CVCWG update

Mar 6th, 2024

Co-Chairs: Isla Simpson (NCAR), Aixue Hu (NCAR), Sarah Larson (NC State)
Liaisons: Adam Phillips (NCAR), Gary Strand (NCAR)

NCAR

NSF

Here we value respectful dialogue, please . . .

CGD's Vision: a Culture of Respect & Belonging

https://www.cgd.ucar.edu/about/diversity

Revised June 2023

Norm	Meeting Agenda and Action
Share the Air OR Share Speaking Time	MEETING AGENDA: specify time for individuals with different and varied perspectives ACTION: Designate a facilitator (who encourages **sharing**). Speak **concisely** when it's your turn.
Show Appreciation & Acknowledge Teamwork	MEETING AGENDA: Include **bright spots** as an agenda item; create collaborative time during meetings ACTION: Include your **team member's name** on your slides, name who provided you with the idea
Listen to Understand	MEETING AGENDA: everyone **summarizes**; write and **share** meeting minutes ACTION: Ask real questions to **learn more**, not to argue - for example, "Tell me more"
Communicate Context	MEETING AGENDA: Items or discussion start with **background information** ACTION: Describe the **goal/purpose** of the conversation/meeting
Value New Ideas & Encourage Innovation	MEETING AGENDA: specify time for new ideas/innovation, ACTION: "Tell me more," and build on others ideas - "yes, that's great , **and…. (not but)**"
Offer Constructive Feedback	MEETING AGENDA: make time for **review and reflection** ACTION: ask "what worked well?" Check your understanding. Ask "what feedback would be meaningful?"

Some other reminders…

- People are here in person and online. Online participants, to ask questions please raise your hand or type on the chat - we will monitor both.

- This meeting is being recorded and live-streamed. If you do not want your presentation recorded, please notify us immediately.

- Live-streaming is being done on a YouTube channel which is subject to copyright laws. Do not violate copyright laws in your presentation.

- Can we have a show of hands for those who are planning to join for the happy hour at the end of the day? This does not constitute a firm commitment but we'd like to gauge numbers to see about booking a table.

CESM2 large ensemble	CESM2 single forcing large ensemble

Note: not run by the CVCWG

Historical → SSP3-7.0, 1850-2100

100 members
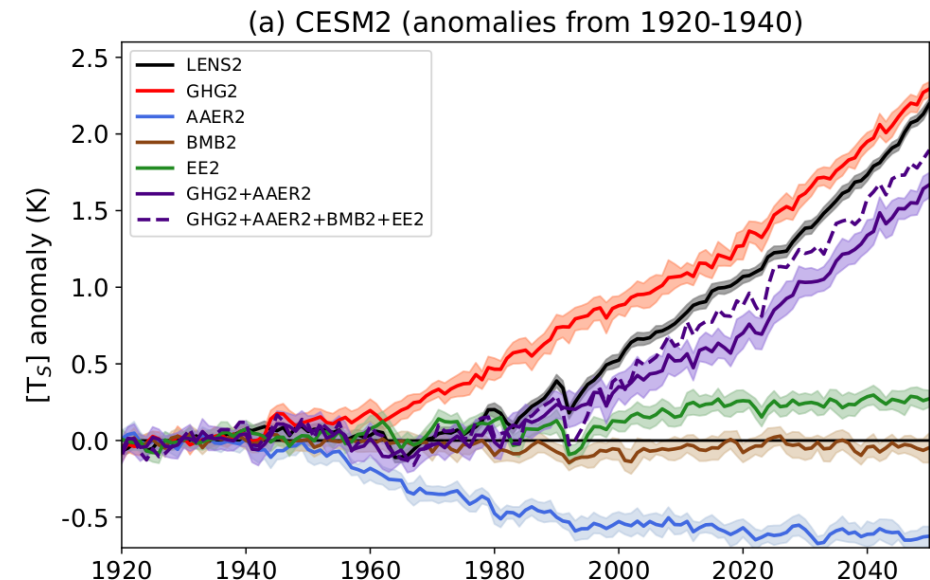
Article   Assets   Peer review   M

Ubiquity of human-induced changes in climate variability

Keith B. Rodgers ✉, Sun-Seon Lee, Nan Rosenbloom, Axel Timmermann ✉, Gokhan Danabasoglu,
Clara Deser, Jim Edwards, Ji-Eun Kim, Isla R. Simpson, Karl Stein, Malte F. Stuecker, Ryohei Yamaguchi,
Tamás Bódai, Eui-Seok Chung, Lei Huang, Who M. Kim, Jean-François Lamarque, Danica L. Lombardozzi,
William R. Wieder, and Stephen G. Yeager

Historical → SSP3-7.0, 1850-2050

AAER (20 members): only anthropogenic aerosols evolving

GHG (15 members): only greenhouse gases evolving

BMB (15 members): only biomass burning aerosols evolving

EE (15 members): all other forcings evolving

xAER (10 members): everything except anthropogenic aerosols evolving

(a) CESM2 (anomalies from 1920-1940)

Simpson et al (2023), J.Clim.

New simulations (since the summer meeting)

Regionally refined North Atlantic AMIP simulations

- 1958-present day
- CAM-SE (1/8th degree in the North Atlantic)
- Prescribed SSTs from the iHESP 1/10th degree FOSI simulation

Motivation: How does North Atlantic jet stream variability/eddy mean flow feedbacks change at high resolution? Does ocean → atmosphere coupling change at high resolution?

Simulation is completed out to 2014.

Should become available sometime later this year
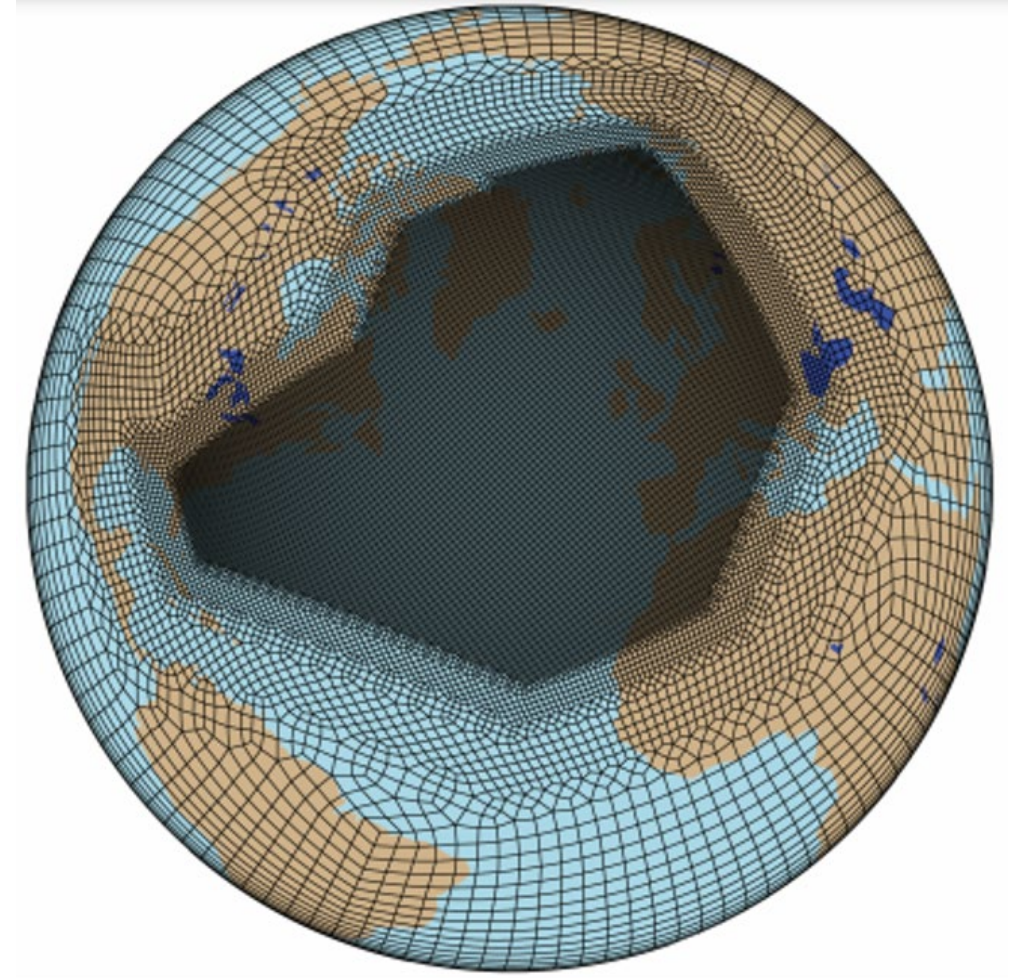
Thanks to Robb Jnglin Wills, Adam Herrington
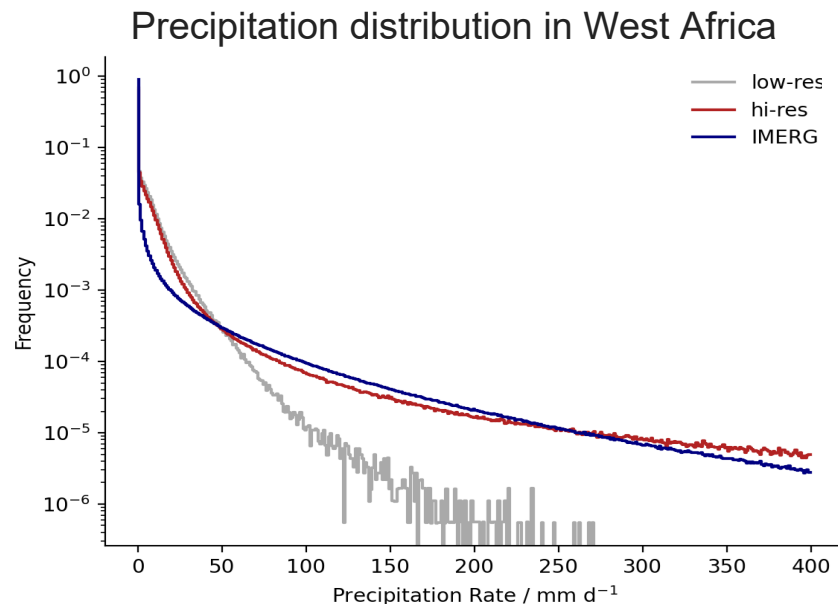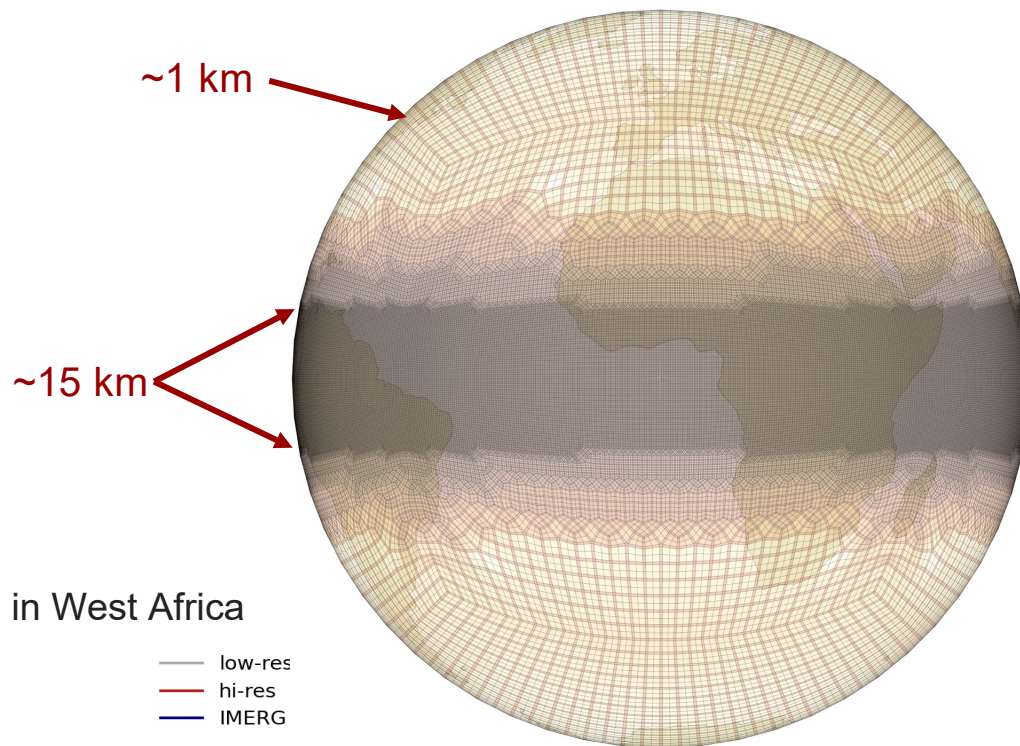
Tropical Belt

Brian Medeiros

Goal:
- Explore the impacts of enhanced horizontal resolution in the tropics

Setup:
- Regional refinement down to 15 km in the tropics, 100km in extatropics (ne30->ne240)
- Standard CAM6 physics, no re-tuning, 5-minute timestep
- 7-year simulation (F2000, L32), 2-years allowed for spin up
- Limited output because of volume, but designed to describe mean climate, tropical waves, and extremes (including ARs and TCs)
- Data is on glade if there's interest (ask Brian)
- Hoping to follow up with L58, CAM7, and AMIP forcing

~1 km

~15 km

Precipitation distribution in West Africa

low-res
hi-res
IMERG

Frequency

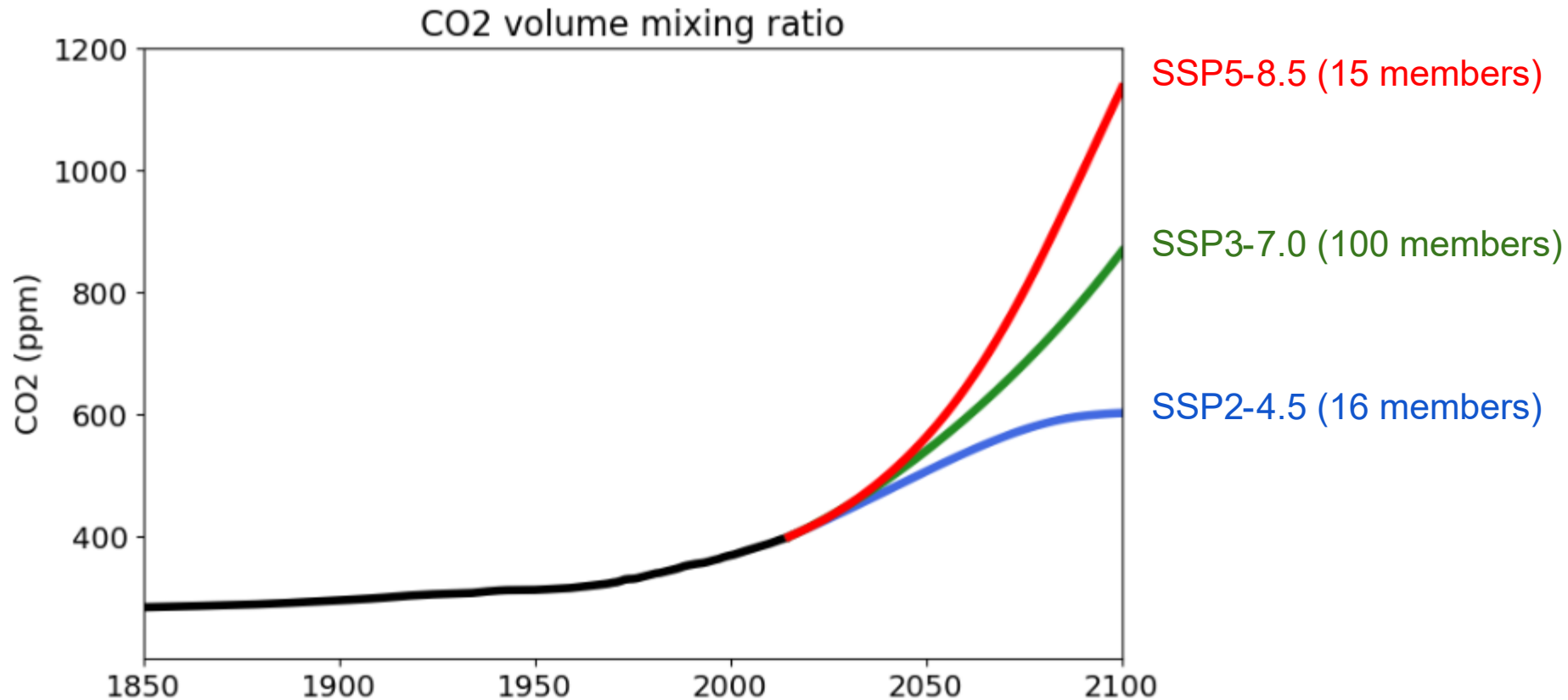Precipitation Rate / mm d^{-1}

SSP5-8.5 ensemble

Adam Phillips, Nan Rosenbloom

A new 15 member ensemble with the SSP5-8.5 now complements the existing SSP3-7.0 large ensemble and the SSP2-4.5 medium ensemble.

https://www.cesm.ucar.edu/working_-groups/climate/simulations/cesm2_-ssp585

CO2 volume mixing ratio

SSP5-8.5 (15 members)

SSP3-7.0 (100 members)

SSP2-4.5 (16 members)

A 3 member ensemble of the RFMIP "piClim‑histall" experiment is available following the protocols of LENS2.

- prescribed climatological SSTs taken from years 401 to 2000 of the CESM2 piControl
- 1850-2014 under CMIP6 historical forcings (with the smoothing of biomass burning emissions in the late 20th/early 21st centuries - the "smbb" forcing of LENS2 (second 50 members)).
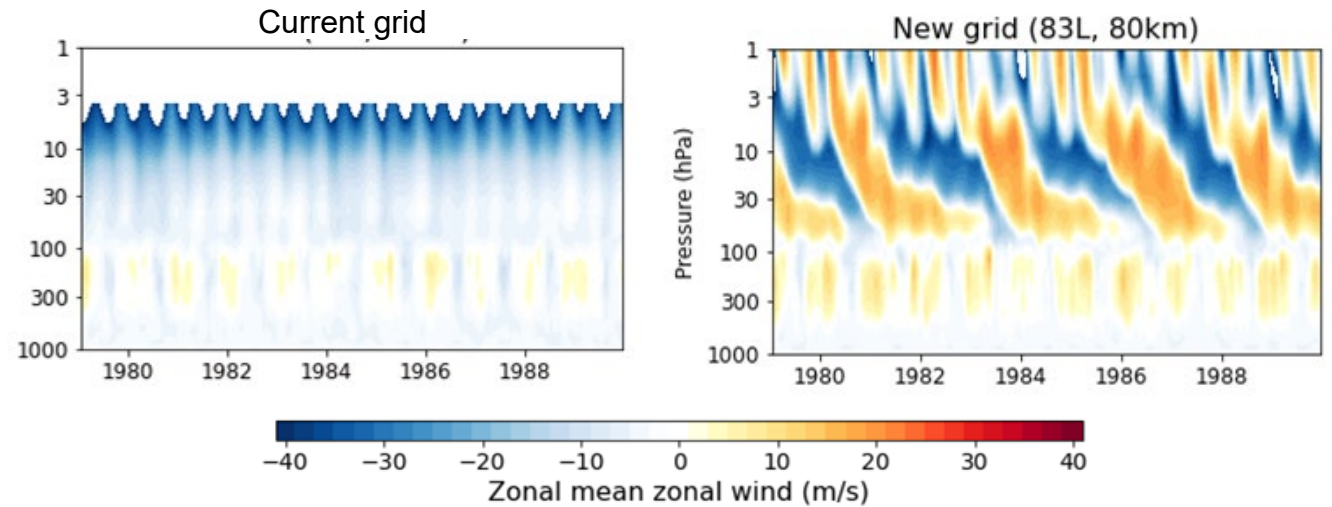
Useful for

a. diagnosing the transient effective radiative forcing
b. examining the direct impact of external forcings more generally

https://www.cesm.ucar.edu/working_-groups/climate/simulations/cesm2_-rfmip
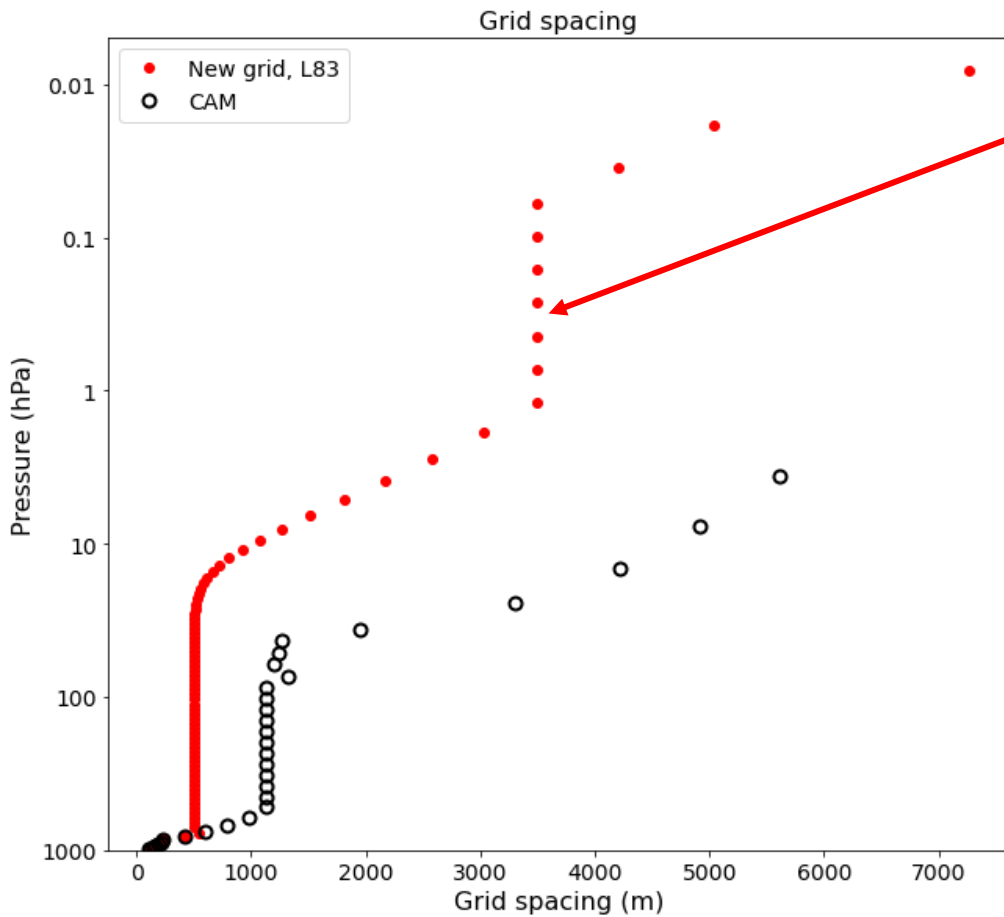
Next generation grid for CAM (excluding additional levels in the boundary layer)

Current grid

New grid (83L, 80km)

Zonal mean zonal wind (m/s)

- 100 year piControl
- 3 coupled historical simulations (1850-2100, historical → SSP3-7.0)
- 3 AMIP simulations (1950-2014)
- Nudged QBO simulations for QBOi

Description paper to be submitted within the next few weeks

Flavio Lehner, Yan-Ning Kuo (Cornell), Clara Deser, Adam Phillips, Isla Simpson (NCAR), Matt Newman, Sang-Ik Shin (CIRES/NOAA)

Goal:
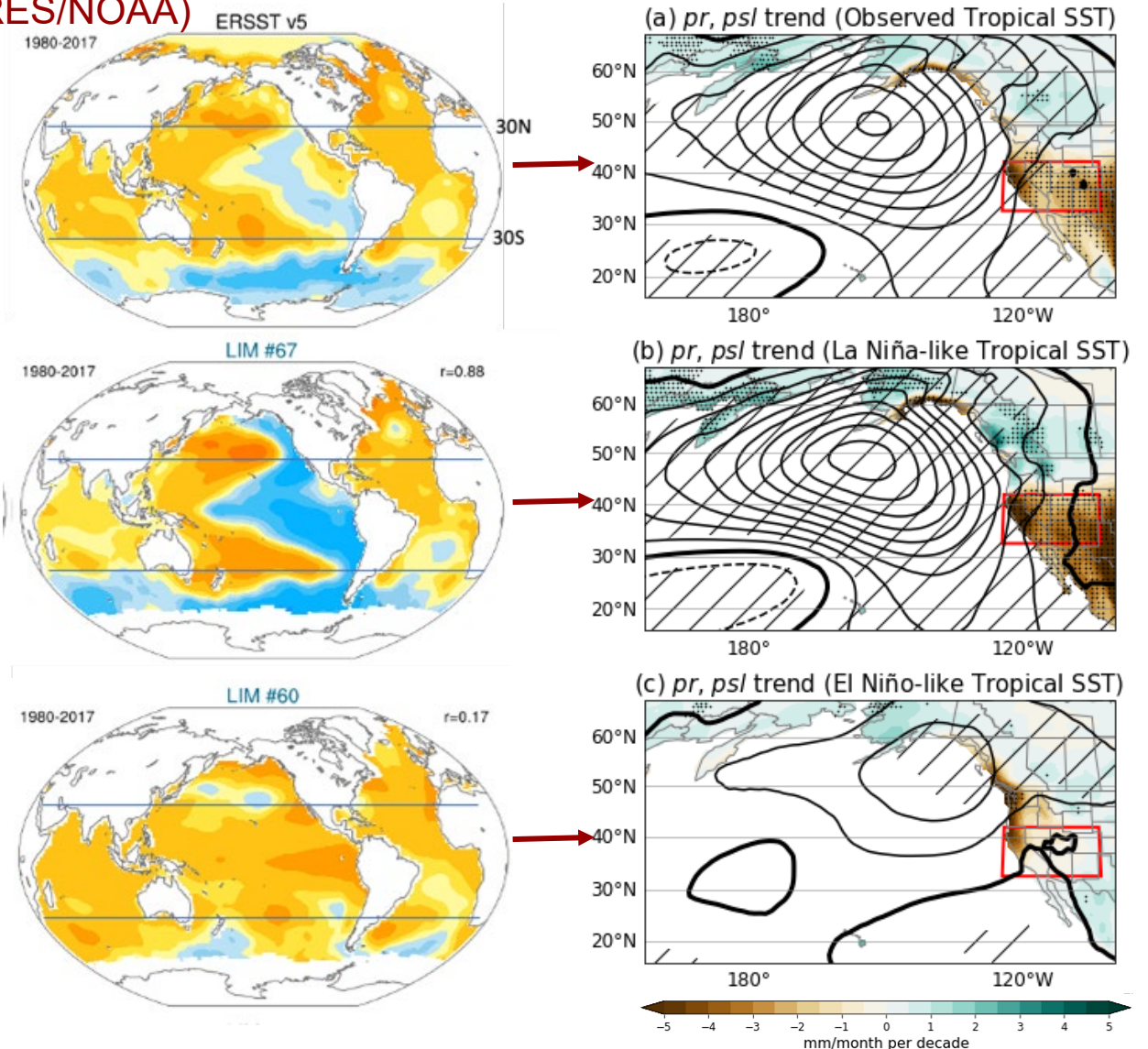- Investigate *alternative* historical SST trajectories and their teleconnections

Setup:
- Tropical Ocean Global Atmosphere (TOGA) simulations with CAM6
- SSTs from select realizations of a Linear Inverse Model (LIM) large ensemble trained on ERSSTv5

Existing simulations (time period 1960-2017):
- 10 members w/ observed SSTs
- 10 members w/ La Niña-like SST trend pattern
- 10 members w/ El Niño-like SST trend pattern

Regardless of SST trend pattern, there's still a tendency for a trend toward increased SLP in the North East Pacific and drying of the US Southwest. It's just much weaker without the La Nina-like SST trend
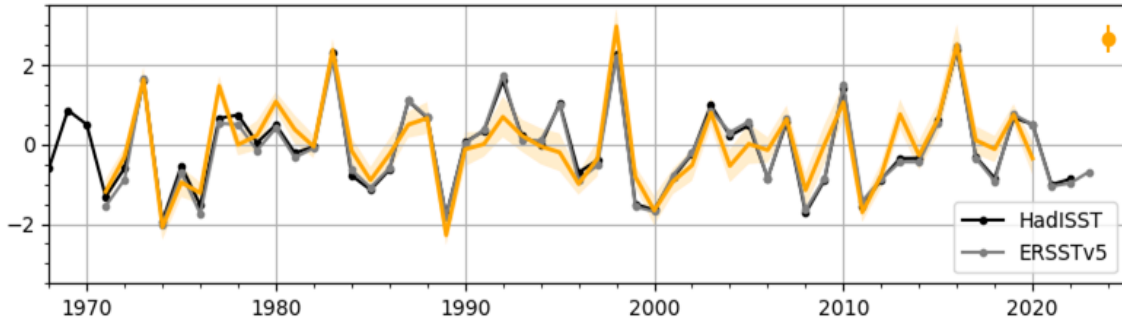

Kuo et al. (in prep.)

SMYLE predictions of the DJF Nino3.4 index i.e., initialized predictions with CESM2.

Aug initialization

Nov initialization
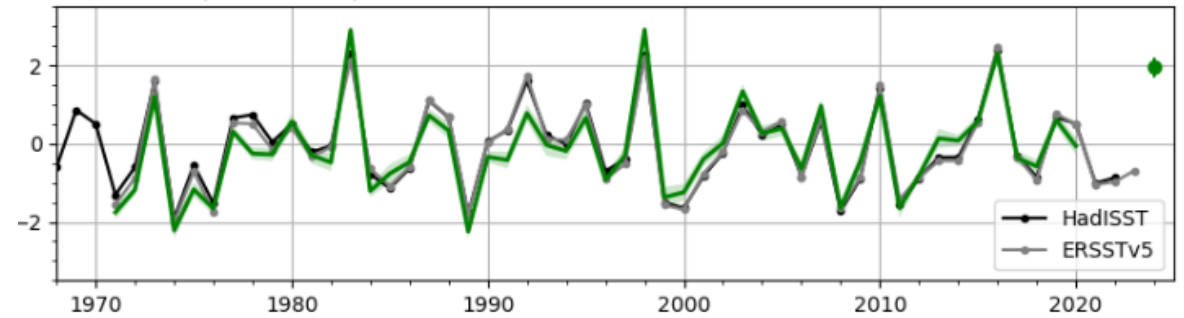
a. AUG init (4-mon lead), ACC=0.88, nRMSE=0.47

a. NOV init (1-mon lead), ACC=0.95, nRMSE=0.33

From Steve Yeager

2023/2024 ENSO ensembles

Clara Deser, Steve Yeager, Nan Rosenbloom, Isla Simpson, Adam Phillips, John Fasullo, Pedro DiNezio, Dillon Amaya, Mike Alexander

Goal:
- Investigate impacts of this years El Nino and how those impacts might be affected by long term trends

Setup:
- 50 member ensembles
- Prescribed SSTs from SMYLE after bias correction
- Cases in the present day and in a counterfactual (1979) world where SSTs have been detrended and external forcings of 1979 are used
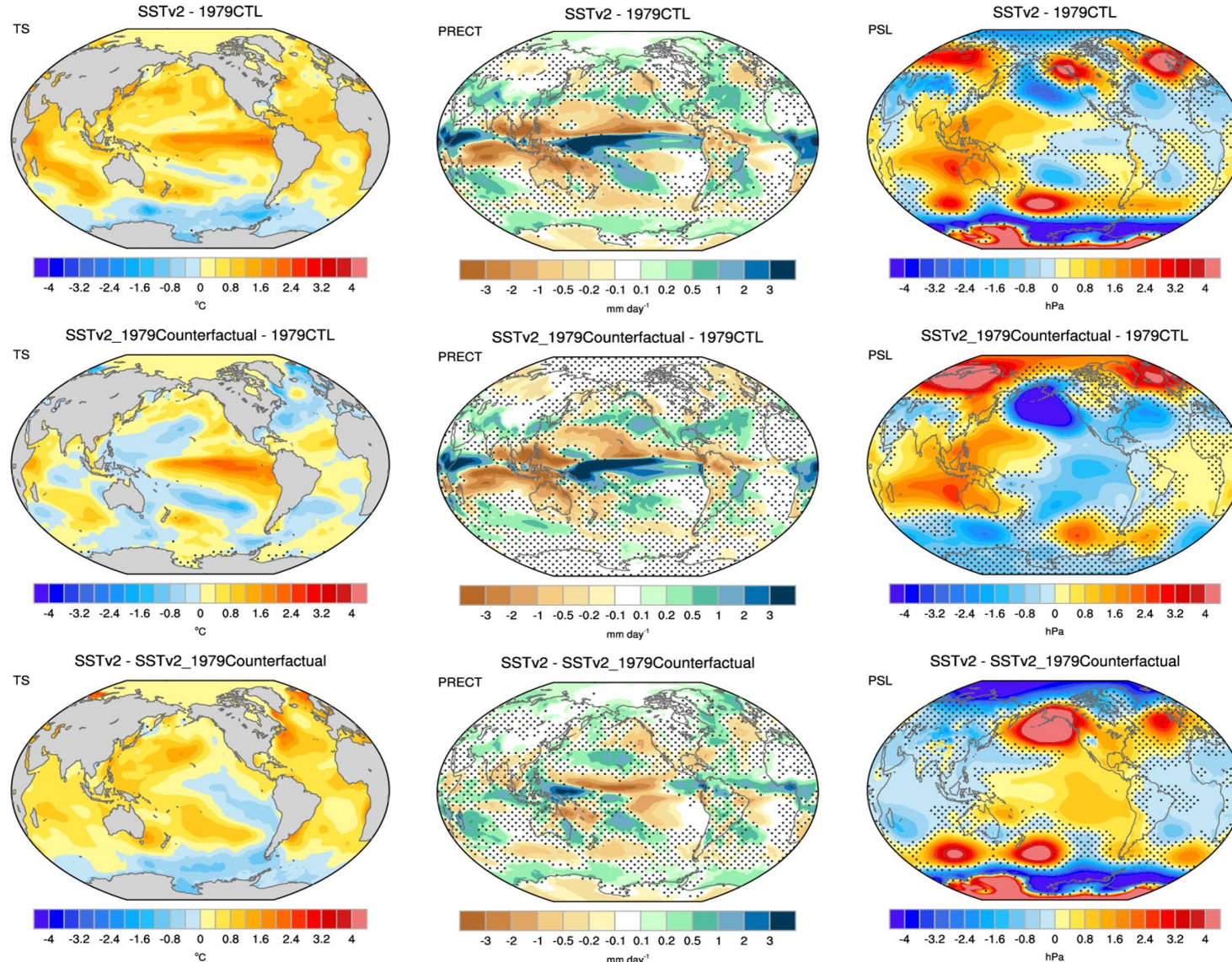
1.Historical pacemaker simulations:

   10 ensemble members from 1850 to 2021 (historical forcing 1850-2014, SSP585 2015-2021);

   Pacemaker simulations: Pacific, Atlantic and Indian Oceans (10 ensemble members each);

   Observed SST anomaly added onto model climatology: 15S-15N (10S-10N for Atlantic);

   Transition zone: 15-30 North and South (10-30 North and South for Atlantic).

   Planed in CVCWG CSL allocation and currently 10 ensemble members of Pacific pacemaker runs are ongoing and others are setting up.

2.Pacemaker hindcast experiments:

   Initial condition, Global SSTs and SSSs are restored to observations for the period 1982-2021.

   pacemaker runs: Hind_CTRL, Hind_P, Hind_A, Hind_I

   4 start months (Feb 1, May 1, Aug. 1 and Nov. 1), simulations last for 12 months.

   Planned in ESPWG CSL allocation and hindcasts for Feb 1 as the starting date are nearly done by Steve.

There will be a meeting based on these experiments in late June before AOGS meeting in South Korea (If you are interested, please contact Ingo Richter (richter@jamstec.go.jp))

TIPMIP
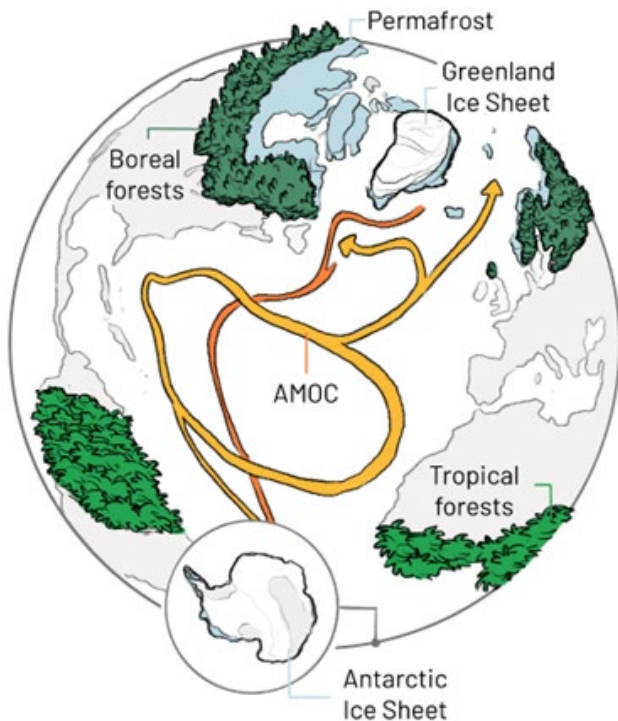
Types of experiments

Initially, there will be three major types of experiments for TIPMIP:

1. A baseline experiment to analyze the historical and projected response of selected tipping elements to different climate and land-use change scenarios,

2. A commitment experiment to assess the long-term consequences of surpassing different temperature and CO_2 levels,

3. A reversibility experiment to probe the reversibility of impacts and potential hysteresis behaviour.

The initial focus of these experiments is to assess the following key large scale tipping elements:
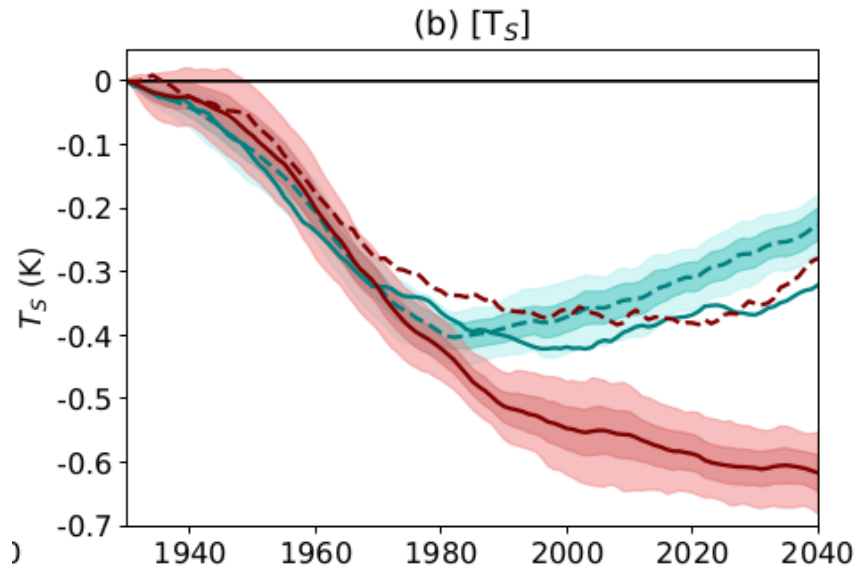
- Tropical rainforests
- Greenland Ice Sheet
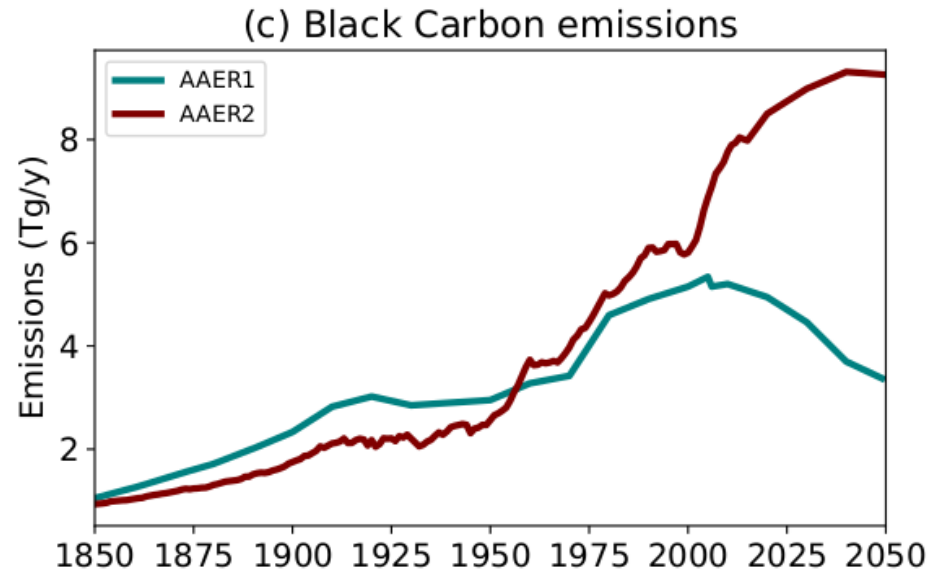- Antarctic Ice Sheet
- AMOC
- Boreal forest
- Permafrost
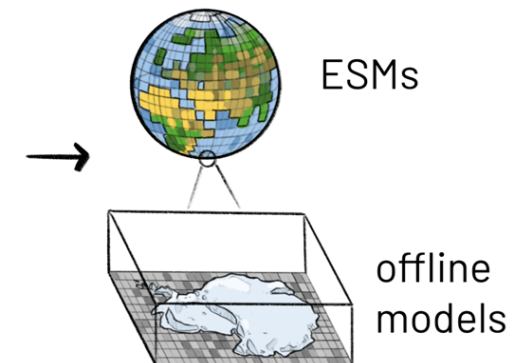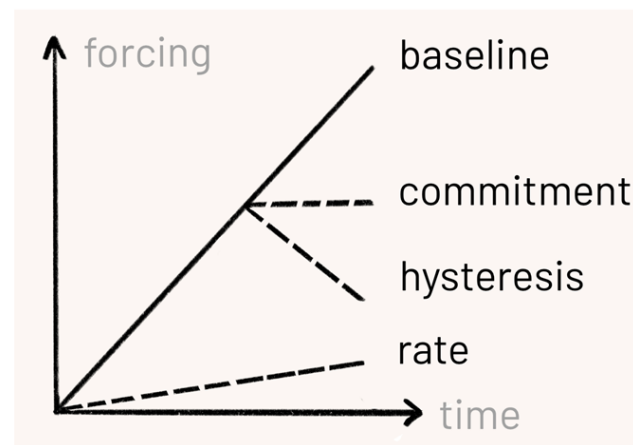
- Single forcing anthropogenic aerosol forcing with CMIP5 aerosol forcing.
  - Is there still interest in this?
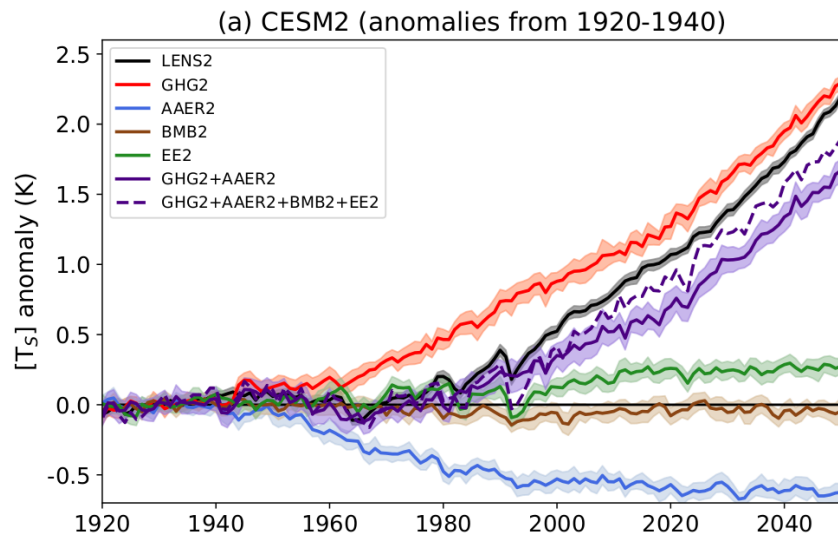

(b) [T$_s$]

(c) Black Carbon emissions

Global mean Ts response to aerosols. In CESM2 it matters which method you use. In CESM1 it matters less.

Forcings are really different. How much does that contribute to the different behavior between CESM1 and CESM2?

- Volcanoes only ensemble
  - Is there still interest in this?

(a) CESM2 (anomalies from 1920-1940)

What leads to the warming in the "everything else" ensemble after about the year 2000

(d) Solar + Volcanic
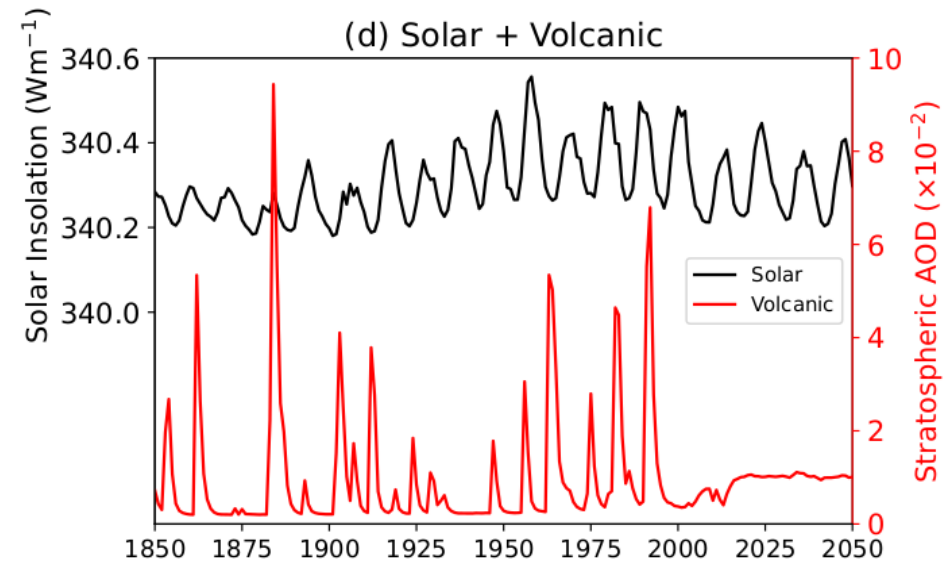
Is it the lack of large volcanic eruptions and the switch to a background volcanic aerosol?

- Interactive biomass burning emissions simulations.
- *Depend on whether the capability is there yet*

- Other investigations into the regionally refined North Atlantic setup
- *We need to get started on looking at the simulation we have first.*

- Regional refinement over the North Pacific.
- *Could be worthwhile getting a regionally refined AMIP simulation that is analogous to the North Atlantic one going in the Pacific sector?*

- Pencil model piControl
- *Wasn't proposed this allocation cycle but was unable to be completed in the previous allocation due to all the technical challenges of setting up the simulations. Young-Oh says they're close to being ready*

- Is there interested in the single forcing anthropogenic aerosol runs with CMIP5 forcings?
- Interest in the volcanoes only runs?
- Is there interest in more RFMIP-type runs e.g., single forcing simulations or the various SSP scenarios?
- Should we consider a long regionally refined Pacific AMIP simulation analogous to the Atlantic one?

Please also be thinking about what simulations you would like to see the working group perform in the next allocation cycle. We'll be discussing this at the end of the day.