO2*
 - *piClim-BC*
- 6 fixed SST experiments to quantify feedbacks, e.g.:
 - *piClim-2xDust*
 - *piClim-2xSS*

AerChemMIP2: Future Plans



Future Work:

- Continue to engage with international community (e.g., CCMI, IAMA, & AGU)
- Gather feedback responses and gauge potential interest from the community
- Continue to liaise with other MIPs (e.g., RFMIP, DAMIP, and ScenarioMIP)
- Aim to have draft paper on scientific goals and experimental protocol by early to mid 2024

AerChemMIP2: Please provide your input

AerChemMIP2 Survey:

- We are now seeking your feedback on
 - 1) AerChemMIP from CMIP6 and,
 - 2) Priorities and improvements for AerChemMIP2 in CMIP7
- The questionnaire itself can be found at: <https://forms.gle/SY4HR9pkqaAyupEW7> or by following the QR code opposite
- Please respond by **Monday 15 January 2024**.

Open now:



AerChemMIP2: Please provide your input

Points for Discussion:

- Are these the most pressing scientific questions?
- What's missing?
- What are key diagnostics that we could/should request?
- How can we harness / link to the more detailed process-based models?
- What would the aerosol modelling community like to see?

Open now:



More information on CMIP7 Activities

- [CMIP7 Website](#)
- [CMIP International Project Office \(IPO\)](#)
- Twitter/X: [@wcrpmip](#)

