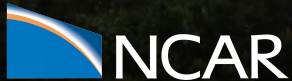


ESPWG Update

Winter Meeting 2024

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



5 March 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*



A few reminders...

- Please remember that there are people online & in-person. Do your best to participate in an inclusive manner.
- This meeting is being recorded and live-streamed. If you do not want your presentation recorded, please notify us immediately.
- Live-streaming is done on a YouTube channel which is subject to copyright laws. Do not violate copyright laws in your presentation.

Agenda

8:30 AM: Welcome & Logistics, Co-chairs

8:40 AM Enhancing Heavy Rainfall Forecasting in High-Resolution Regional Models Over West Africa for Operational Application, Eniola Olaniyan

9:00 AM Sources of Subseasonal Precipitation Skill in South America, Kathy Region

9:20 AM Subseasonal Potential Predictability of Horizontal Water Vapor Transport and Precipitation Extremes in the North Pacific, Tim Higgins

9:40 AM Quantifying sources of subseasonal prediction skill in CESM2, Yaga Richter

10:00 AM An Earth-system-oriented view of the S2S predictability of Weather Regimes using Machine Learning, Jhayron Pérez-Carrasquilla

10:20 AM Exploring the Relative Contribution of the MJO and ENSO to Midlatitude Subseasonal Predictability, Kirsten Mayer

10:40 AM Break

11:00 AM CGD SEMINAR: Predicting the El Nino of 2023/24 and its climate impacts over North America, Clara Deser & Steve Yeager

12:00 PM Lunch

1:00 PM CESM2 Performance in Subseasonal Arctic Sea Ice Loss, Madeline Frank

1:20 PM Why do climate models underpredict low-frequency hydroclimate variability? Sanjiv Kumar

1:40 PM Interpretable ENSO Forecasting using a Hybrid Deep Learning Analog Approach, Kinya Toride

2:00 PM Object-Based Evaluation of Marine Heatwave Predictions in SMYLE, Jacob Cohen

2:20 PM Are El Niño Precursors Captured by SMYLE? Emily Wisinski

2:40 PM A Multi-year Climate Prediction System Based on CESM2, Yong-Yub Kim

3:00 PM ESPWG updates, Sasha Glanville

3:20 PM Discussion

4:00 PM Adjourn

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

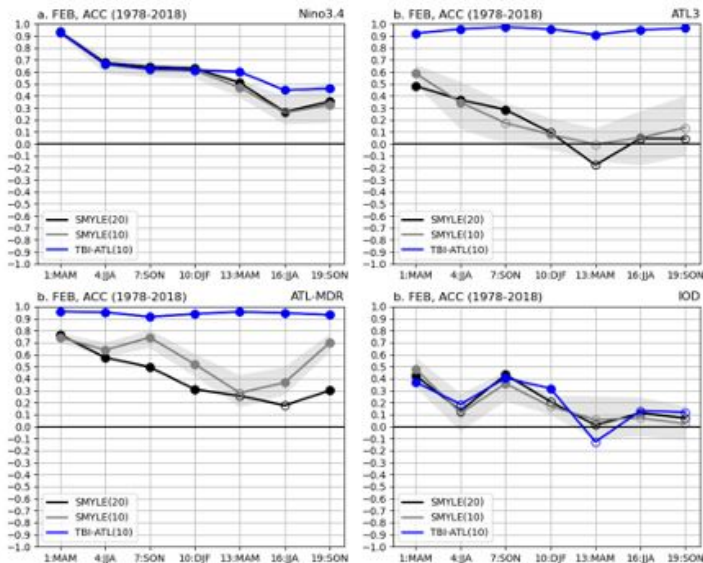
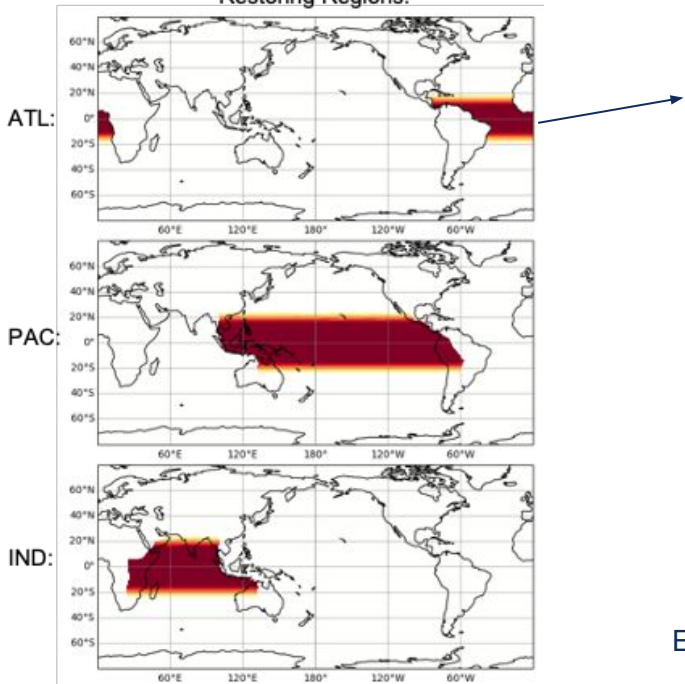
<https://www.cesm.ucar.edu/working-groups/earth-system/>

- 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”)*
- CESM2 **SMYLE** TBI CoEx pacemaker experiments
 - preliminary set of CLIVAR TBI (ATL, PAC, IND) FEB hindcasts complete
 - 10 member ensemble
- CESM2 **DP** (decadal extension of CESM2 SMYLE-Nov)
 - Nov-init from 1958-2020
 - 20 member ensemble
- CESM2 **S2S** CAM with DART atmosphere initialization
 - 11-member, 45-day ensembles initialized weekly (2011-2020)
 - preliminary results on next slide



CLIVAR Tropical Basin Interaction (TBI) Coordinated Experiments

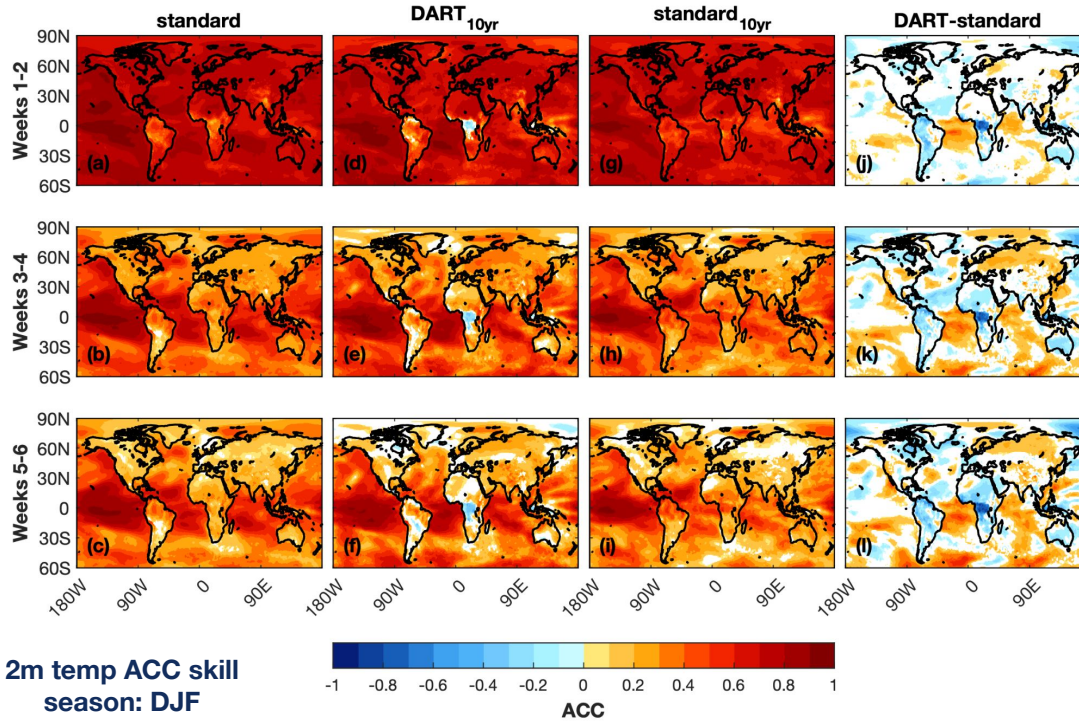
Restoring Regions:



Equivalent to SMYLE, except:

- SST restoring to observed anomalies within tropical regions.
- Only FEB initializations
- Only 10-member

CESM2-S2S hindcasts with DART atmosphere

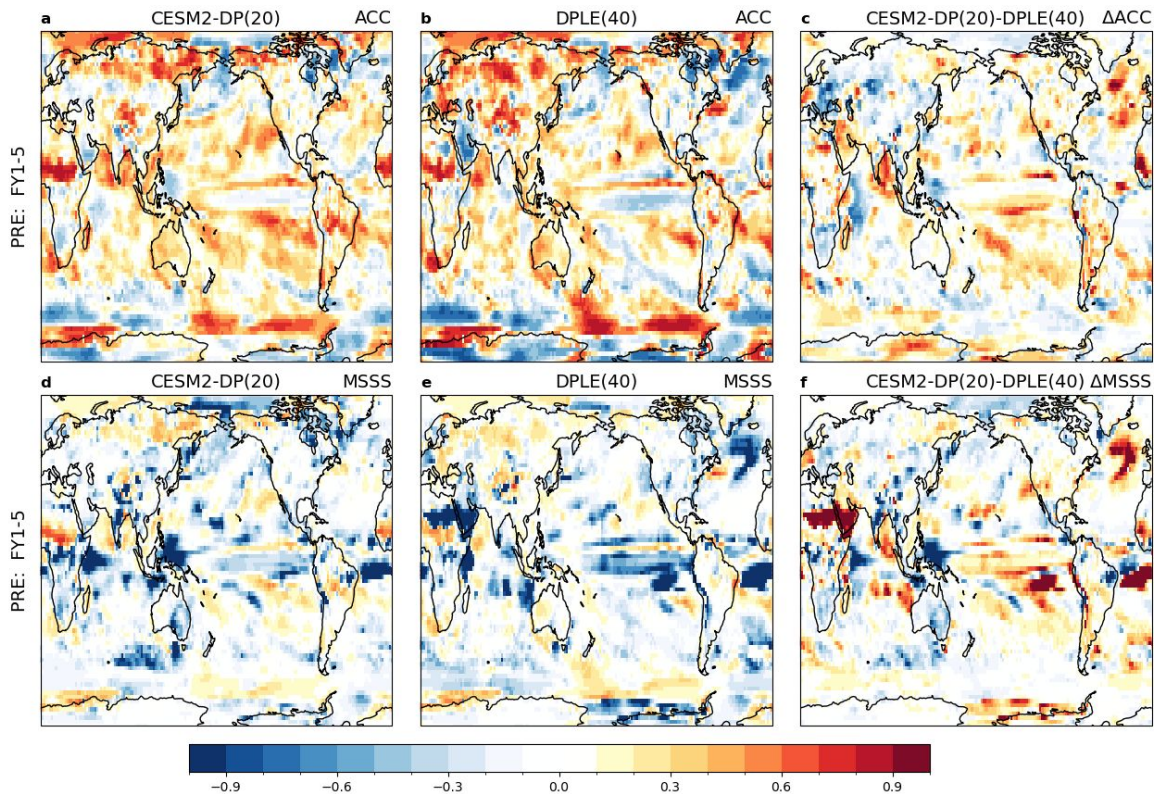


- **Atmosphere:** replaced NCEP with DART
- **Land:** NCEP-forced (default)
- **Ocean:** JRA55do-forced (default)
- 2011-2020, November-March
- Mondays only
- 11 members

DART uses ensemble data assimilation to merge observations with short CAM forecasts to create a description of the atmosphere that's more accurate than either of those. It takes into account the uncertainties in both.

(contact: Kevin Raeder)

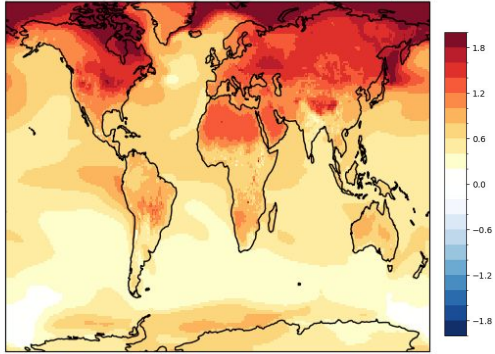
CESM2-DP Preliminary Results



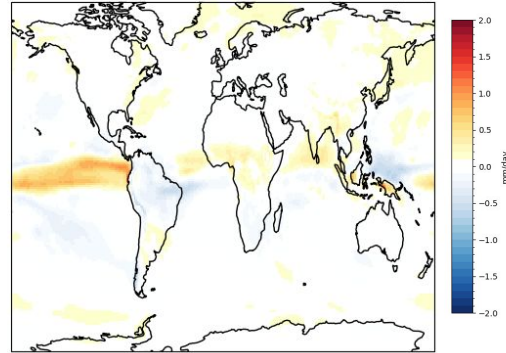
- 1958-2020 DP hindcast set is nearly complete
⇒ SMYLE has been backward extended with 1958-1969 starts
- Quality control and initial analysis of CESM2-DP has begun

CESM2-DP decadal forecast submitted to WMO

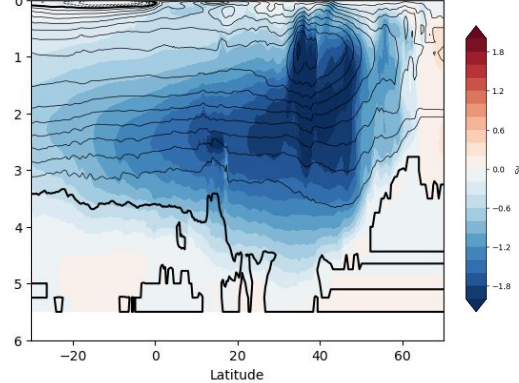
TREFHT: FY2-10 CSM2-DP(20)



PRECT: FY2-10 CSM2-DP(20)



AMOC: FY2-10 CSM2-DP(20)



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

Earth System Predictability Across Timescales (ESPAT) Workshop

<https://ncar.ucar.edu/predictability>

EARTH SYSTEM PREDICTABILITY ACROSS TIMESCALES
WORKSHOP

CO-CREATING A VISION WITH AND FOR THE COMMUNITY

REGISTRATION IS OPEN FOR OUR COMMUNITY WORKSHOP

Join us in co-creating a vision and plan for NSF NCAR and the community to advance predictability research across the Earth system.

Earth system predictability across timescales, including understanding and prediction of extreme weather and climate change impacts, is one of society's most pressing needs.

NSF NCAR is hosting the workshop to develop a comprehensive, multi-disciplinary approach that builds on the center's community partnerships and informs its strategic direction.

HOME

Tutorials + workshops

PREDICTABILITY WORKSHOP

RELATED LINKS

Earth System
Predictability Across
Timescales

- April 10-12 2024
- NSF NCAR's Center Green campus in Boulder, Colorado
- In-person or virtual
- Key opportunity to provide feedback that will guide NCAR's plan for ESP

Intro to Discussion

Plenty of core hours remain in ESPWG CSL allocation (expires Oct 2024). Please share your ideas.
⇒ Send 1-page proposal to co-chairs if you would like to use some ESPWG compute allocation

Possible experiments to run in next 6 months:

- Extend CESM2-DP to 20-yr (coordination with EU ASPECT)
- Expansion of SMYLE TBI pacemakers (new start months)
- S2S-DART with land ic's from DART
- S2S with online nudging

Other topics:

- JRA55do will no longer be updated. This has implications for real-time ocean initialization.
- Need to start thinking about CSL renewal proposal later this year (big ideas!)
- Possible large, international workshop on seasonal-to-decadal prediction at NCAR in November 2024

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
- Steve Yeager (yeager@ucar.edu)
- Kathy Pegion: (kpegion@gmu.edu)
- Sasha Glanville (sglanvil@ucar.edu)
- Yaga Richter (jrichter@ucar.edu)