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.

**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.