



# Understanding changes in the eastern Arctic Ocean from NABOS observations

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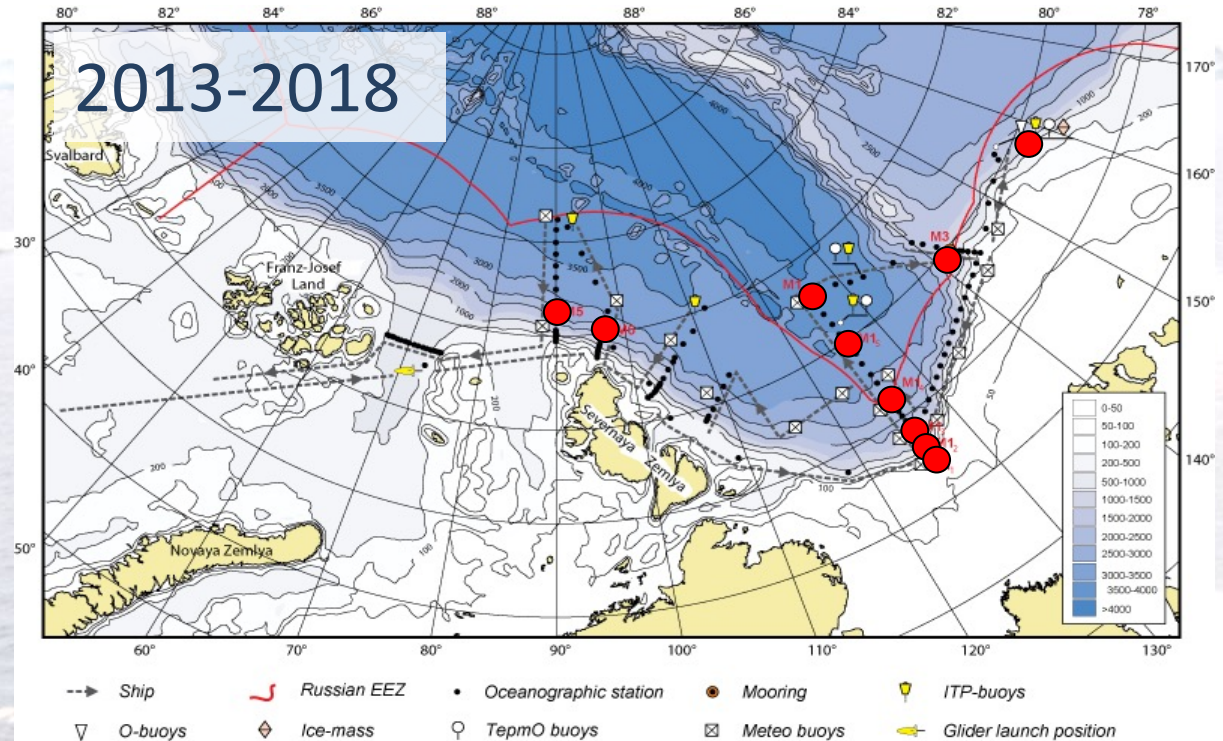
July 26, 2022

Fairbanks, Alaska

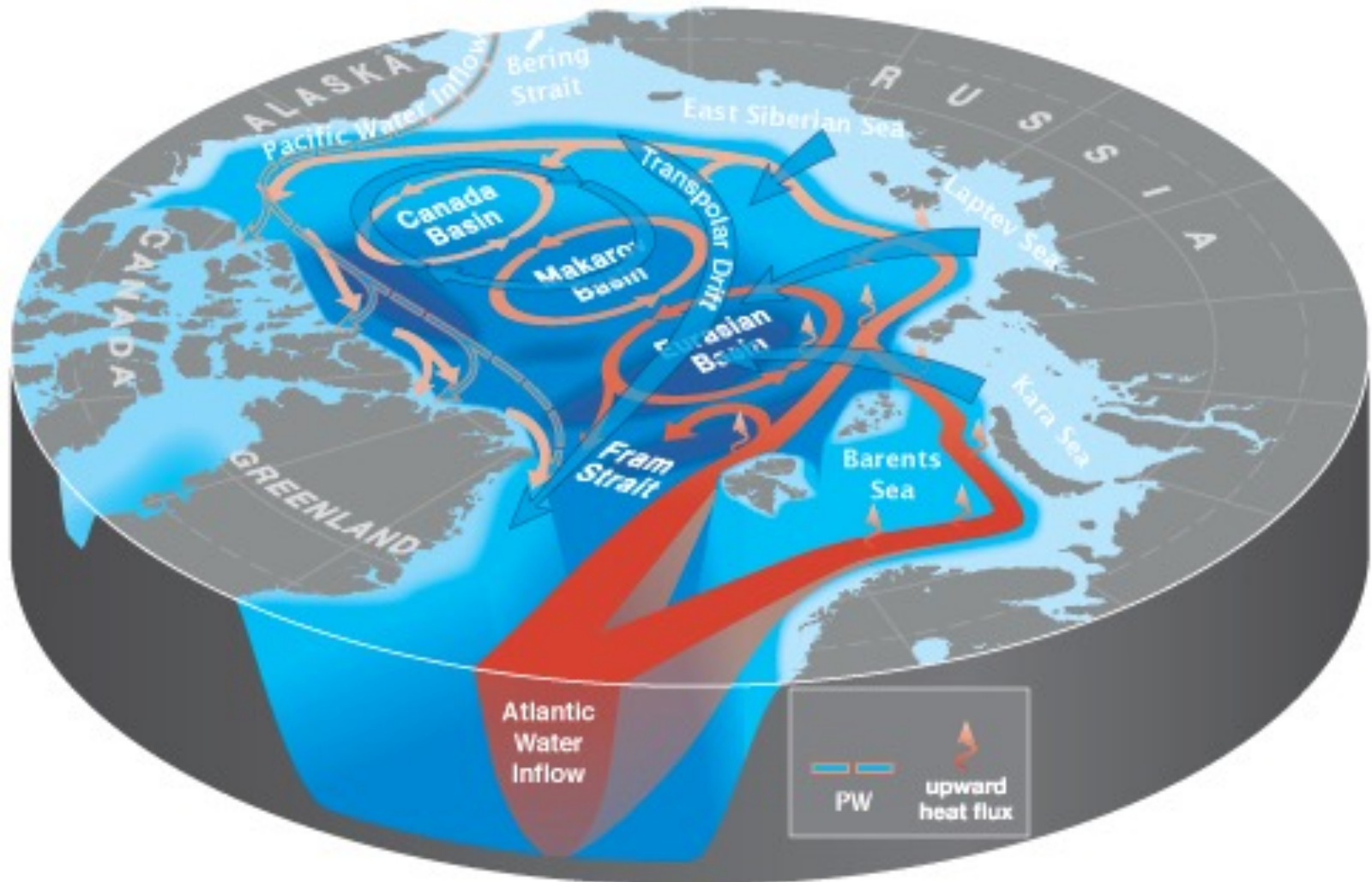


Overarching *goal* of NABOS  
 (= Nansen and Amundsen Basins  
 Observational System), as an element  
 of the Arctic Observing Network, is to  
 compile a cohesive picture of climatic  
 changes in the eastern Arctic Ocean.

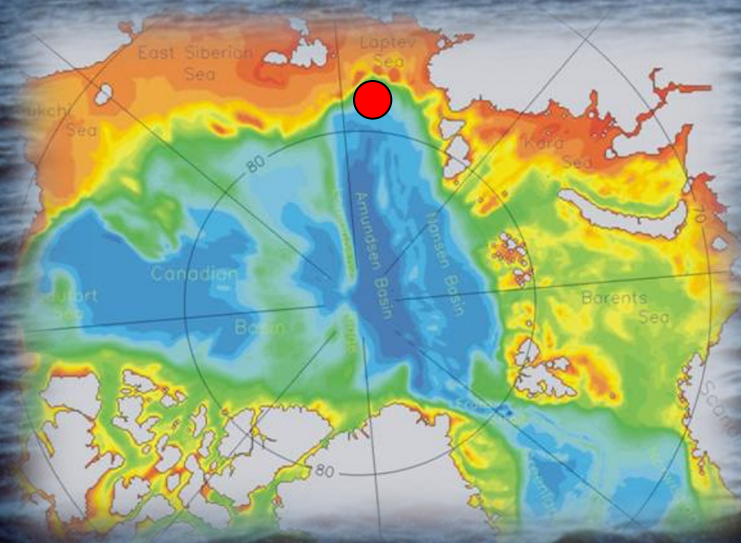
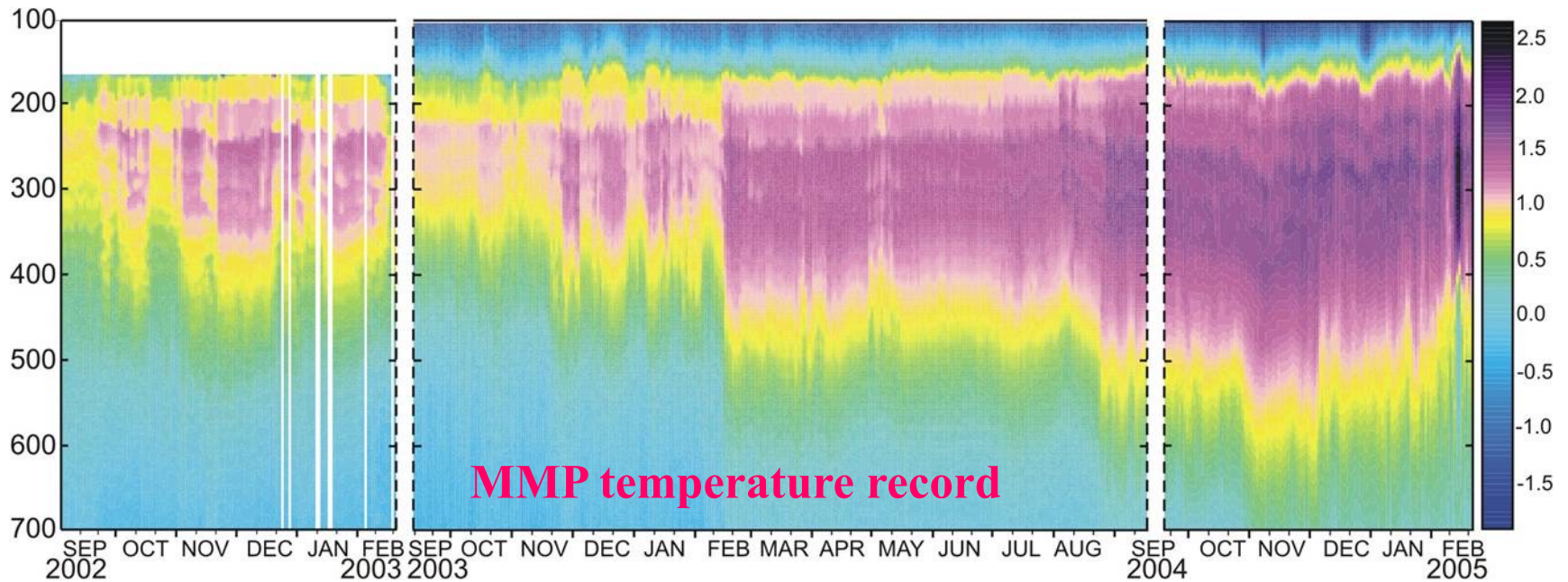
*Moorings,  
 Lagrangian drifters  
 (buoys), multi-  
 disciplinary ship  
 observations are the  
 means for monitoring  
 climate changes.*



# Schematic circulation of the Arctic Ocean



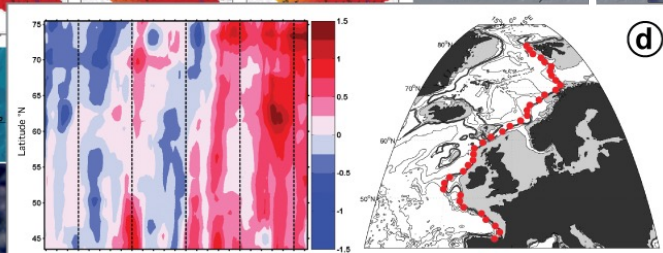
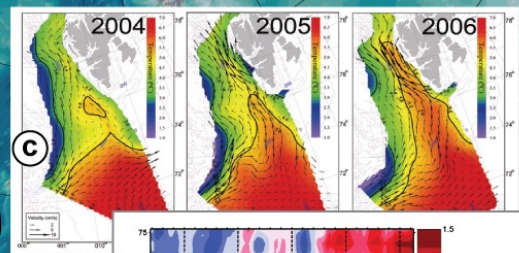
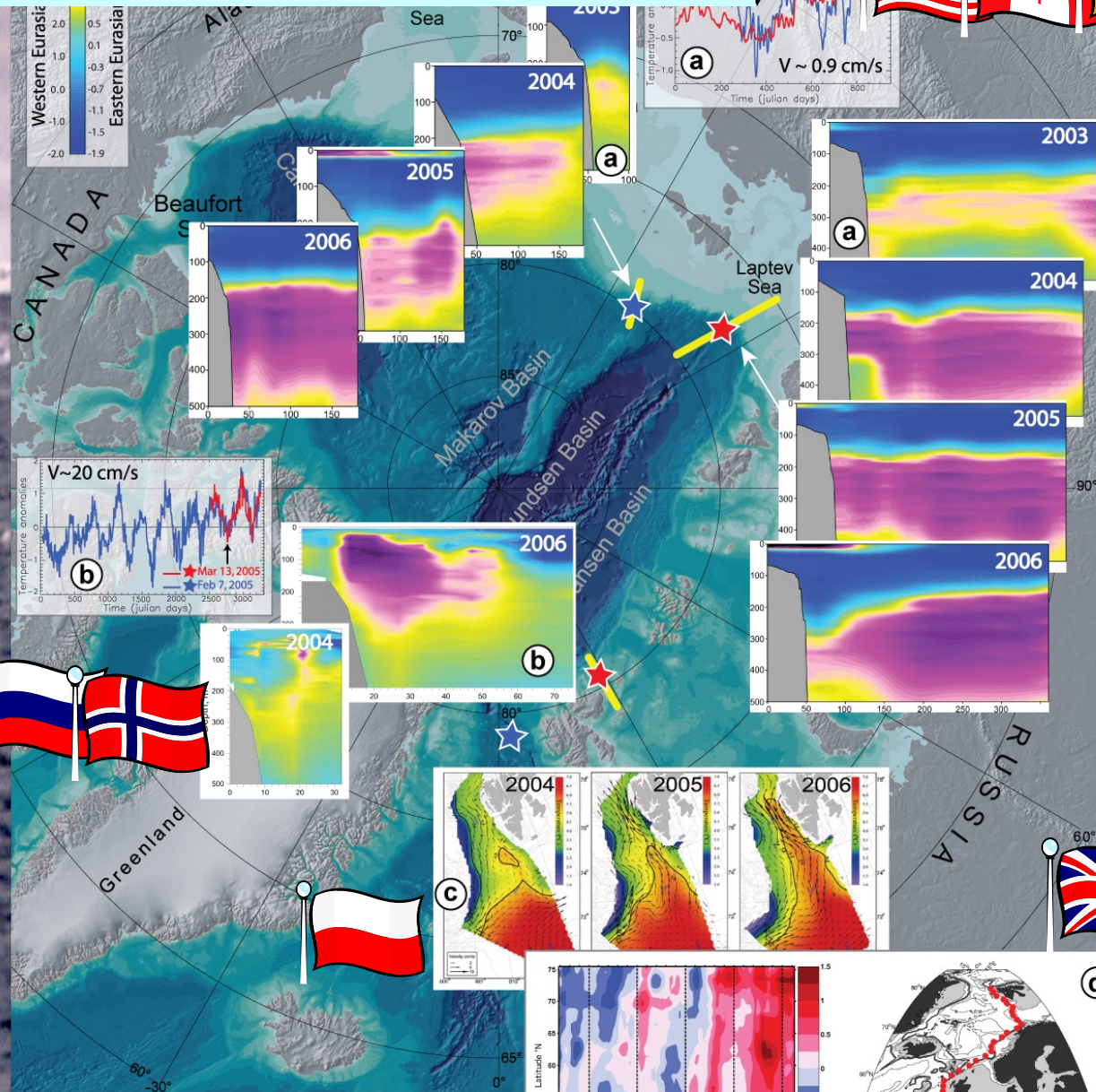
# Moorings are a powerful tool: Documenting warming



Abrupt Atlantic Water warming captured in the Laptev Sea in 2004.

*Polyakov et al., 2005*

# Essential international collaboration



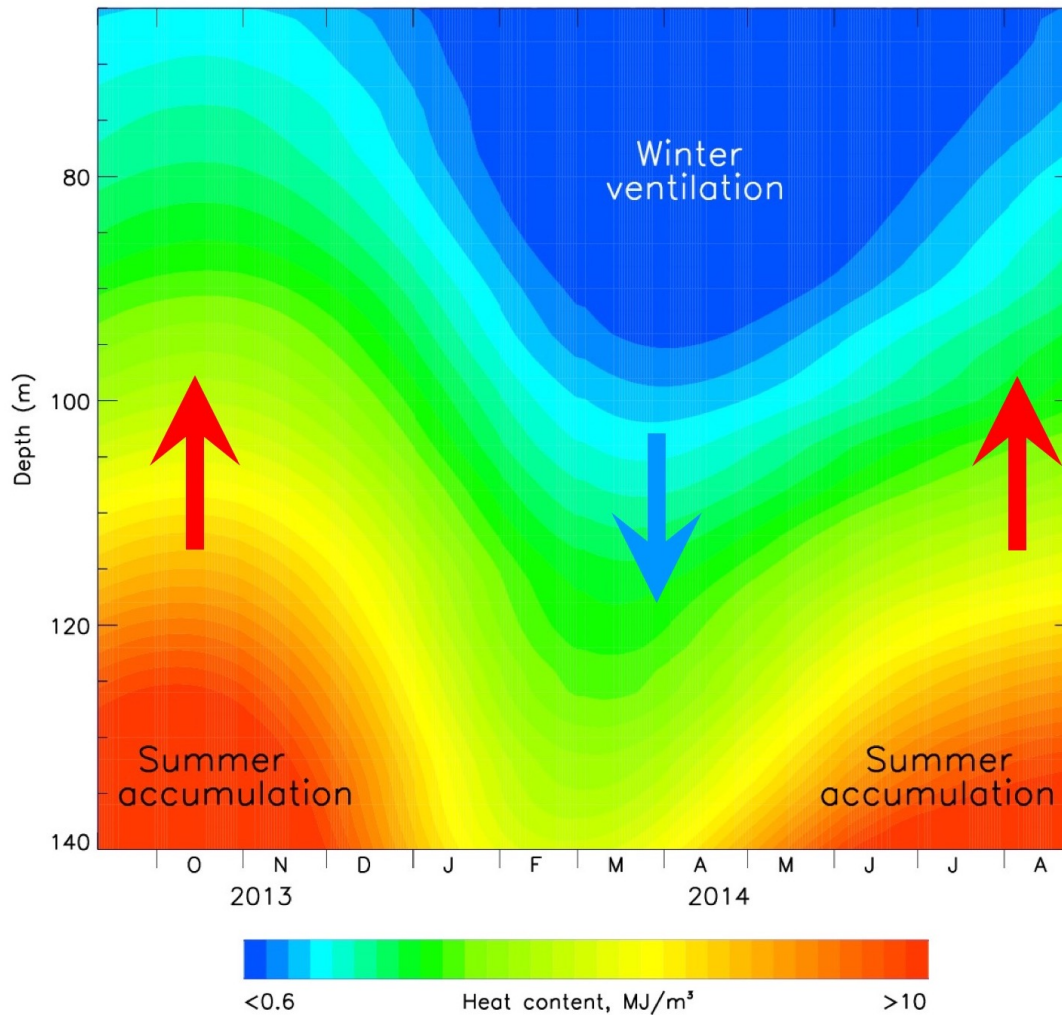
**NABOS-2013**  
**“Akademik Fedorov”**



**NABOS-2015**  
**“Akademik Tryoshnikov”**

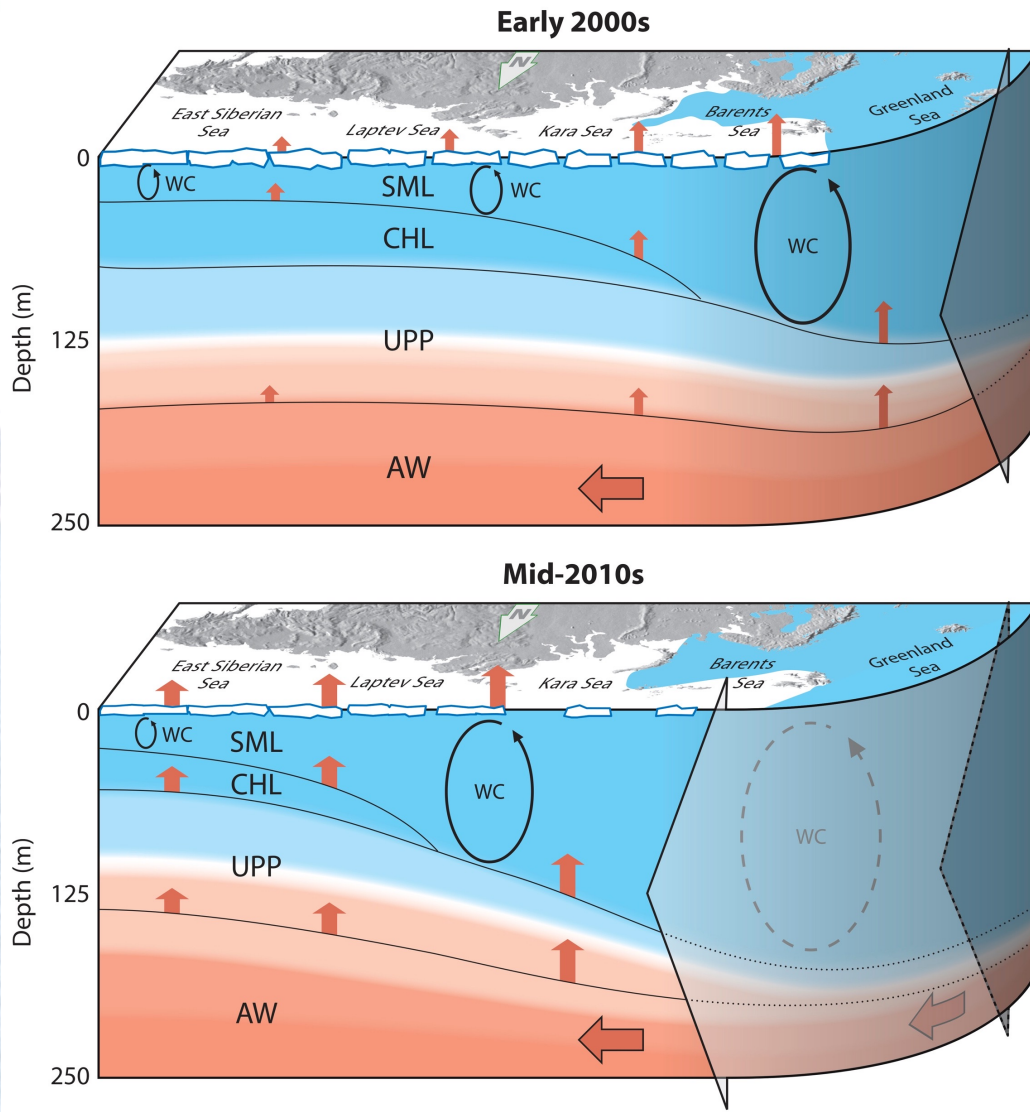


# Increased oceanic heat fluxes explain most of sea ice reduction in the eastern Eurasian Basin in recent years



Blue arrow shows penetrative winter ventilation to the depths exceeding 140m !!  
Adapted from *Polyakov et al.* (2020).

# Atlantification of the eastern Arctic Ocean

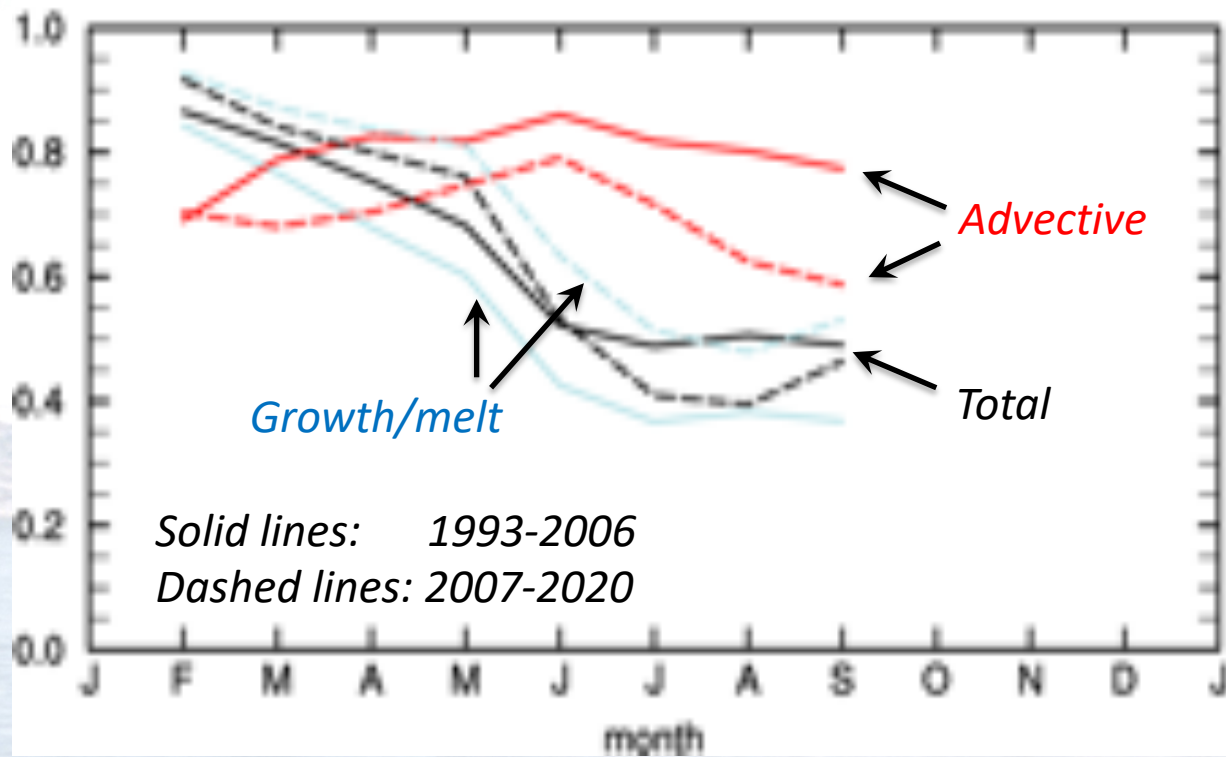


Winter convection (WC) penetrated through the Cold Halocline Layer (CHL) in the eastern Eurasian Basin in recent years releasing AW heat upward.

This is similar to what was observed in the past in the western Nansen Basin.



# Arctic sea-ice predictability



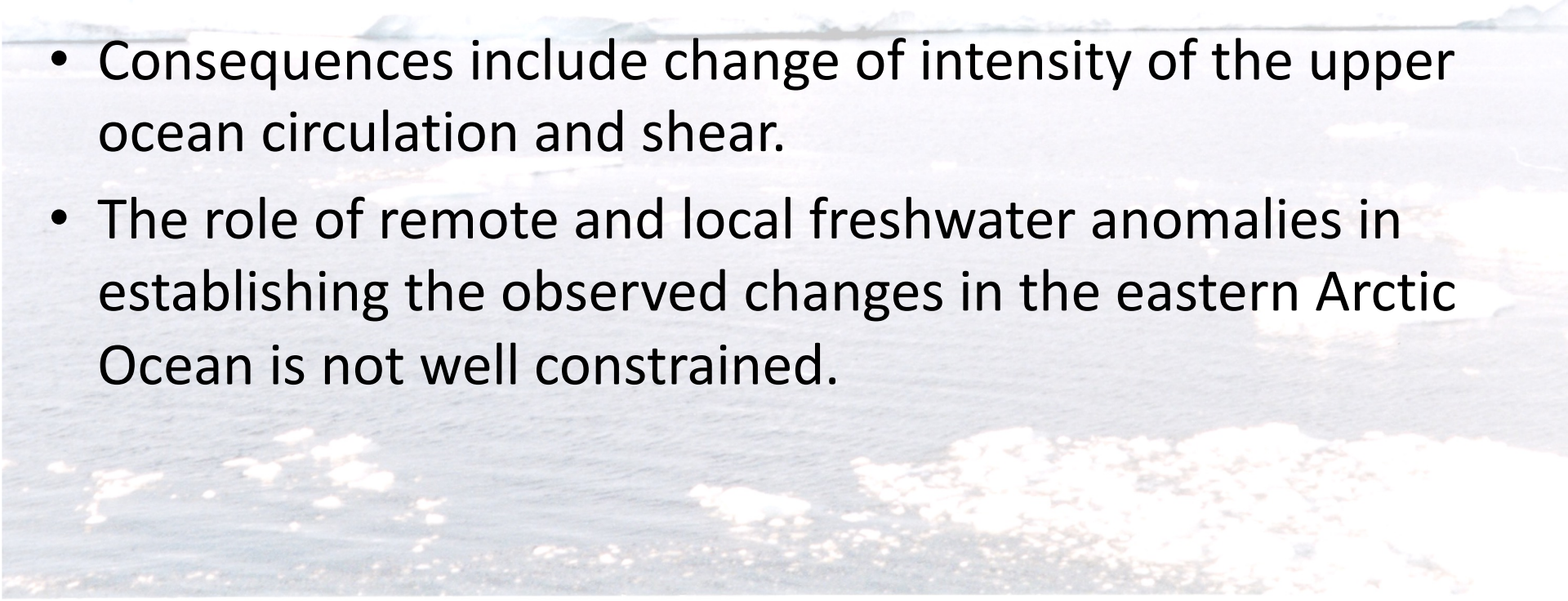
Pan-Arctic predictable component (PC) of sea ice thickness change and its decomposition into dynamic thermodynamic and components: Higher PC => higher predictability.

Competing influences of sea ice dynamics and thermodynamics on temporal change of predictability

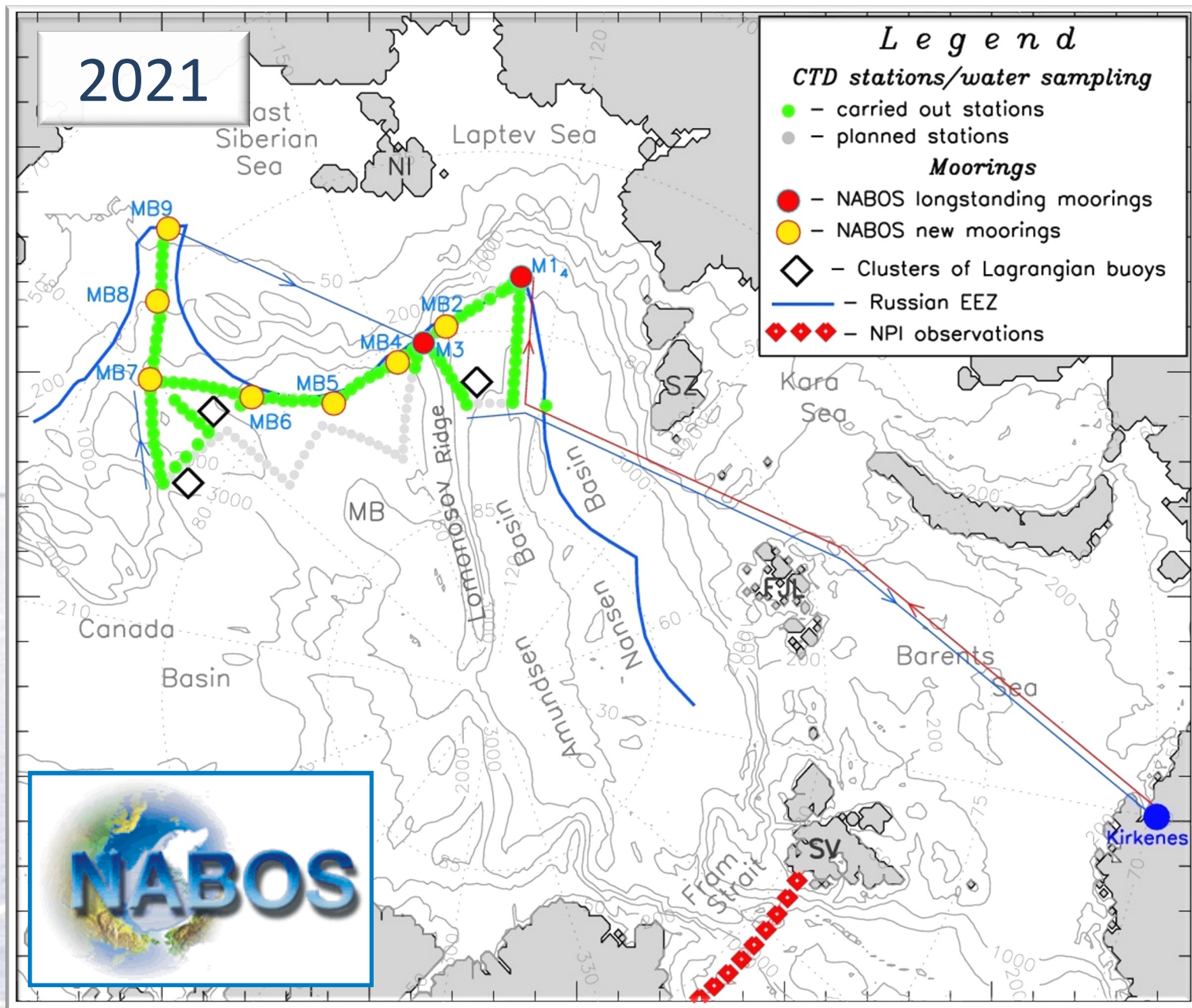
Polyakov (UAF/FMI), Mayer (ECMWF), Tietscge (ECMWF), Karpechko (FMI) 2021.

# Conclusions

- Recent loss of cold halocline layer in the eastern Eurasian Basin makes this region similar to the western Eurasian Basin -> “atlantification” - a fundamental step toward a new Arctic climate state.
- Consequences include change of intensity of the upper ocean circulation and shear.
- The role of remote and local freshwater anomalies in establishing the observed changes in the eastern Arctic Ocean is not well constrained.



# Plans and challenges



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- *NABOS plans include: 2023 & 2025 cruises, with the same spatial pattern as in 2021. These observations are essential for understanding changes in the Arctic and for making reliable sea-ice forecasts.*
- *The war in Ukraine has made the use of Russian research ships and collaboration with Russian scientists very difficult.*
- *Continuation of NABOS critically depends on ships available for complex operations in the eastern Arctic Ocean. Help of US and international partners is sought.*