



Update on status, activities and results of NABOS

Igor Polyakov and NABOS team

PAG Meeting, Victoria BC, Canada

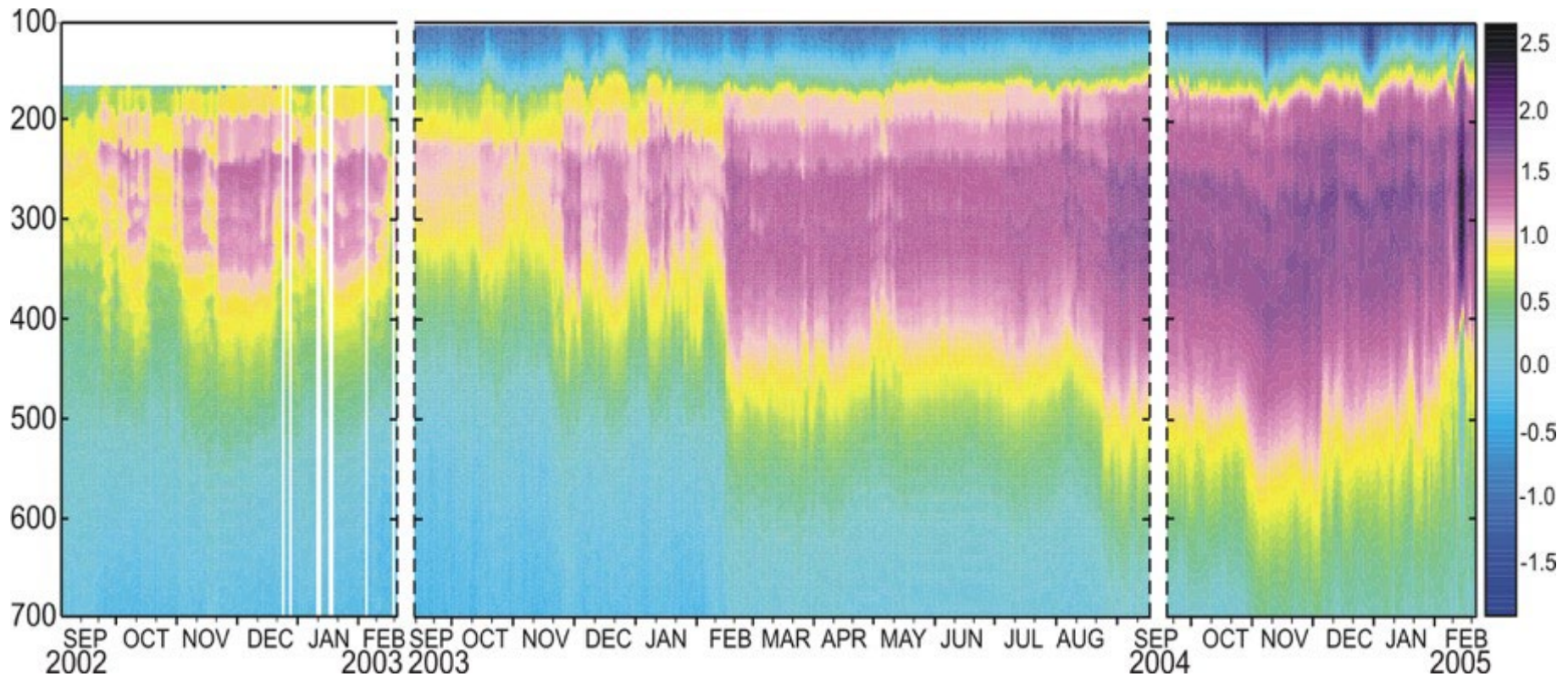
December 6, 2022



Brief history :

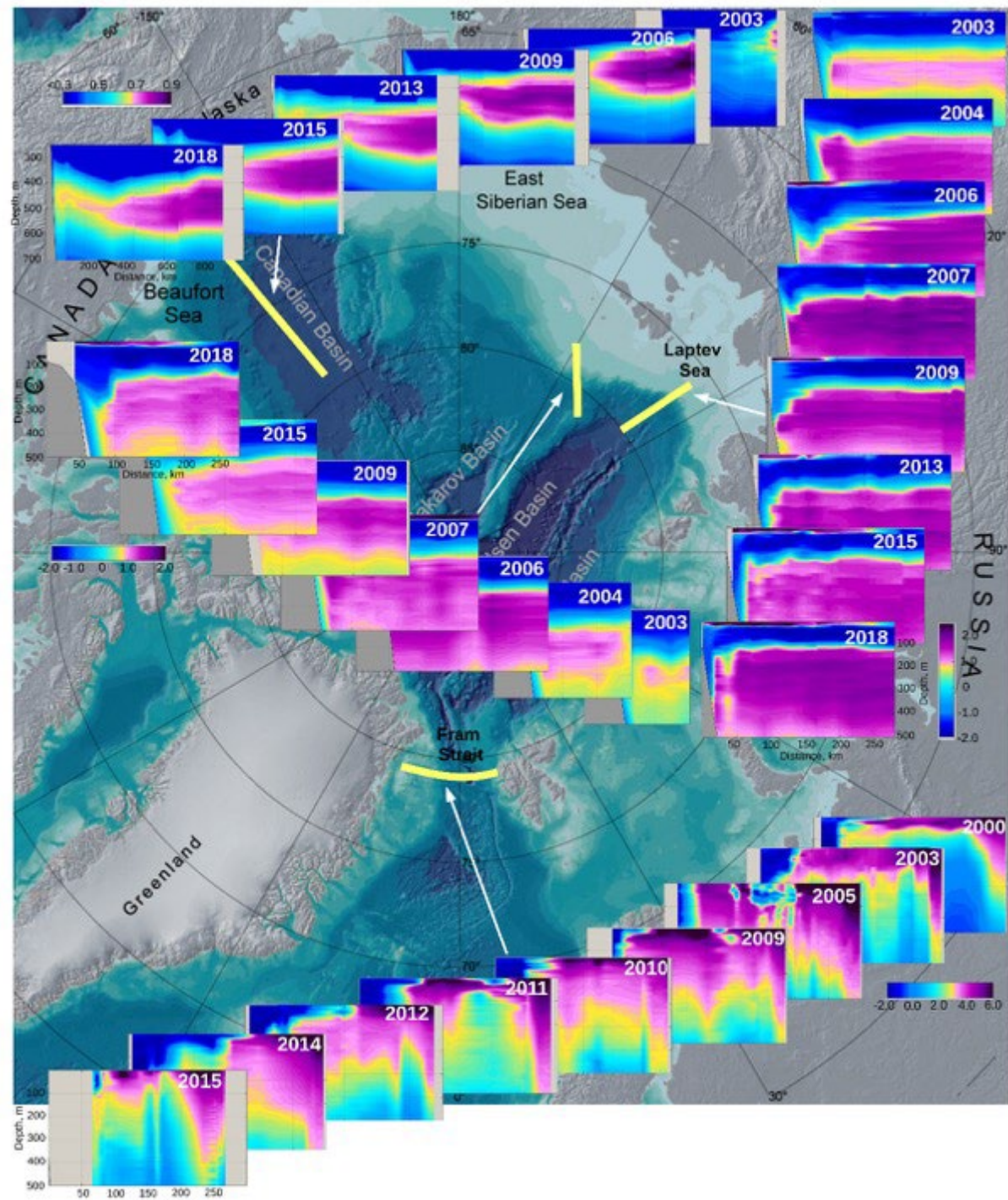
- ☐ 2002-2013
- ☐ 2013-2018

2002-2013: NABOS moorings were instrumental to capture AW temperature anomaly entered the central Arctic Ocean



Repeated observations at the same locations were critical

Atlantic water was 0.24°C warmer in 2007 compared with the 1990s



2005



International collaboration was always critical: Summer Schools during NABOS cruises

Researchers from 17 countries took part in NABOS cruises

2006





NABOS-II

2013-2018

*Atlantification of the
eastern Arctic Ocean*

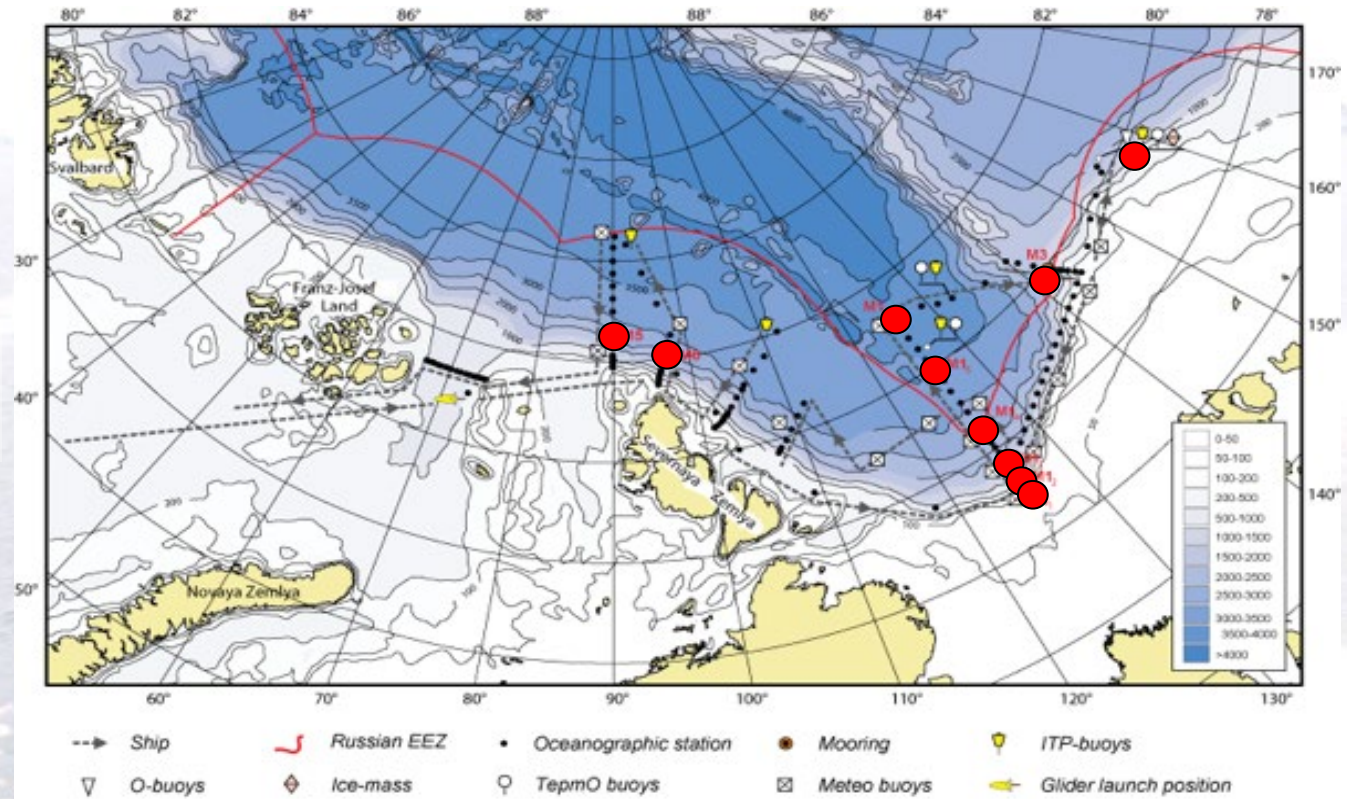


NABOS 2015

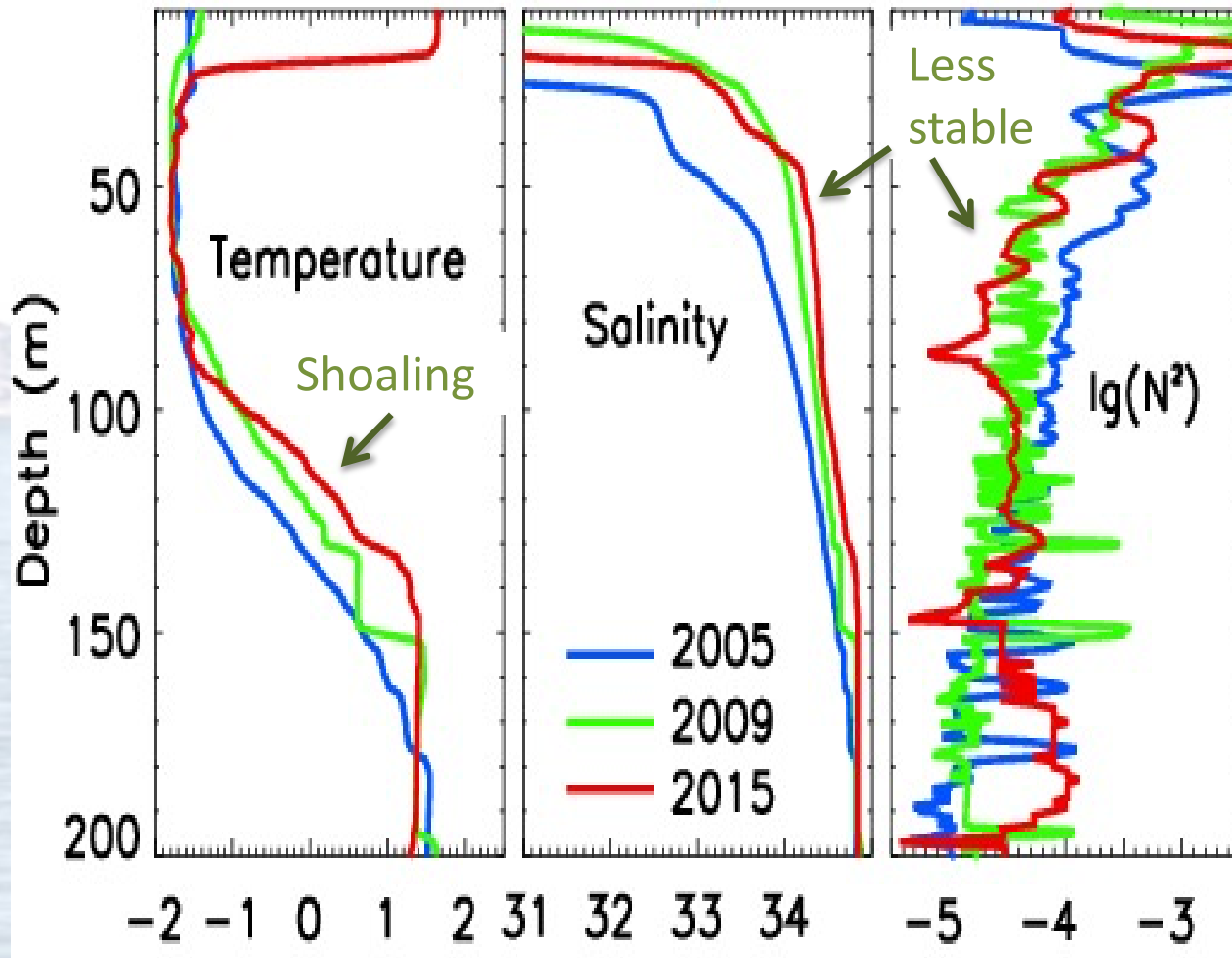


Overarching *goal* of NABOS
(= Nansen and Amundsen Basins
Observational System), as an element
of the Arctic Observing Network, is to
compile a cohesive picture of climatic
changes in the eastern Arctic Ocean.

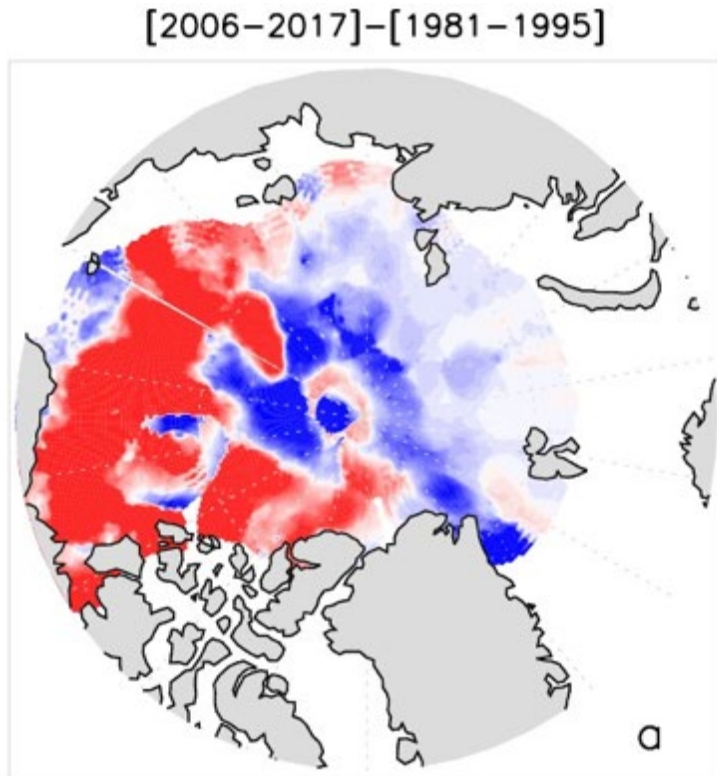
2013-2018



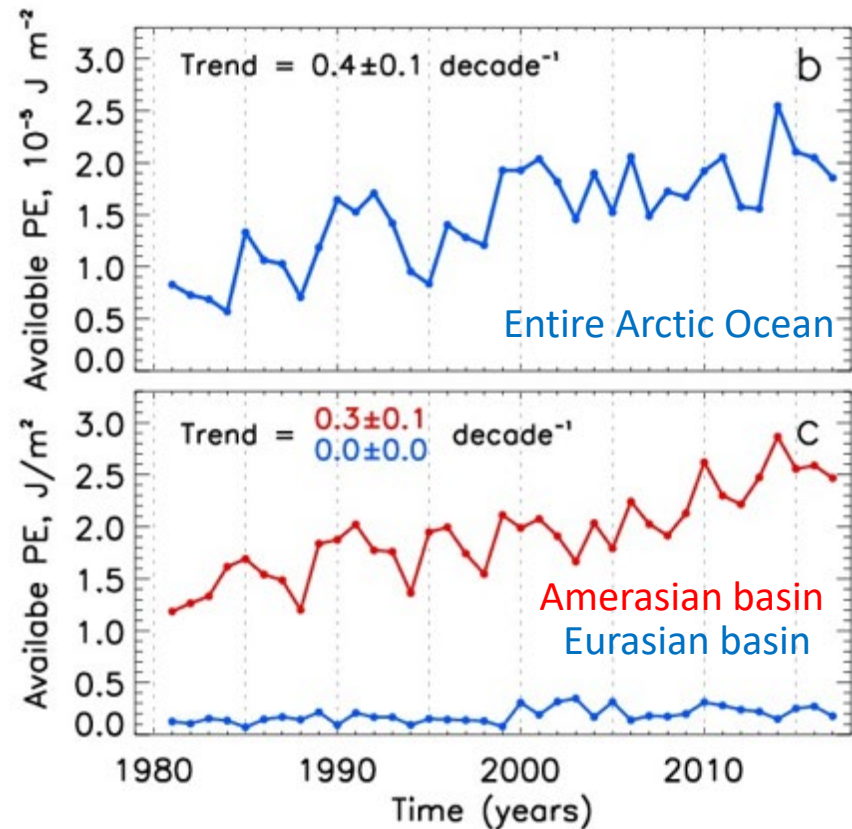
Shoaling of intermediate Atlantic Water and weakening of stratification in recent years in the eastern Eurasian Basin (EEB)



Strength of Arctic halocline illustrated by the Available Potential Energy



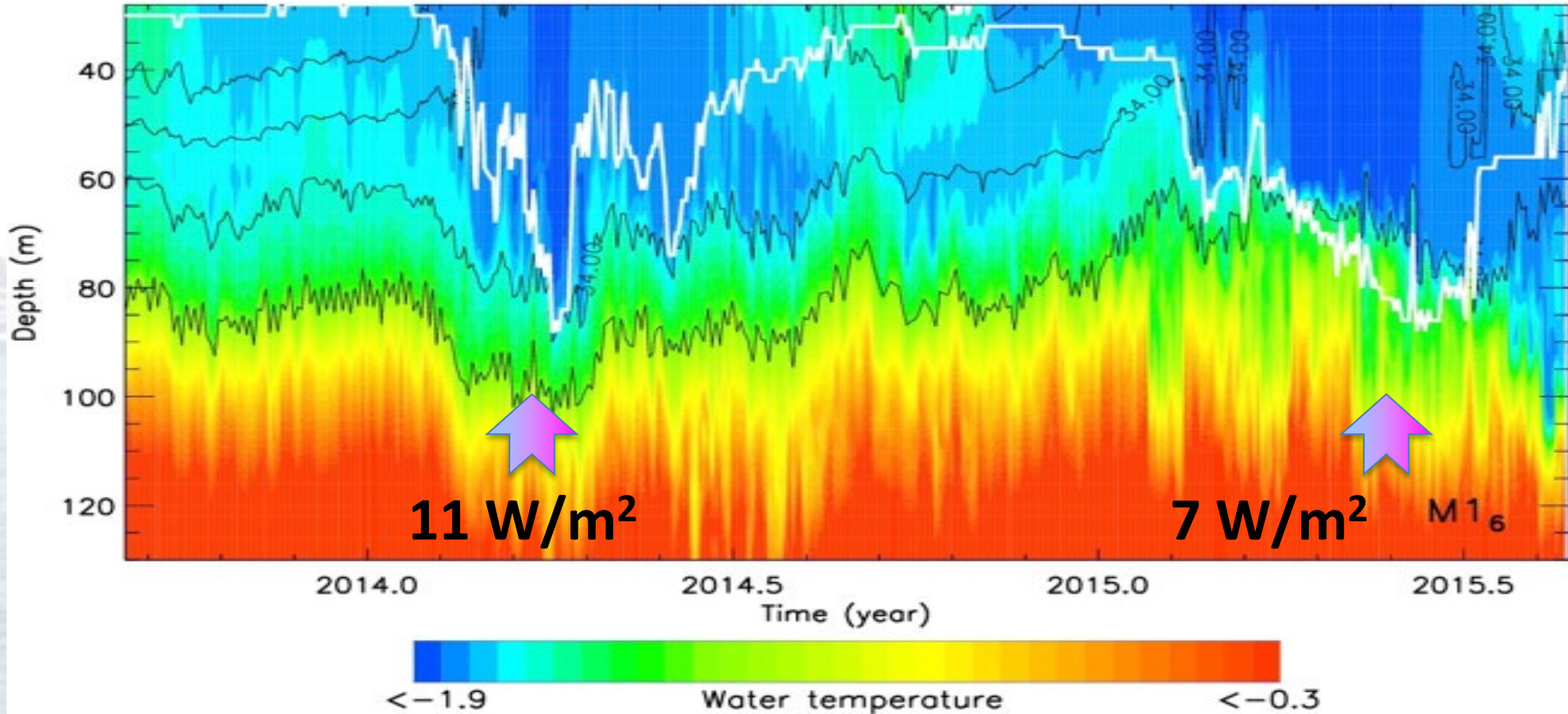
(a) Map showing APE difference between two selected periods of time.



(b, c) Time series showing APE averaged over (b) the entire Arctic Ocean and (c) Amerasian (red) and Eurasian (blue) basins.

Increased oceanic heat fluxes explain sea ice reduction in the eastern Eurasian Basin in recent years

EEB water temperature & salinity



2021-2025 funding cycle

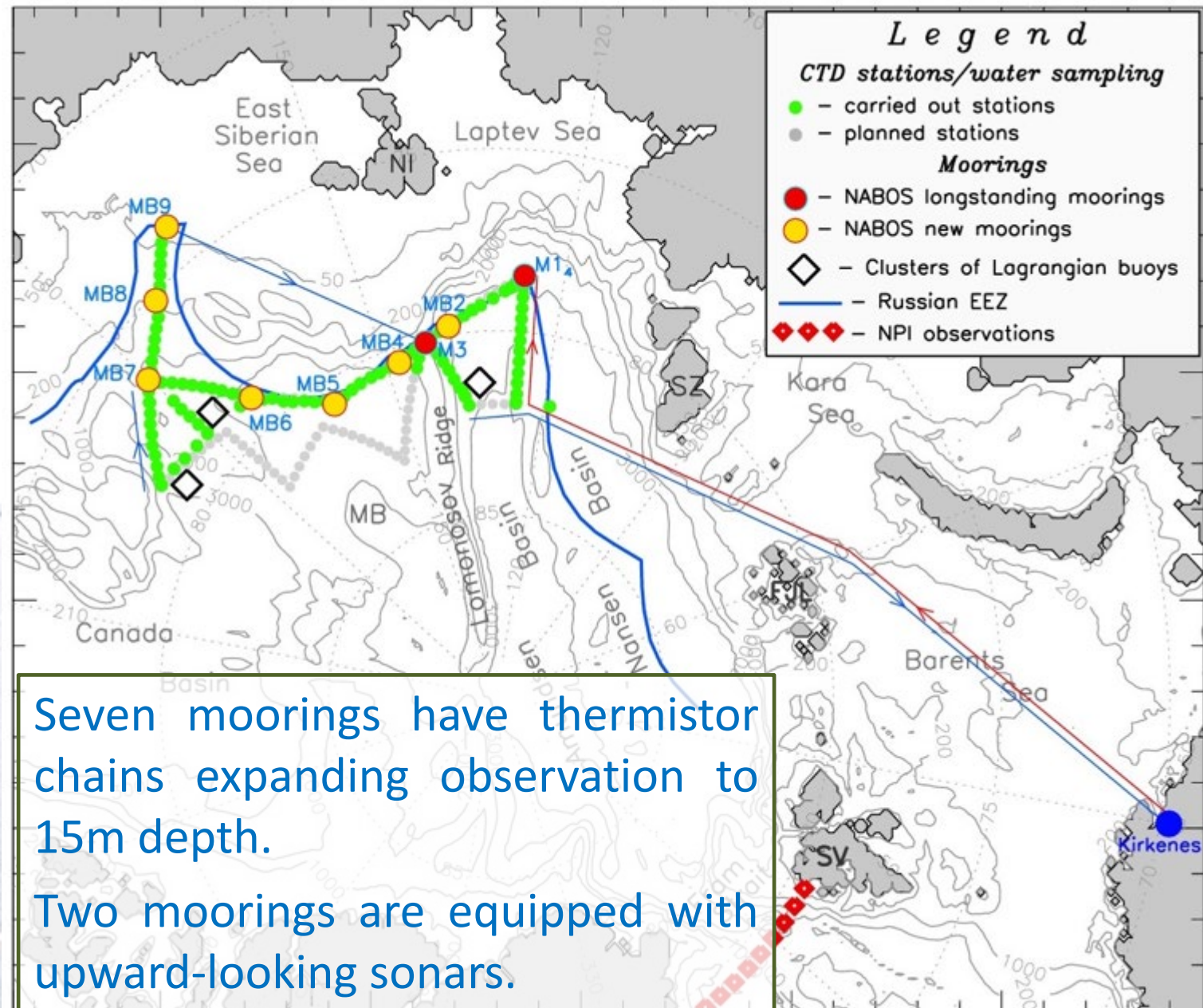
Goal of NABOS-III

The ***goal*** of the program is focused on developing a *comprehensive* and *quantitative* understanding of how the eastern EB functions as a switchgear, accumulating and releasing major Arctic riverine transports and redistributing ice and fresh water between the eastern and western Arctic in response to atmospheric and oceanic forcings. No change has been made in this statement.

Cruises: 2021, 2023, and 2025.

All observations are outside of the Russian EEZ.

2021 NABOS cruise



Seven moorings have thermistor chains expanding observation to 15m depth.

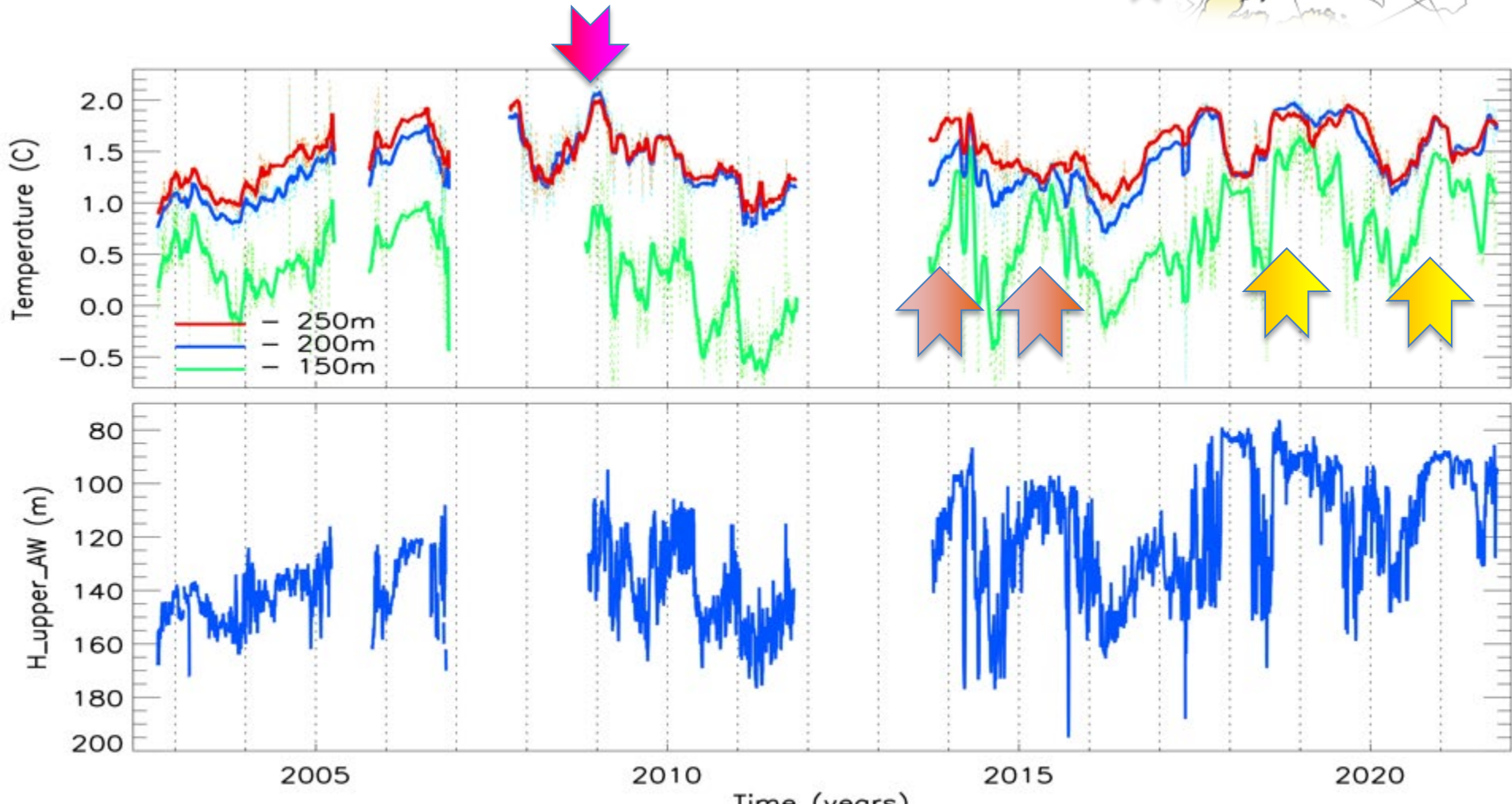
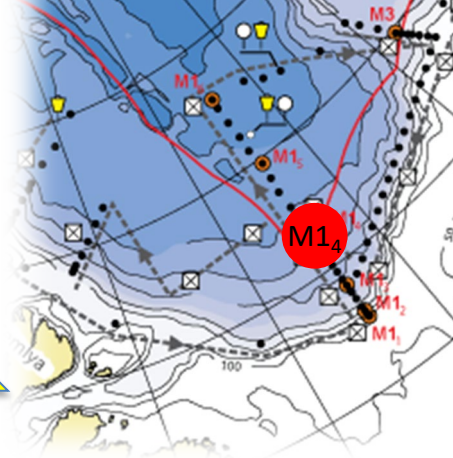
Two moorings are equipped with upward-looking sonars.

During the cruise we:

- ✓ Recovered one mooring at the central Laptev Sea slope which was deployed in 2018. All instruments provided full three-year long records. This is a continuation of our climatologic record started in 2002.
- ✓ Deployed nine long-term moorings.
- ✓ Made 103 CTD stations.
- ✓ Collected several thousands water samples.
- ✓ Deployed many buoys.
- ✓ Made three ice stations.
- ✓ Continued our tradition of multinational collaboration. Scientists from four countries worked together in this expedition.
- ✓ Conducted an extensive outreach campaign.

20 YEARS OF MOORING OBSERVATIONS:

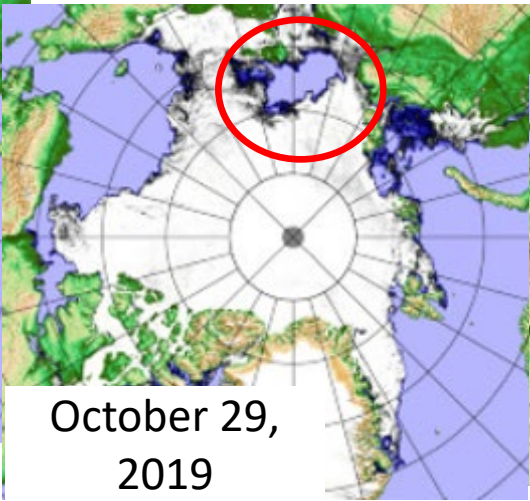
- Shoaling of AW,
- Peak of AW core temperature in 2007-2008, 
- Winter disappearance of CHL in the mid-2010s, 
- Expansion of this process into fall in recent years. 



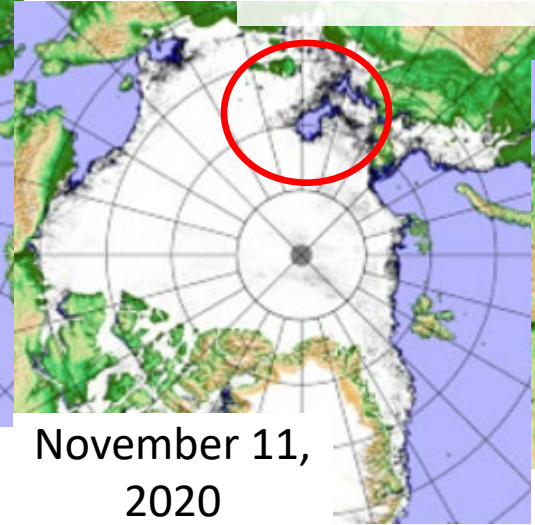
Autumnal delay of EEB sea ice formation in recent years



October 31,
2018



October 29,
2019

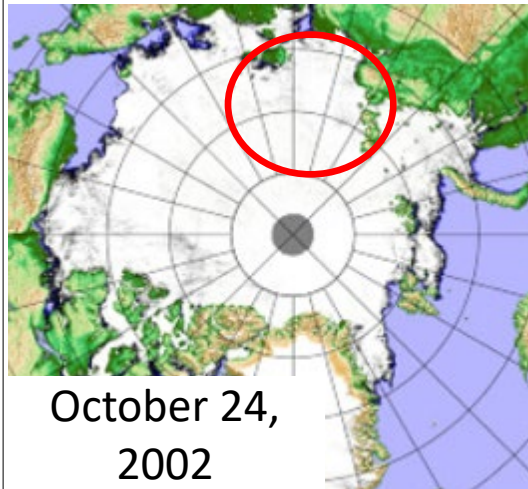


November 11,
2020



October 24,
2021

... and its lack just 15 years ago



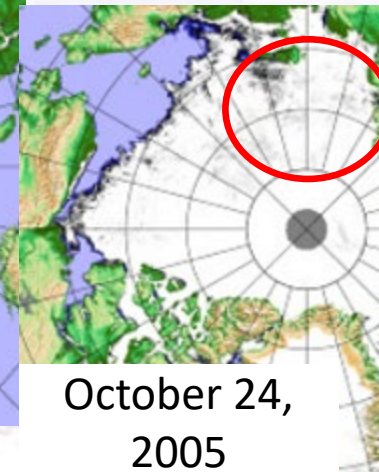
October 24,
2002



October 24,
2003

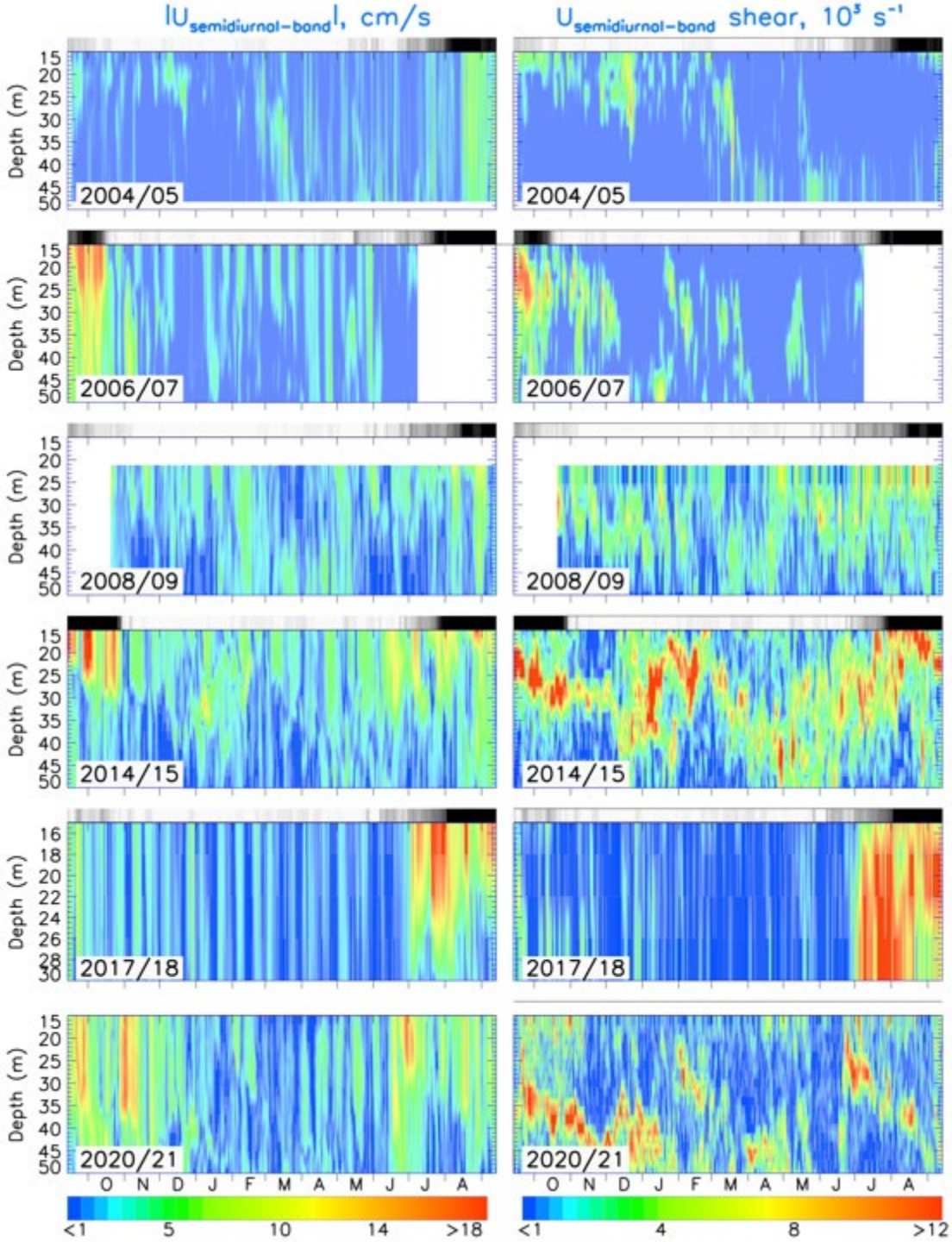


October 24,
2004

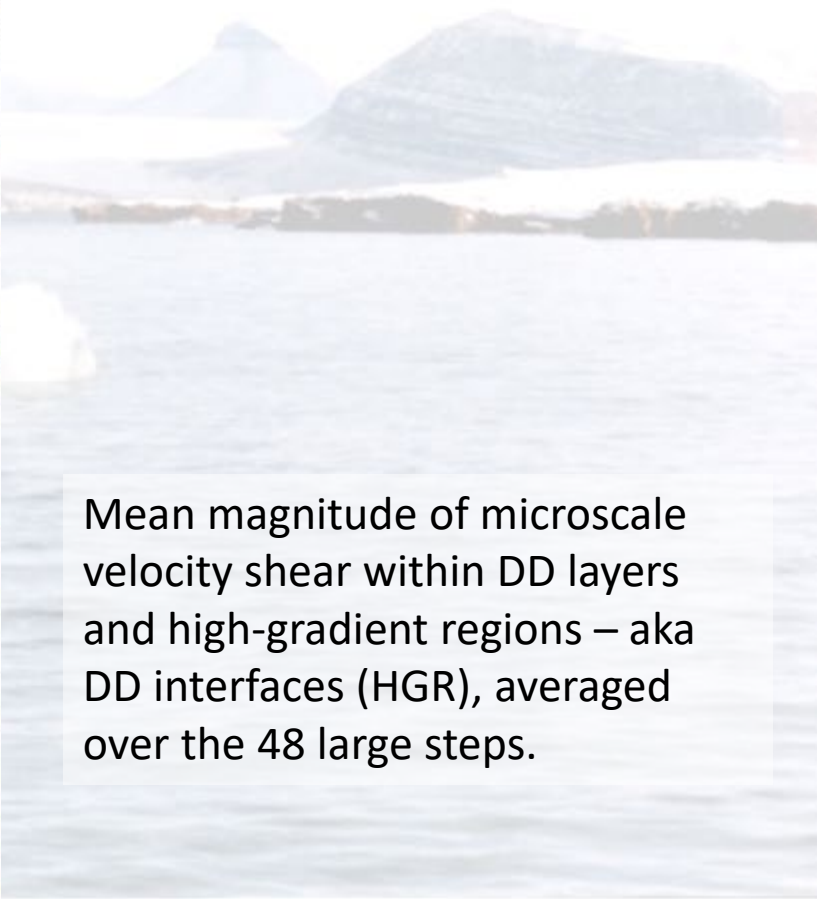


October 24,
2005

The effects of Atlantification are traceable all the way to the Fram Strait (Belter et al. 2021)



Enhanced velocity shear in the big DD interfaces



Mean magnitude of microscale velocity shear within DD layers and high-gradient regions – aka DD interfaces (HGR), averaged over the 48 large steps.

Conclusions

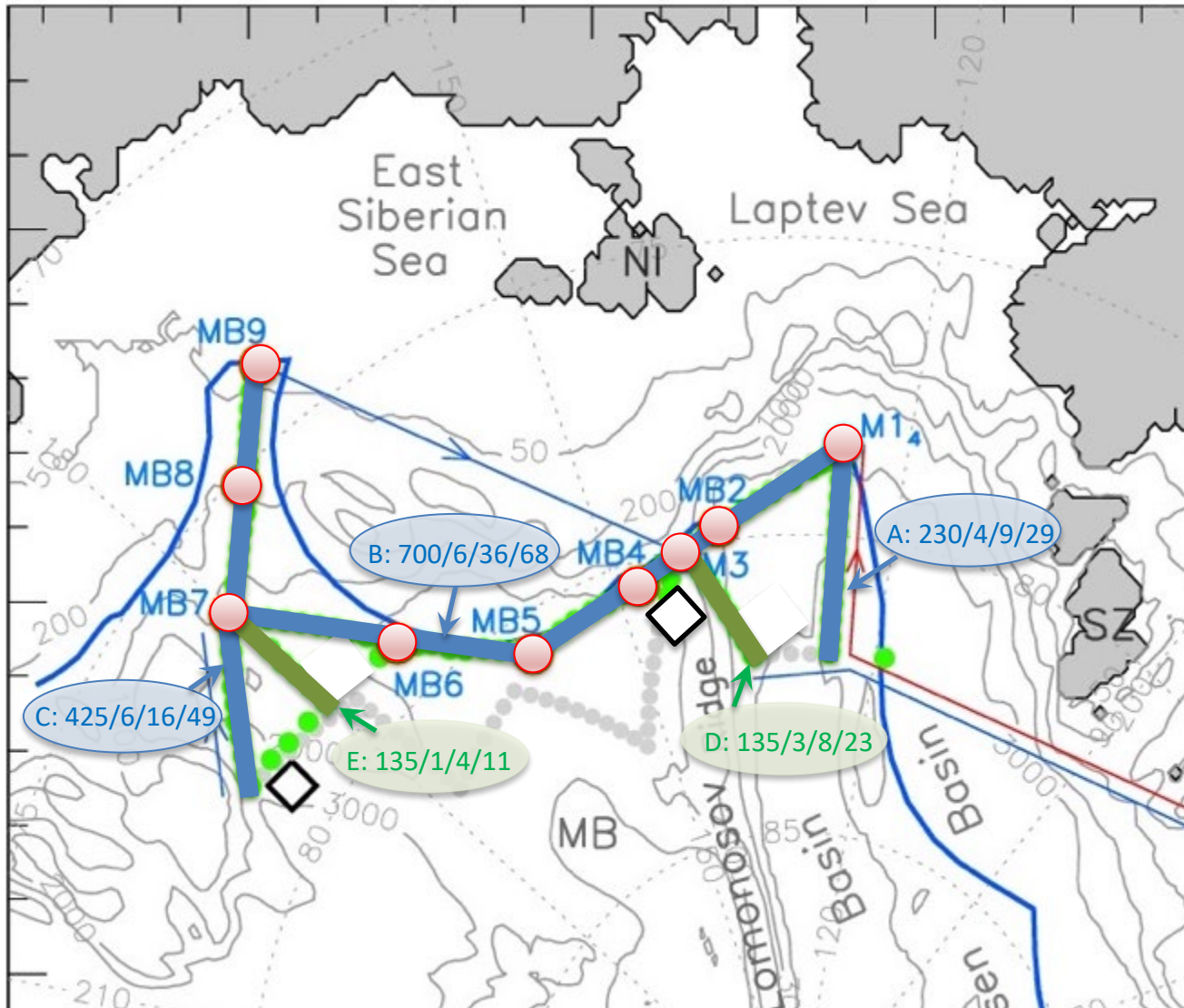
- Atlantification - a fundamental step toward a new Arctic climate state – continues its way into the central Arctic.
- There are still a lot of unknowns in the story about Arctic Ocean change.



Plans :

- ❑ Carry out cruises in 2023 and 2025.
- ❑ Renew NABOS funding for 2026-2030.
- ❑ Jointly with KOPRI develop DBO in the ESS.

2023 NABOS cruise



Priority # 1:

- Mooring recovery and deployment . 24 hrs per each site. Five WHOI technicians and two UAF researchers.

Priority # 2:

- CTD sections. Labels at each section indicate its name (A or B etc.), length (mi), number of deep CTD casts (~3hr/cast), number of shallow CTD casts (~1.5hr/cast), and total time required for CTD work (L/D/S/T). Transit time between CTD casts is not included. Four chemical technicians and two personnel.

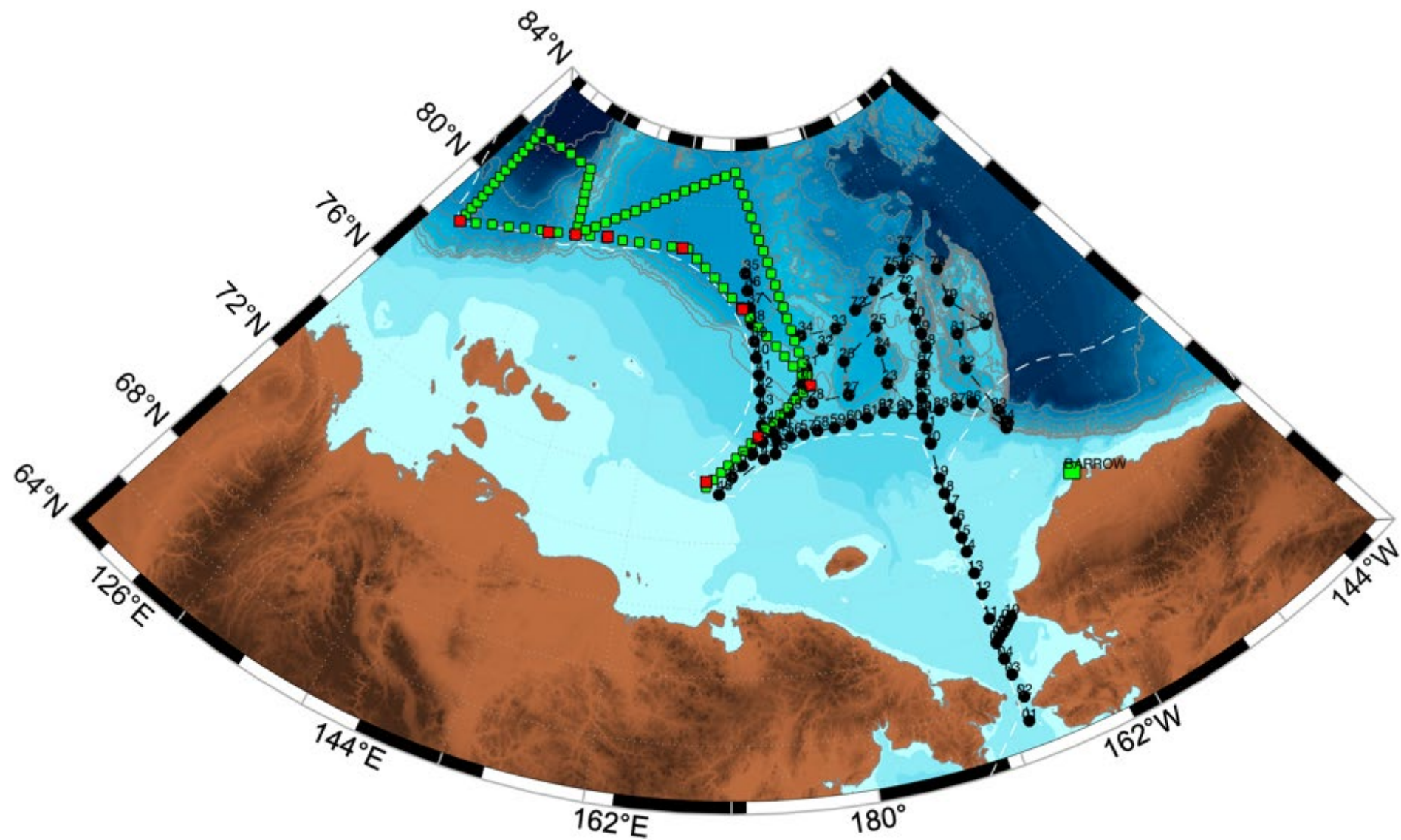
Priority # 3:

- CTD sections. Numbers have the same meaning as above.

Priority # 3:

- Buoy deployment sites. 12 hrs per each site.

KOPRI & NABOS propose a DBO in the ESS



Acknowledgements

The program is funded by:



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