

Benchmarking simulated sea-ice in ESMs: objective assessment of sector scale sea ice – Thu #117

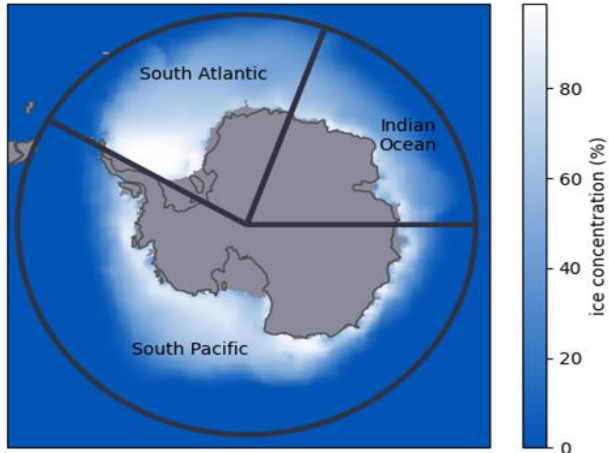


Ana Ordonez¹, Jiwoo Lee¹, Paul J. Durack¹, Peter J. Gleckler¹,
Karl E. Taylor¹, Kristin Y. Chang¹, Katherine M. Smith²

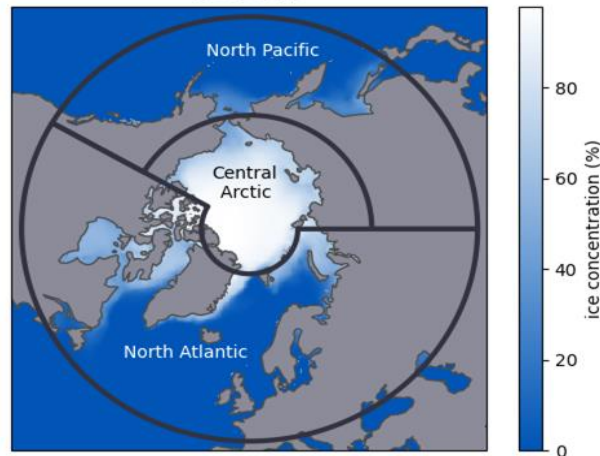
¹Lawrence Livermore National Laboratory, ²Los Alamos National Laboratory

Moving beyond hemispheric sea ice extent

Antarctic regions with mean OSI-SAF ice concentration 1988-2020



Arctic regions with mean OSI-SAF ice concentration 1988-2020

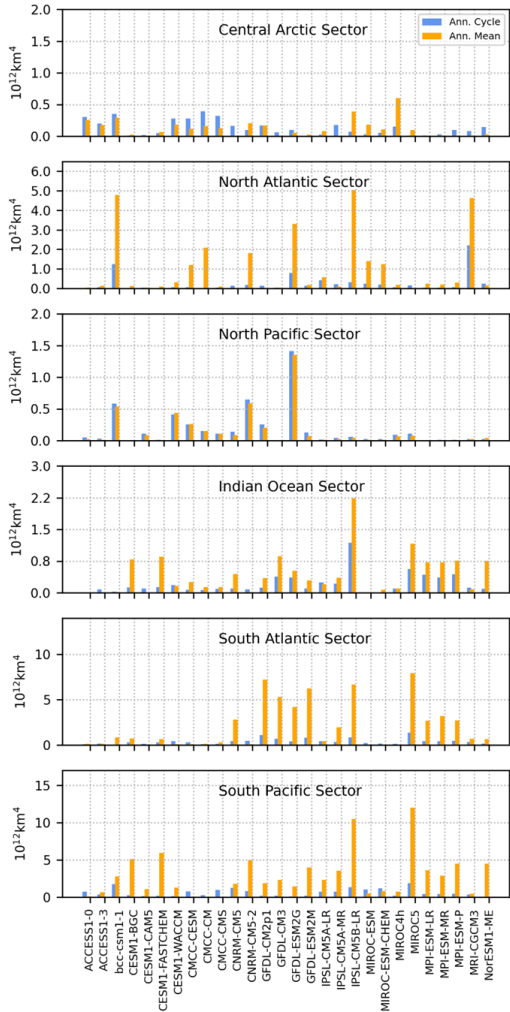


- **Developed for the HiLAT/RASM CAMAS workshop PCMDI Metrics Package (PMP) tutorial, Santa Fe, February 2024**
- Total hemispheric sea ice area is a routine way of large scale evaluation
- Hemisphere-scale assessments hide important compensating errors across basins
- Sector-based approach alleviates deficiencies in hemispheric analysis
- Analysis aligns sea ice behavior to basins, elucidating ocean bias relationships with sea ice

Behaviors across CMIP5 and CMIP6 models

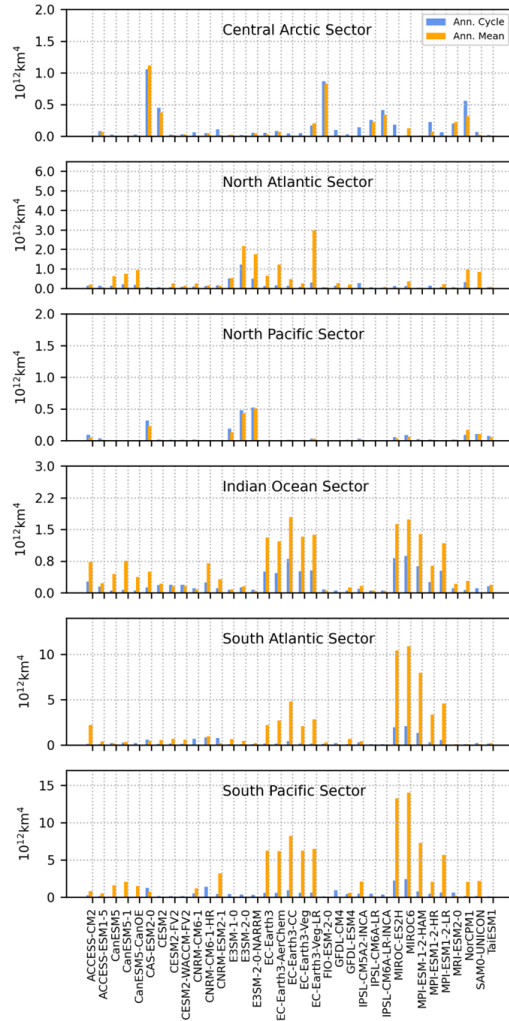
CMIP5

Mean Square Error relative to OSI-SAF



CMIP6

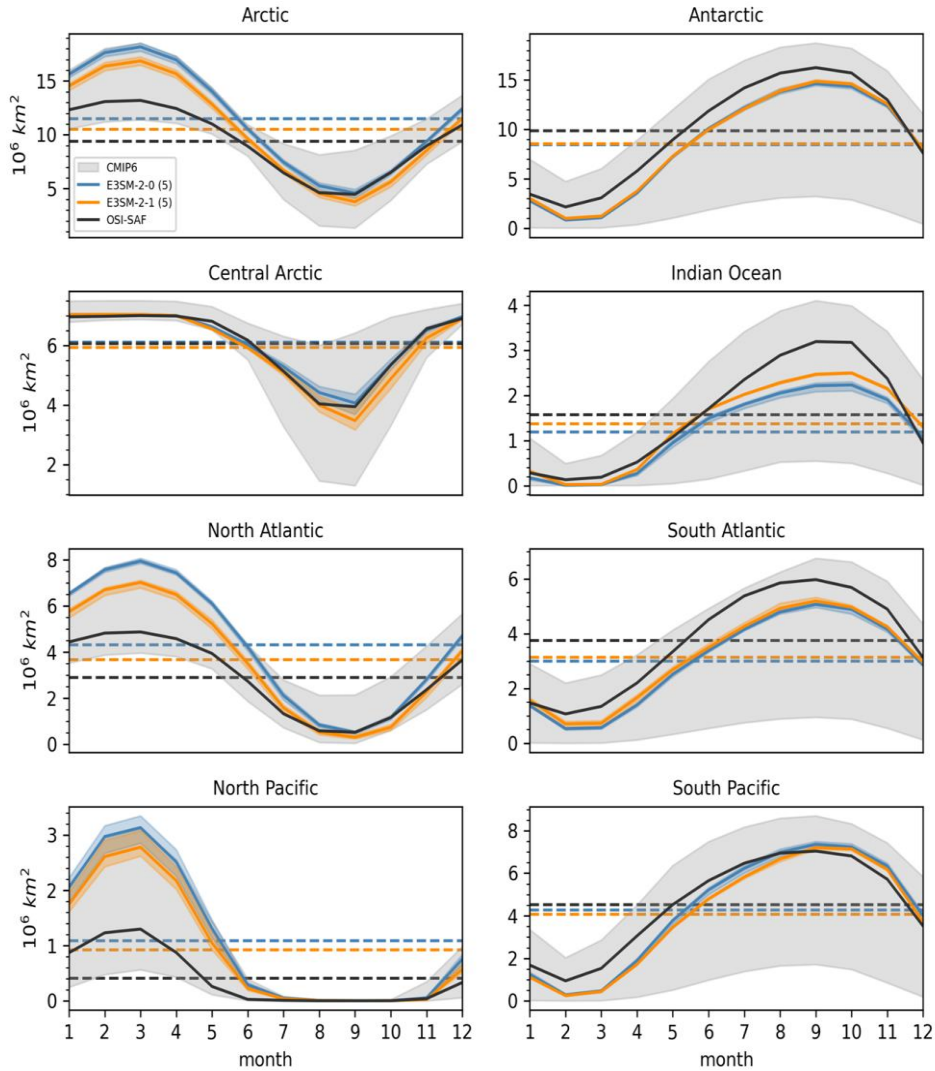
Mean Square Error relative to OSI-SAF



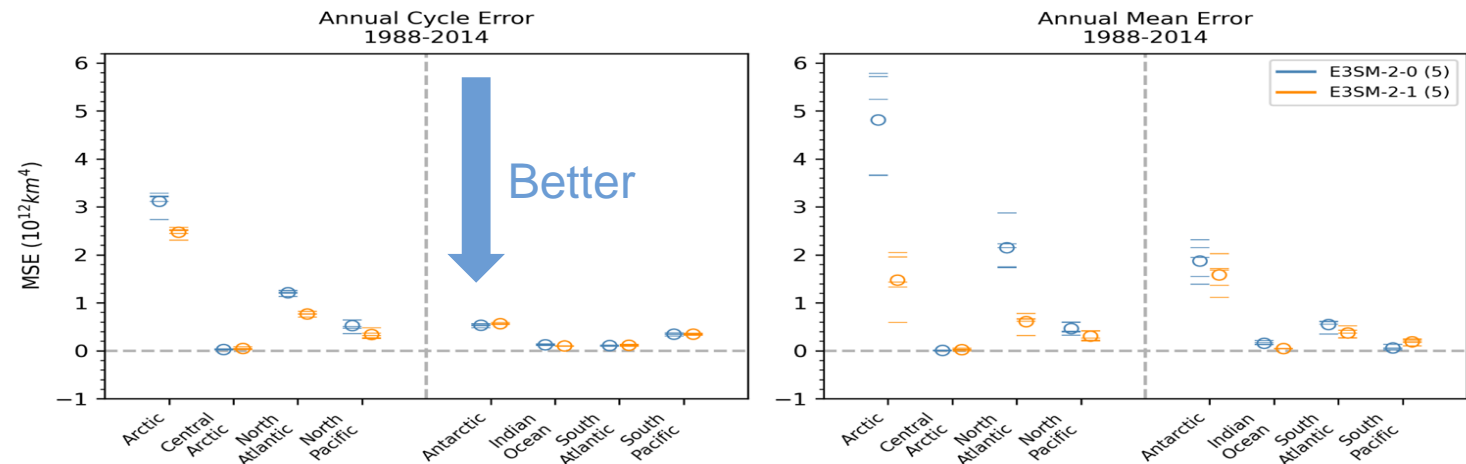
- Target well observed 1988-2005 period, with temporal coverage across CMIP5 and CMIP6 historical
- Little evidence of systematic improvement CMIP5 -> CMIP6 – but true for multi-model mean
- Qualitative improvement in Arctic sea ice – smaller magnitude errors
- Some qualitative improvement in Antarctic sea ice – select models
- Implemented in PMP, in preparation for CMIP7 – Rapid Evaluation Framework (REF)

Improvements E3SMv2 vs E3SMv2.1

1988-2014



- Ocean eddy parameterization amongst other updates E3SM2.0 -> 2.1
- Significant multi-ensemble climatological seasonal improvements toward observed state in both hemispheres (left)
- Reduced absolute errors compared to observations, all sectors (below)



**Paul J.
Durack**

PCMDI, LLNL

durack1@llnl.gov

Jiwoo Lee

PCMDI, LLNL

lee1043@llnl.gov

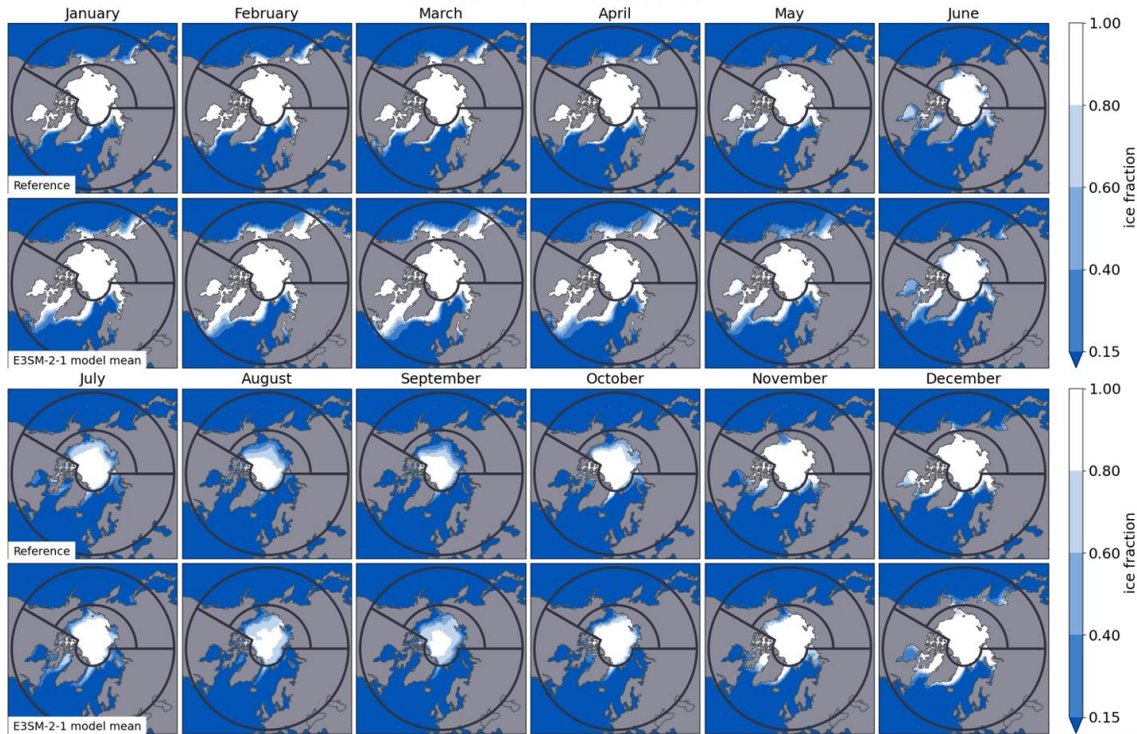
 National Laboratory

Disclaimer

This document was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor Lawrence Livermore National Security, LLC, nor any of their employees makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or Lawrence Livermore National Security, LLC. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or Lawrence Livermore National Security, LLC, and shall not be used for advertising or product endorsement purposes.

Improvements E3SMv2 vs E3SMv2.1

1988-2014 Arctic sea ice



- Total sea ice area

1988-2014 Antarctic sea ice

