Modeling advances improve understanding of seasonal to decadal sea ice predictability

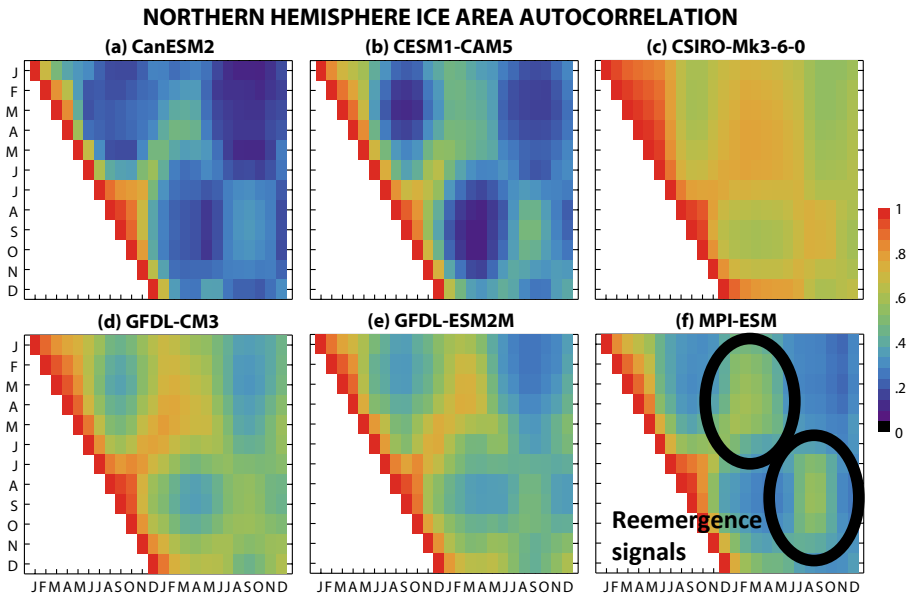
Objective

- A review of sea ice models used for climate studies and of the recent advances made with these models to understand sea ice predictability

Approach

- Dynamic and thermodynamics processes represented by sea ice models for climate applications enable simulation of critical ice-ocean-atmosphere interactions.
- Seasonal sea ice can be predicted based on mechanisms associated with ice thickness or ocean heat anomalies. On longer timescales, internal climate variability is an important source of uncertainty.
- Anthropogenic signals have already emerged from internal climate noise.
- While models differ in the magnitude and timing of predictable signals, many sea ice predictability characteristics are robust across models, as in the Multi-Model Large Ensemble (MMLE).
- Newer sea ice model developments include biology, chemistry, landfast ice, wave-ice interactions, and advanced snow properties and processes.

Holland, M.M., and E.C. Hunke. 2022. A review of Arctic sea ice climate predictability in large-scale Earth system models. *Oceanography*, https://doi.org/10.5670/oceanog.2022.113.



Autocorrelation of Northern Hemisphere ice area anomalies from MMLE models using data from 1960–2000 and all ensemble members. Ice anomalies on the y-axis month are correlated with future anomalies shown on the x-axis. To isolate anomalies from internal variability, the ensemble mean is removed from each model.

Impact

Earth system modeling studies have provided new insights on sea ice predictability across timescales, which in turn provide useful information for building more skillful forecast systems.