

ESPWG Co-chairs Update

June Meeting 2024

WG Co-chairs: Stephen Yeager, Kathy Peignon
WG liaison: Sasha Glanville



11 June 2024



Here we value respectful dialogue, please...

WELCOME to the ESPWG Winter Meeting

*Co-chairs: Steve Yeager, Kathy Pegion
Thanks to: Yaga Richter, Sasha Glanville*



Agenda

11:00 AM: Welcome & Logistics, Co-chairs

11:05 AM Quantifying sources of subseasonal prediction skill in CESM2 within a perfect modeling framework, Judith Berner

11:05 AM Co-chairs Update

11:20 AM Linking the large-scale processes and the landfalling features of atmospheric rivers in multi-scale non-hydrostatic CESM simulations over the western US, Xingying Huang

11:35 AM Interaction of rivers with the upper-ocean: A climate modeling perspective towards better S2S forecasts, Ankur Srivastava

11:50 AM Building seasonal climate forecasts from large ensembles, Dillon Amaya

12:05 PM Co-chairs Update (continued) & Discussion

12:30 PM Lunch

1:30 PM Bio Bloom Forecast: Harnessing satellite observations to predict phytoplankton extreme events, Nicole Lovenduski

1:45 PM Can we do better at predicting regional hydroclimate? Travis Aeronson

2:00 PM Australian bushfire smoke, multi-year La Nina, and implications for the Interdecadal Pacific Oscillation (IPO), Jerry Meehl

2:15 PM The Role of Stratosphere-Troposphere Coupling in Subseasonal Forecasts of the North American 2017-2018 Cold Air Outbreak, Oliver Millin

2:30 PM Resolution sensitivity of coupled model response to persistent NAO forcing, Steve Yeager

2:45 PM Discussion

3:00 PM Adjourn

- Speakers: Please remember to reserve 2-3 minutes of your 15-minute slot for questions

ESPGW Legacy Datasets

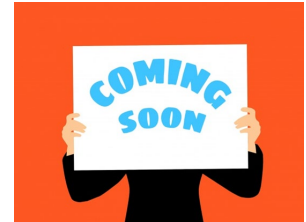
https://www.cesm.ucar.edu/working_groups/earth-system/

- **CESM1 Subseasonal -to-Seasonal (S2S)** reforecasts
 - *Ref: Richter et al., 2020, W&F, Data in IRI SubX library*
- **CESM1 Seasonal** reforecasts
 - 10-member, 12-month ensembles initialized monthly (1st of month 1980-2010)
 - *NMME (<https://iridl.ldeo.columbia.edu/SOURCES/Models/.NMME/.NCAR-CESM1/>)*
- **CESM1.1 Decadal Prediction Large Ensemble (DPLE)**
 - 40-member, 122-month ensembles initialized annually (Nov. 1st 1954-2017)
 - *Ref: Yeager et al., 2018 ([doi:10.1175/BAMS-D-17-0098.1](https://doi.org/10.1175/BAMS-D-17-0098.1))*
- **CESM2 S2S** reforecast sets (CAM6 & WACCM6)
 - **CAM**: 11-member, 45-day ensembles initialized weekly (1999-2020)
 - **WACCM**: 5-member, 45-day ensembles initialized weekly (Sep - Mar, 1999-2020)
 - *Ref: Richter et al., 2022 ([doi:10.1175/WAF-D-21-0163.1](https://doi.org/10.1175/WAF-D-21-0163.1))*
- **CESM2 Seasonal -to-MultiYear Large Ensemble (SMYLE)**
 - 20-member, 24-month hindcasts initialized quarterly (Feb, May, Aug, Nov 1970-2019)
 - *Ref: Yeager et al., 2022 ([doi:10.5194/gmd-2022-60](https://doi.org/10.5194/gmd-2022-60))*

ESPWG New Datasets

https://www.cesm.ucar.edu/working_groups/earth-system/

- CESM2 **S2S** CAM single-climo and dual-climo initialization experiments
 - 11-member, 45-day ensembles initialized weekly (1999-2020)
 - Set one or two components (atmosphere, land, or ocean) to climatology, while other(s) are realistic
 - *Ref: Richter et al., 2024 (“Quantifying sources of subseasonal prediction skill in CESM2”)*
 - **NEW**: extension to 2022 (May-Aug)
- CESM2 **SMYLE** TBI CoEx pacemaker experiments
 - preliminary set of CLIVAR TBI (ATL, PAC, IND) FEB hindcasts
 - Regional SST anomaly nudging
 - 10 member ensemble
- CESM2 **SMYLE** realtime extension (“SMYLE-XT”)
 - Feb/May/Aug/Nov initializations 2020-2023
 - 20 member ensemble
 - **NEW**: recently rerun with modified land initial conditions
- CESM2 **SMYLE** backward extension
 - Nov initializations 1958-1969
 - 20 member ensemble



ESPWG New Datasets

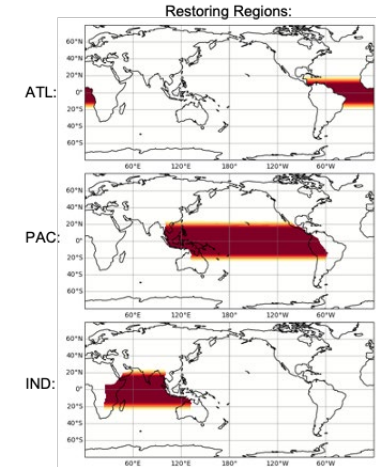
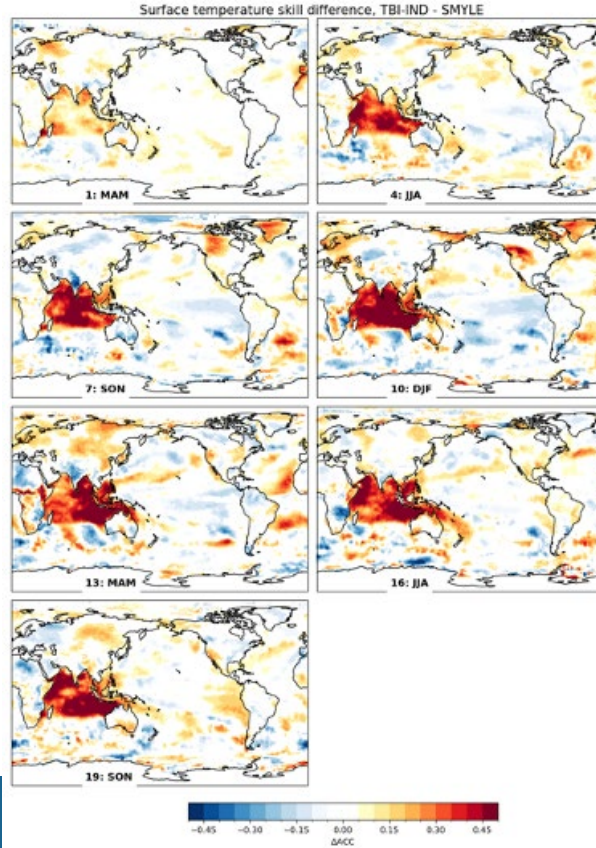
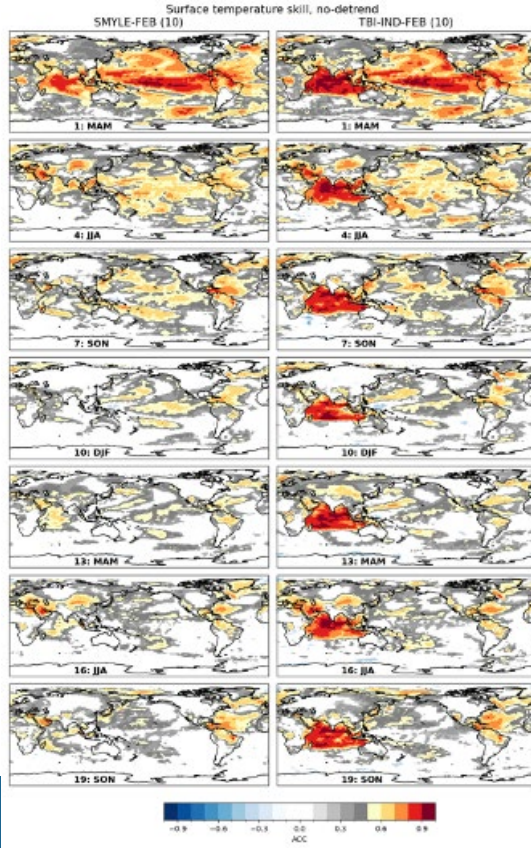
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- CISM2 **DP** (decadal extension of CISM2 SMYLE-Nov)
 - 122-month hindcasts
 - Nov-init from 1958-2023
 - 20 member ensemble
- CISM2 **MDP** (multidecadal extension of CISM2 SMYLE-Nov)
 - 242-month hindcasts
 - Nov-init from 1960,1965,...,2015,2023
 - 10 member ensemble
- CISM2 **S2S** CAM with DART atmosphere/land initialization
 - 11-member, 45-day ensembles initialized weekly (2011-2020)



CESM2-SMYLE pacemaker hindcasts

SAT ACC skill:

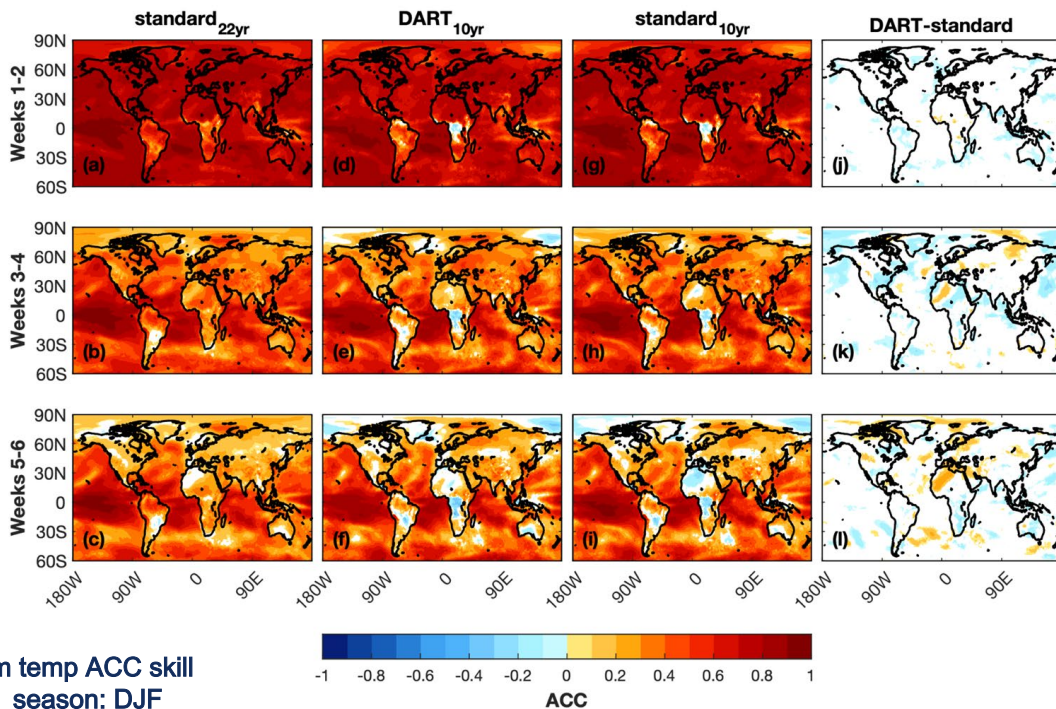


TBI-IND:

- Improved Indian Ocean variability degrades tropical Pacific skill

CESM2-S2S hindcasts with DART initialization

DJF 2m Temperature ACC (DARTatm)

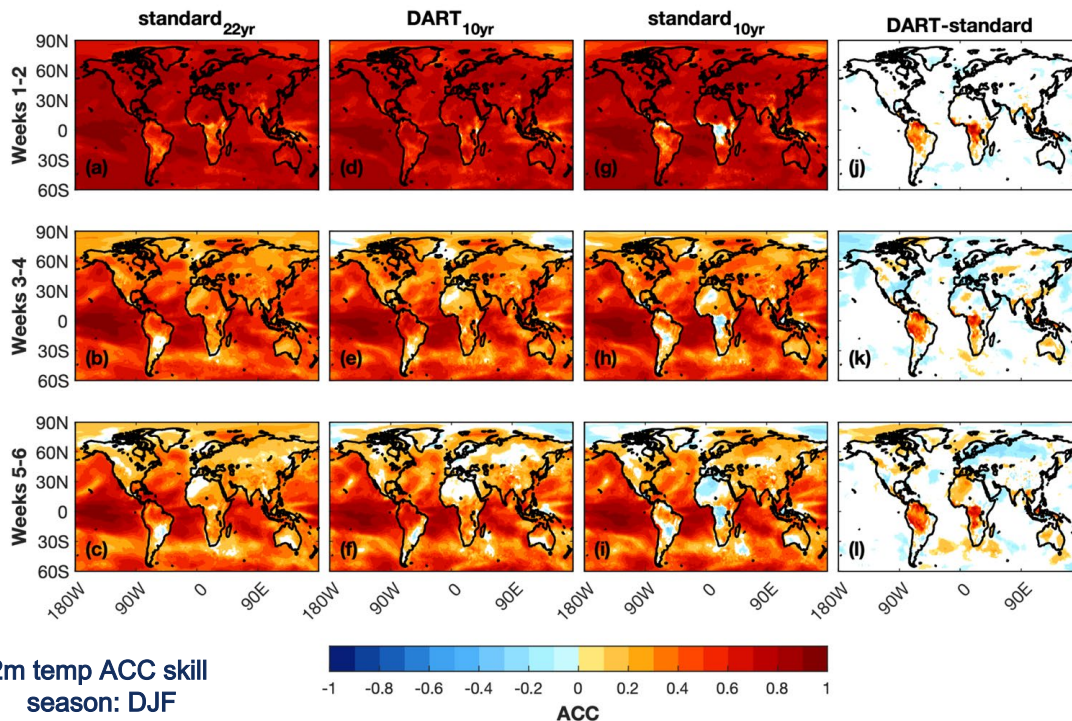


- Atmosphere : replaced NCEP with DART
- Land : NCEP-forced (default)
- Ocean : JRA55do-forced (default)
- 2011-2020, November-March
- Mondays only
- 11 members

(Sasha Glanville, Kevin Raeder)

CESM2-S2S hindcasts with DART initialization

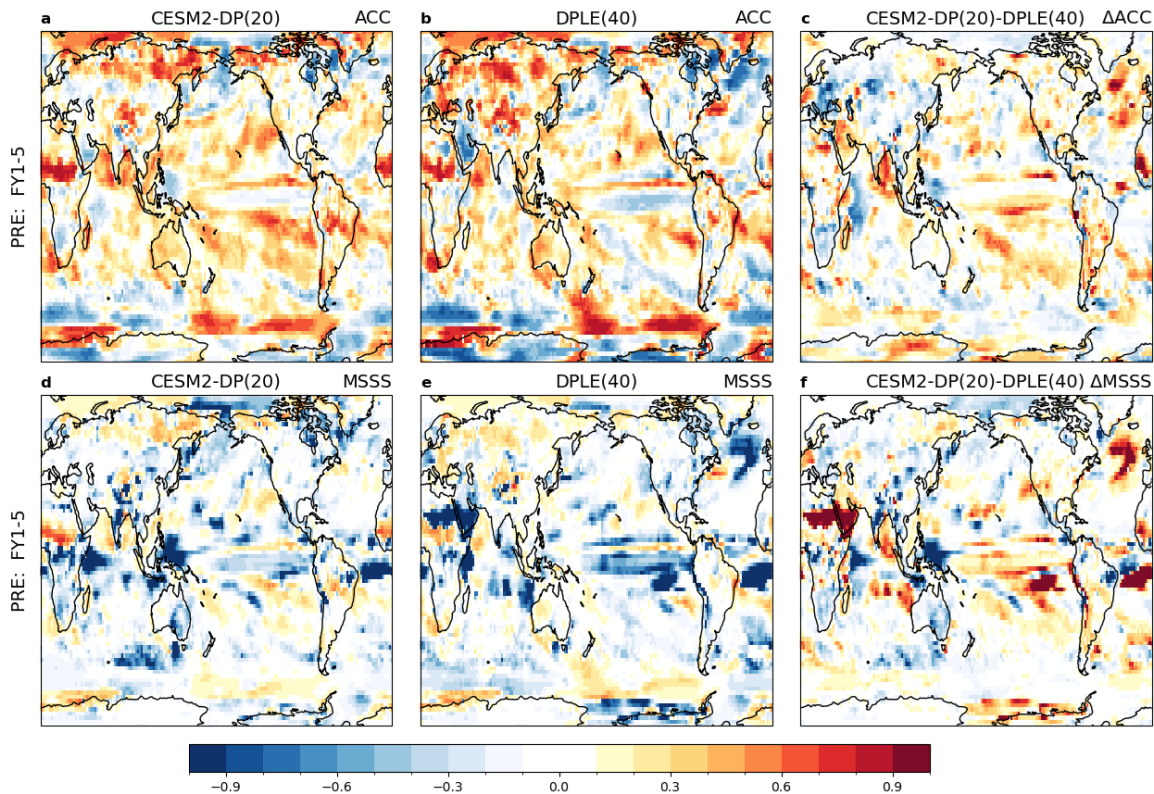
DJF 2m Temperature ACC (DARTatmIInd)



- Atmosphere : replaced NCEP with DART
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(Sasha Glanville, Kevin Raeder)

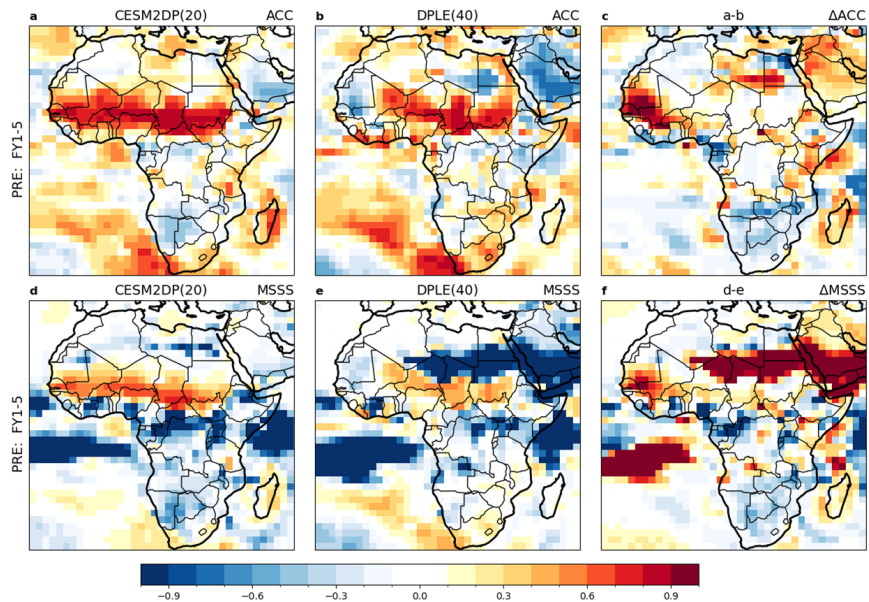
CESM2-DP Preliminary Results



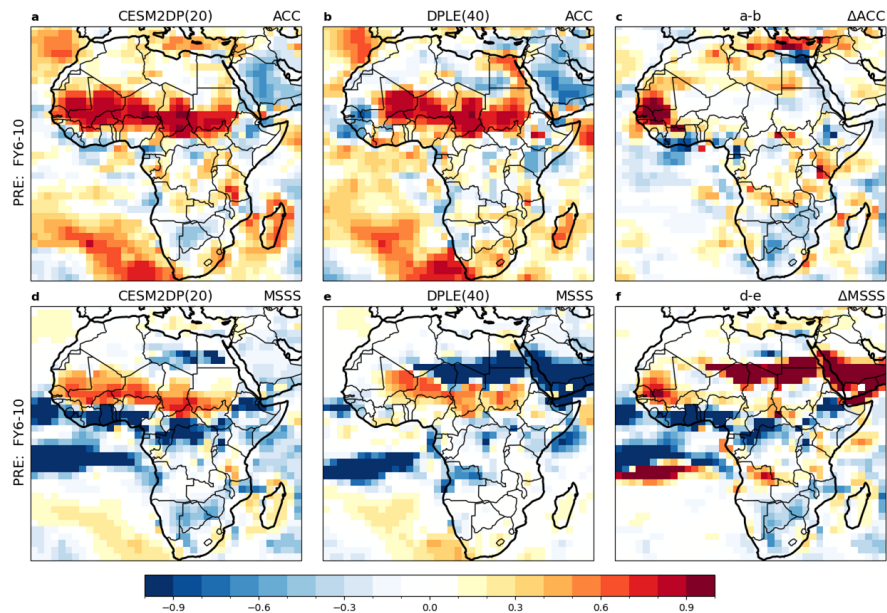
- 1958-2023 DP hindcast set is nearly complete
- Quality control and initial analysis of CESM2-DP has begun
- Need to reorganize data

CESM2-DP Preliminary Results

FY1-5

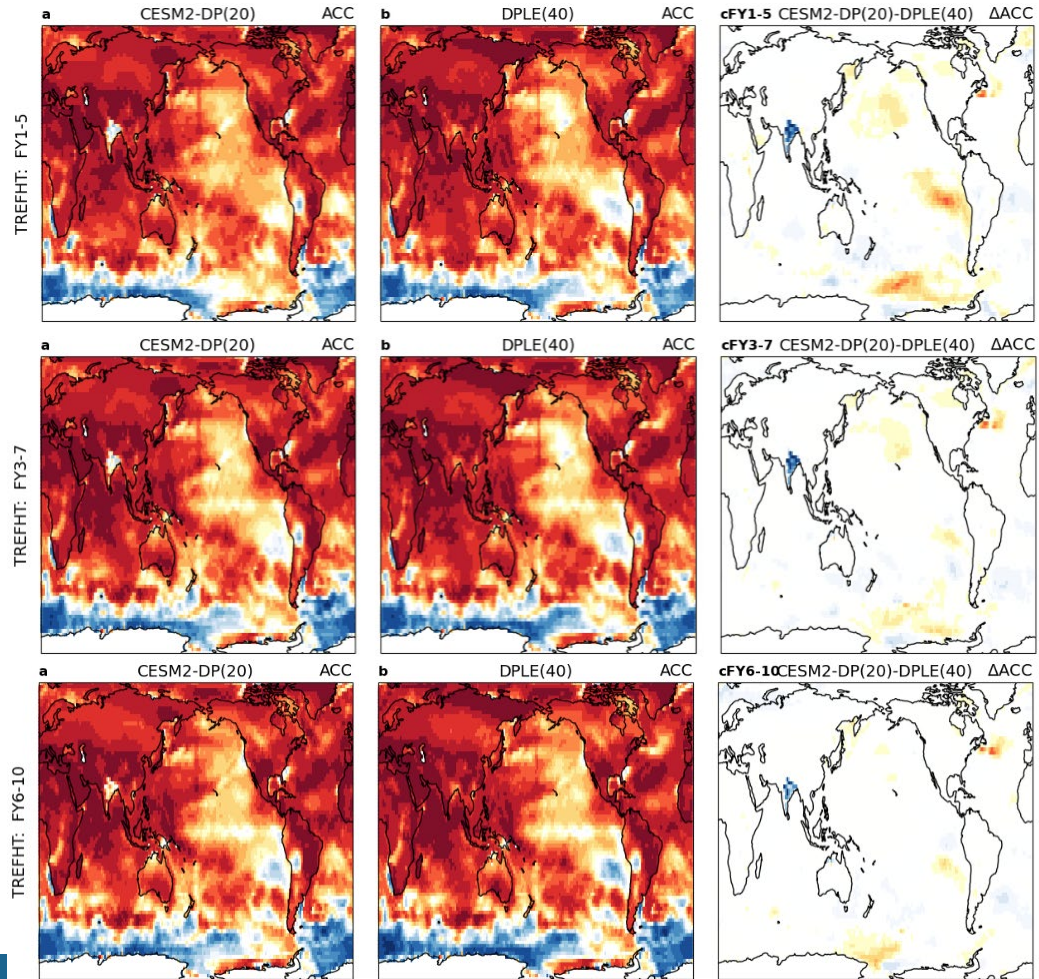


FY6-10



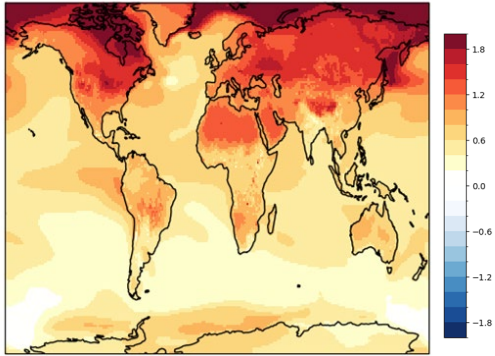
CESM2-DP Preliminary Results

- Interesting improvements in Pacific skill at early leads that may come from improved initialization

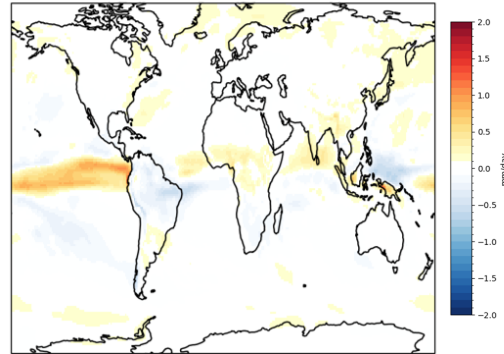


CESM2-DP decadal forecast submitted to WMO

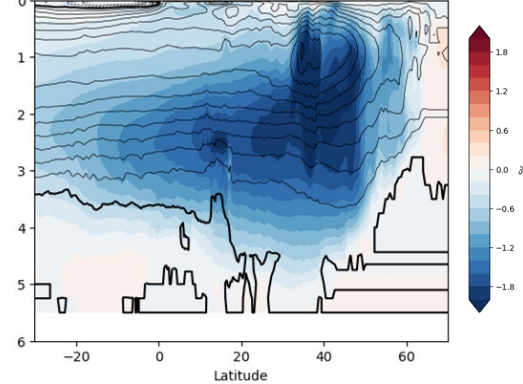
TREFHT: FY2-10 CESM2-DP(20)



PRECT: FY2-10 CESM2-DP(20)

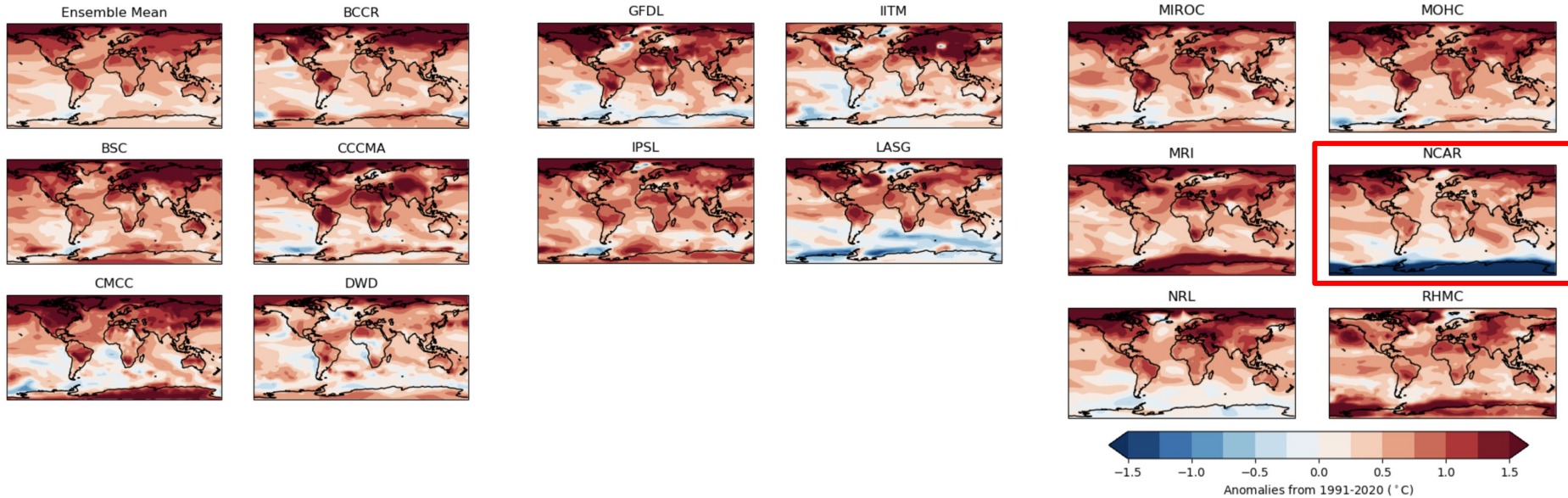


AMOC: FY2-10 CESM2-DP(20)



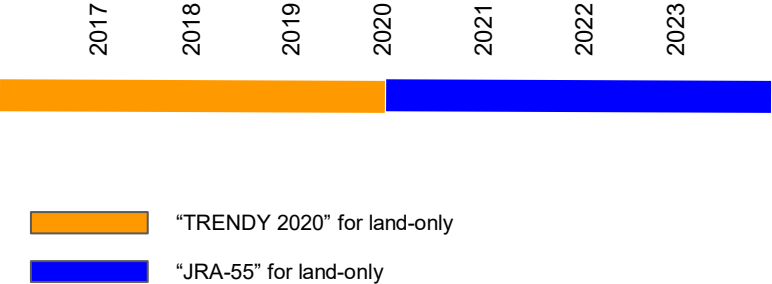
- Initialized Nov 1st 2023
- CESM2-DP will be included in 2024 edition of WMO Global Annual to Decadal Climate Update (in prep)

CESM2-DP decadal forecast submitted to WMO

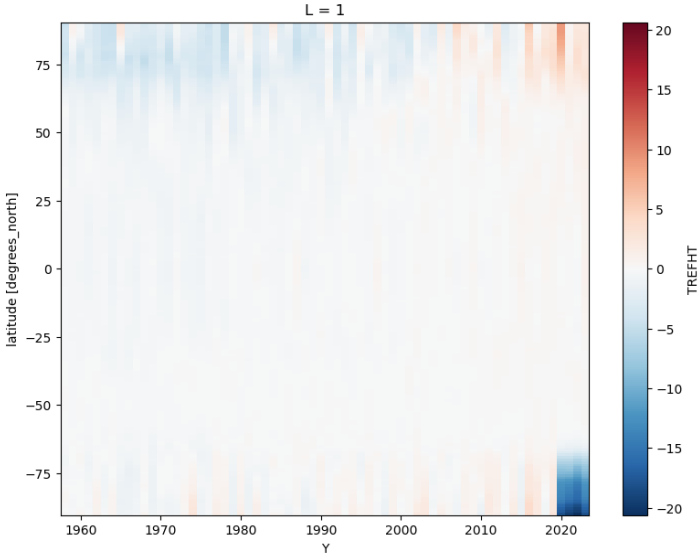


- Annual SAT forecasts for 2024 (FY1)
- CESM2-DP is an outlier over Antarctica

Land Initialization Issues



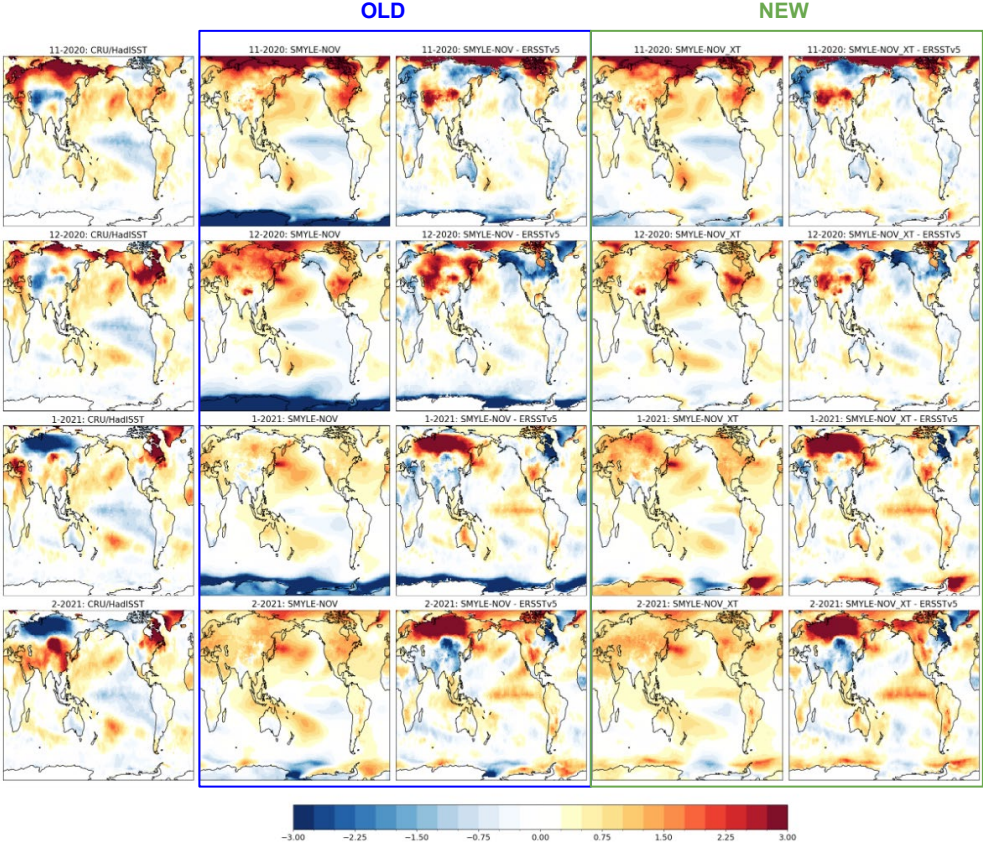
SMYLE-NOV zonal mean SAT anomaly (FM=1):



Land Initialization Issues

2017 2018 2019 2020 2021 2022 2023

- "TRENDY 2020" for land-only
- "TRENDY 2023" for land-only
- "JRA-55" for land-only, "No Antarctica" domain

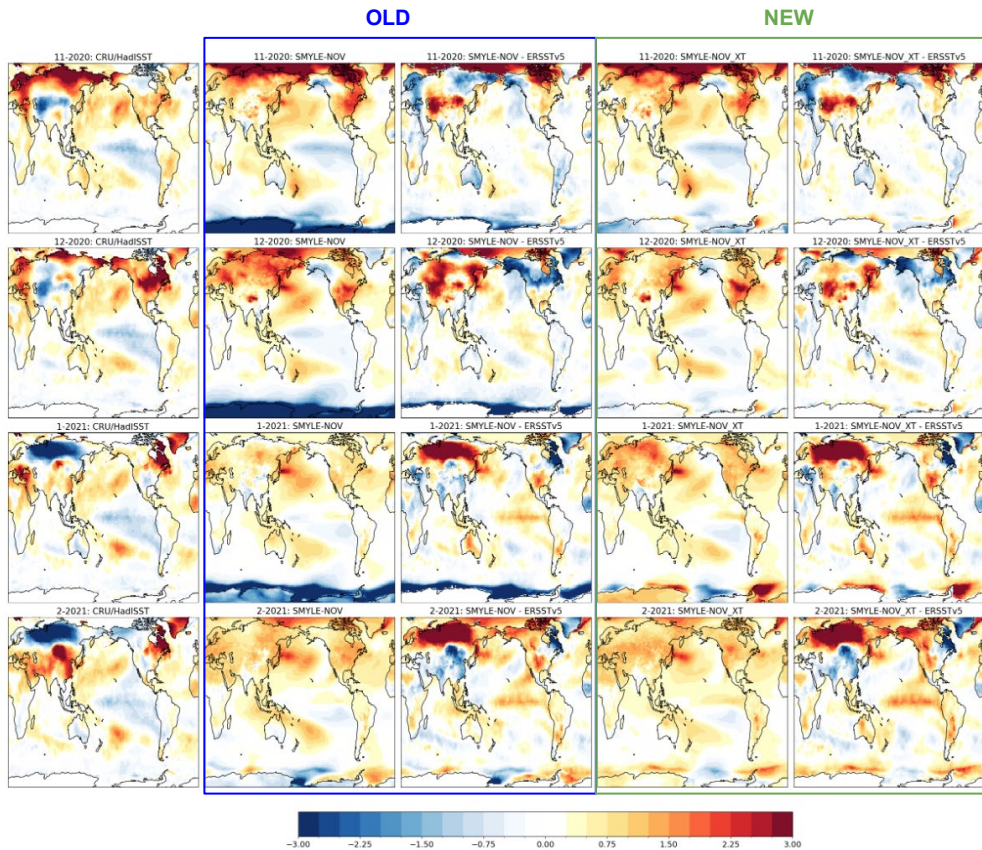


Land Initialization Issues

→ ESPWG needs a better strategy for land component initialization

2017 2018 2019 2020 2021 2022 2023

- "TRENDY 2020" for land-only
- "TRENDY 2023" for land-only
- "JRA-55" for land-only, "No Antarctica" domain



Recent ESPWG Allocation Usage

- Completed 10-member CESM2-SMYLE pacemaker suite (Feb init)
- Completed 20-member CESM2-DP (1958-2019)
- Rerunning 2020-2023 hindcasts (CESM2-SMYLE, CESM2-DP) due to land init issues
 - Important for early-access users of SMYLE realtime to take note!
- CESM2-MDP (contribution to EU-ASPECT multi-model study)
- CESM2-S2S with DART initialization (Glanville/Raeder)
- CESM2-S2S land/atmosphere coupling sensitivity experiments (Richter/Glanville)
- CESM2-S2S w/ online deterministic bias correction & stochastic physics (Berner/Chapman)

⇒ We have used up all of our Year2 allocation from the 2023/24 CESM CSL Proposal. We have received supplements and will continue to seek any extra CESM core-hours through October.

Intro to Discussion

Potential topics:

- Post-JRA55do ocean/sea-ice initialization
 - Should we try “replay” method (coupled nudging to existing analyses)?
- Land initialization matters. How can we improve it?
- CSL renewal proposal (fall 2024)
 - What should ESPWG prioritize?

Open Discussion



Get Involved!

- Would like to see **more community involvement** in analysis of existing datasets, planning and setting up new experiments, & contributions to diagnostics

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- Sasha Glanville (sglanvil@ucar.edu)