Atlantic Water Boundary Current (AWBC)

The AWBC enters the Nordic Seas as warm and saline waters. It returns to the Atlantic as cold and dense water masses in the depth. Follow the AWBCs modification and journey through the Arctic and Nordic Seas.

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Abstract

Warm water from the Atlantic is flowing into the Arctic through the Fram strait and Barents Sea, after following the Norwegian coast. In the Arctic it follows the continental boundary eastwards. After a full circulation in the Arctic Sea, it exits through the Fram strait again, only now as a denser water mass in the East Greenland Current (EGC). This current is called the Atlantic Water Boundary Current (AWBC). During this circulation the AWBC is gradually being modified to a denser water mass, and it is a crucial supplier for North Atlantic Deep Water (NADW). The AWBC interacts with freshwater input from continental rivers, the sea-ice cover, topographies, the atmosphere and other water masses along its circulation. This poster will elaborate the modification throughout its Arctic journey.

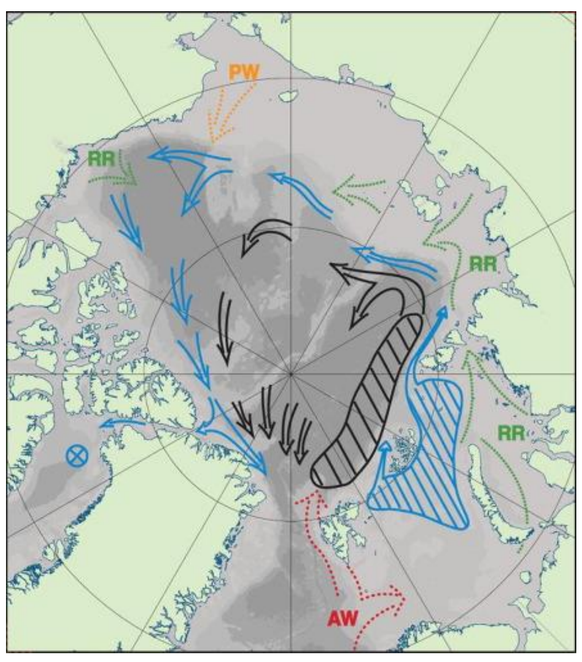

Figure 1: Atlantic water (AW) entering the Arctic. River runoff (RR) from the continents. Pacific Inflow (PW) through the Bering strait. Formation of the Barents sea halocline (blue) and Fram strait halocline (black) in areas marked with diagonal lines. The arrows represent the circulation.
Rudels et.al (2004)

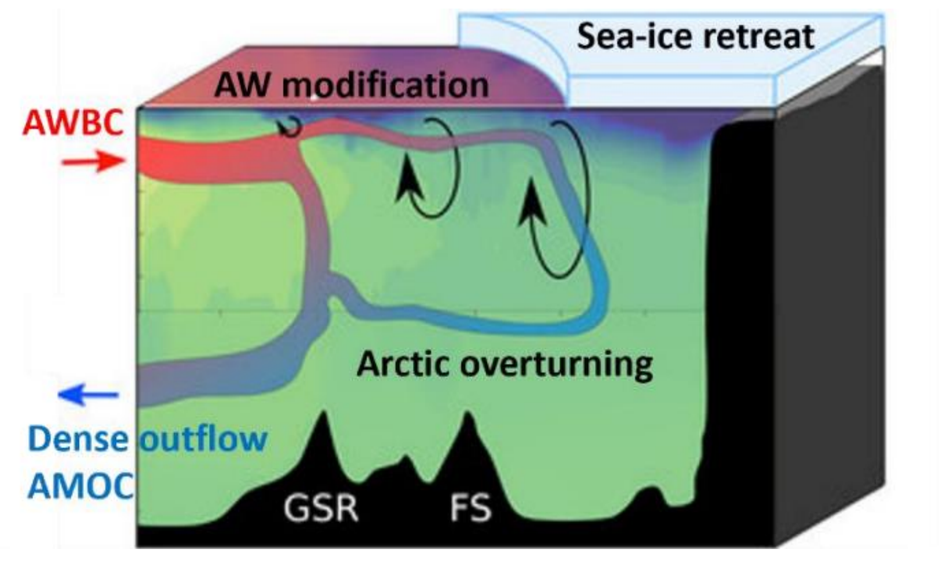

Figure 3: Arctic Meridional Overturning Circulation (ArMOC). Warm saline water travels to the Arctic, and returns as cold dense waters at depth. GSR – Greenland-Scotland Ridge. FS – Fram Strait. by courtesy of Marius Årthun, from ArMOC project proposal.

I) Norwegian Sea

Warm Atlantic Water first travelse through the Norwegian sea. Here it undergoes gradual densification through heat loss to the atmosphere. Before it divides into two branches: 1 into the Barents Sea and 1 through the Fram Strait.

II) Barents Sea

The Barents sea lies on a continental shelf. Here the AWBC is cooled through convection. Further, through ice formation and brine rejection, its salinity and density increases.

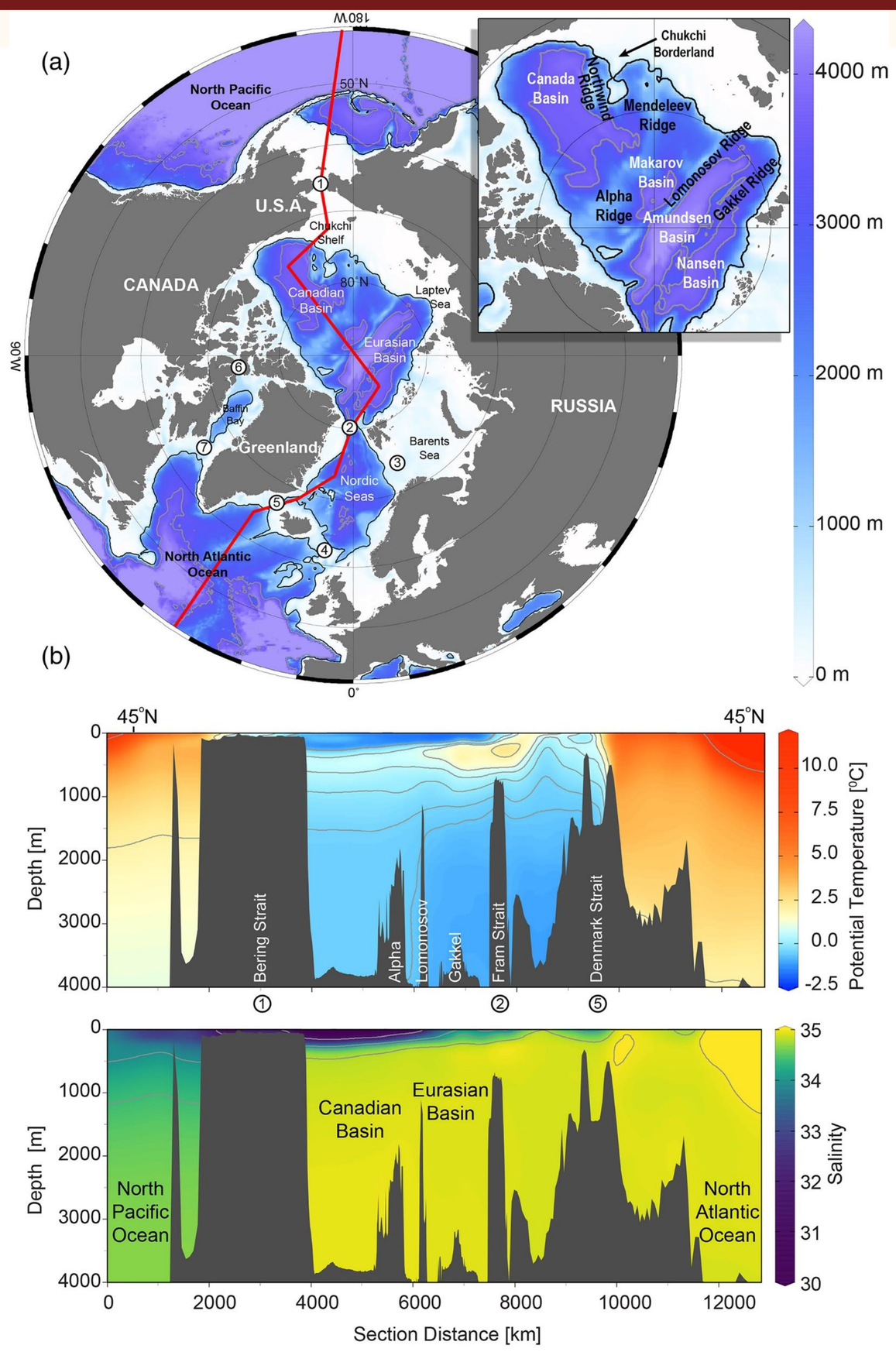

Figure 2: Along cross section from North Atlantic Ocean (NAO) to North Pacific Ocean (NPO). **a)** Red line shows the section across the from NAO till NPO. **b)** Potential temperature along the red line. **c)** Salinity across the red line.
Timmermans & Marshall (2020)

III) Eurasian Basin

Surface layer exposed to cooling and freshening due to ice melt just north of Svalbard. Merges with the Barents branch north of Novaya Zemlya. Crosses both Nansen-Gakkel and Lomonosv ridge.

V) Greenland Sea

Exits Fram strait fresher, but colder and denser than before entry. Further densification through atmospheric heat loss now along the Greenland coast. Now as the EGC.

VI) Canadian Basin

Shelf waters apply salinity to the AWBC. Circles around the canadian basin before merging with basin waters from the eurasian basin.

The AWBC has been gradually modified to colder and denser water masses. Subducting and returning to the Atlantic in the depths.

REFERENCES

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