NOAA RESEARCH
ARCTIC SPOTLIGHT

Steven Fine, Ph.D.
Acting Deputy Assistant Administrator for Programs and Administration
Office of Oceanic and Atmospheric Administration
National Oceanic and Atmospheric Administration
NOAA

NOAA's ARCTIC VISION and STRATEGY

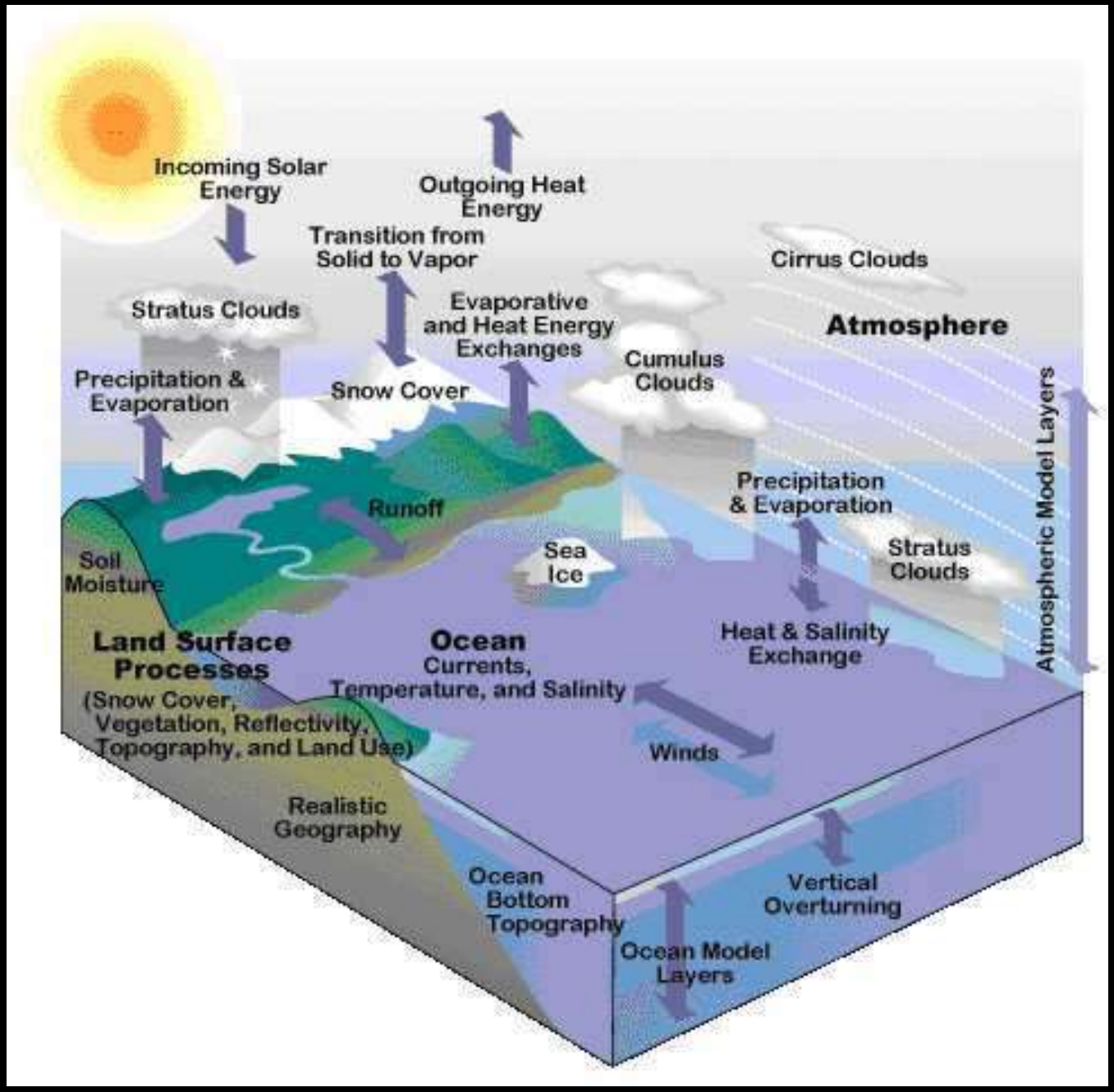
VISION

Conservation, management, and use are based on sound science and support healthy, productive, and resilient communities and ecosystems; and

the global implications of Arctic change are better understood and predicted.

GOALS

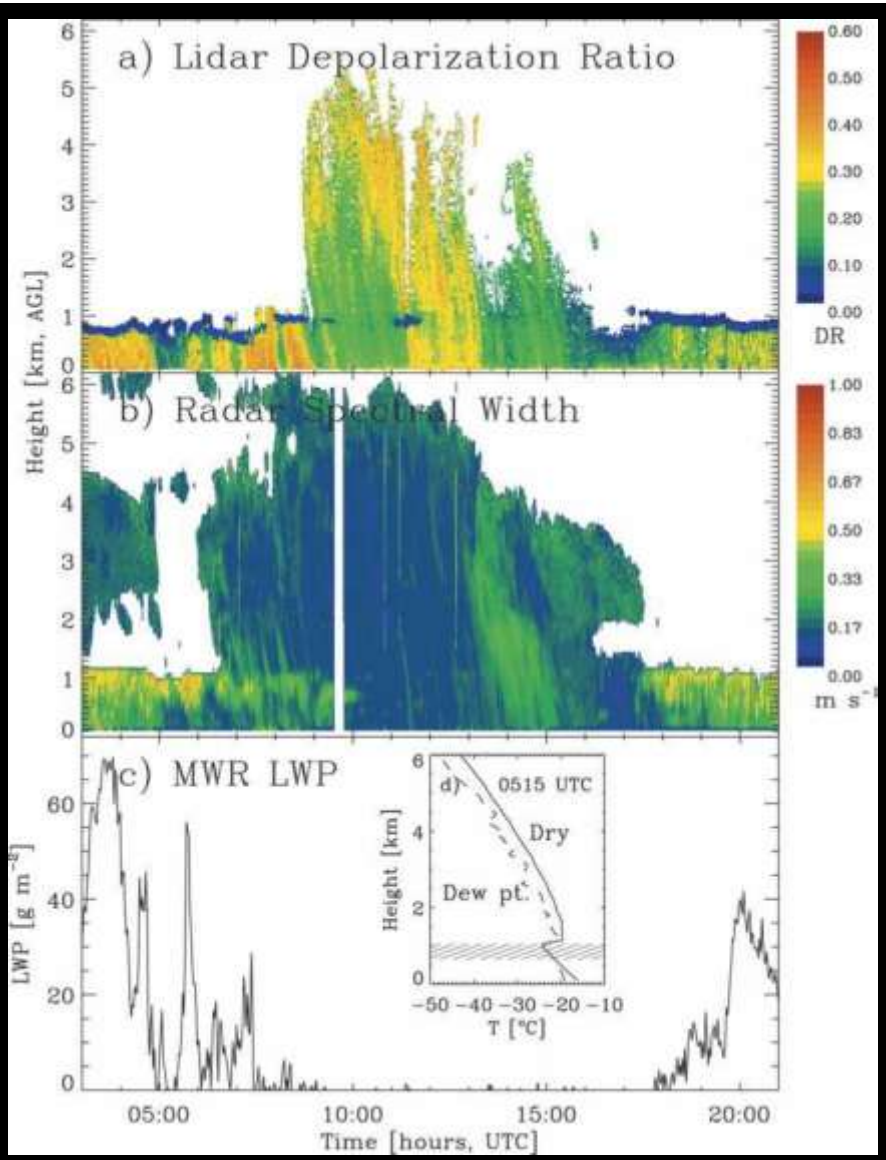
- Forecast sea ice
- Strengthen foundational science to understand and detect Arctic climate and ecosystem changes
- Improve weather and water forecasts and warnings
- Enhance international and national partnerships
- Improve stewardship and management of ocean and coastal resources in the Arctic
- Advance resilient and healthy Arctic communities and economies


Incoming Solar Energy
Outgoing Heat Energy
Transition from Solid to Vapor
Cirrus Clouds
Stratus Clouds
Evaporative and Heat Energy Exchanges
Atmosphere
Precipitation & Evaporation
Snow Cover
Cumulus Clouds
Atmospheric Model Layers
Runoff
Precipitation & Evaporation
Soil Moisture
Sea Ice
Stratus Clouds
Land Surface Processes
(Snow Cover, Vegetation, Reflectivity, Topography, and Land Use)
Ocean
Currents, Temperature, and Salinity
Heat & Salinity Exchange
Winds
Realistic Geography
Ocean Bottom Topography
Vertical Overturning
Ocean Model Layers

UCAR

International Arctic Systems for Observing the Atmosphere

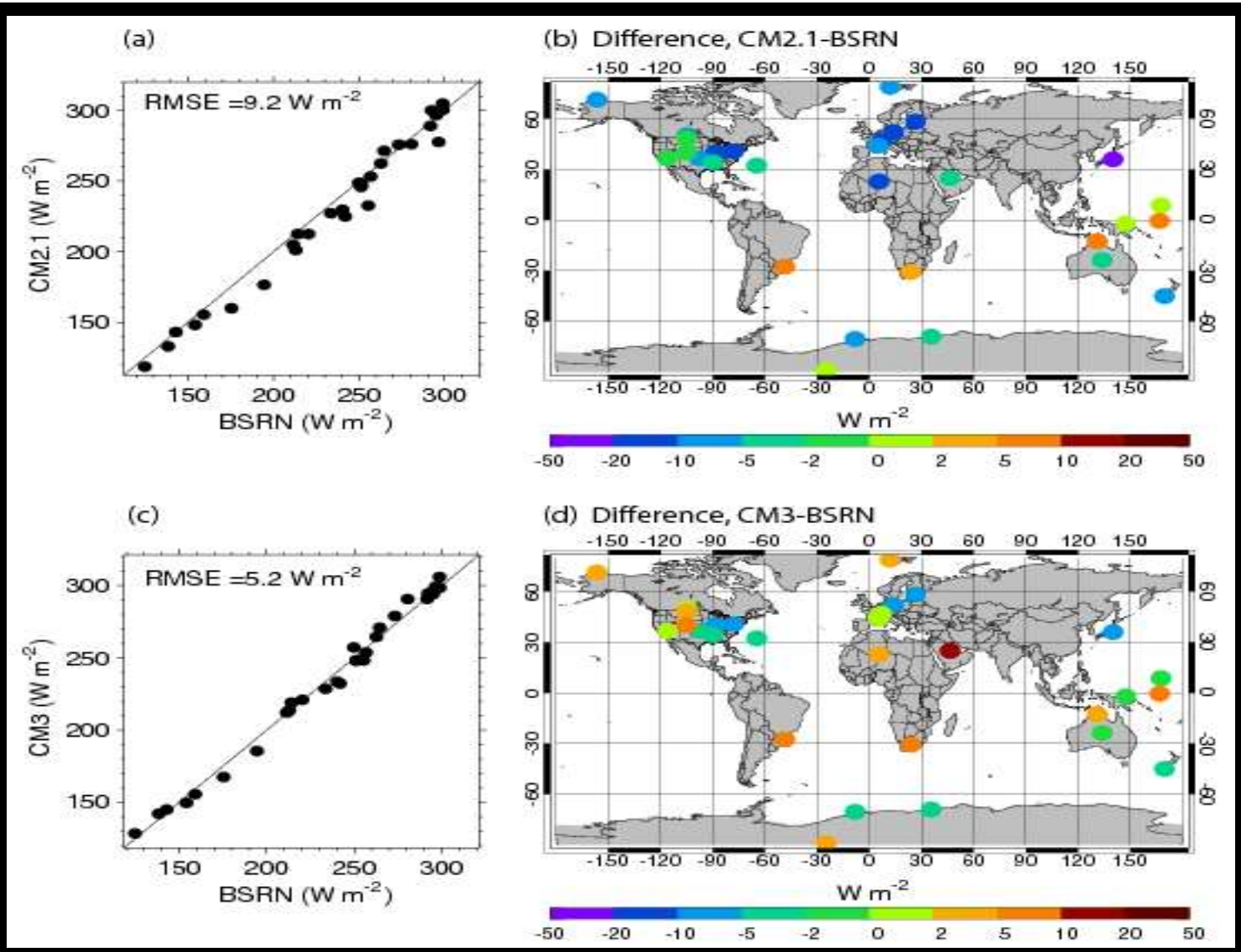
Mixed-Phase Clouds



(Shupe, Matrosov, and Uttal, 2006)

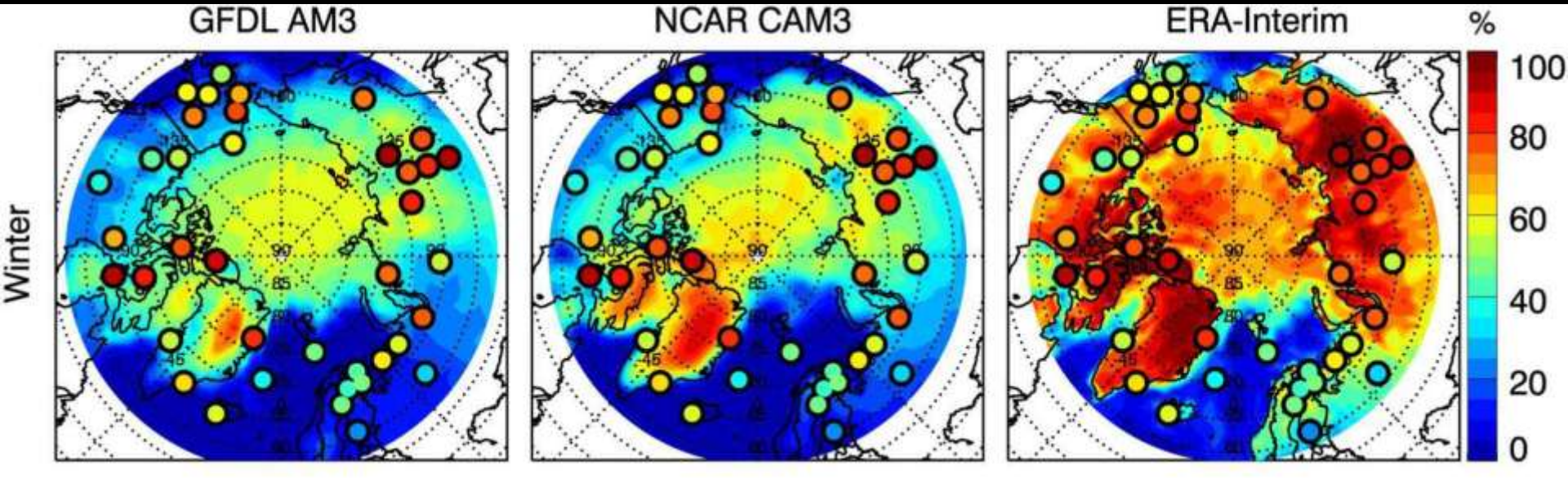
ATMOSPHERIC OBSERVATIONS & MODELS

Surface clear-sky downward shortwave radiation



(Donner et al., 2011, J. Climate, in press)

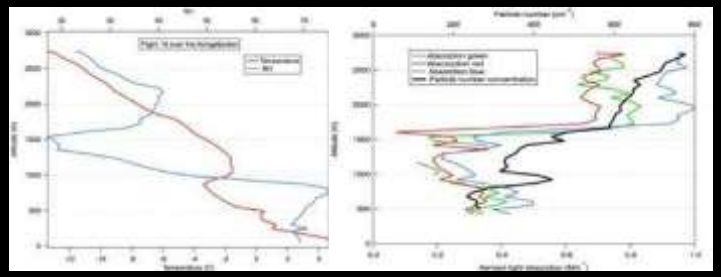
Comparisons: Surface-based inversion frequency in winter



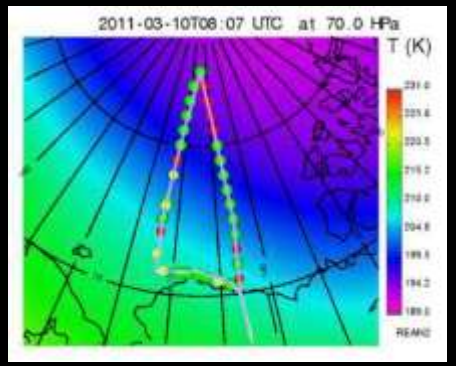
- Similar seasonal patterns and spatial distributions
- Climate models underestimate SBI frequency

Unmanned Aerial Systems

Quiet and easily transportable for high resolution imaging



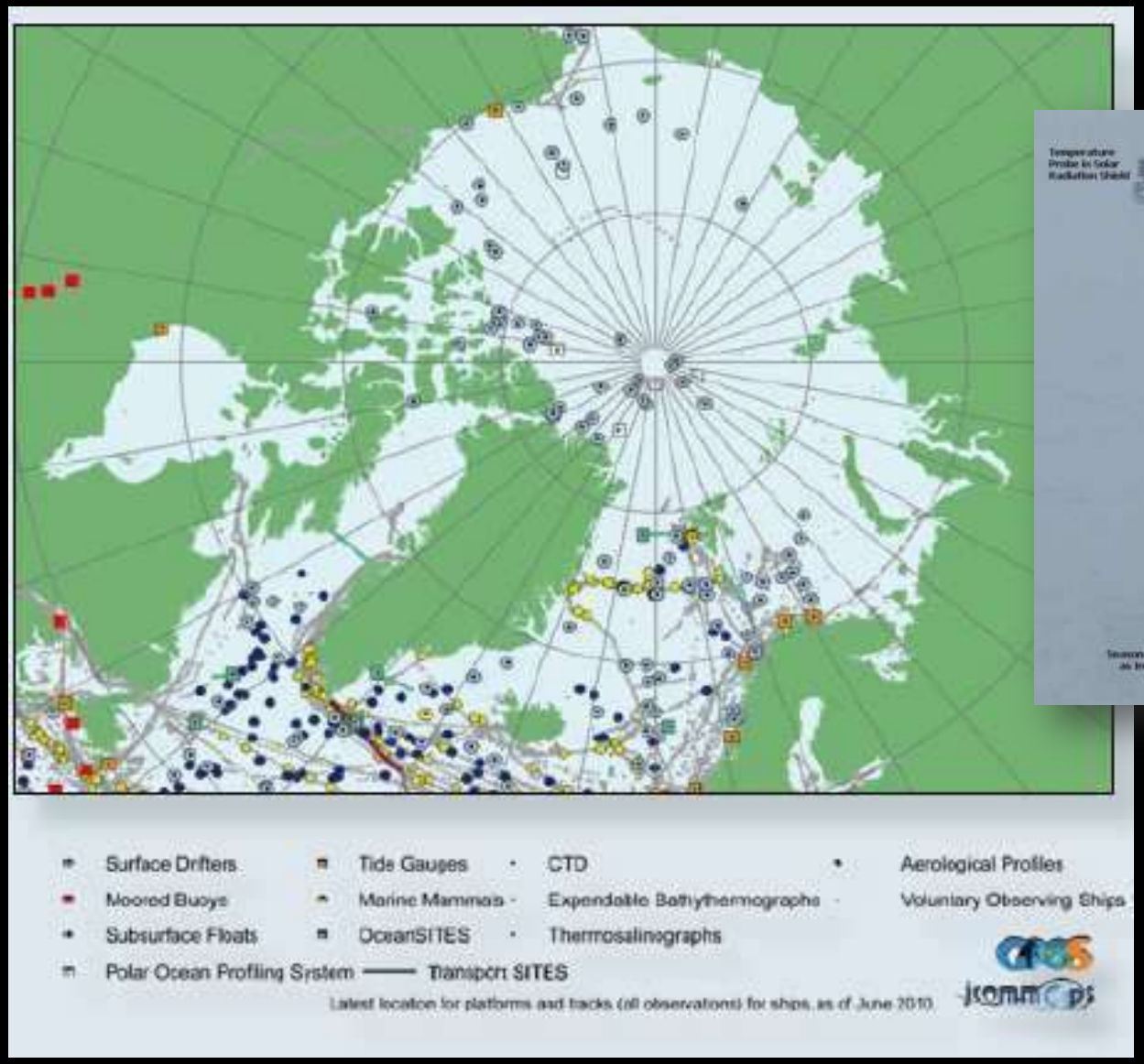
Versatile platform and payload capabilities for low altitude profiling



High altitude, long endurance for comprehensive imaging and profiling

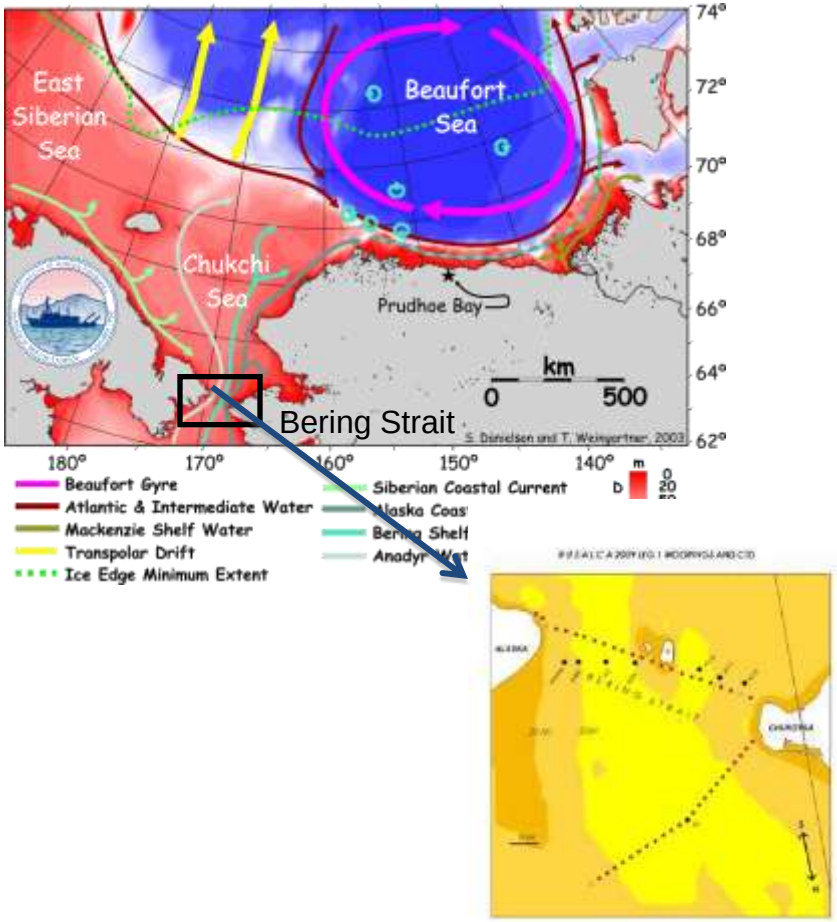
OCEAN OBSERVATIONS

Arctic Array

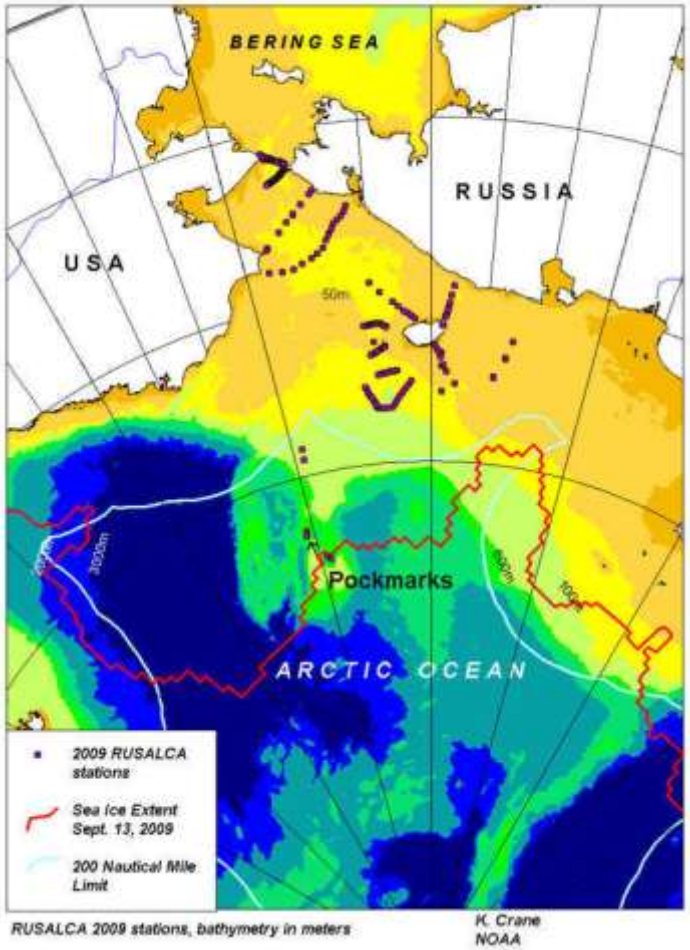


OBSERVATIONS

RUSALCA –Russia-U.S. Consensus of the Arctic

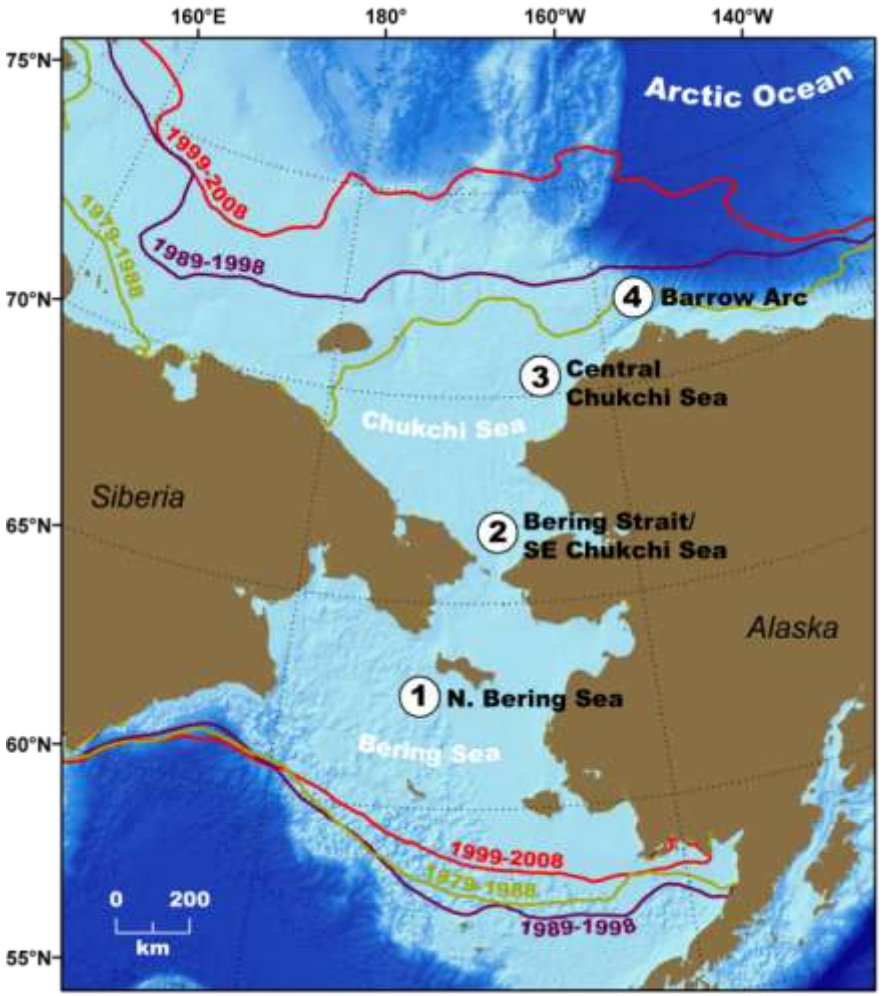


2009 Station Locations



LINKING ECOSYSTEMS & ICE COVER

Distributed Biological Observatory



Map courtesy Karen Frey;
Further details see Grebmeier et al. 2010, EOS 91(18):161-162]

CHEMISTRY

Ocean Acidification

Image : University of Alaska Fairbanks

NOAA Ocean Acidification Research Plan

Arctic Report Card: *Update for 2010*

Tracking recent environmental changes

Return to previous Arctic conditions is unlikely

Record temperatures across Canadian Arctic and Greenland, a reduced summer sea ice cover, record snow cover decreases and links to some Northern Hemisphere weather support this conclusion

Atmosphere	Biology	Greenland
Sea Ice	Ocean	Land

Red boxes: Consistent evidence of warming.
Yellow boxes: Many indications of warming.

Atmosphere
Arctic climate is impacting mid-latitude weather, as seen in Winter 2009-2010

Sea Ice
Summer sea ice conditions for previous four years well below 1980s and 1990s

Ocean
Upper ocean showing year-to-year variability without significant trends

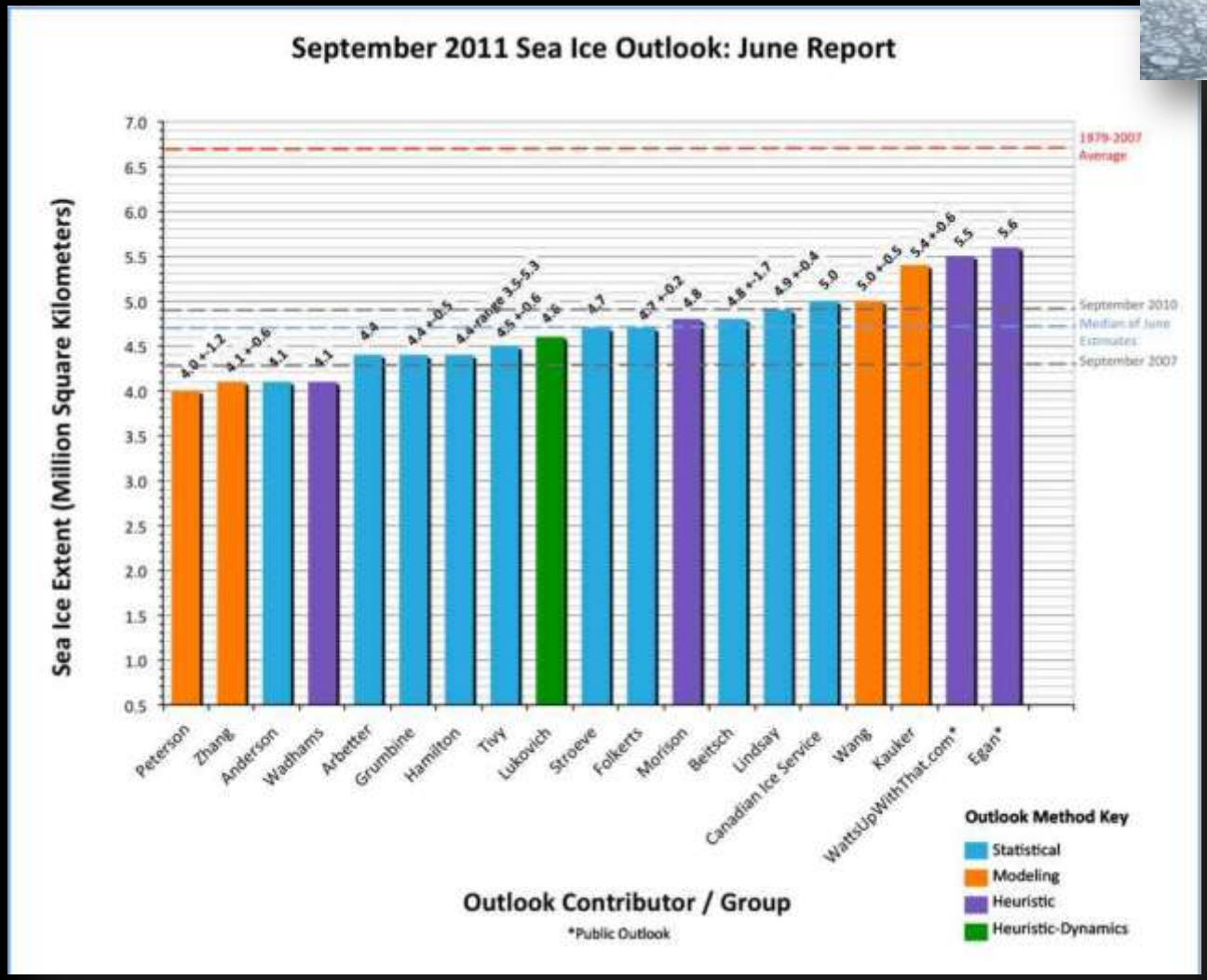
Land
Low winter snow accumulation, warm spring temperatures lead to record low snow cover duration

Greenland
Record setting high temperatures, ice melt, and glacier area loss

Biology
Rapid environmental change threatens to disrupt current natural cycles

www.arctic.noaa.gov/reportcard

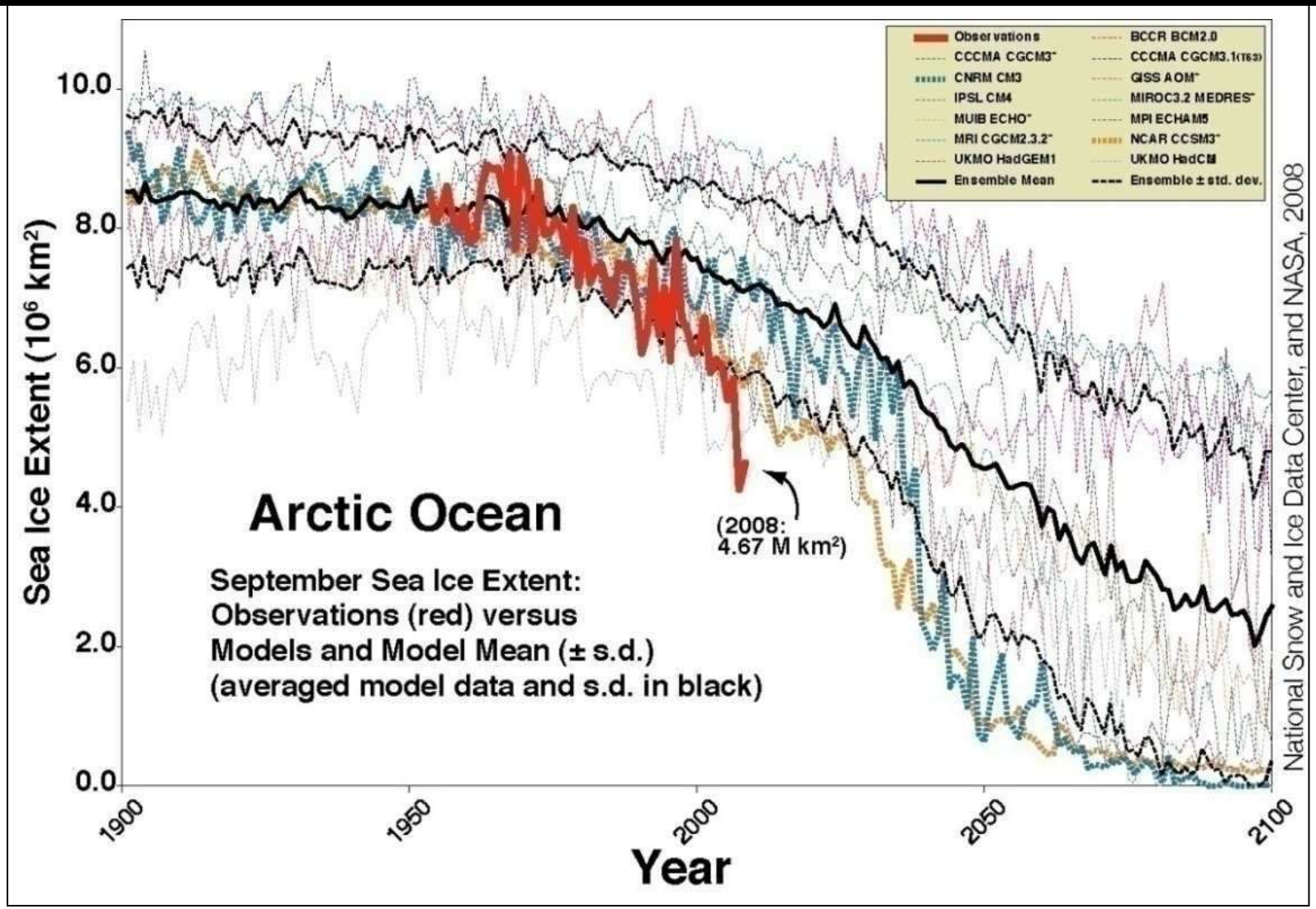
Sea Ice Outlook



www.arcus.org/search/seaiceoutlook/

OBSERVATIONS VS. MODELS

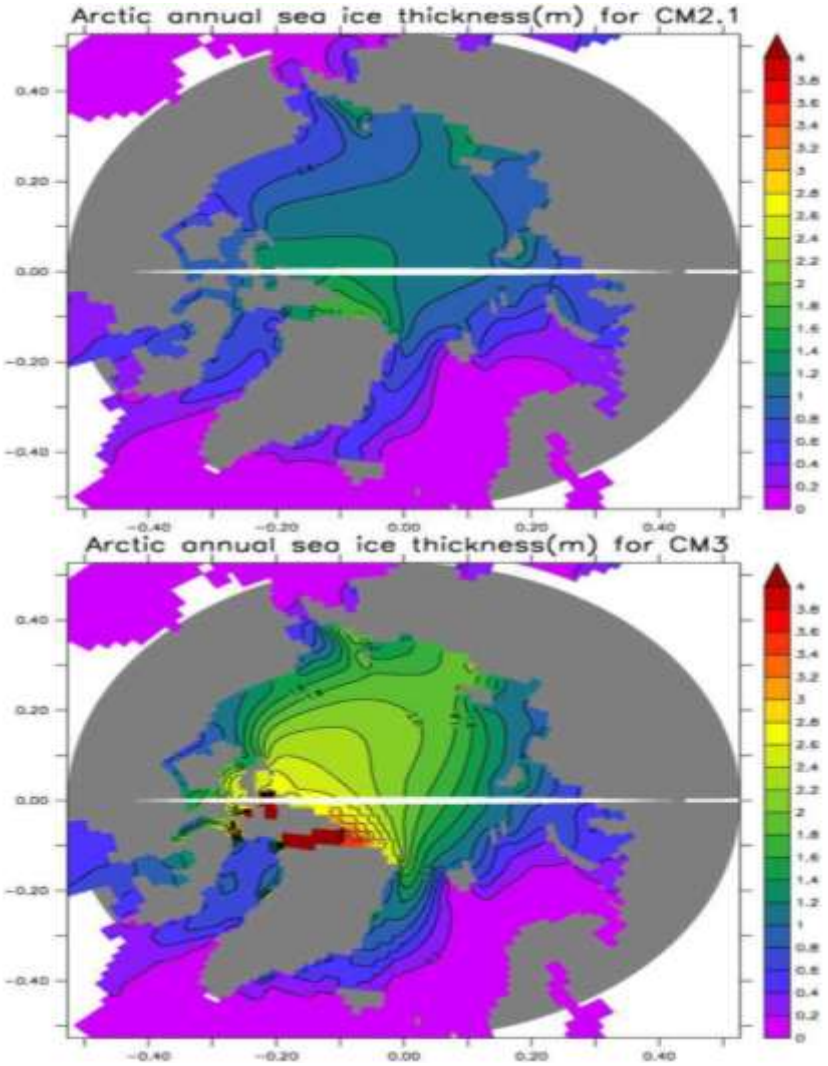
Sea ice extent

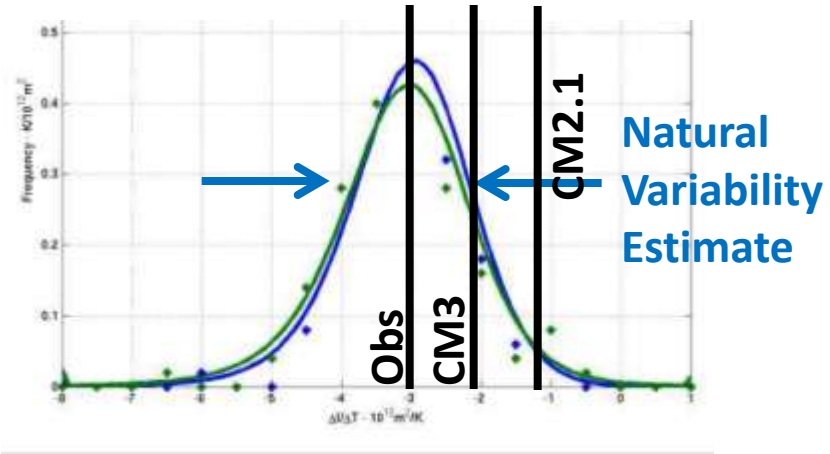


Stroeve et al 2007

MODELS

Sea ice extent





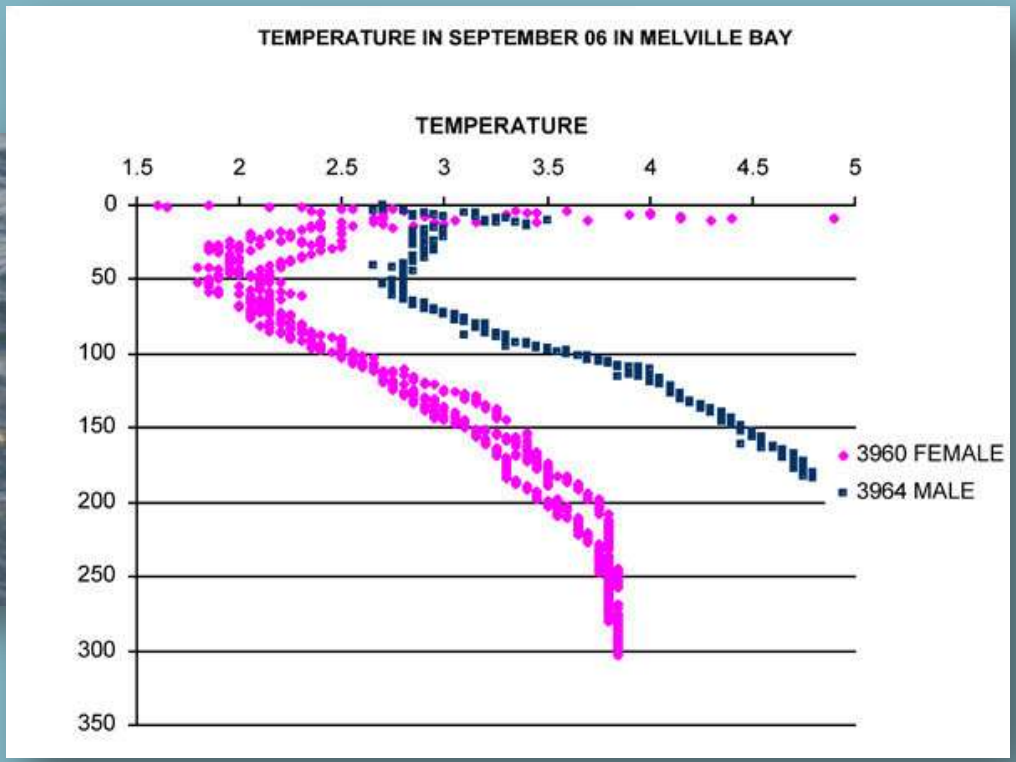
Griffies *et al.* (2011, *J. Climate,* in press)

Winton (2011, *J. Climate*)

OCEAN OBSERVATIONS

Mobile Platforms

NOAA/University of Washington



NOAA's ARCTIC VISION and STRATEGY

VISION

Conservation, management, and use are based on sound science and support healthy, productive, and resilient communities and ecosystems; and

the global implications of Arctic change are better understood and predicted.

GOALS

- Forecast sea ice
- Strengthen foundational science to understand and detect Arctic climate and ecosystem changes
- Improve weather and water forecasts and warnings
- Enhance international and national partnerships
- Improve stewardship and management of ocean and coastal resources in the Arctic
- Advance resilient and healthy Arctic communities and economies