

Update on BGCWG Activities June 2019

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NCAR/CGD

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Working Group Info

- Co-chairs:
 - Gretchen Keppel-Aleks, Univ. Michigan
 - Keith Lindsay, NCAR
 - Abigail Swann, Univ. Washington
- Community Liaison:
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BDRD/BPRP Notation

- BGC CO₂: what is used by surface components
- RAD CO₂: what is used by ATM radiative code
- Diagnostic CO₂: prescribed ATM concentrations
 - Ex: constant, read from file, 1% ramp
- Prognostic CO₂: predicted ATM concentrations
 - atmospheric constituent computed from surface CO₂ fluxes
- BDRD: BGC and RAD CO₂ use Diagnostic CO₂
- BPRP: BGC and RAD CO₂ use Prognostic CO₂

CESM2.1.1 Release

10 June 2019

- Available at <https://github.com/ESCOMP/cesm>
- Includes emission based prognostic CO₂ compsets:
- B1850_BPRP (esm-piControl): zero CO₂ emissions
- BHIST_BPRP (esm-hist): historical CO₂ emissions
 - includes aircraft CO₂ emissions
- Functional support for 2° atm B1850, BHIST compsets
 - Prescribed CO₂ concentrations

CLM high latitude SOM issue

- CLM developers noticed that CLM spinup for coupled model led to unrealistically large SOM pools in Canadian archipelago
 - Pools are inconsistent with vegetation/productivity
 - They are an artifact of spinup
- These pools persist in CESM2 BDRD CMIP6 runs
- Zero'd out inconsistent C & N pools in CLM restart file before starting esm-piControl, so that their decay doesn't feed into global C cycle.

Dry Tracers in CAM

- CAM didn't conserve dry tracers (e.g., CO₂) for awhile
 - Fixed in Jan 2019 (cam_cesm2_1_rel_10)
- Fix led to distorted spatial structure of CO₂
 - Modification to conservation fix for CO₂ was implemented in late-Feb (cam_cesm2_1_rel_13)
- Other dry tracer initialization issue fixed in mid-Mar (cam_cesm2_1_rel_19)
- Don't do science with diagnostic CO₂ tracers in prescribed CO₂ experiments

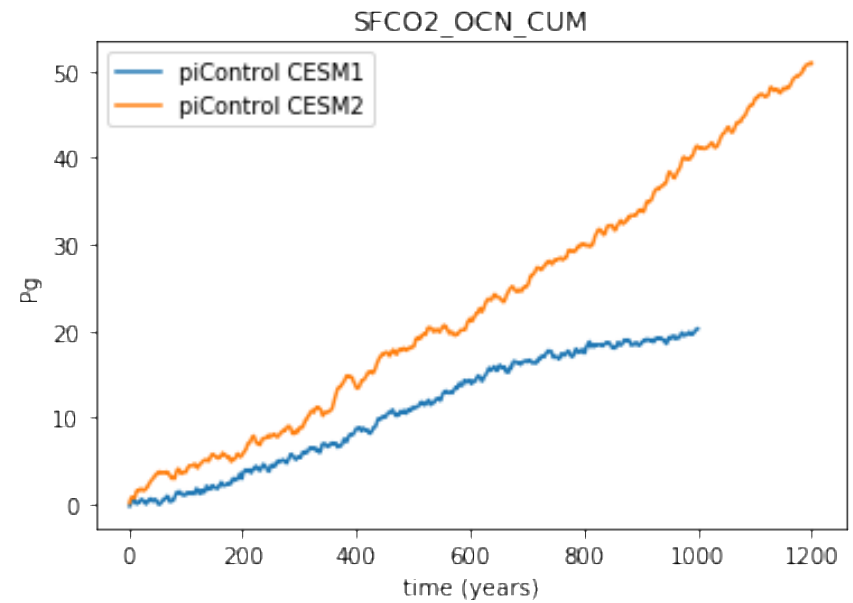
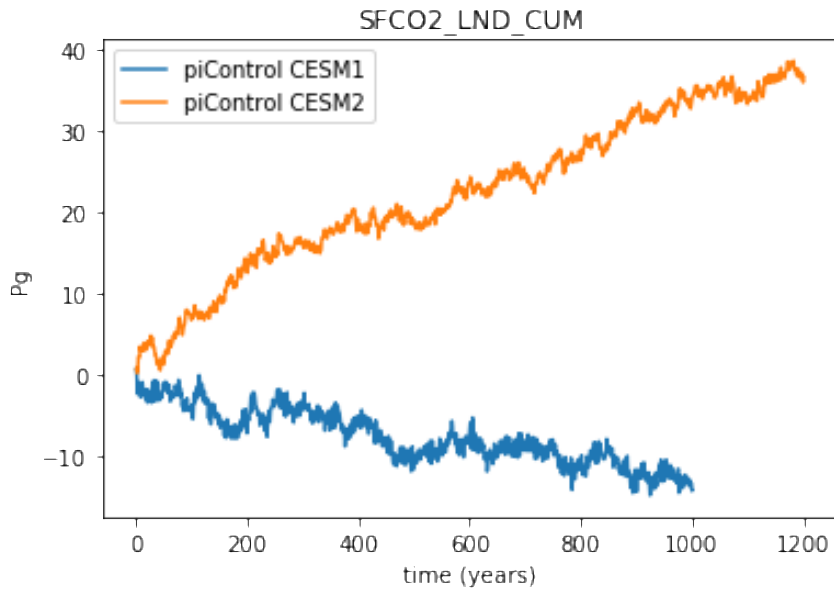
Completed BPRP experiments in CMIP6

- esm-piControl
- esm-hist
- esm-ssp585

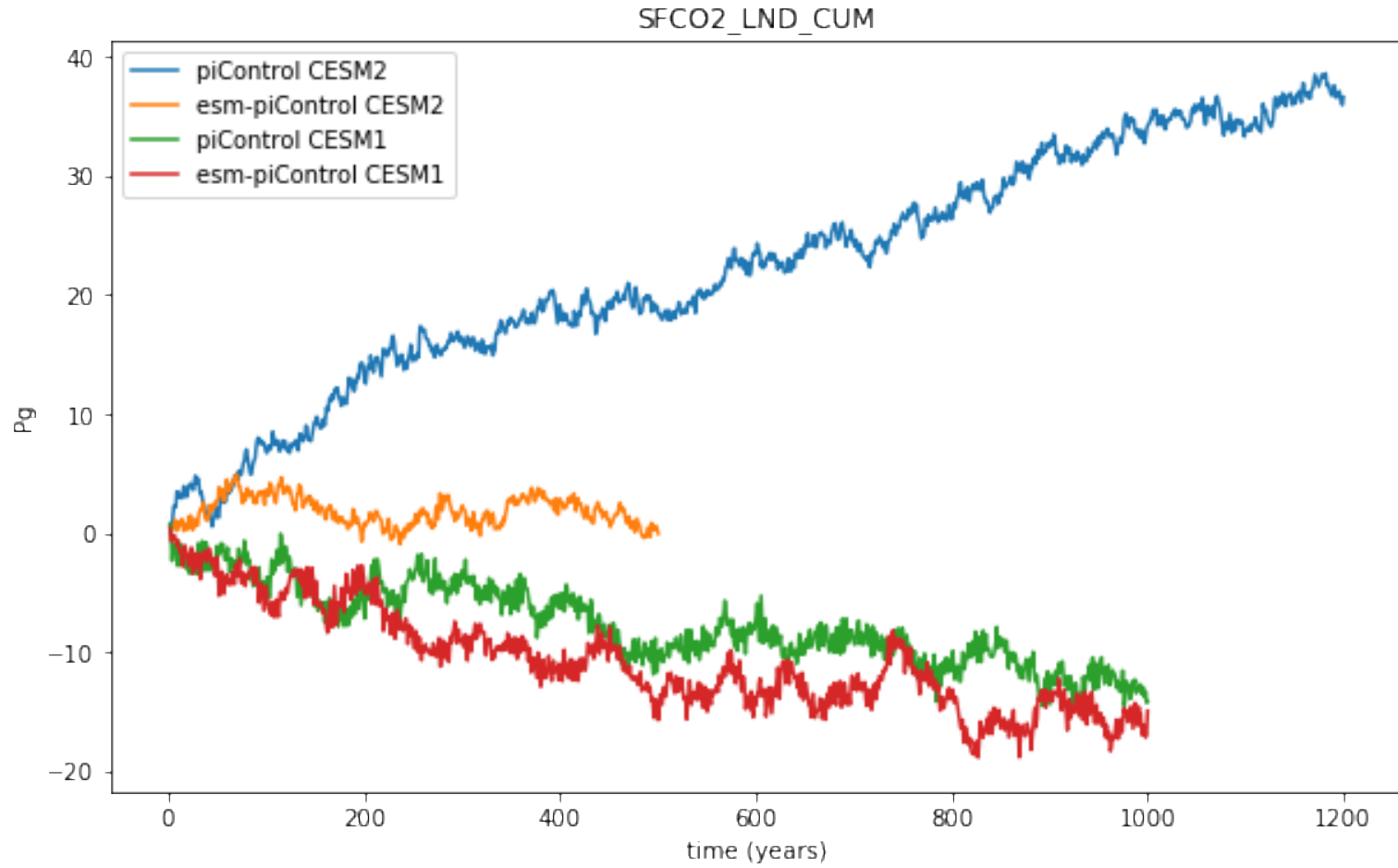
- Community involvement in analysis is welcome



Component Carbon Inventories Drift piControl (prescribed CO₂)

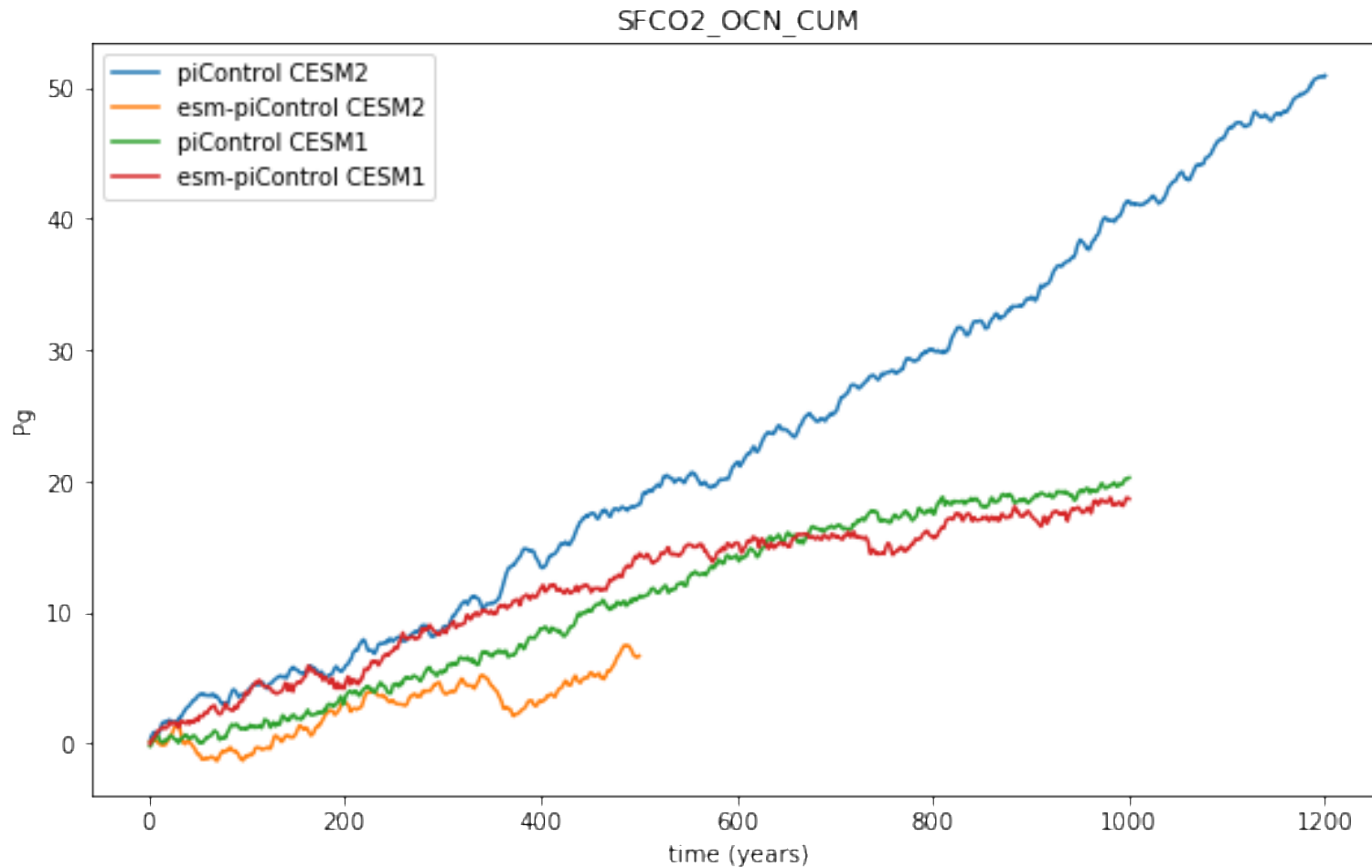


Land Carbon Inventory Drift piControl & esm-piControl

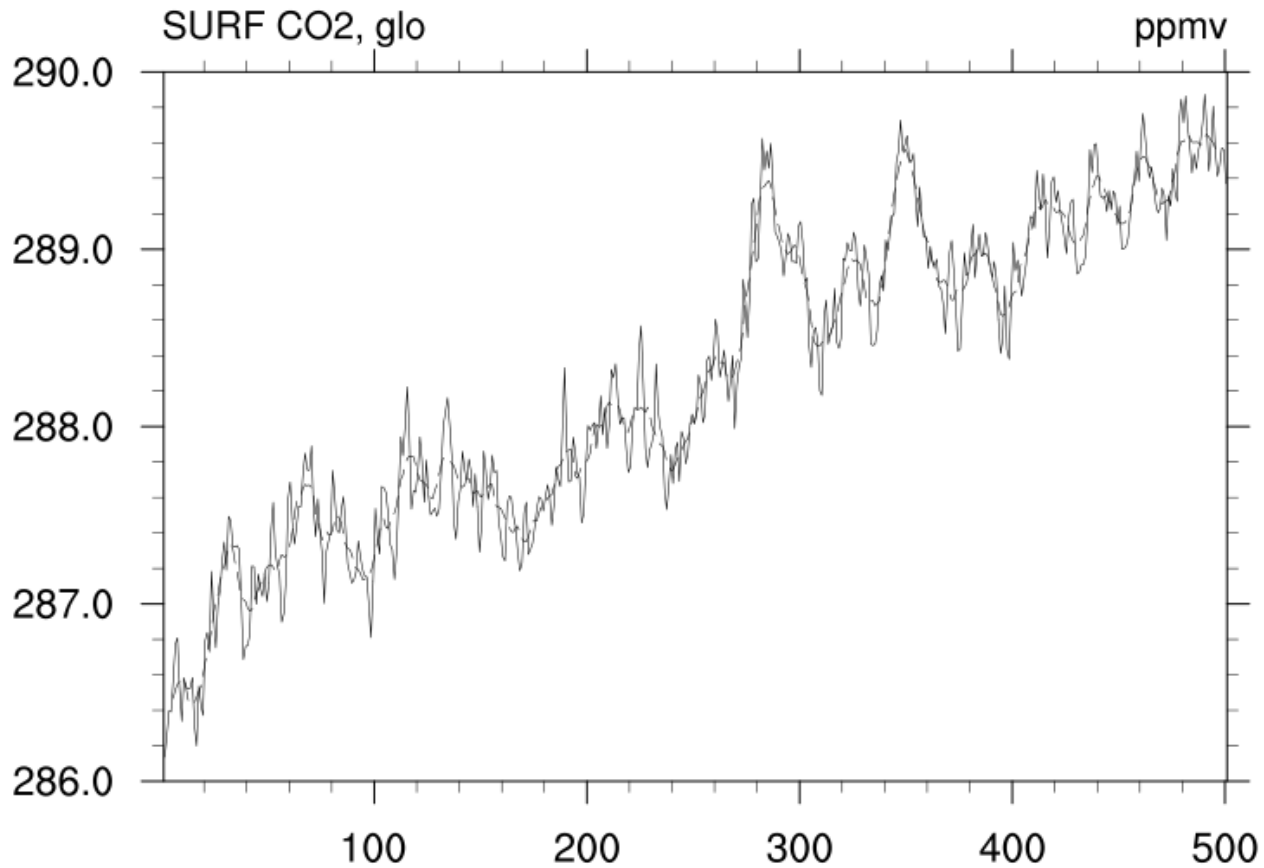


Ocean Carbon Inventory Drift

piControl & esm-piControl



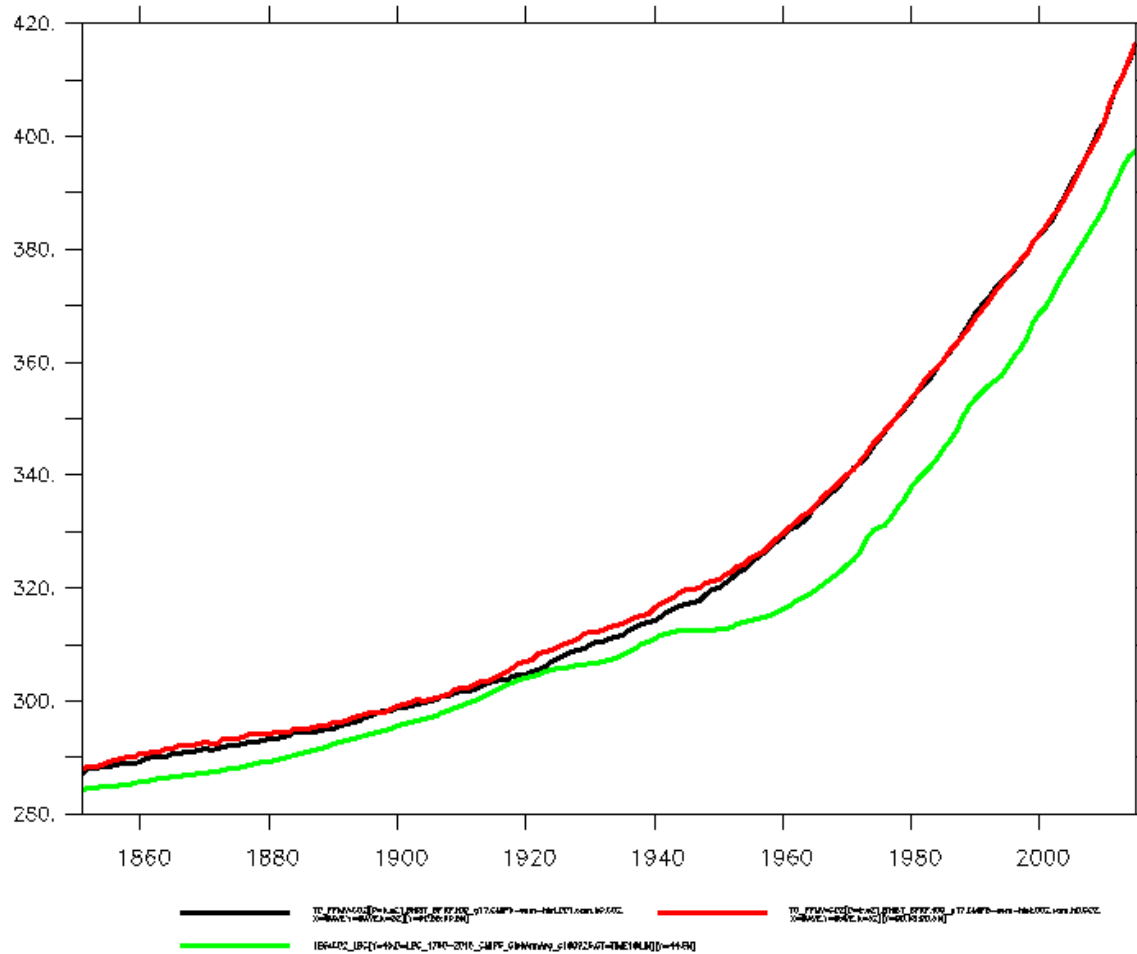
Atmosphere Surface CO₂ Drift esm-piControl



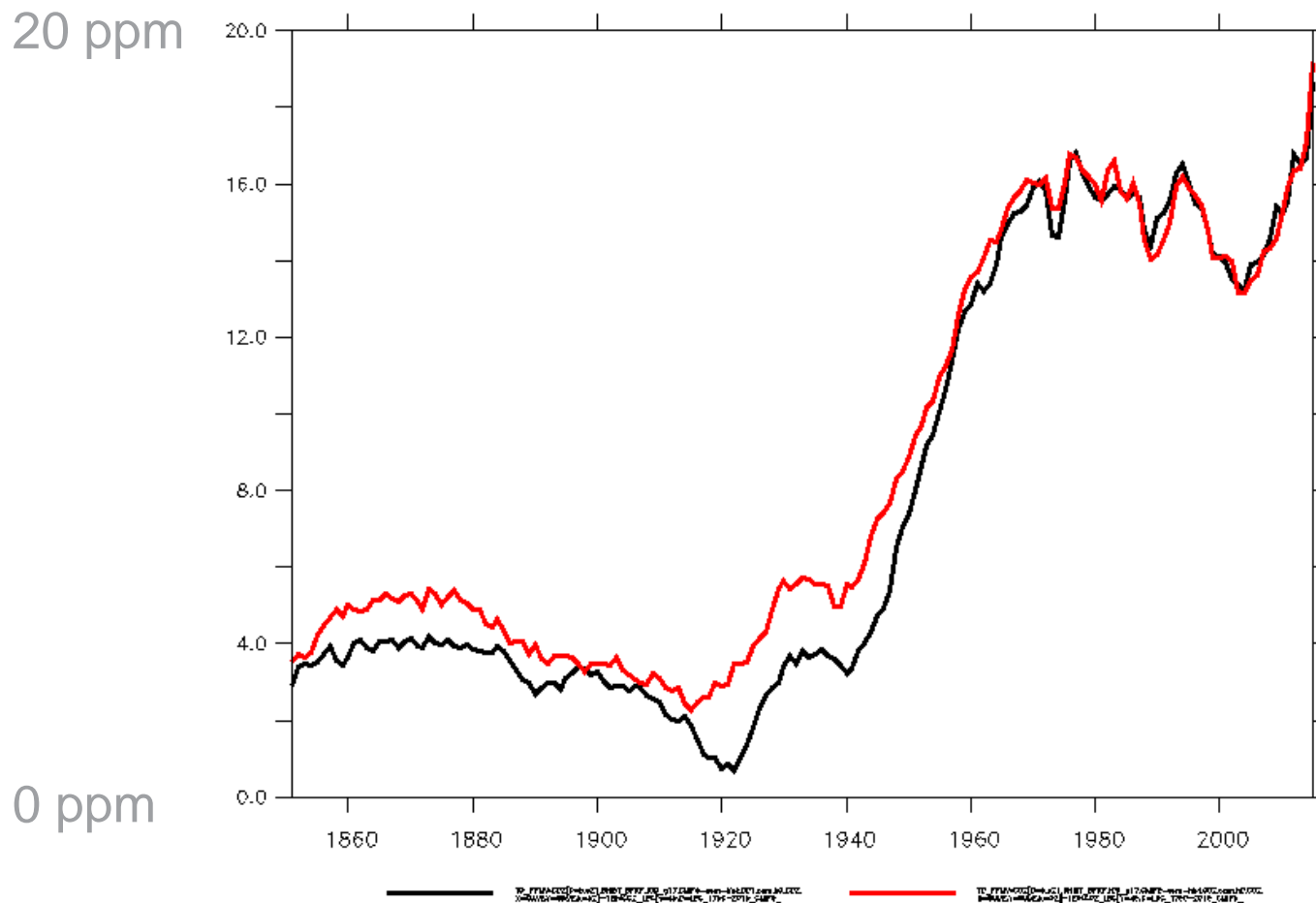
Surface CO₂ in esm-hist Experiment

420 ppm

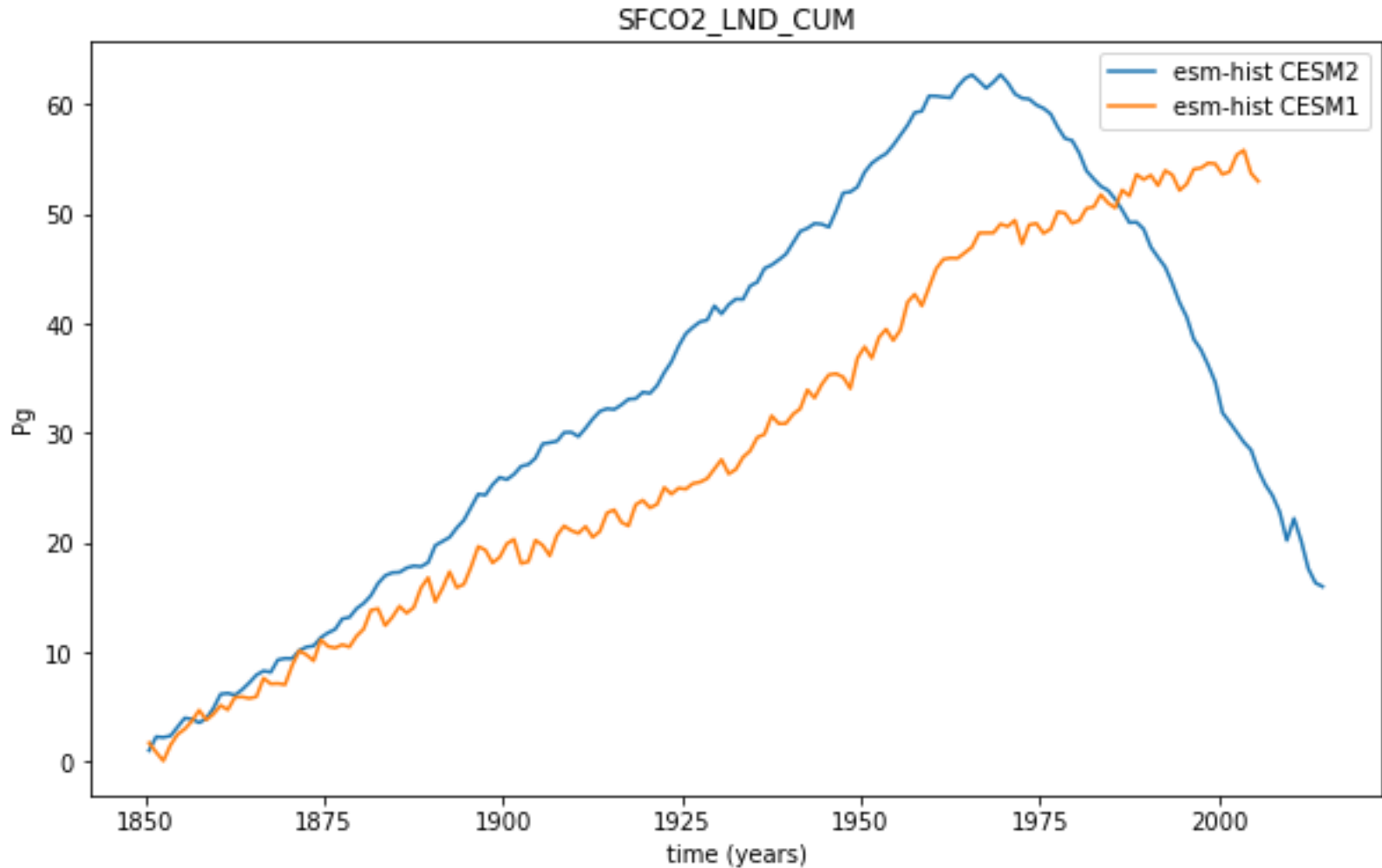
280 ppm



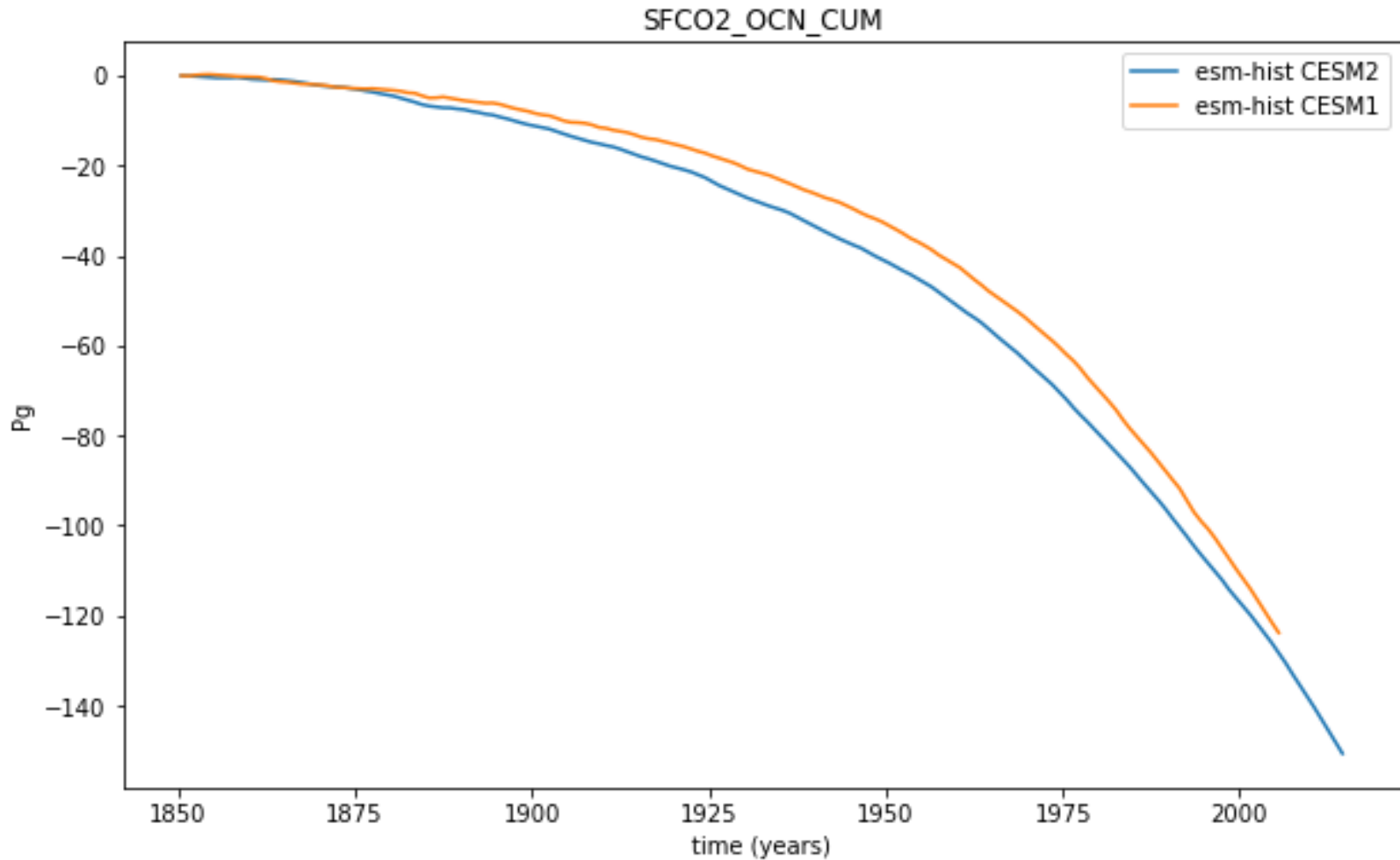
Surface CO₂ Bias in esm-hist Experiment



Cumulative Land to Atmosphere CO₂ Flux esm-hist



Cumulative Ocean to Atmosphere CO₂ Flux esm-hist



Near-term Future Activities

- Continue running, and analyzing, BGCWG related CMIP6 experiments
- CMIP6 MIPS
 - C4MIP: Coupled Climate Carbon Cycle
 - CDRMIP: Carbon Dioxide Removal
 - OMIP-BGC
- CESM 2.x Special Collection Papers
- Ocean transition to MOM6

