The Cyclonic Mode of Arctic Ocean Surface Circulation
Background and Motivation

- The Arctic Ocean began to change profoundly in the early 1990’s with an increase in the Arctic Oscillation (AO), a shift in frontal locations and currents, and flushing of old ice from the basin in favor of more seasonal ice.
- Results from the SCICEX’93 cruise of the USS Pargo are an early example.

The pattern of 1970s RMS salinity variation from US-Russian climatology => this is a fundamental mode of variability

Pargo ‘93 Salinity – Summer Climatology shows a +2 increase in salinity in the central Arctic Ocean and Makarov Basin => a cyclonic shift in the Transpolar Front between Atlantic and Pacific waters.
Background and Motivation

- The Pargo shift was arguably forced by the 1989 record increase in winter AO

![Graph of Winter AO - 1950-89 Average]

Max AO in 1989

Min AO in 2010

Winter AO – 1950-89 Average
Background and Motivation

• But the observations of the Pargo would have been meaningless without the extensive hydrographic record compiled by the Soviet Union and its release in the Joint U.S.-Russian Atlas of the Arctic Ocean made possible by the Gore-Chernomyrdin Agreement.

• Seeing similarly dramatic changes in most parts of the Arctic and recognizing the need for ongoing observations were the impetus for the interagency Study of Environmental Arctic Change (SEARCH), the NSF Arctic Observing Network (AON), and numerous other observation and modeling efforts.

• After 20-years of vastly improved observations and modeling it is time to assess what we have learned about the changing circulation of the Arctic Ocean and Sub-Arctic Seas and determine what is needed to make progress in the future.
Workshop Objectives

a) Assess the state of understanding of the changes in the circulation of Arctic Ocean and sub-Arctic seas and their relation to climate. *(Emphasis Monday, Breakout 1 Issue)*

b) Identify needs for sustained ocean observations to measure variability and change in Arctic Ocean circulation and approaches for supporting them. *(Emphasis Tuesday, Breakout 2 Issue)*

c) Assess advancements in modeling that improve representation of the ongoing changes in circulation and identify improvements needed to predict future changes. *(Emphasis Wednesday, Breakout 3 Issue)*
Thank You
We hope you enjoy the workshop.