

Abstract: While historical reconstructions of Arctic climate change from Global Climate and Earth System Models (GC/ESMs) are in broad agreement with observations, 21st century projections of the magnitude of arctic climate change vary widely in the latest suite of global climate predictions and generally remain outpaced by observations. There are a number of reasons why GC/ESMs may not be able to simulate rapid change in the Arctic, which stem from a combination of coarse model resolution, inadequate parameterizations of sub-grid processes, and a limited knowledge of physical interactions.

We demonstrate the capability of the Regional Arctic System Model (RASM) in addressing some of the GC/ESM limitations in simulating observed seasonal to decadal variability and trends in the sea ice cover and climate. RASM is an example of limited-area, process-resolving, fully coupled earth system model, which due to the additional constraints from lateral boundary conditions and nudging within a regional model domain facilitates detailed comparisons with observational statistics that are not possible with GC/ESMs. We use RASM to investigate and present examples of the role of local processes, feedbacks among them, and sensitivities of simulated sea ice states and surface climate to scale dependence of model parameters to better understand model uncertainties in simulating variability and predicting seasonal to decadal change in Arctic climate.

Overarching Objective: Response to DoD and National Arctic Strategic Requirements

U.S. Navy Arctic Roadmap (2014) - Appendix 3: Arctic Roadmap Implementation Plan



2.2 Science and Technology

2.2.6: Increase ONR's Arctic Research Efforts and brief milestones annually to Chief of Naval Research. Improving the Navy's ability to understand and predict the Arctic physical environment at a variety of time and space scales.

2.3 Environmental Observation and Prediction

2.3.5: Encourage research into and development of comprehensive Arctic System Models

Implementation Plan for the National Strategy for the Arctic Region (2014)

Pursue Responsible Arctic Region Stewardship

- Develop a Framework of Observations and Modeling to Support

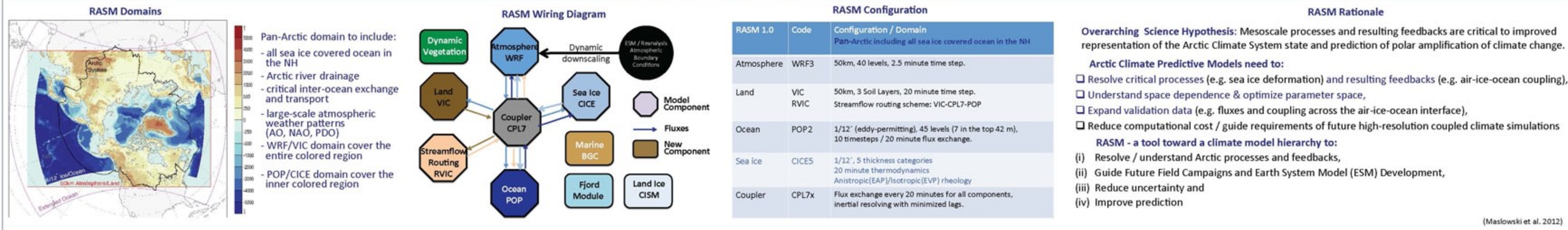
Forecasting and Prediction of Sea Ice

Objective: Improve sea ice forecasts and predictions at a variety of spatial and temporal scales
 Lead Agency: Department of Defense (ONR)

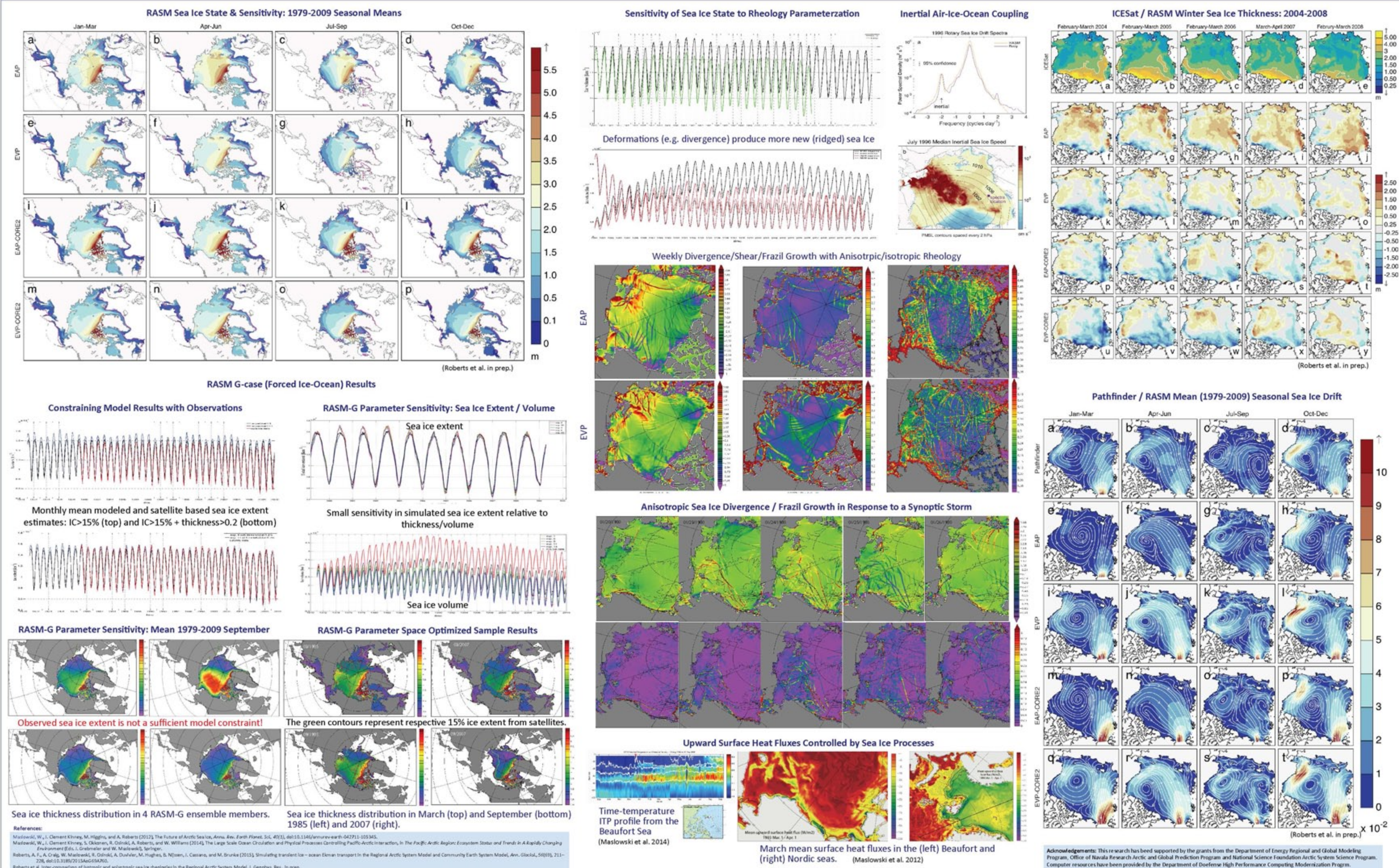
- Integrate Arctic Regional Models

Objective: Coordinate an integrated and focused effort to improve Arctic modeling to benefit understanding of ongoing processes, better project future Arctic changes, and guide future process research and decisions
 Lead Agency: Department of Energy

Regional Arctic System Model (RASM) - Overview



Selected RASM Results



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