

# **NSF role in support of science in a changing Arctic**

*Simon Stephenson*

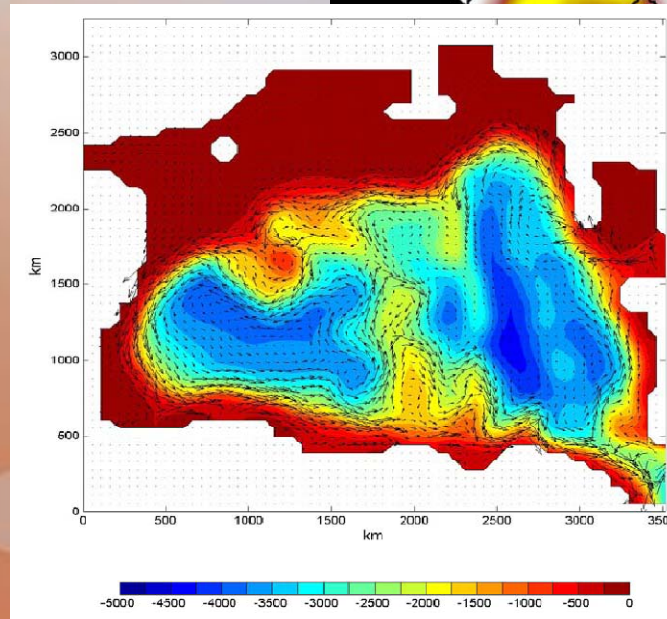
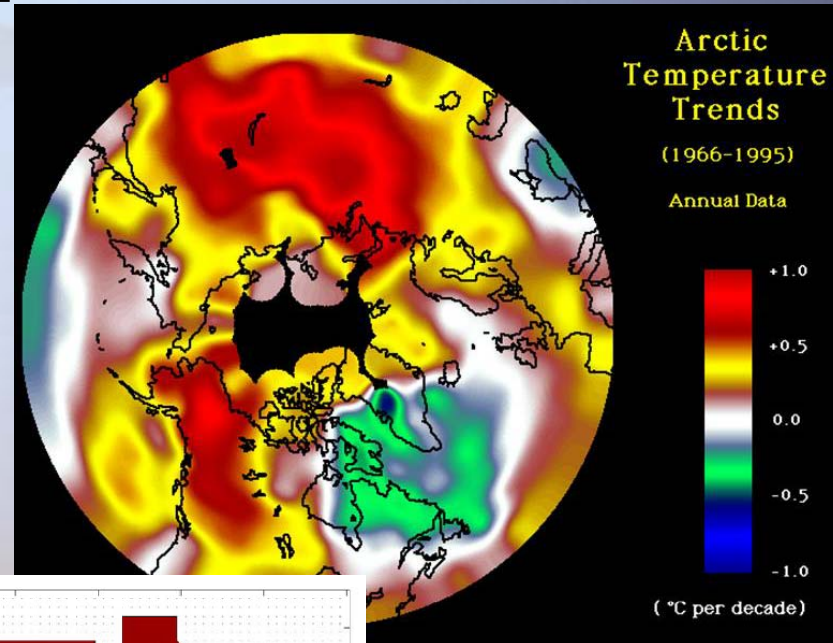
*Division of Arctic Sciences*

*National Science Foundation*

NSF

# Arctic Science at NSF

- Arctic System Science
- Natural Sciences
- Social Sciences
- SEARCH & AON (Environmental Change)

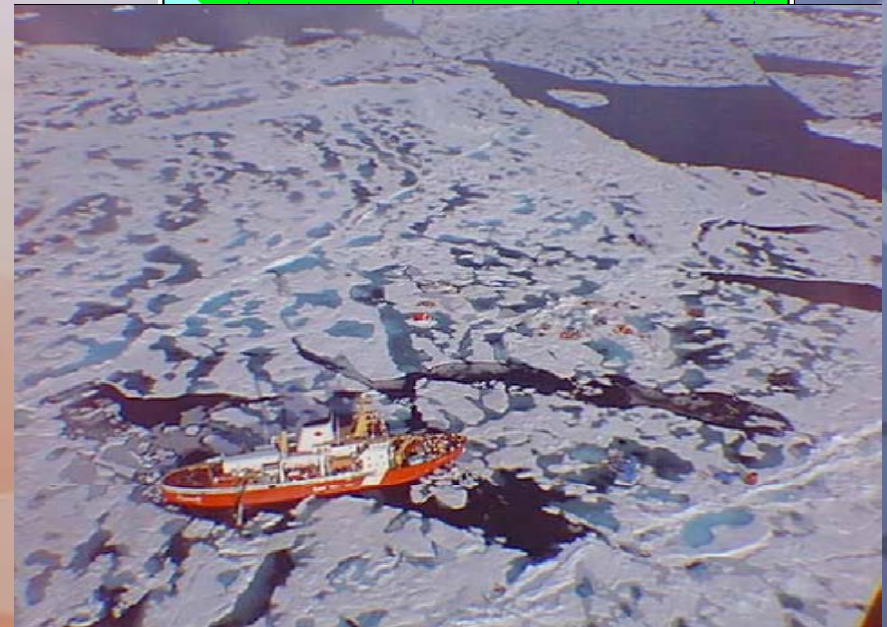
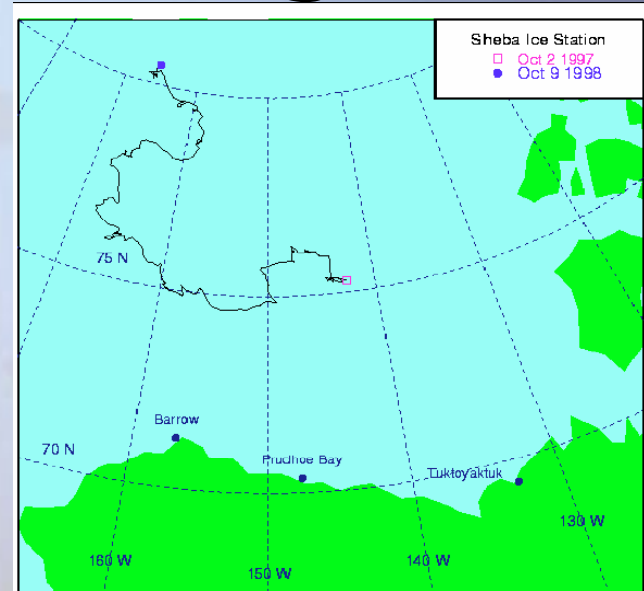


Walsh et al

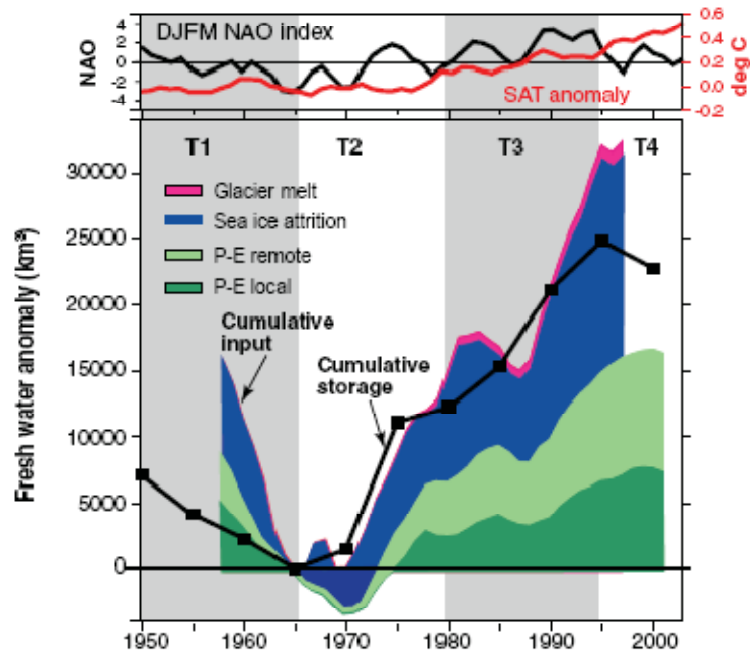
Yang

# SHEBA: Surface Heat Budget of the Arctic the Arctic

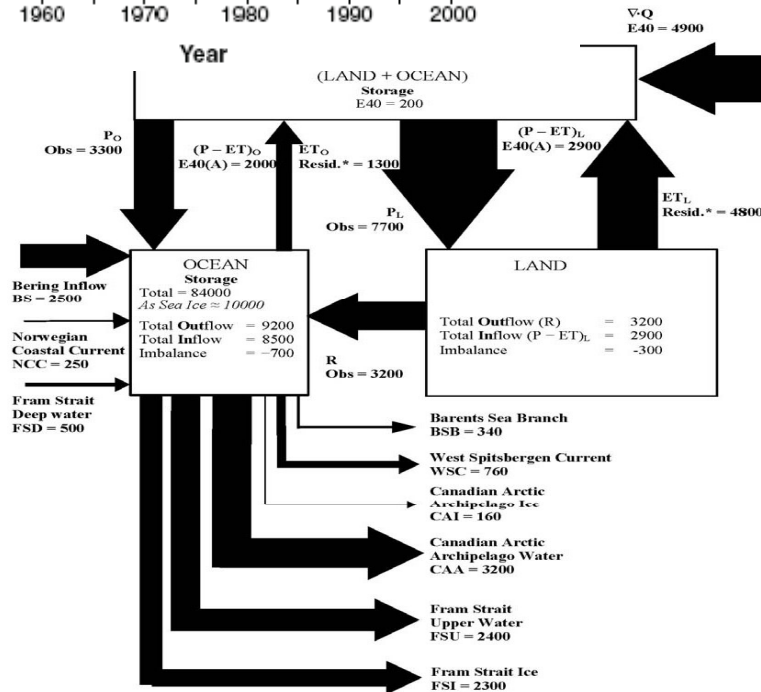
- To determine the ocean-ice-atmosphere processes that control the surface albedo and cloud-radiation feedback mechanisms over arctic pack ice, and to use this information to demonstrably improve models of arctic ocean-atmosphere-ice interactive processes.



# Fresh Water initiative

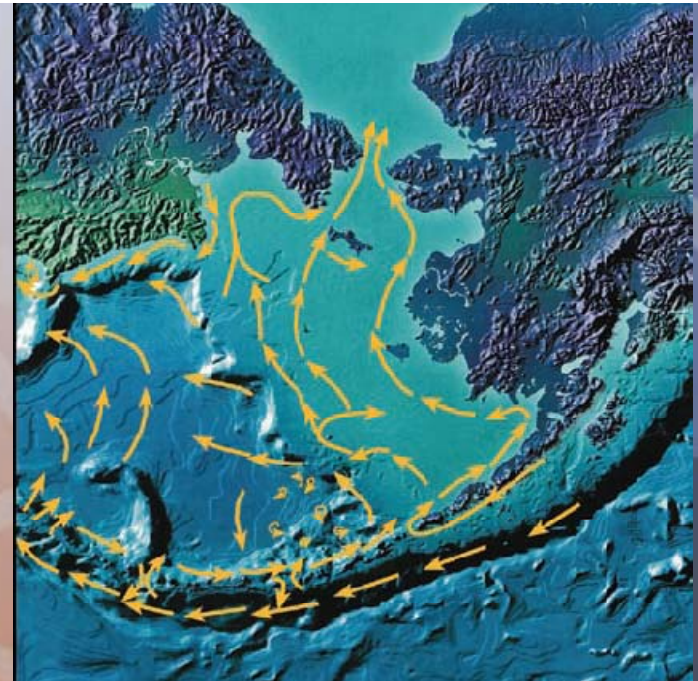
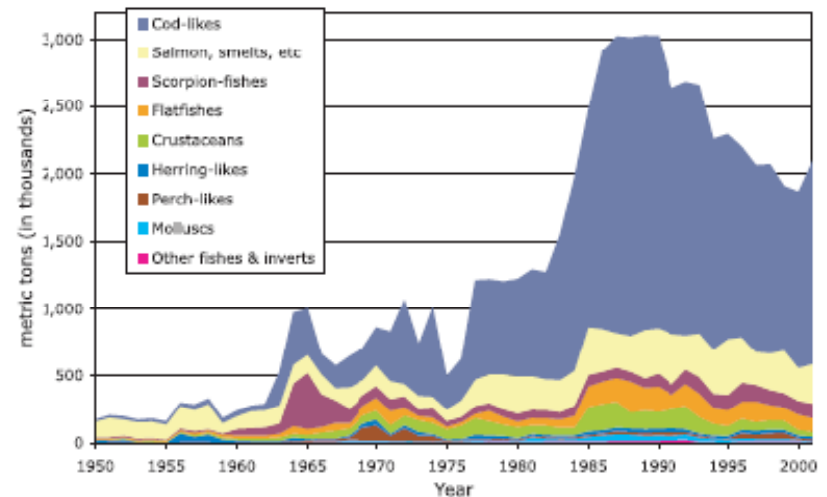


- Assess and better understand the stocks and fluxes within the arctic hydrologic cycle.
- Document natural variability in and changes to the arctic water cycle, contributing a hydrological component to the multiagency SEARCH (Study of Environmental ARctic Change) Program.
- Understand the sources of natural variability and causes of arctic water cycle change and -assess their direct impacts on biological and biogeochemical systems.
- Develop predictive simulations of the response of the earth system and human society to feedbacks arising from natural variability and progressive changes to the arctic hydrological cycle.



# BEST: Bering Sea Ecosystem Study

- The overarching question to be addressed in the BEST Program is - *how will climate change affect the marine ecosystems of the eastern Bering Sea?*
- Partnership with NPRB and NOAA



# Coupled Human & Sea-Ice system

- Barry et al:
  - Changes in ecosystems at scales relevant to coastal inhabitants
  - Insights into present and potential adaptations
  - Partnerships with indigenous ice experts in Barrow, Clyde River, Qaanaaq

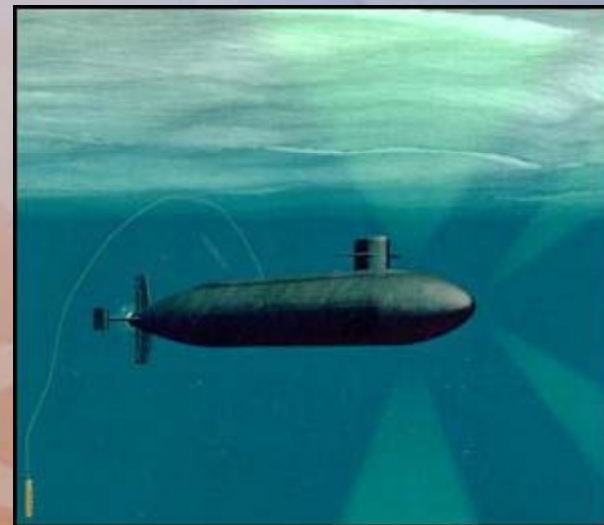
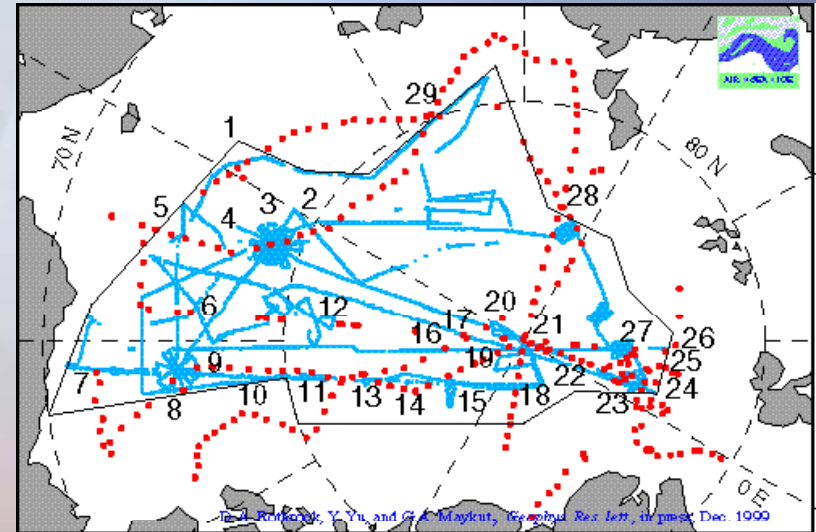


Photo: Andy Mahoney

NSE

# Submarines and sea-ice draft

- Comparison of sea-ice draft data acquired on submarine cruises between 1993 and 1997 with similar data acquired between 1958 and 1976 indicates that the mean ice draft at the end of the melt season has decreased by about 1.3 m in most of the deep water portion of the Arctic Ocean, from 3.1 m in 1958-1976 to 1.8 m in the 1990s. The decrease is greater in the central and eastern Arctic than in the Beaufort and Chukchi seas. Preliminary evidence is that the ice cover has continued to become thinner in some regions during the 1990s.
  - Rothrock et al 1999



# 1988-1990 Surge/Purge of Thick, Old Sea Ice out of the Central Arctic

Pfirman et al 2006

[http://www.geomapapp.org/arctic/ice\\_movies/](http://www.geomapapp.org/arctic/ice_movies/)

Ice Origin

Ice Age

