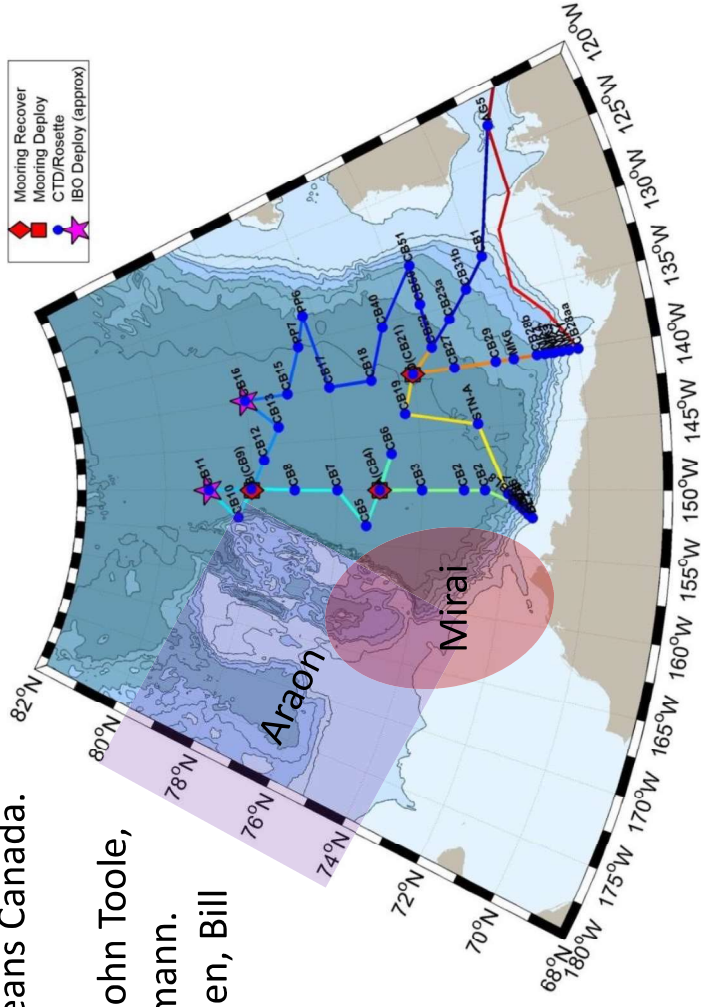


2003-2022 Joint Ocean Ice Study / Arctic Observing Network - Beaufort Gyre Observing System

A USA-Canada collaboration supported by NSF and Fisheries and Oceans Canada.

- 2022 was our 20th year. Funded until 2024.
- Initially led by Andrey Proshutinsky, Mary-Louise Timmermans, John Toole, Rick Krishfield, Eddy Carmack, Fiona McLaughlin, Sarah Zimmermann.
- Now led by: Mary-Louise Timmermans, Isabela Le Bras, Jeff O'Brien, Bill Williams, Sarah Zimmermann, Paul Macoun.
- Designated as Go-Ship line ARC-02 in 2015.

CCGS Louis S. St-Laurent



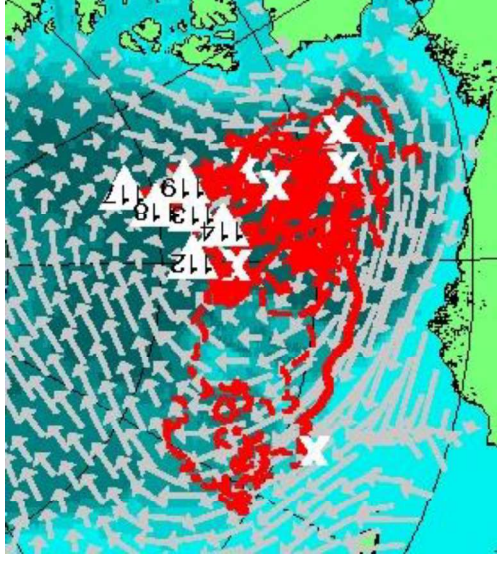
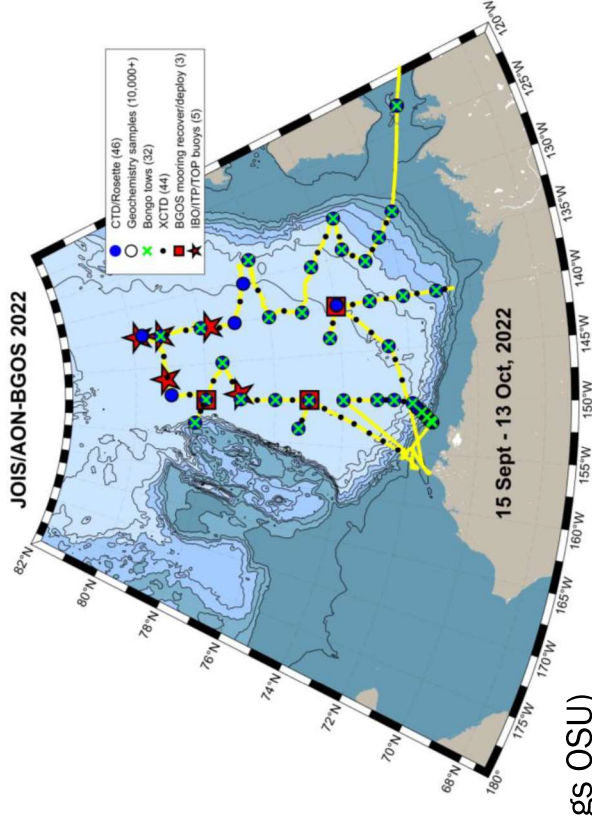
Data and Dispatches (2003-2022):

Project	Website/Email
AON-BGOS/JOIS	https://www2.whoi.edu/site/beaufortgyre/
Ice-Tethered Profilers	https://www2.whoi.edu/site/itp/
Ice Mass Balance Buoys	http://imb-crrrel-dartmouth.org/
JOIS	Bill.Williams@dfp-mpo.gc.ca
Dispatches	https://www2.whoi.edu/site/beaufortgyre/

2023 Joint Ocean Ice Study / Arctic Observing Network - Beaufort Gyre Observing System

Current Observations and Collaborations:

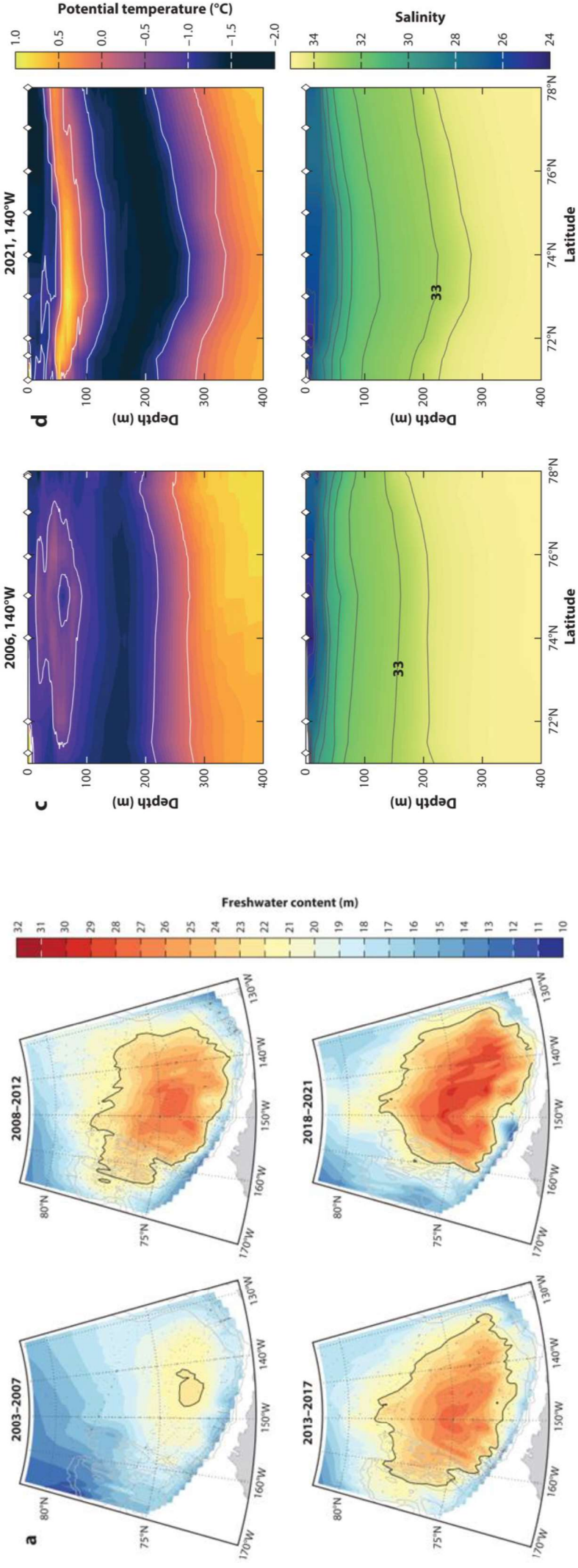
- 3 AON-BGOS moorings: recovery and redeployment (WHOI, Yale)
- Ice Based Observatories (WHOI, Yale):
 - 3 Ice Tethered Profilers (ITP)
 - 4 Tethered Ocean Profilers (TOP)
 - 2 Seasonal Ice Mass Balance Buoys (Don Perovich CRREL)
 - 1 Arctic Ocean Flux Buoy (Tim Stanton, NPS)
 - Ice/snow thickness surveys and ice cores
- CTD/XCTD survey (DFO, WHOI, Motoyo Itoh JAMSTEC)
- E/M sea-ice thickness and observations (Kazu Tateyama KIT, Jenny Hutchings OSU)
- Biogeochemical sampling from rosette and underway:
 - Oxygen, nitrate, phosphate, silicate, chlorophyll (DFO)
 - DIC, Alkalinity, O18 (Michiyo Yamamoto-Kawai TUMSAT)
 - pCO2 (Mike DeGrandpre U.Montana)
 - CDOM (Celine Gueguen U. Sherbrooke)
 - RNA/DNA (David Walsh Concordia, Connie Lovejoy U. Laval)
 - Radio isotopes (John Smith DFO, Nuria Casacuberta ETH Zurich)
 - Zooplankton (John Nelson DFO)



Freshwater and heat accumulation in the Beaufort Gyre

Analysis of the Beaufort Gyre Freshwater Content in 2003–2018. Proshutinsky et al., 2019

The Arctic Ocean's Beaufort Gyre. Timmermans ML, Toole JM. 2023.



Variations in Rates of Biological Production in the Beaufort Gyre as the Arctic Changes: Rates From 2011 to 2016

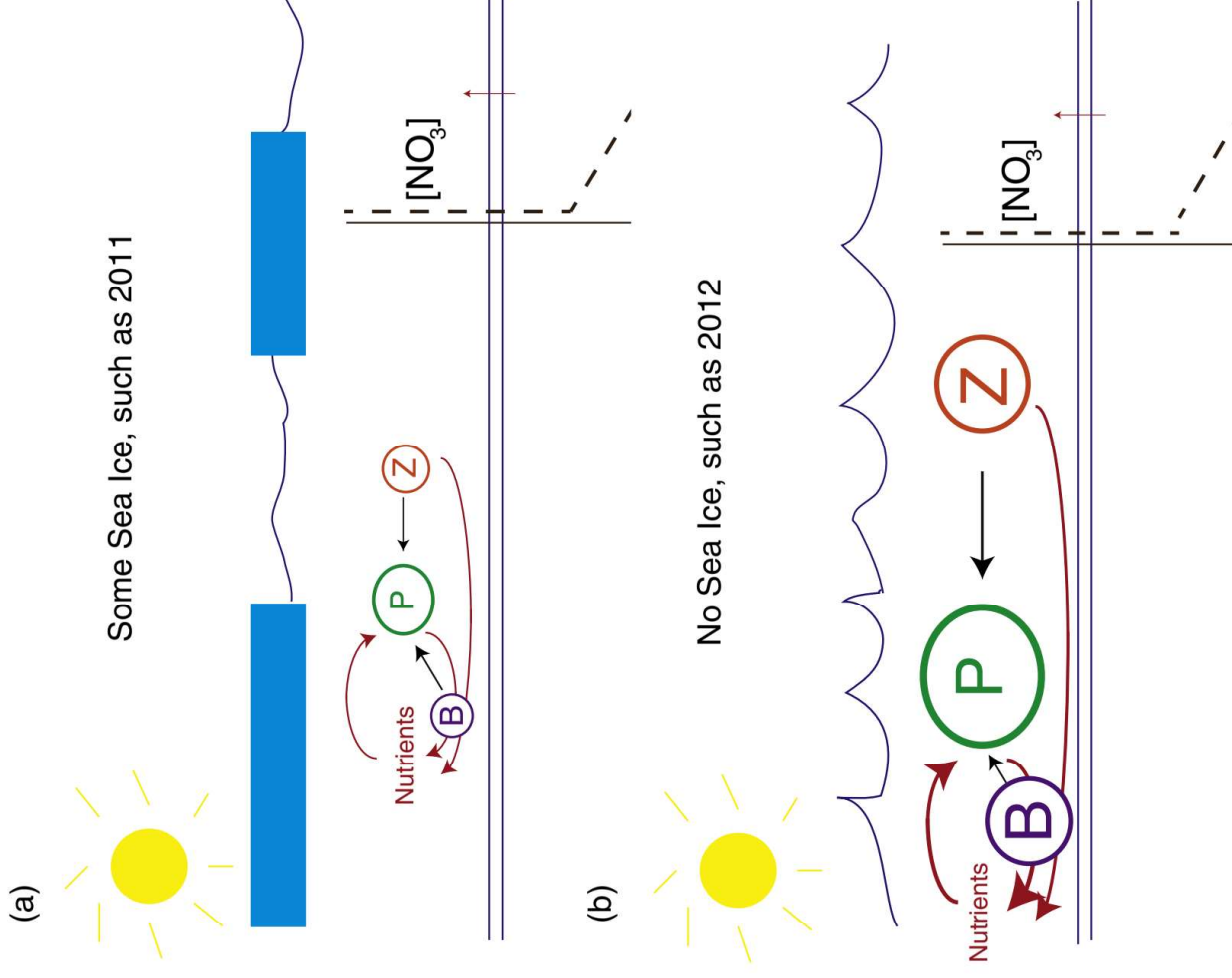
Brenda Ji et al. 2018

Rachel Stanley et al. 2015

“NCP and GOP show spatial and temporal variations with higher values linked with lower concentrations of sea ice and increased upper ocean stratification.”

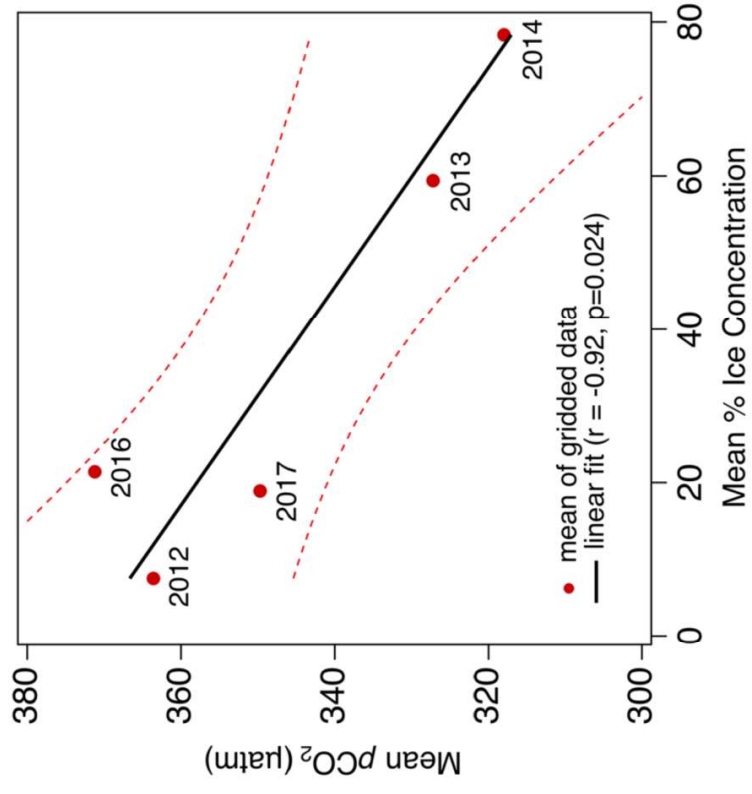
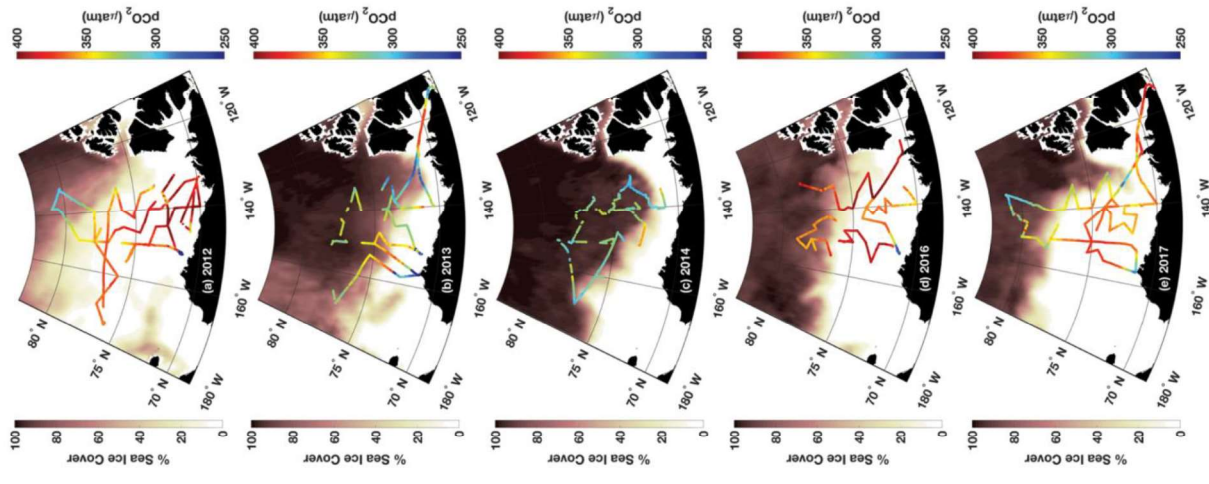
Zooplankton community structure and dynamics in the Arctic Canada Basin during a period of intense environmental change (2004–2009)

Brian Hunt et al., 2014



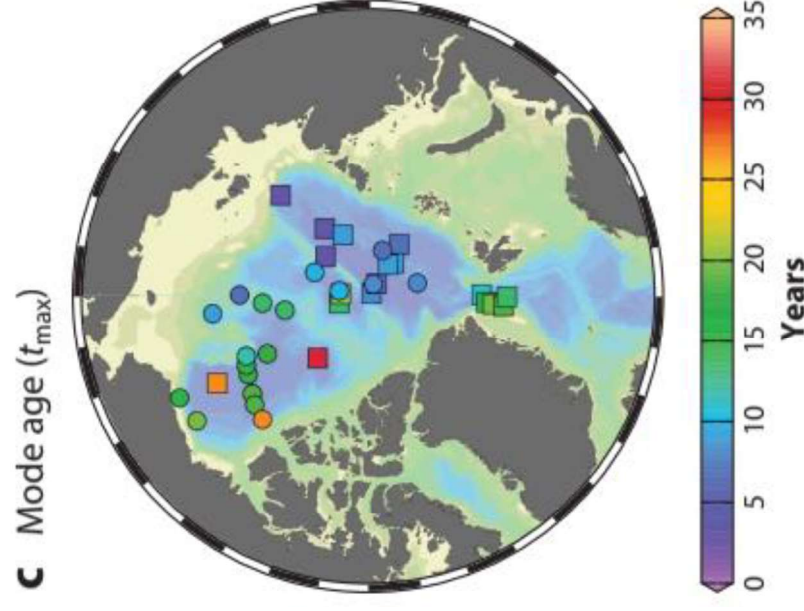
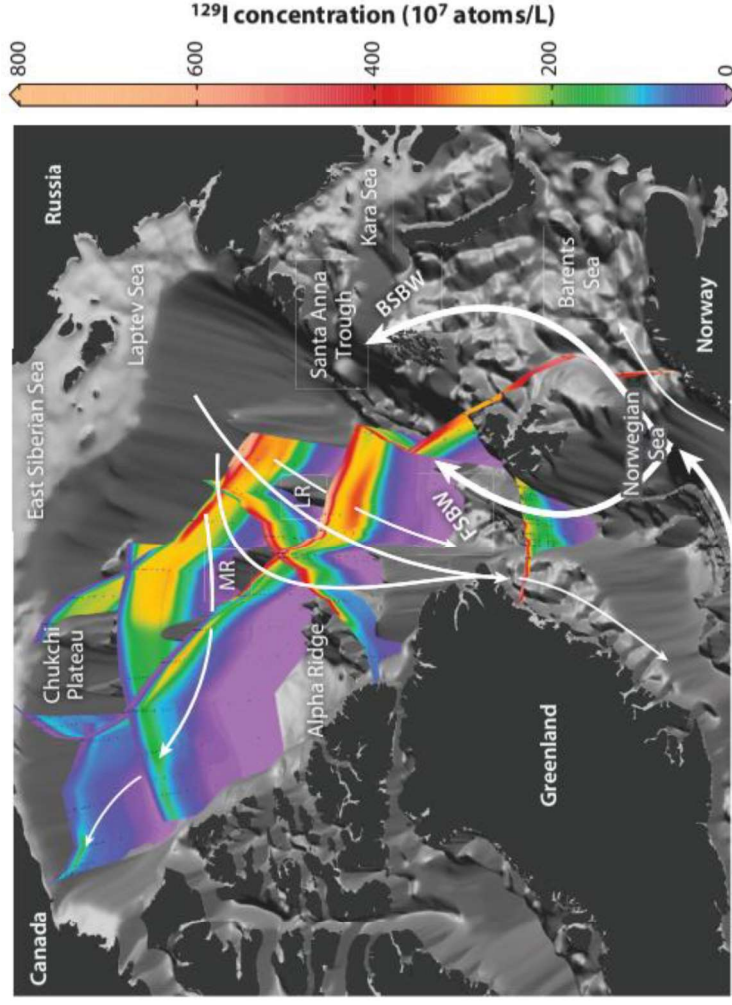
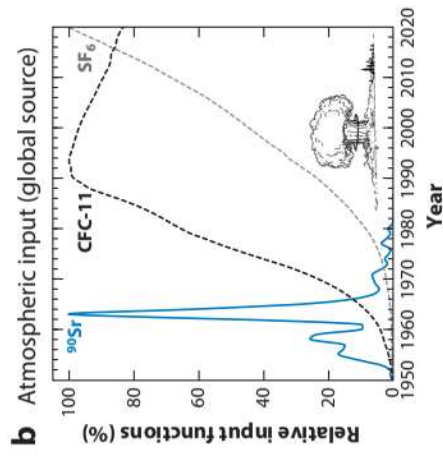
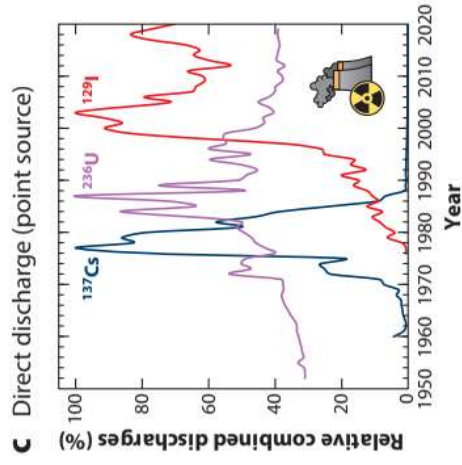
Changes in the Arctic Ocean Carbon Cycle With Diminishing Ice Cover

DeGrandpre et al. 2020



Nuclear Reprocessing Tracers Illuminate Flow Features and Connectivity Between the Arctic and Subpolar North Atlantic Oceans

Casacuberta and Smith, 2023



Outlook:

Atmospheric forcing.

Sea ice: changes in air-ice and ice-ocean coupling.

Role of eddies in the gyre.

Pathways of water to the gyre.

Pathways of water within and then from the gyre.

Heat in Pacific Summer Water and Atlantic Water.

Changes in ocean acidification, biological production.



Thank-you!

