



Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC)

With contributions from Shupe, Persson, Tjernström, Dethloff, & others

Multi-year, coordinated, and comprehensive measurements, extending from the atmosphere through the sea-ice and into the ocean, are needed in the central Arctic Basin to provide a process-level understanding of the changing central Arctic climate system that will contribute towards improved modeling of Arctic climate and weather, and prediction of Arctic sea-ice concentrations

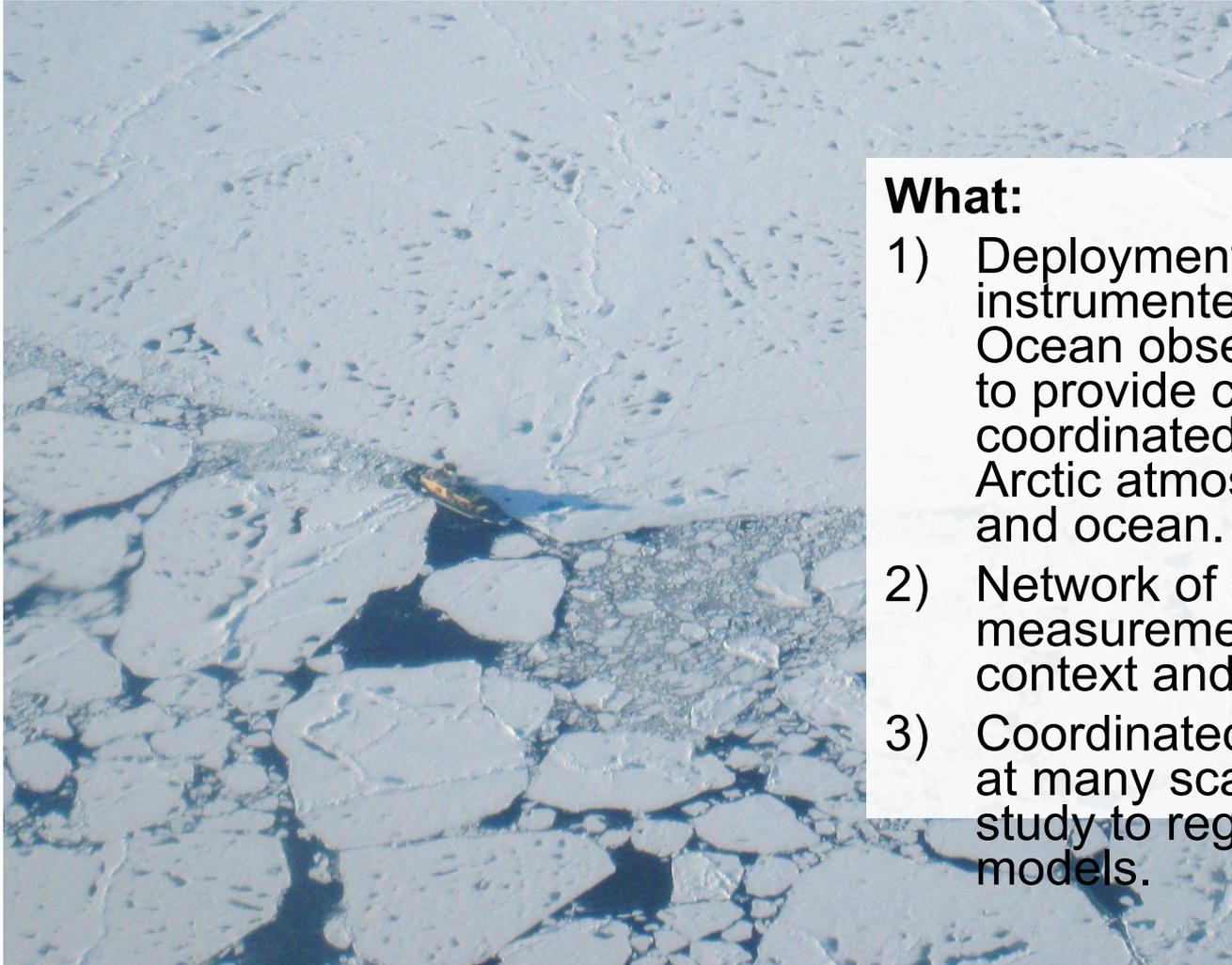
Why:

- In many significant ways we lack a system- and process-level understanding of dramatic Arctic changes
- Models have great difficulties with many aspects of the problem, particularly near the interfaces.
- There exist few process-level observations of the central Arctic climate system, particularly in the new Arctic.
- A changing Arctic can have important implications for large-scale circulation and lower latitude weather/climate.
- Shipping, resource development, other societal



Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC)

With contributions from Shupe, Persson, Tjernström, Dethloff, & others



What:

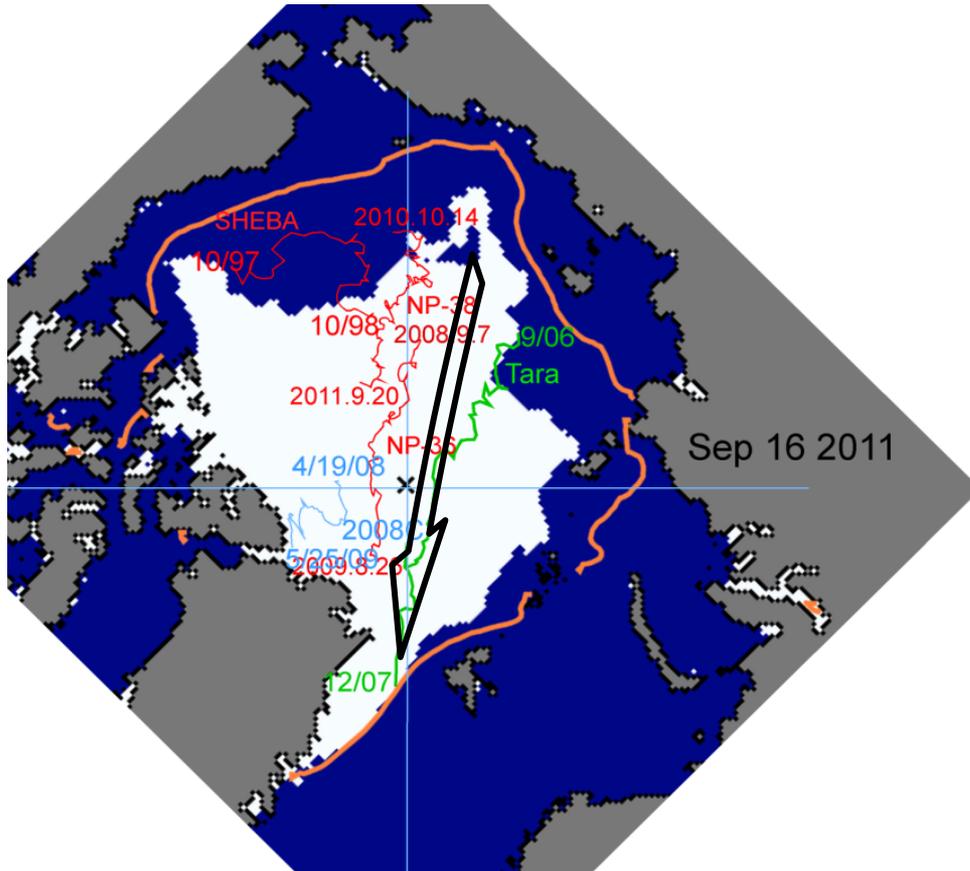
- 1) Deployment of a heavily instrumented, manned, Arctic Ocean observatory (ship-based) to provide comprehensive and coordinated observations in the Arctic atmosphere, cryosphere, and ocean.
- 2) Network of spatial measurements to provide context and variability.
- 3) Coordinated modeling activities at many scales from process-study to regional climate models.



Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC)

With contributions from Shupe, Persson, Tjernström, Dethloff, & others

Anticipated drift trajectory



September 2011 sea ice extent (courtesy NSIDC). Numerous drift tracks of stations suggest possible observatory tracks

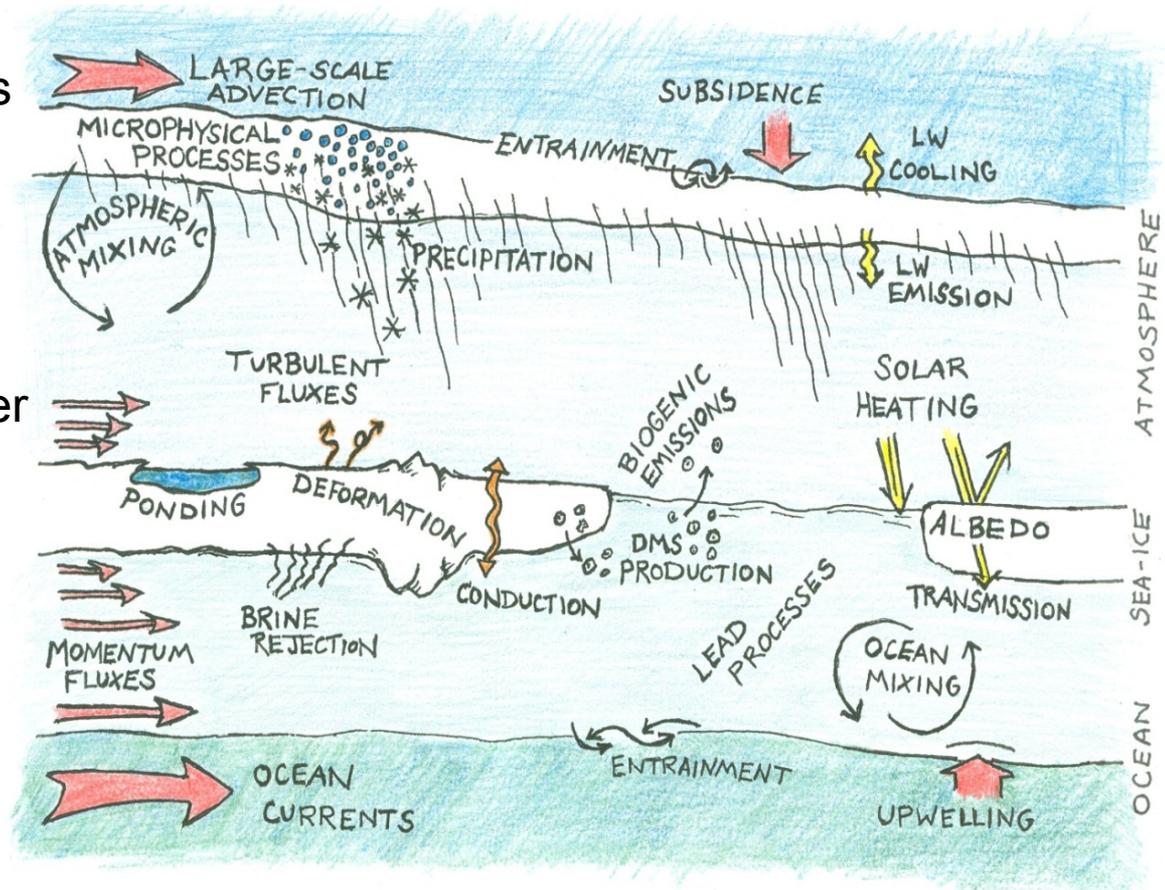
- **When:** Approximate timeline: start 2016-2017, covering multiple annual cycles if possible
- **Where:** Central Arctic Basin “trans-Polar” drift – allows for measurements in regions with limited instrumentation and different ice & weather regimes; might provide a multi-year data set
- **Who:** Coordinated through IASC, International participation (e.g. US, Germany, Sweden, Russia, Finland, Japan...), synchronized international funding, and use of international

Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC)

With contributions from Shupe, Persson, Tjernström, Dethloff, & others

Primary Science Themes:

- Primary causes & processes of recent sea-ice loss?
- Roles of atmospheric and ocean contributions in sea-ice mass/energy/motion budgets.
- Heat and momentum transfer through atmos. and ocean boundary layers
- Changes in large-scale circulation patterns & impacts on local processes
- Linkages between physical and biological systems
- Gas and aerosol production and exchange
- Relative roles of large-scale transport vs. local processes
- Process differences in first-year vs. multi-year ice



Science Planning Workshop is intended to more clearly define the overall scientific objectives.



Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC)

With contributions from Shupe, Persson, Tjernström, Dethloff, & others

Discussion points:

What are the most important issues regarding the atmospheric and oceanic BLs (that could be addressed from a multi-disciplinary drifting observatory)?

What types of measurements are needed?

What are the appropriate scales?

What processes have likely changed with the transition into a “new” Arctic?

What processes lead to the largest uncertainties in models and/or inhibit our progress in modeling the system?

