Freshwater impacts on the biogeochemistry of the East Greenland Shelf

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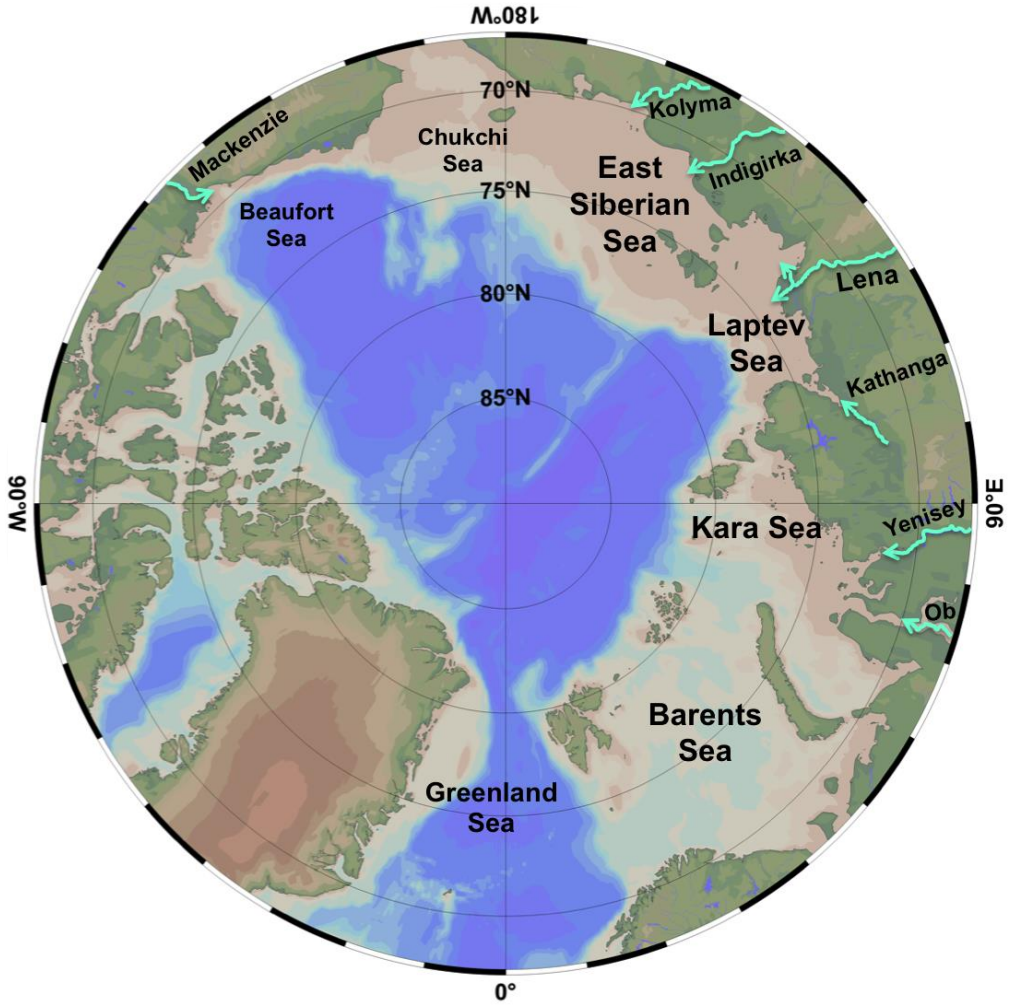
The Arctic Ocean: a fresher ocean basin



Strong riverine influence

- 11% of global river runoff
- 1.3% World's ocean volume

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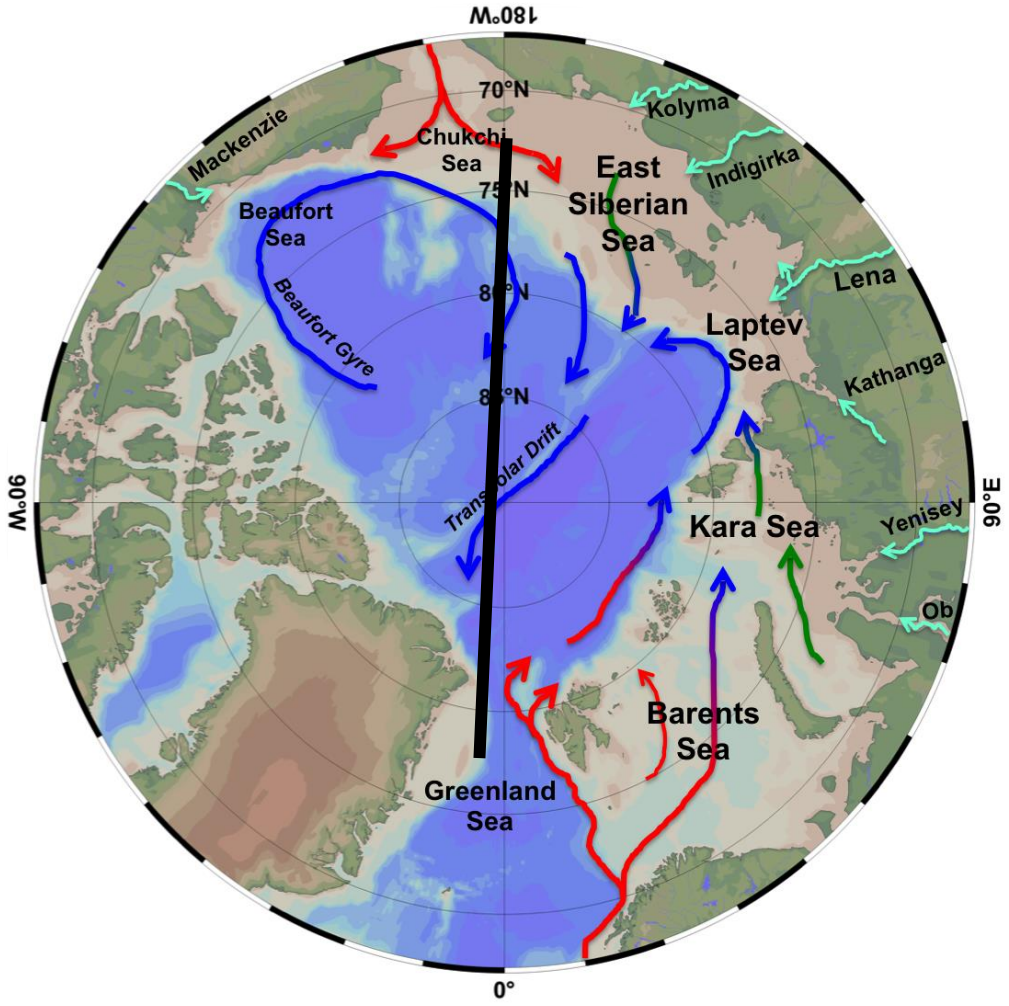

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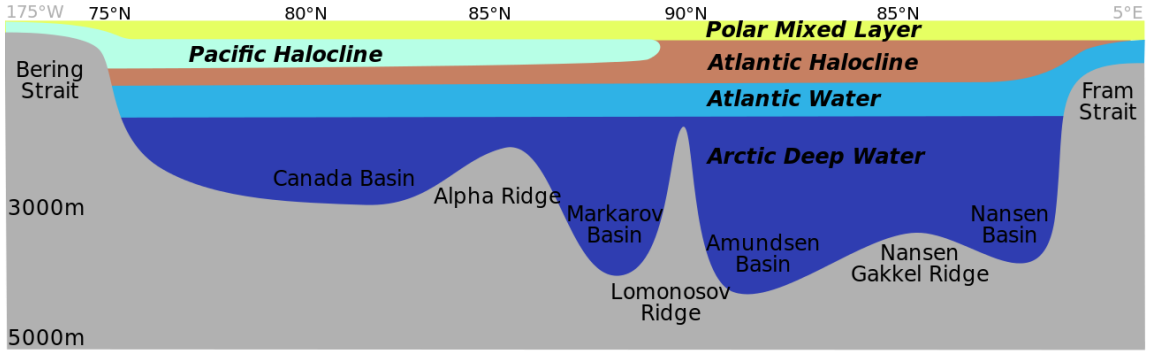
Water water advection

- Fram and Bering Straits

Halocline water



Adapted from Aagaard & Carmack 1989

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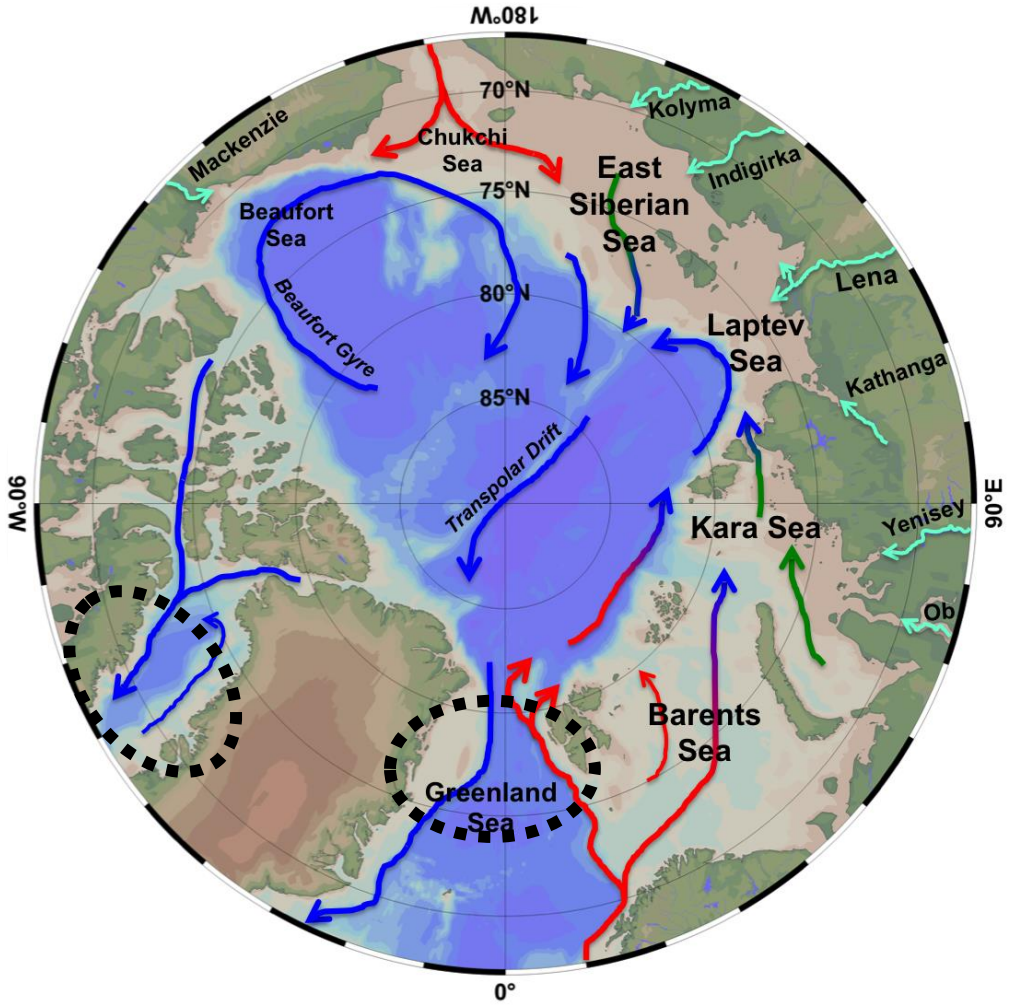

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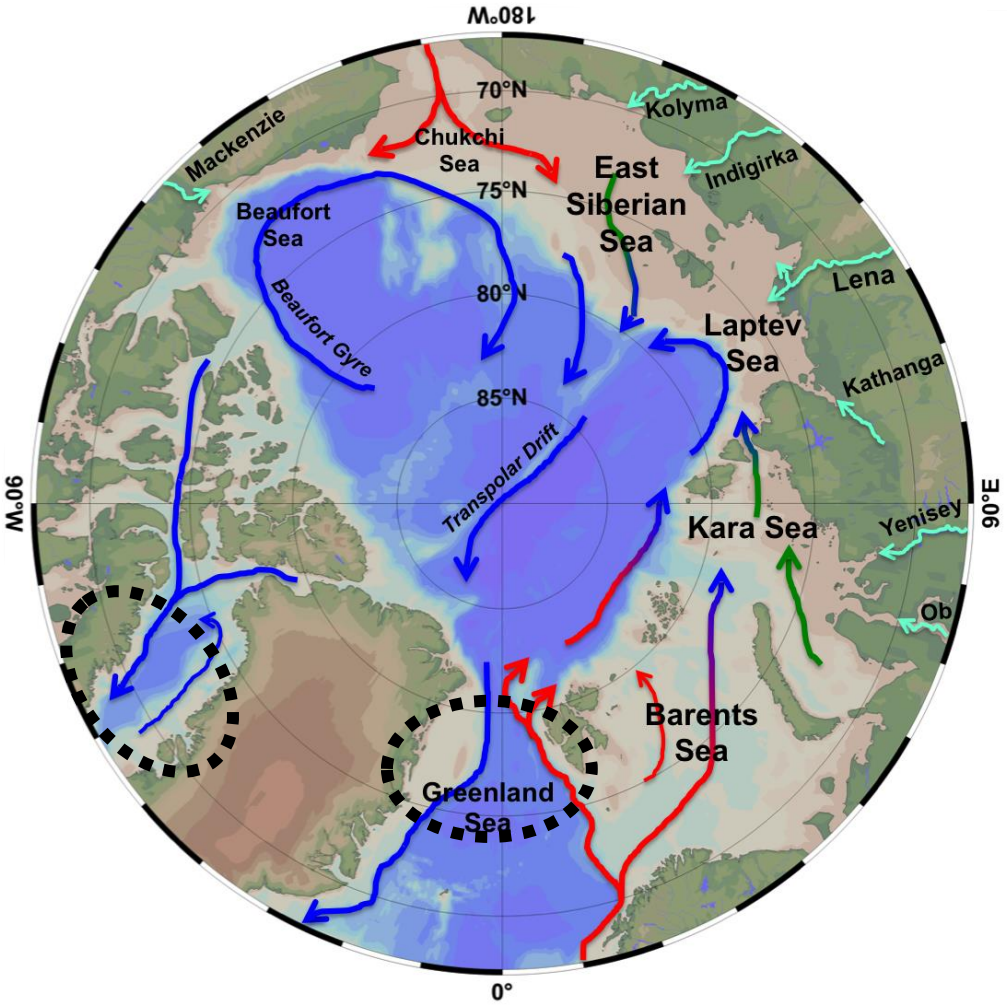
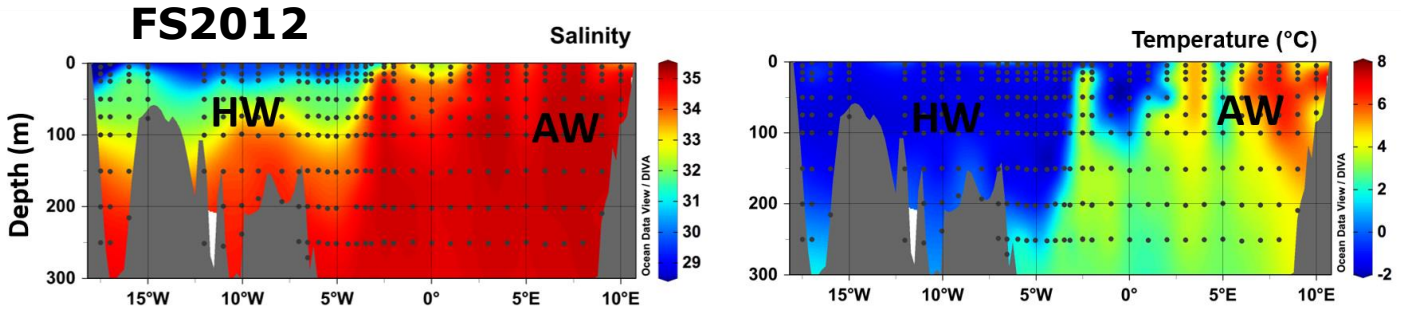
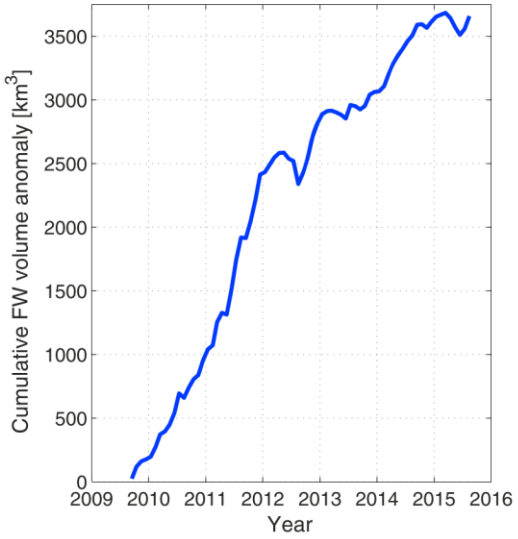
Export through Fram and Davis Straits

East Greenland Shelf: a freshwater gateway



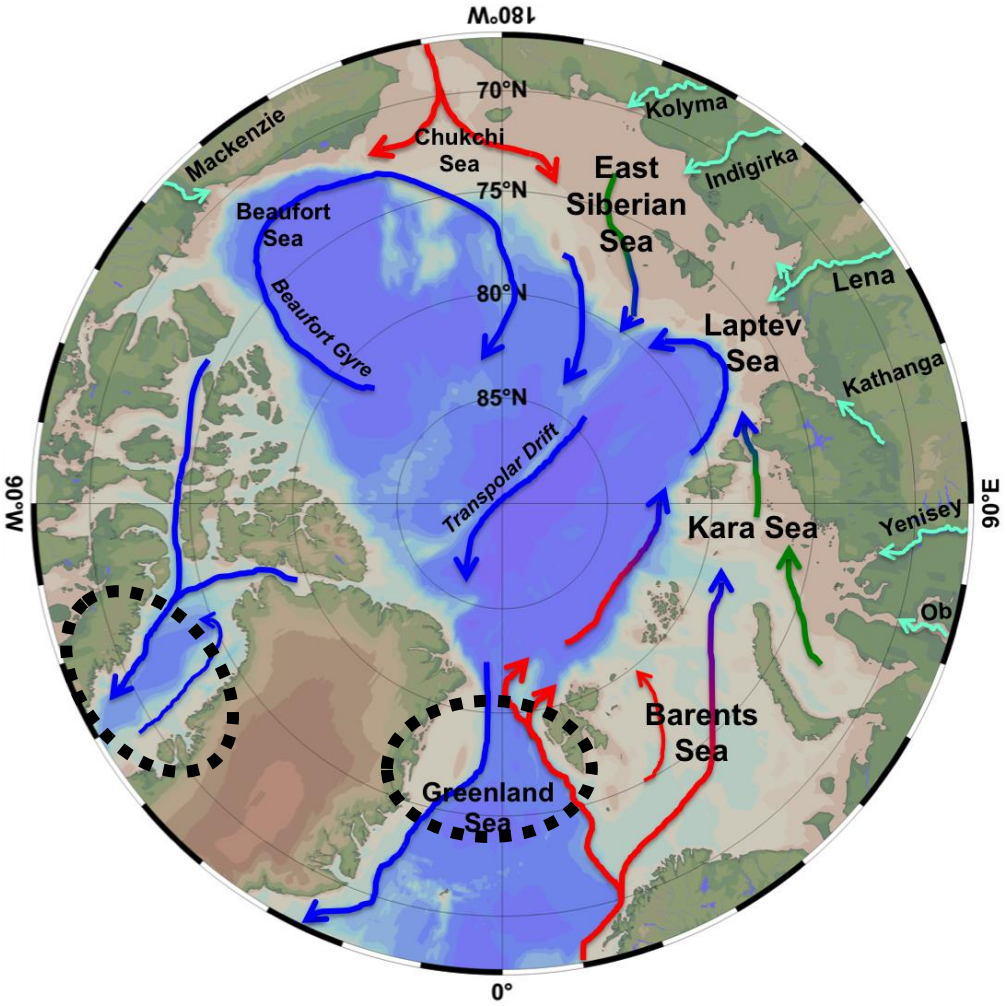


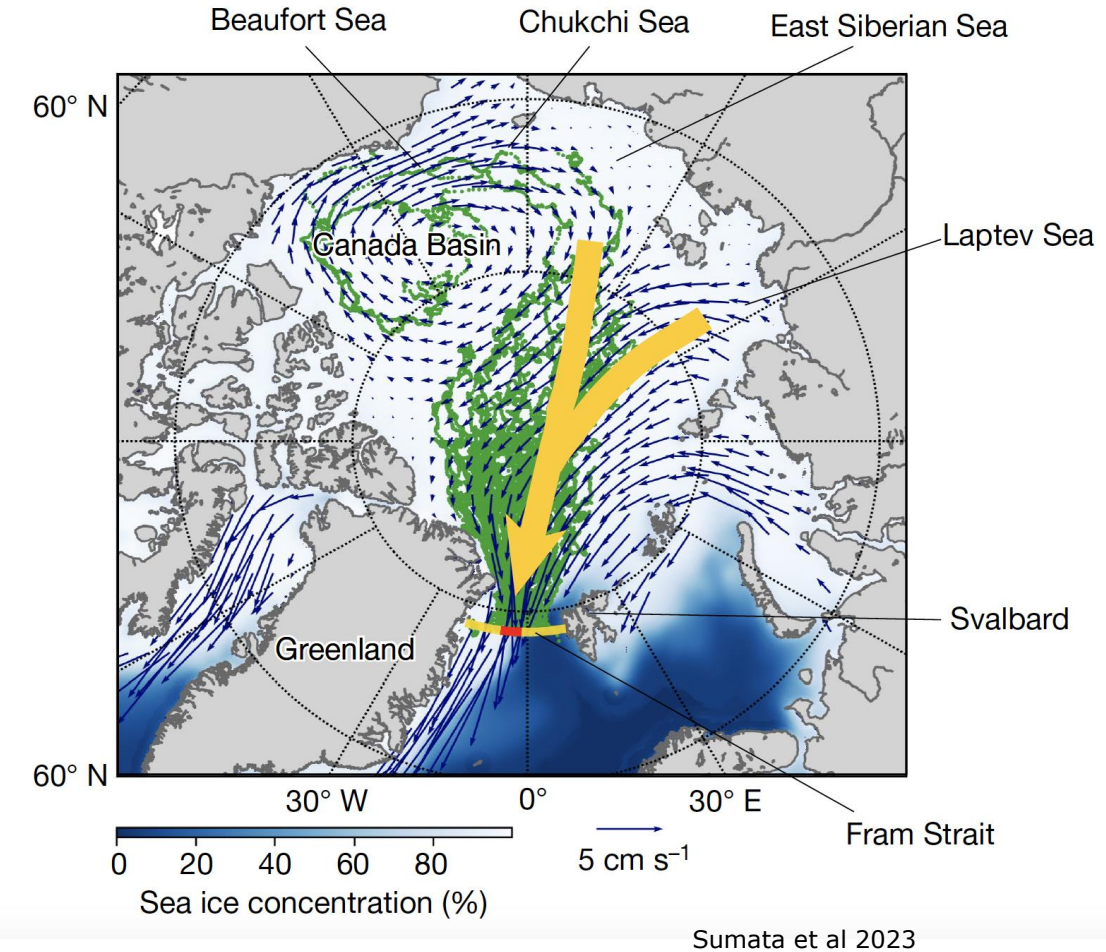
Gonçalves-Araujo et al 2016



De Steur et al 2018

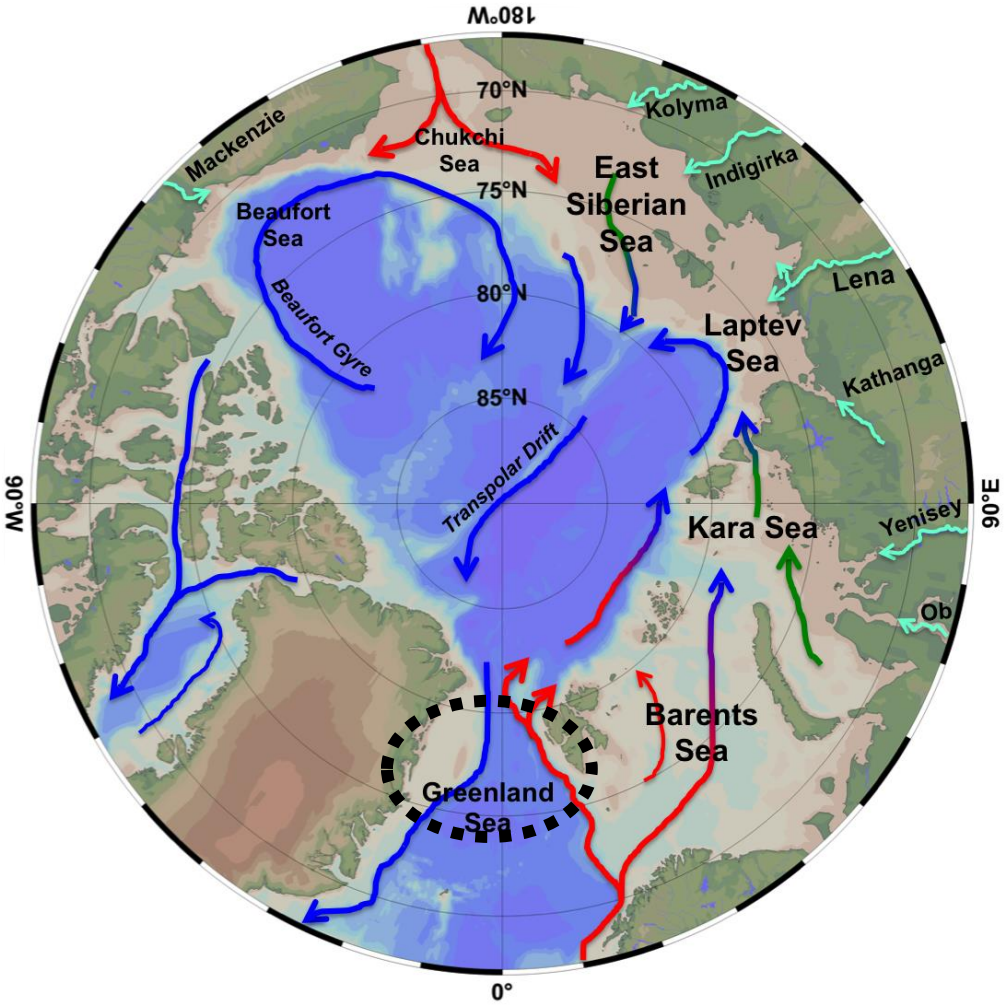
East Greenland Shelf: a freshwater gateway



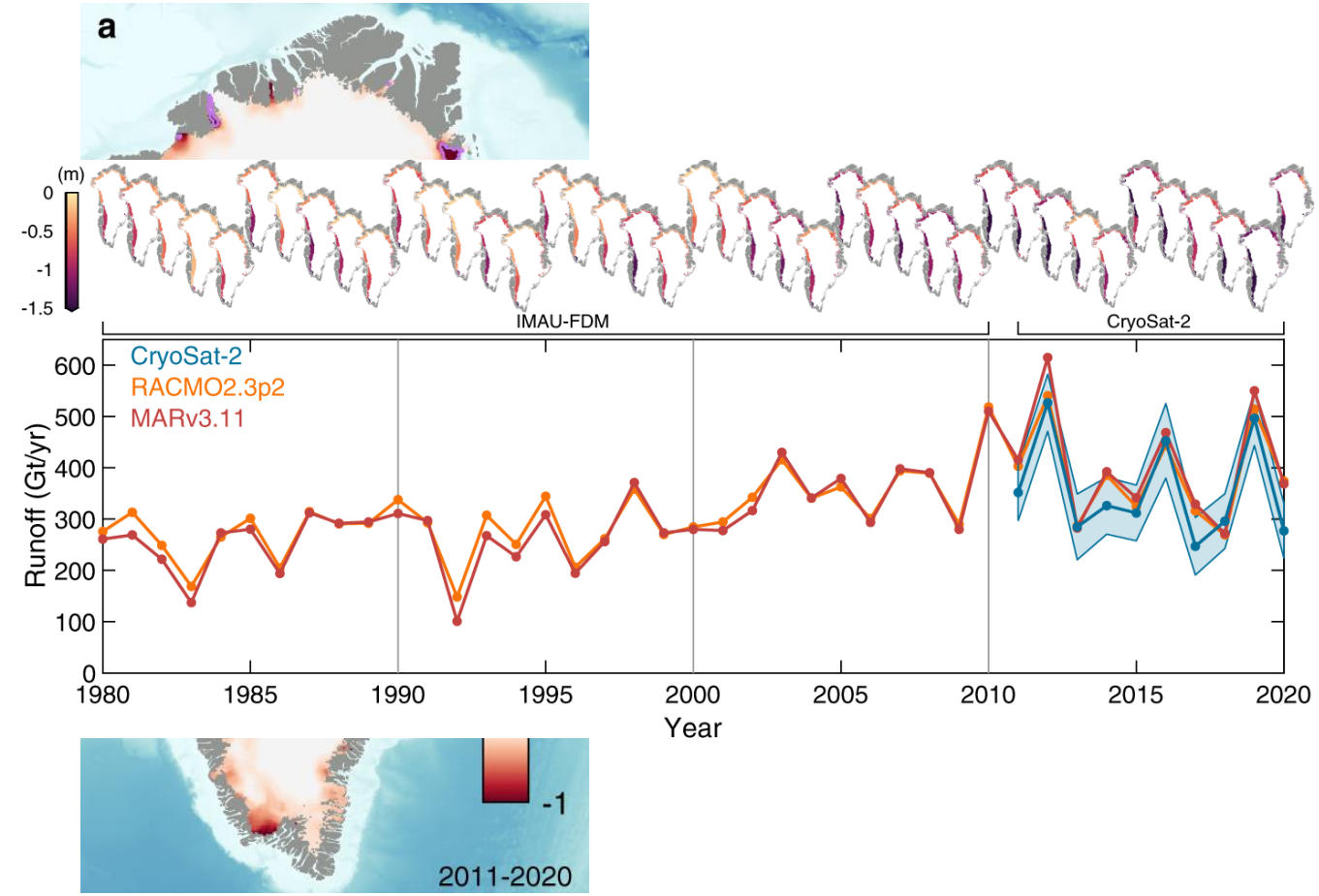


Sumata et al 2023

East Greenland Shelf: a freshwater gateway

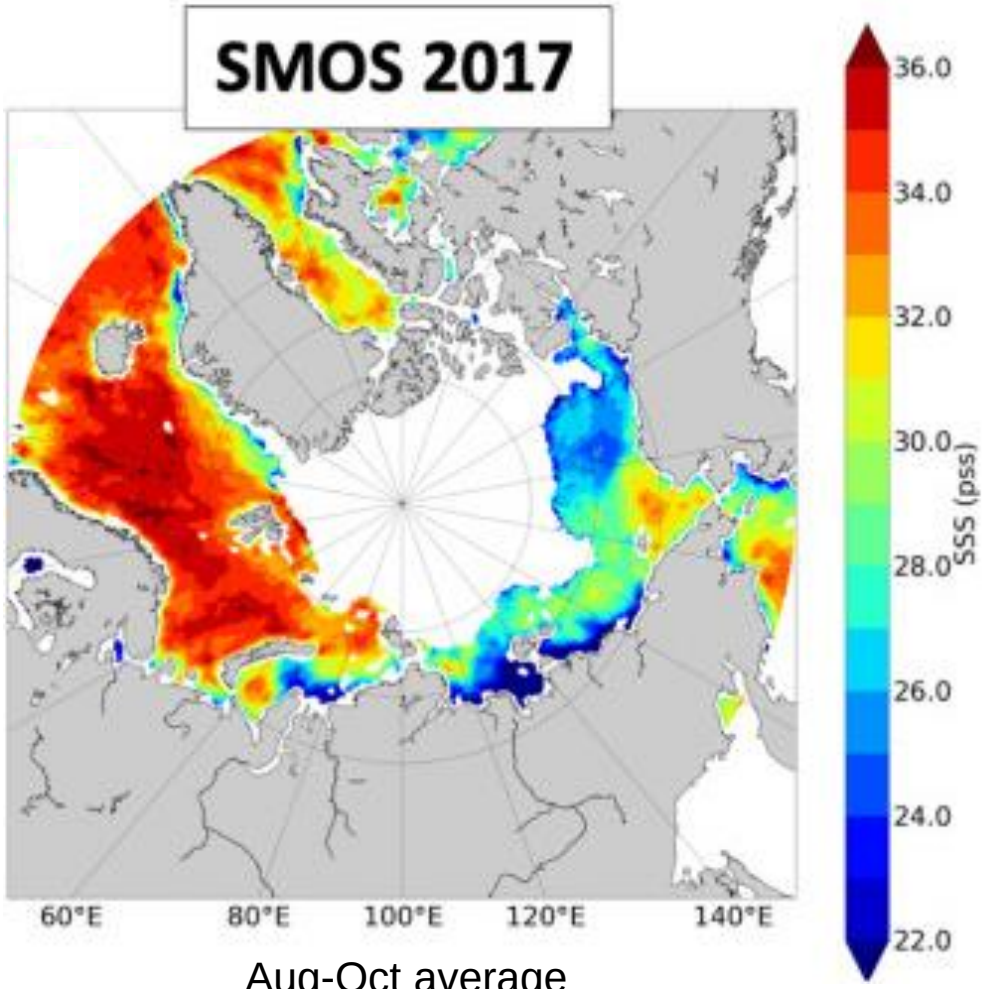


Rate of surface elevation change



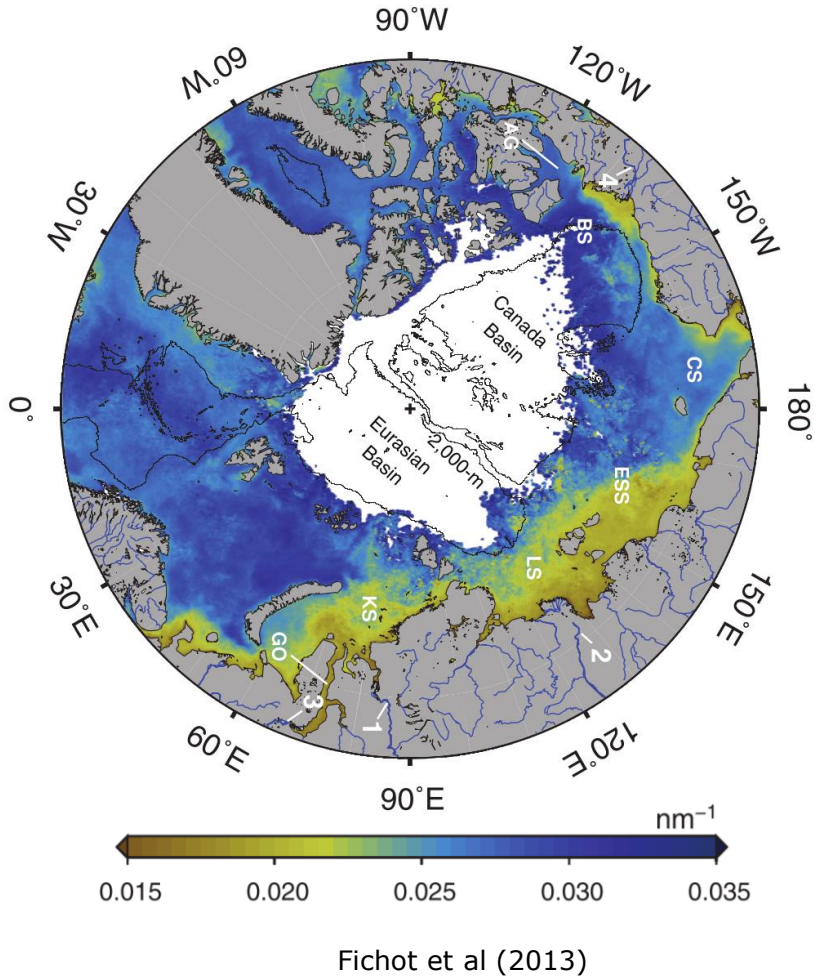
Slater et al 2021

But not only freshwater → Dissolved Organic Matter



Aug-Oct average

Supply et al 2020



Fichot et al (2013)

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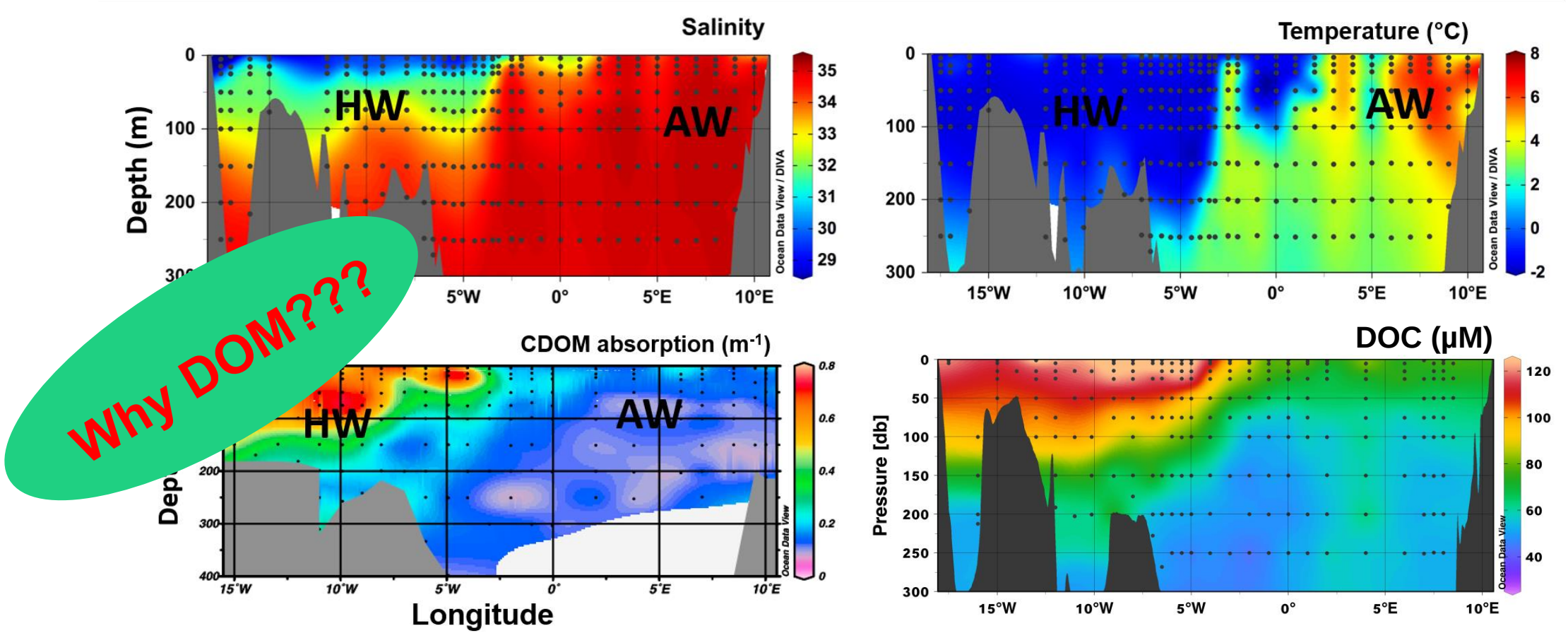
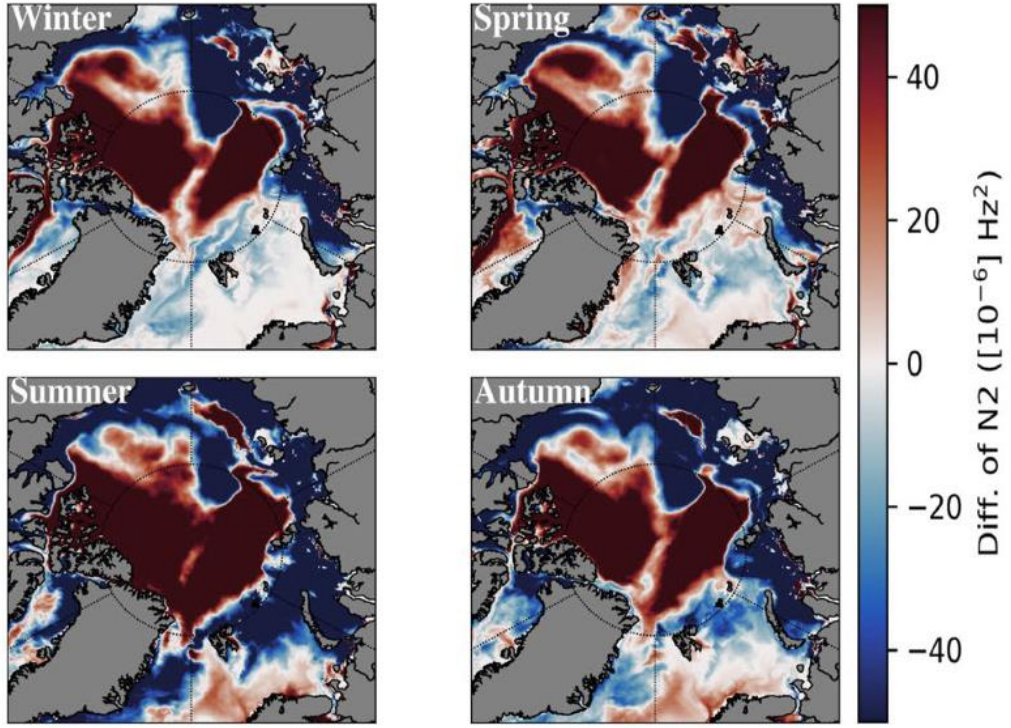


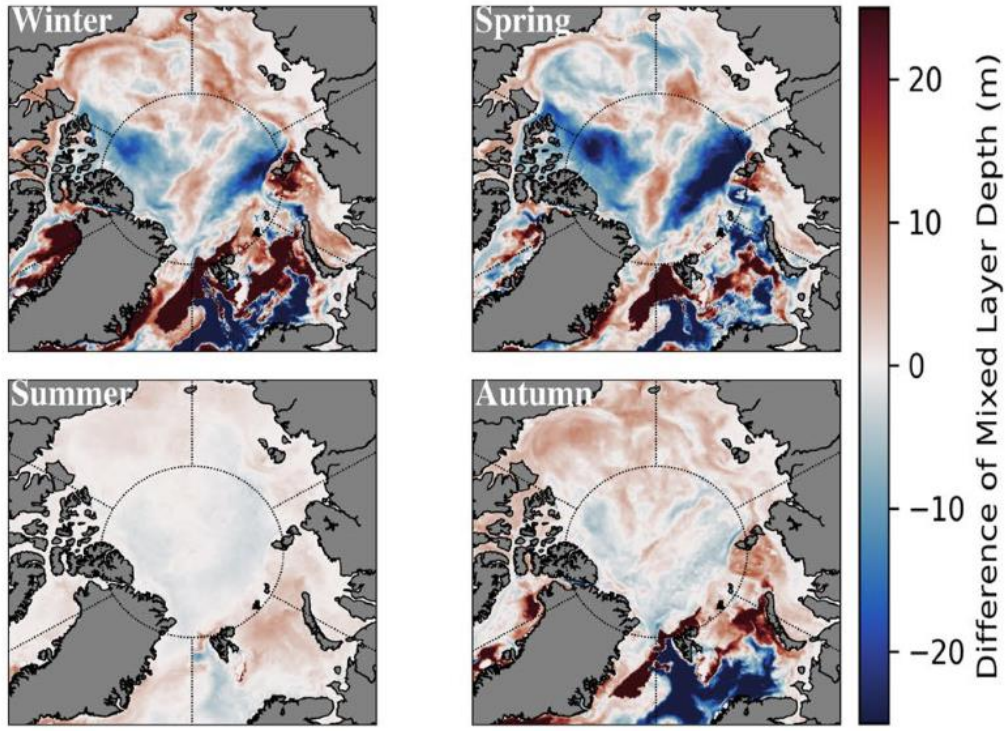
Granskog et al 2012; Gonçalves-Araujo et al 2016, 2020, 2023

Increased stratification

Differences between 1970-1999 and 2010-2019

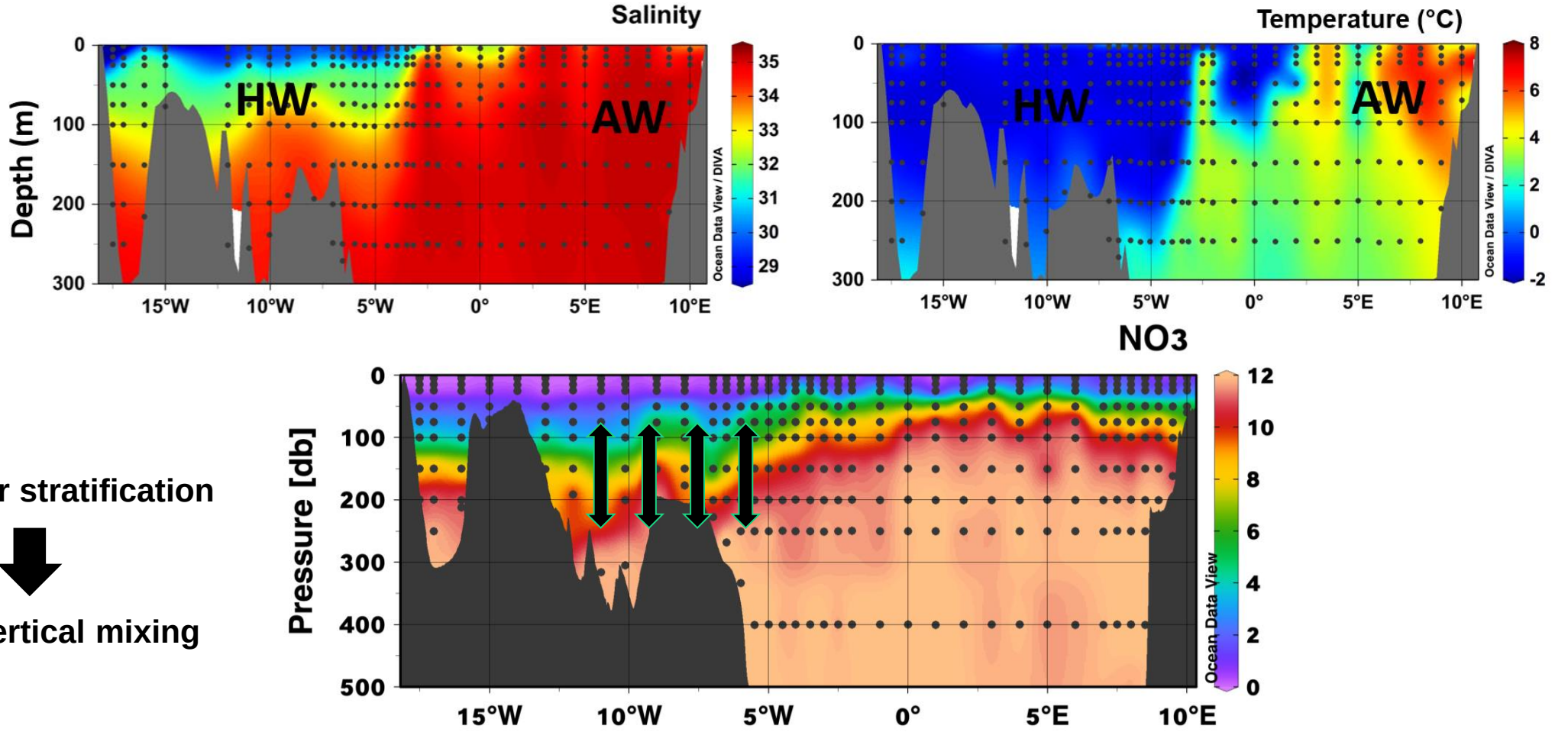


Hordoir et al 2022



Hordoir et al 2022

Biogeochemical implications

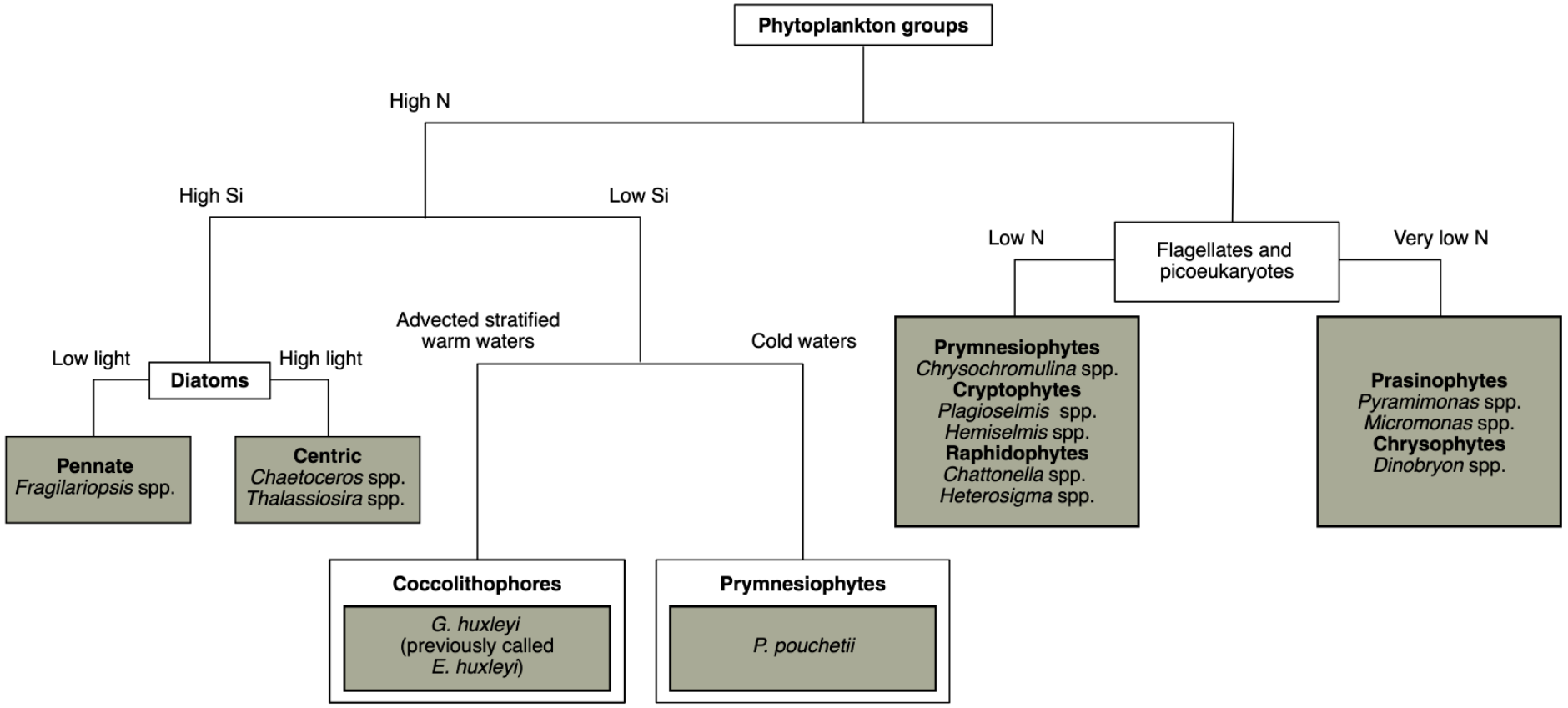


Stronger stratification

Less vertical mixing

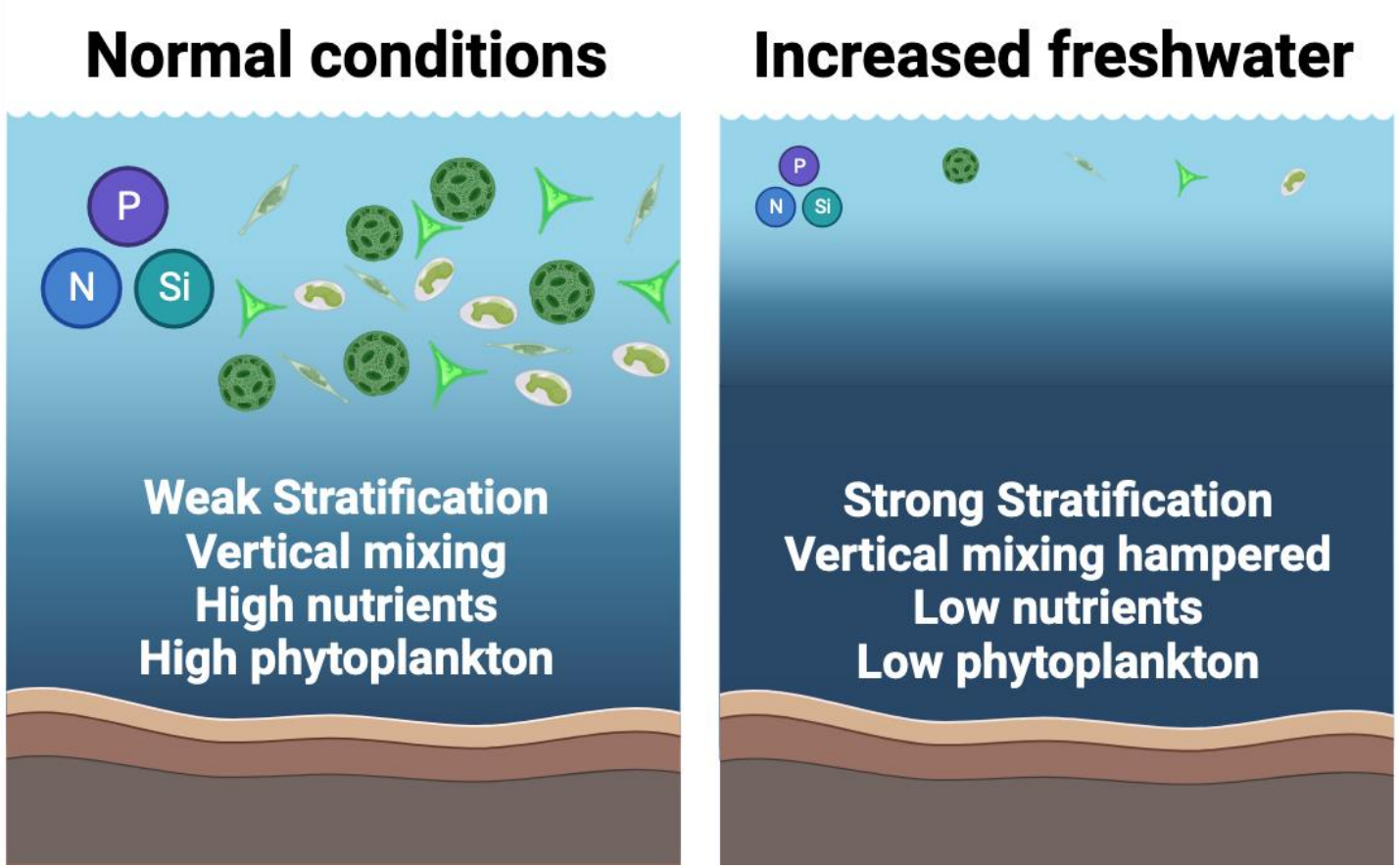
Adapted from Gonçalves-Araujo et al 2016, 2020

Biogeochemical implications

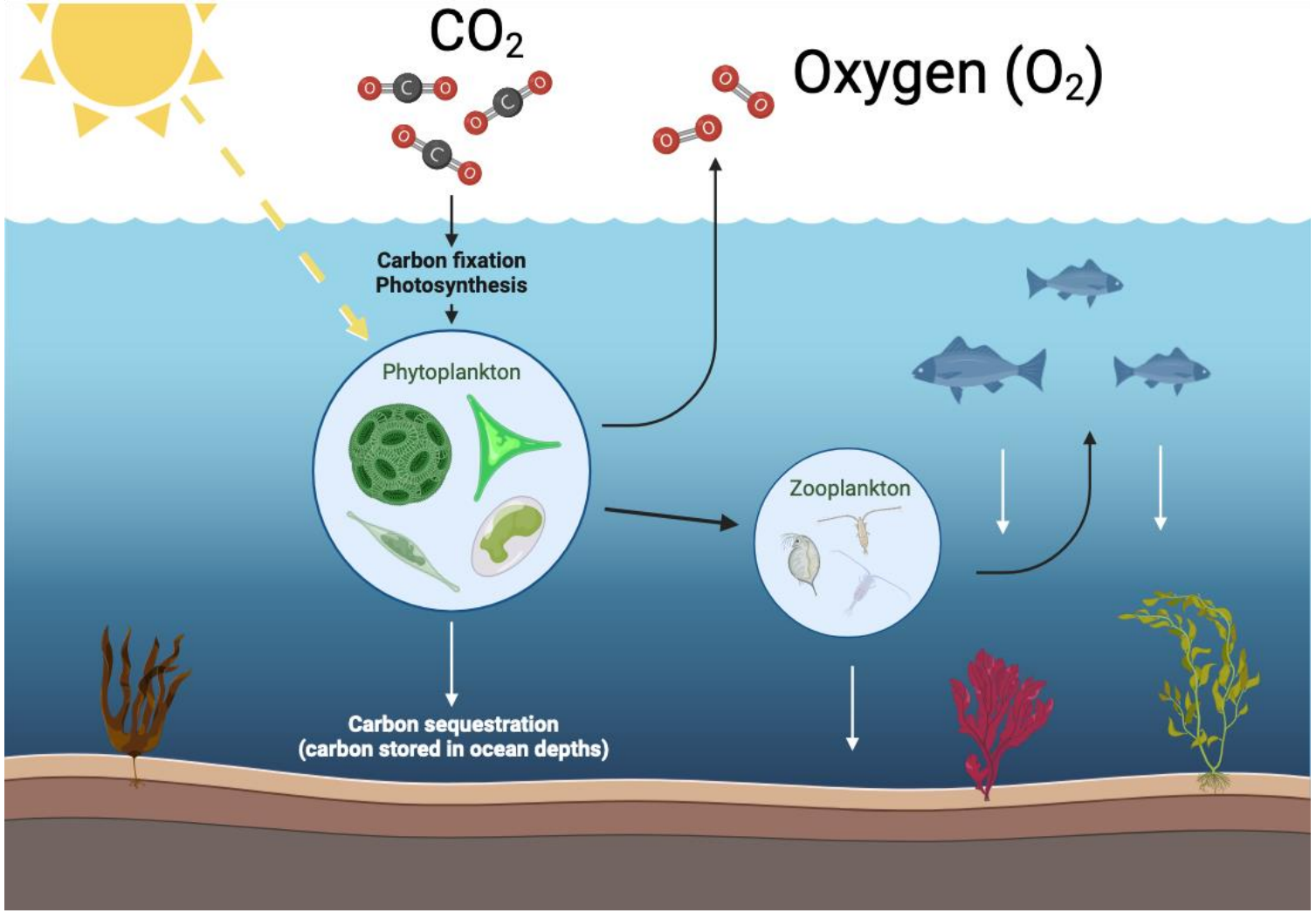


Ardyna & Arrigo 2020

Biogeochemical implications



Why do we care?



Final considerations

- Freshwater fluxes play a significant role on Arctic surface layer
- Freshwater transports DOM which can have positive feedback
  - warming the surface layer
  - can also be a CO_2 source
- Increased stratification can change phytoplankton composition and biomass
  - impacts on ecosystem services and livelihood
- Still lack basic knowledge on the current functioning → enable reliable predictions
- We need more multidisciplinary research

Thank you!

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DTU