



NAFO Northwest Atlantic
Fisheries Organization



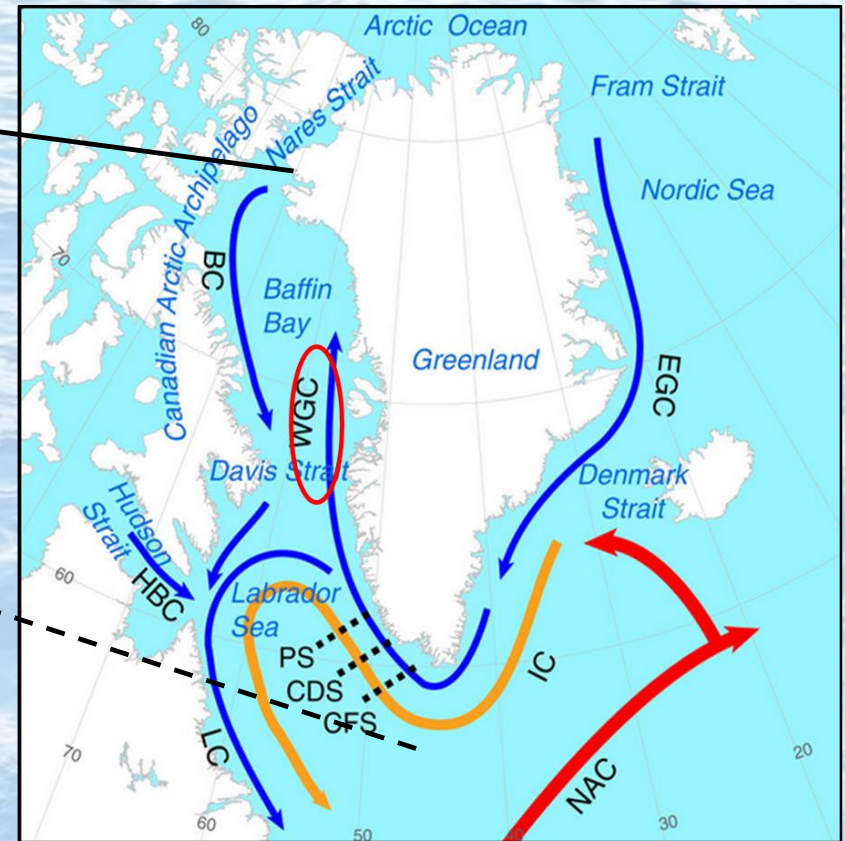
The hydrographic conditions off Southwest Greenland – NAFO Subarea 1 (2023)



PINNGORTITALERIFFIK

GRØNLANDS NATURINSTITUT GREENLAND INSTITUTE OF NATURAL RESOURCES

NAFO Subarea 1 – Main features and general circulation



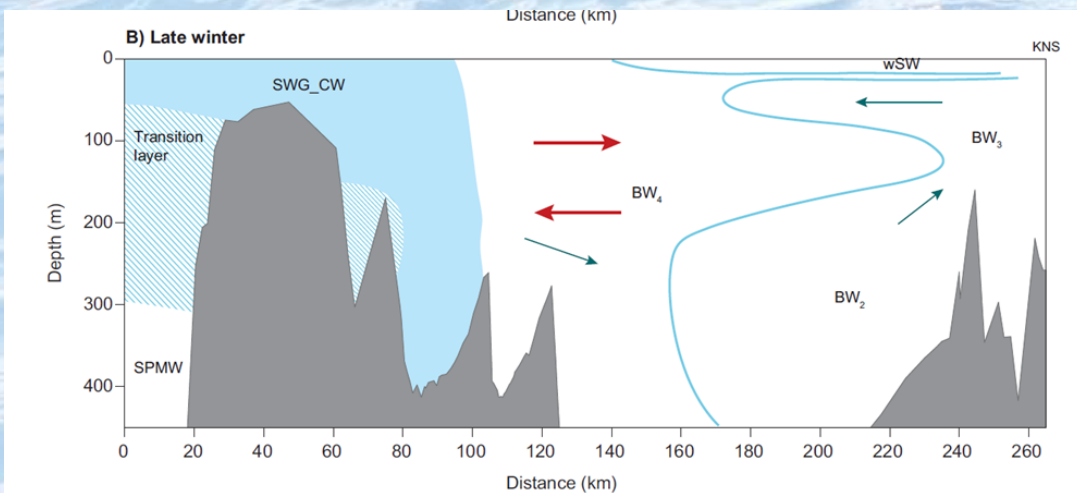
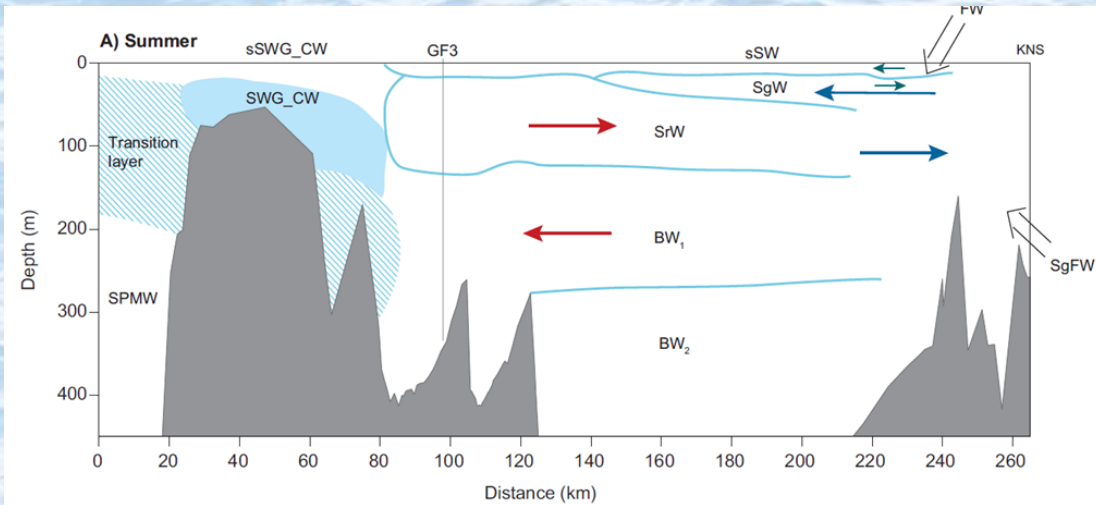
- West Greenland Current (**WGC**) transports warm and saline water from the North Atlantic northward along the west Greenland continental slope.
- Baffin Island current (**BC**) transports cold and fresher water from the Arctic Ocean southward along the continental slope.

CIRCULATION PATTERNS

- EGC** – East Greenland current transports cold and low-salinity water from the Arctic Ocean
- LC** – Labrador current transports cold and low-salinity water from polar origin
- IC** – Irminger Current transport warm and saline waters from the eastern North Atlantic
- NAC** – North Atlantic current transports warm water to the northern Atlantic
- HBC** – Hudson Bay current exchanges waters between the Hudson Bay and the Labrador Sea



NAFO Subarea 1 –General circulation



- During summer the estuarine circulation driven by runoff (→), subglacial circulation driven by **SgFW** discharge (←);
- intermediate baroclinic circulation (→) in summer and late winter;
- Dense coastal inflows (←) in late winter.

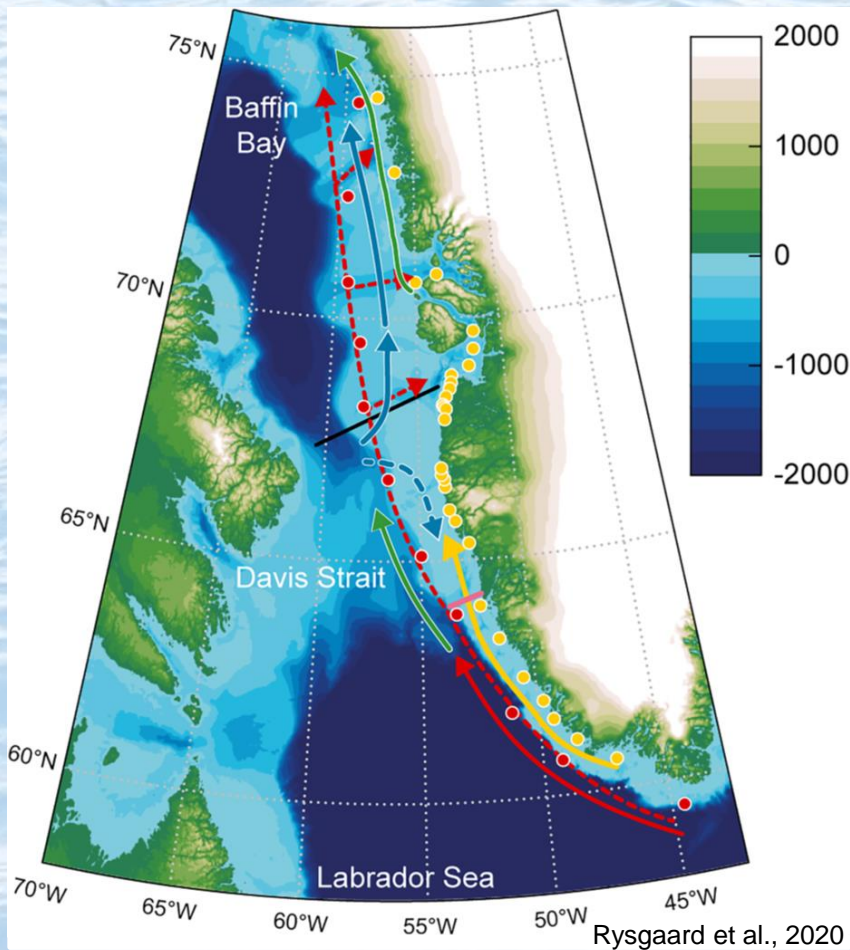
CIRCULATION PATTERNS

CW, coastal water;
sCW, summer coastal water;
SPMW, subpolar mode water;
 BW_i, basin water types $i = 1-4$;
SrW, sill region water;

SgW, subglacial water;
sSW, summer surface water;
wSW, winter surface water;
SgFW, subglacial freshwater;
KNS, Kangiata Nuaata Sermia.



NAFO Subarea 1: Main features and general circulation



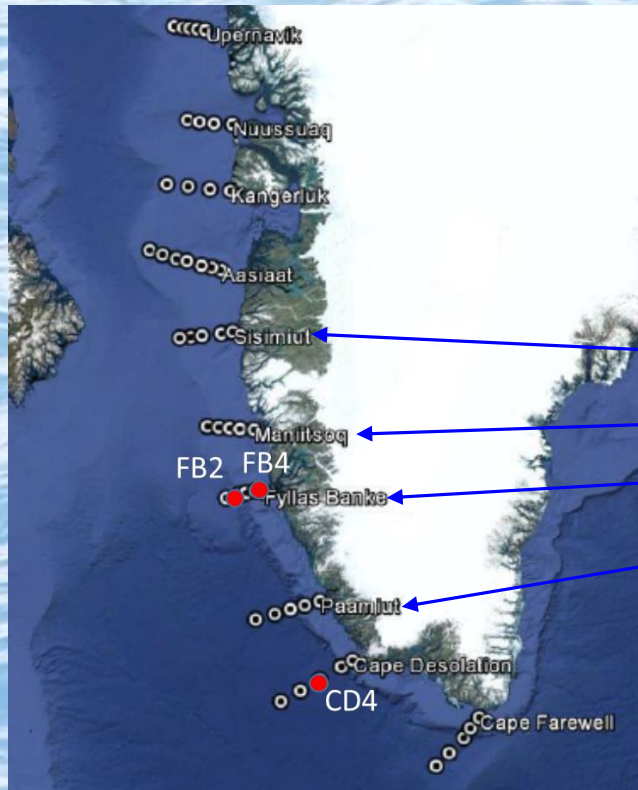
BBPW – Baffin Bay Polar Water



- West Greenland Current (**WGC**) has 3 components:
 - a cold, fresh and surface near inshore surface coastal waters (**CW**);
 - a saltier, warmer and deeper offshore water – the Subpolar Mode Water (**SPMW**);
 - freshwater runoff from Greenland.



NAFO Subarea 1: Oceanographic sections and main climate variables



- Location of standard sections in West Greenland waters.
- **Oceanographic sections** sampled in **May-July 2023**.
 - Sisimiut 1-5
 - Maniitsoq 1-5
 - Fyllas Banke 1-5
 - Paamiut 1-5
 - Cape Desolation St 1-5
 - reference stations FB2, FB4, CD4

CLIMATE variables

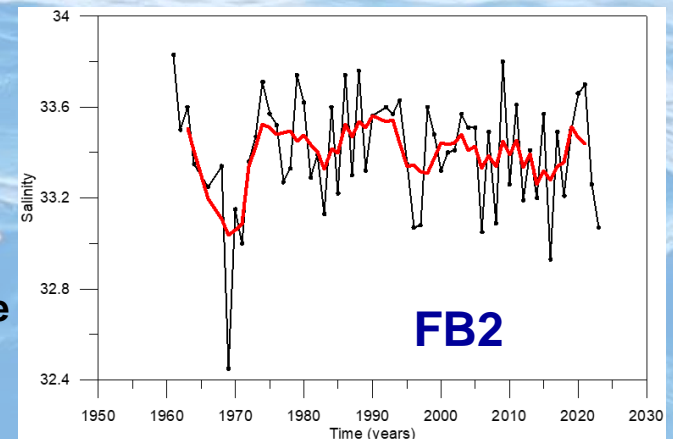
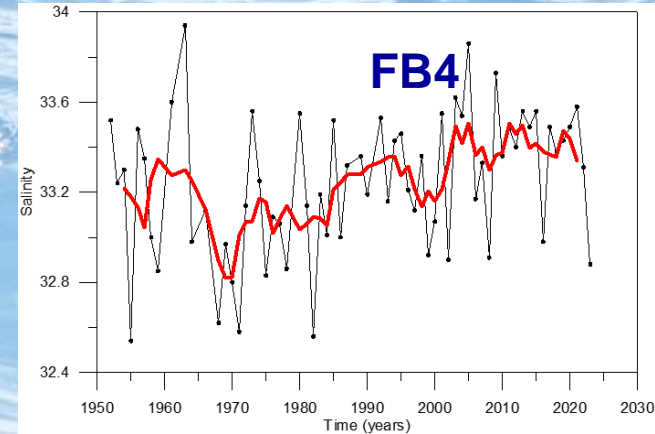
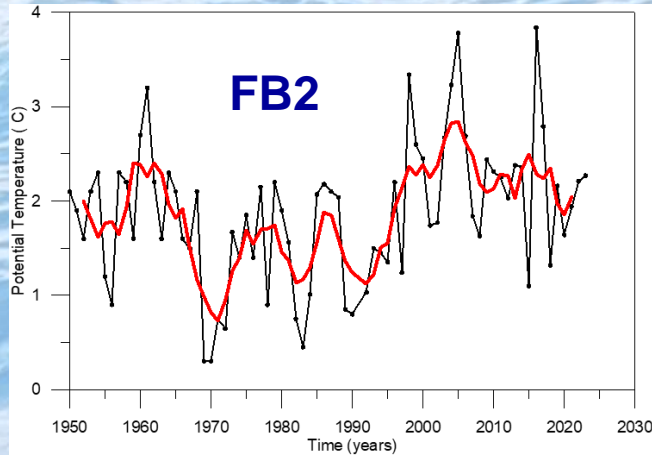
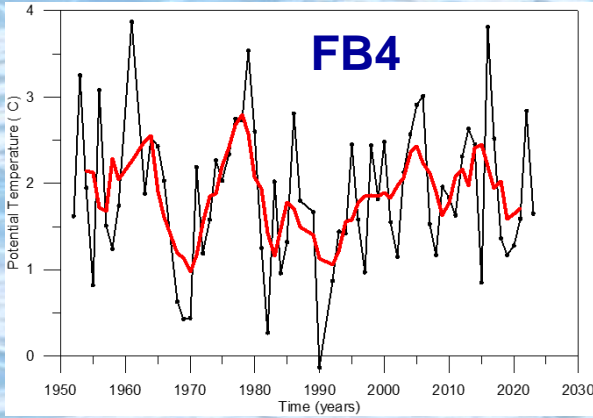
- Winter **NAO** index 2022 = slightly **positive** (2023)
- Nuuk mean **Air Temperature** (2023) = -0.2 °C.
 - +0.8 °C **higher** than the 1911-2010 long-term mean.
 - +1.1 °C **higher** than in 2022



NAFO Subarea 1: Fyllas Banke (FB4 & FB2)

Though the two stations (FB2 and FB4) should have similar **trends** story, **they do not.**

Temperature close to **the long term mean** (-0.04°C lower and +0.37 °C higher) in **coastal (FB4)** and **offshore (FB2)** waters.



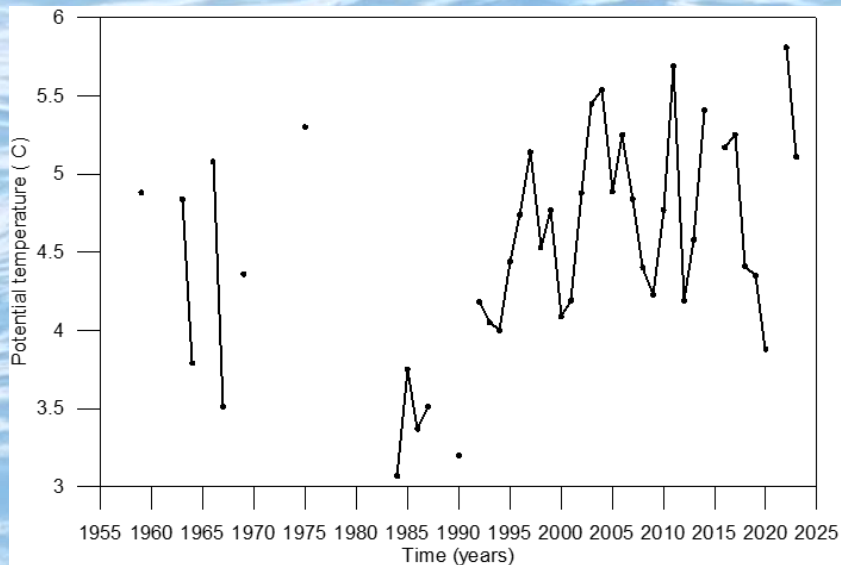
Salinity at FB4 (2023) broke the **positive** trend (-0.39 below **long-term mean**) ($S_{\text{mean}}=33.27$)

In 2023 salinity at FB2 resumed the **negative** **trend** starting around 1970, being - 0.35 below its **long-term mean** ($S_{\text{mean}}=33.42$)



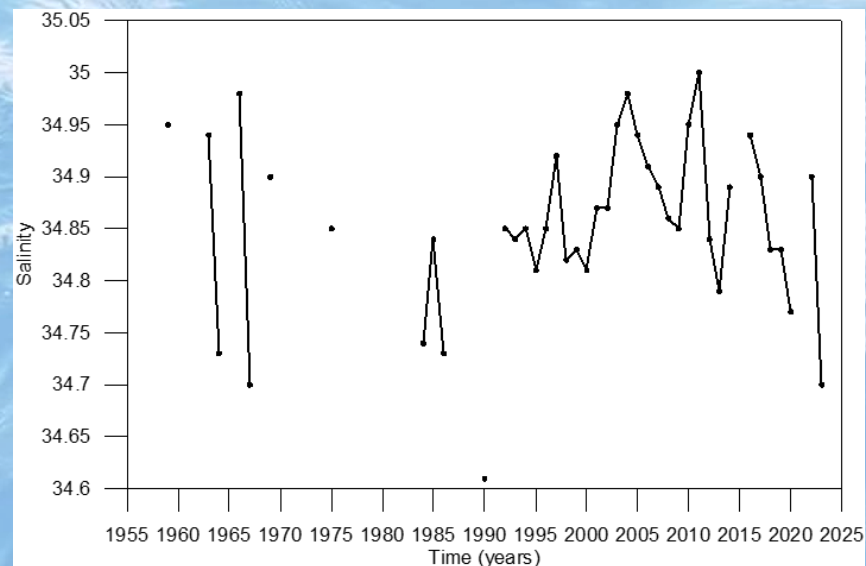
NAFO Subarea 1: Cape Desolation

Average water properties between 75 and 200 m depth are used to **monitor the variability of the Subpolar Mode Water (SPMW) component of the West Greenland Current**

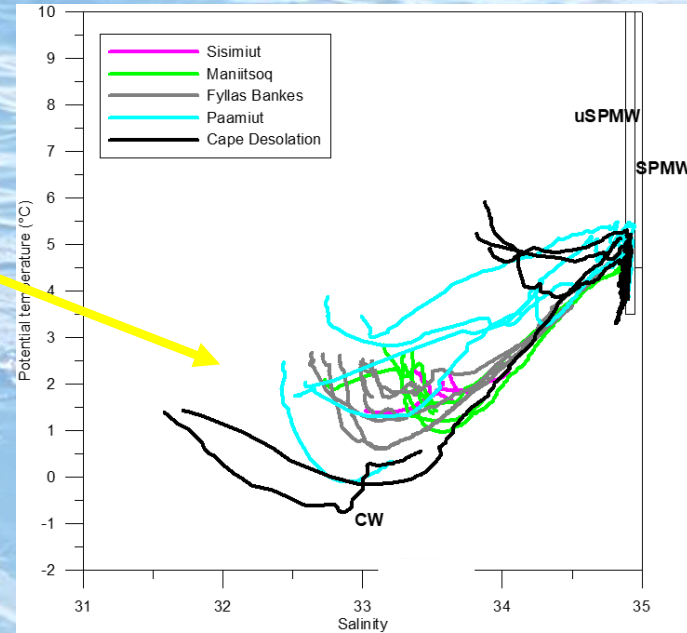
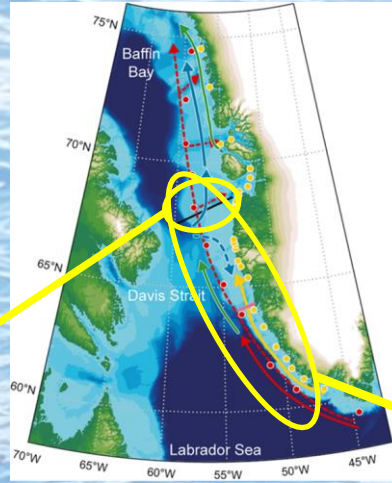
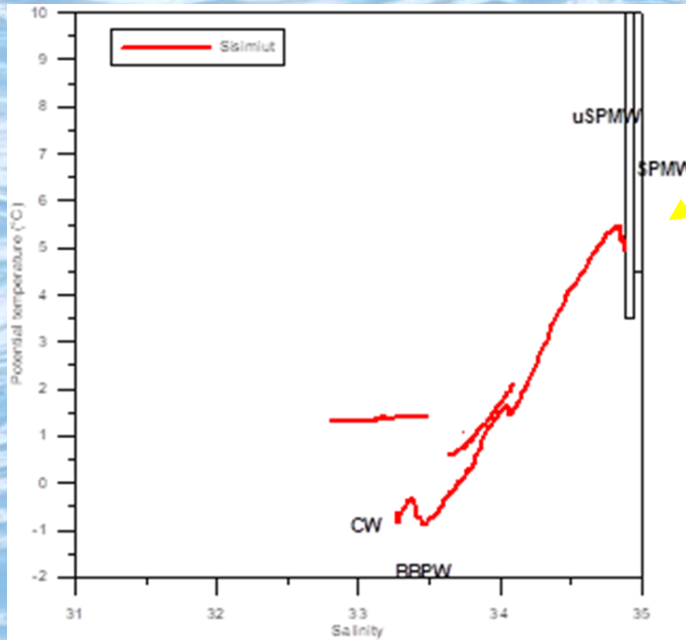


Average water temperature (75-200m) in 2023 was +5.11 °C (0.46 °C **above** the **long-term mean** (1992-2010))

In 2023 salinity was 34.7 (- 0.18 **below** the **long-term mean** (1992-2010))



NAFO Subarea 1 – West Greenland



BBPW – Baffin Bay Polar Water
CW – Coastal Water
uSPMW - upper SubPolar Mode Water
SPMW - SubPolar Mode Water

- salinity > 34.95 (**SPMW** /Atlantic / Irminger water) only observed in the **Paamiut section**
- Salinity between 34.88-34.95 **Cape Desolation** to **Maniitsoq**
- **SPMW** becomes **colder** and **fresher** with distance from south to north

Subpolar Mode Water (SPMW) ⇔ Irminger Water



Highlights

- Hydrographic conditions were monitored at 6 hydrographic standard sections in June 2023 **across** the continental **shelf off West Greenland**.
- Salinity of the coastal and offshore waters showed the **same trend** with marked **decrease**
- After a year with above its long-term mean salinity the **Subpolar Mode Water mass** continued to **freshen**
- The two stations monitored at **Fyllas Banke** should have similar trends story, **but they do not**.





John Mortensen



Greenland Institute of Natural Resources
Kivioq 2, Box 570
3900 Nuuk,
Greenland

Source:

Mortensen, J. (2024). Report on hydrographic conditions off Southwest Greenland June-July 2024, NAFO SCR Doc. 24/006.



Additional information:

Mortensen, J., S. Rysgaard, K. Arendt, T. Juul-Pedersen, D. Søgaard, J. Bendtsen, L. Meire, (2018). Local Coastal Water Masses Control Heat Levels in a West Greenland Tidewater Outlet Glacier Fjord. *JGR Oceans*, 123:8068-8083 <https://doi.org/10.1029/2018JC014549>

Mortensen J, Rysgaard S, Winding MHS, Juul-Pedersen T, Arendt KE, Lund H, Stuart-Lee AE, Meire L. (2022). Multidecadal Water Mass Dynamics on the West Greenland Shelf. *Journal of Geophysical Research: Oceans*, 127:e2022JC018724. <https://doi.org/10.1029/2022JC018724>

Rysgaard, S., W. Boone, D. Carlson, M. Sejr, J. Bendtsen, T. Juul-Pedersen, T. Lund, L. Meire, **J. Mortensen**. (2020). An updated view on water masses on the pan-west Greenland continental shelf and their link to proglacial fjords. *Journal of Geophysical Research: Oceans*, 125:e2019JC015564. <https://doi.org/10.1029/2019JC015564>