Earth & Environmental Systems Modeling

2024 EESM PI Meeting

August 6-9, 2024

Bethesda North Marriott Hotel & Conference Center

Rockville, Maryland, USA

Date and Time: Thursday, August 8, 2024, 1:00-4:00 p.m.

Session Name: 5. Model Bias, Model Uncertainties, and Fitness-for-purpose

Room / Location: Plenary Room

Steering Committee: Luke Van Roekel, LANL (luke.vanroekel@gmail.com) and Forrest Hoffman, ORNL (forrest@climatemodeling.org)

Topic Leads: Dan Ricciuto, Dan Lu, Ian Sue Wing, and Erwan Mornier

Breakout Session Agenda

1:00-1:45 p.m.: Earth System Model Biases and Uncertainties
Invited Talks: 8 minutes with 2 minutes for questions

- Reducing biases in the simulated historical temperature record through calibration of aerosol and cloud processes: Improvements to the aerosol forcing in E3SMv3 – Susannah Burrows, PNNL
- Why are Aerosol-Cloud Interactions and Cloud Feedback Anti-Correlated in Earth System Models? – Xiaohong Liu, Texas A&M
- E3SM v2 biases in the Atlantic climate mean state, variability, and change - Shineng Hu Duke University

Discussion: 1:30 - 1:45

- What are the most critical ESM biases/uncertainties?
- What biases can High resolution solve (what is this resolution) and what can't it solve?

1:45-2:30 p.m.: Accelerating ESM bias/uncertainty reduction through use cases
Invited Talks: 8 minutes with 2 minutes for questions

- Probabilistic Downscaling for Flood Hazard Models – Samantha Roth, Penn State
- Combined climate and hydrologic uncertainties shape projections of future soil moisture extremes – Ryan Sriver, University of Illinois
- Scenario Discovery for Probabilistic Ensembles of a Coupled Human-Earth System Model – Jennifer Morris, MIT

Discussion: 2:15-2:30

- What are the most critical biases/uncertainties in assessment models?
- What are the largest barriers to efficient use of ESM data in assessment models

2:45-3:45 p.m.: Discussion

Questions

1. What new configurations (e.g. cloud locking) can be developed (beyond reduced number of components) to accelerate bias/uncertainty?
2. What is hindering ESM fitness for purpose (biases, data format, size, etc…)?
3. How do use case and ESM communities better interact to solve biases/uncertainties more effectively?
4. How do we deal with the tension of short term needs to address biases and longer term needs of scientists to contribute to the scientific literature?
5. What are the short, medium and long term goals in bias/uncertainty reduction and fitness for purpose?

Wednesday Poster Session

- #163 US western physical wildfire risk variability and projections in statistically downscaled and bias-corrected climate model ensembles - Theo Avila, U. Illinois)
- #156 Matilda V1.0: Integrating parameter uncertainty and ensemble weighting with Hector for probabilistic climate projections - Joseph Brown, PNNL
- #153 Improving the Simulation of Tropical Precipitation in E3SMv3 through Enhancement of Convection Parameterization - Guang Zhang, UCSD
- #155 Deep atmosphere formulation of HOMME - Oksana Guba, SNL
- #158 Automated calibration of uncertain E3SM atmosphere parameters: finding low- and high-ECS alternative parameter sets - Benjamin Wegman, SNL
- #157 Large ensemble scenario discovery on global hydropower expansion and human well-being - Gi Joo Kim, Tufts University
- #160 Impacts of convective microphysics parameterization on MJO simulation in E3SM - Xiaoliang Song, UCSD
- #162 Improving Numerical Stability And Consistency Of Atmosphere-Surface Coupling Methods To Prevent Unphysical Model Behavior In E3SMv3 - Sean Santos, PNNL
- #161 Towards configuring E3SMv3 with alternative ECS values - Bryce Harrop, PNNL
- #154 Recommendations for Diagnosing Cloud Feedbacks Using Cloud Radiative Kernels - Mark Zelinka, LLNL
- #159 Contributions to the Spread of Climate Model Forced Responses - Karl Taylor, LLNL

Thursday Poster Session

- #153 An Overview of the E3SM version 2 Large Ensemble and Comparison to other E3SM and CESM Large Ensembles - Julie Caron, NCAR
- #158 Parametric origins of the negative correlation between cloud droplet number and liquid water path - Daniel McCoy, University of Wyoming
- #156 Results of idealized test cases from a Deep-atmosphere variant of the HOMME dynamical core - Owen Hughes, University of Michigan

- #160 Developing a Physically Based Solution for the Ultra-low Could Droplet Number Issue in E3SM - Yunpeng Shan, PNNL
- #163 Tying in High Resolution E3SM with ARM Data (THREAD) – Project Overview and Recent Progress - Yunyan Zhang, LLNL
- #161 Towards an Improved Mechanistic Representation of Ultrafine Particle Formation and Their Impact on CCN in E3SM Predictions - Jerome Fast, PNNL
- #159 Characteristics of E3SMv2's stratospheric circulation - Christiane Jablonowski, University of Michigan
- #155 Development of High-Resolution Configuration (v3.HR) for E3SMv3: Enhancing Climate System Representation and Simulation Fidelity - Xue Zheng, LLNL
- #154 Improving the representation of clouds and rain in Earth system models with a single liquid category microphysics scheme - Hugh Morrison, NCAR
- #162 UNSAFE: An UNcertain Structure And Fragility Ensemble framework for property-level flood risk estimation - Adam Pollack, Dartmouth
- #157 Enhancing Numerical Accuracy and Physical Realism in Process Coupling for Complex High-Resolution Simulations - Hui Wan, PNNL