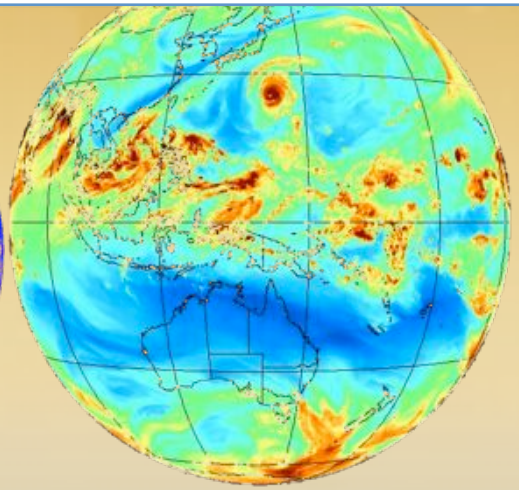
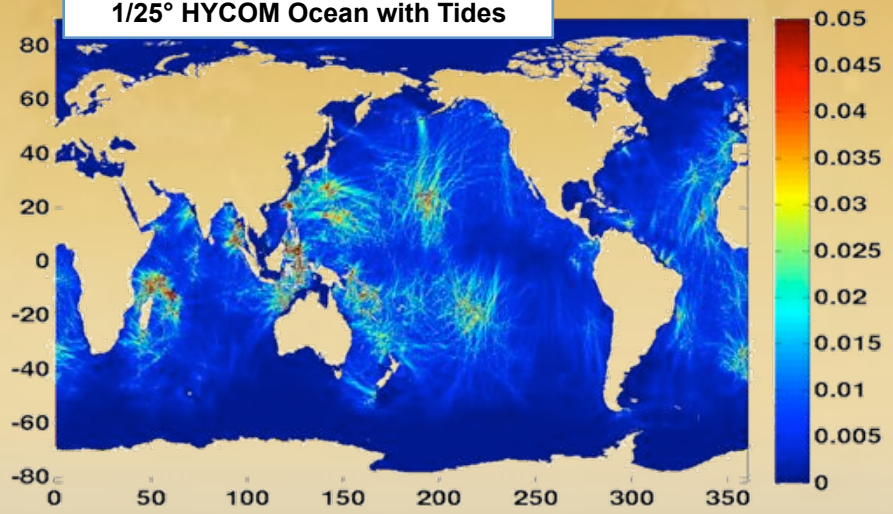
Seamless Global Prediction

Adaptive Grid Capability

High-res Global Water Vapor Forecast



1/25° HYCOM Ocean with Tides



ONR's new effort will focus on building the next-generation integrated global prediction system to support the needs of the US Navy in 2020:

- **Fully-integrated** ocean-wave-ice-atmosphere model
- Appropriately coupled across a **wide range of space and time scales**
- Provide **improved short-term (< 7 days) predictions** of the physical environment in support of safe, efficient, and effective naval operations
- Provide **extended-range predictions** for Navy strategic resource decisions
- **Understand relevant physics** to inform and enable longer (decadal+) predictions
- Define the **limits of predictability** for different physical variables and processes

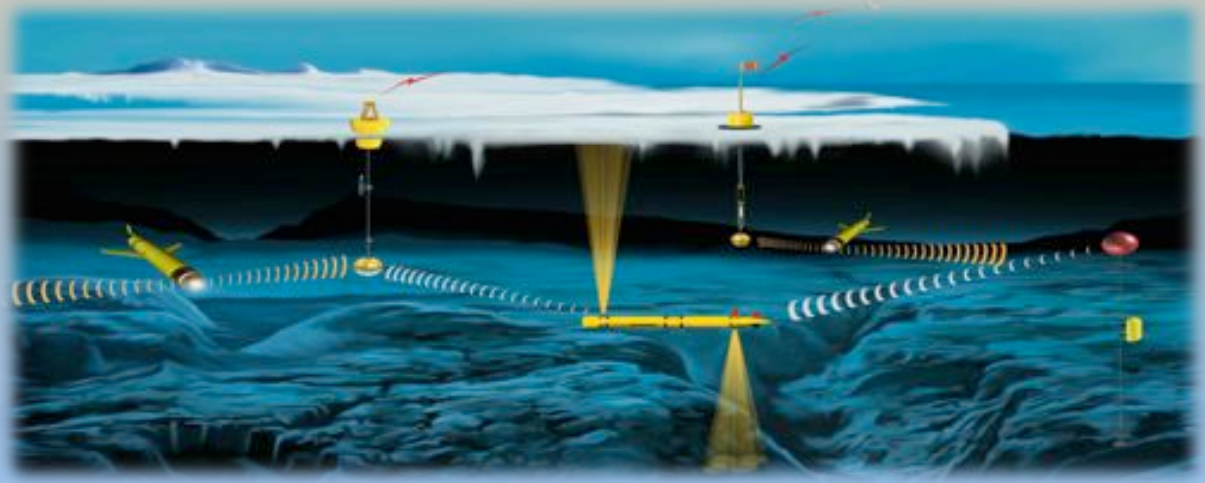
Establishment of an Arctic Research Program

In response to priorities identified in coordination with Task Force Climate Change, a new research program focused on the Arctic has been created at ONR through a realignment of funding priorities

Program Goals:

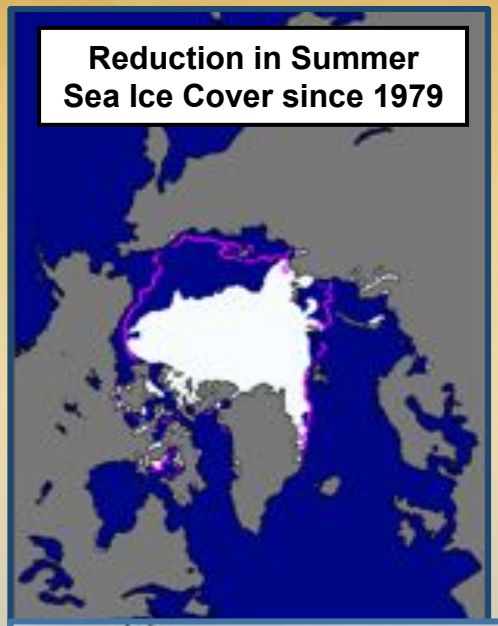
- Improved **basic understanding of the physical environment and processes** in the Arctic region
- Development of a new **dynamic, fully-integrated (ocean – ice – wave – atmosphere) Arctic system model** for improved prediction of the operational environment in high-latitudes at longer lead times
- Utilization of **satellite SAR data** for assimilation into integrated models
- Exploration of **new technologies** (platforms, sensors, communications) required for **persistent observation** and operation in the harsh Arctic environment

SAR Sea Ice Imagery



Advances in technology will be required to develop an Arctic Observing Network that will support scientific exploration and be able to initialize predictive models of the environment

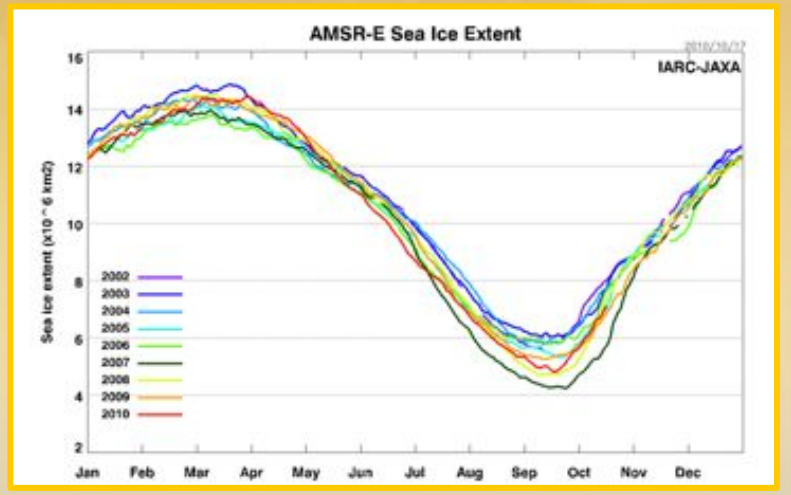
DRI: Emerging Dynamics of the Marginal Ice Zone



The Arctic is becoming more ice-dynamic, with a larger area of sea ice melting and re-freezing on an annual basis.

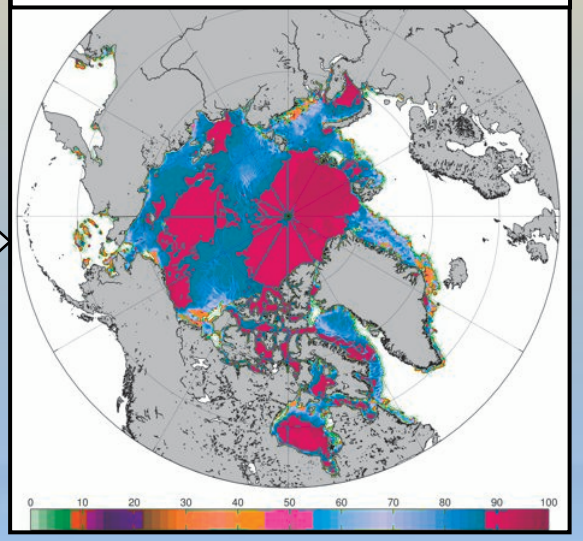
- Increased surface exposure in the Chukchi and Beaufort Seas
- More opportunity for waves, swell, and wind-induced mixing
- Feedback from air-sea interactions

Goal: Better understanding of the coupled physical processes operating in the Marginal Ice Zone



Better understanding of the MIZ physics will enable improved ice-dynamic models of the Arctic

Snapshot of Ice Concentration from coupled HYCOM / CICE model



DRI: Extended Range Prediction

Understanding the Predictability of Seasonal and Intraseasonal Oscillations

- The boundary between weather and climate models is artificial - the earth system is a continuous medium with no spatiotemporal boundaries
- Seasonal prediction represents a bridge between weather prediction and climate prediction
- Climate change influences the natural modes that cause seasonal variations
- Better understand the coupled role of the MJO, monsoon circulations, teleconnection patterns, and polar processes (NAO, AO, NAM) on the predictability of anomalous regional weather patterns

Main driver for model improvement is the need to **understand and address key uncertainties**

Understanding will be increased through a combination of **modeling, theory and observations**

Quantitatively **assess the skill of the models** at simulating and predicting seasonal oscillations

Provide insight into where to **focus and prioritize future process studies**

Seasonal⁺ Oscillations and Teleconnections

High-resolution coupled modeling of the MJO