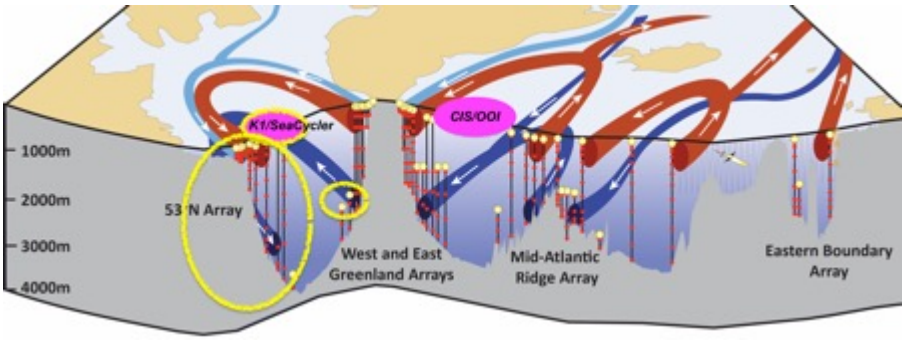
3. Weekly report - Maria S Merian MSM94

Maria S Merian leaves the port of St. Johns, Kanada **(Photo: L. Gerke)**

After a short stopover at "Station 27", a long-term station in front of the harbour entrance of St. Johns, Canada, which has been sampled since 1971, we reached the harbour, which we knew well from many previous voyages, in the morning of August 12th. The stay lasted only a few hours, fuel was bunkered and some equipment was received. Shortly after noon we left the port in bright sunshine and over 20°C, heading northwest, in the direction of the "53°N Array" of moorings.

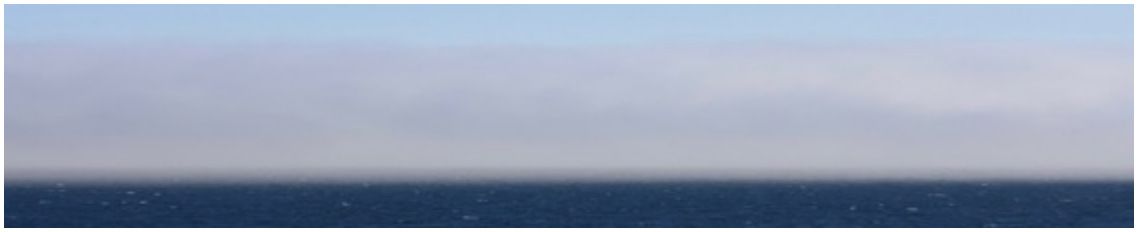
At this point a few words about why we are making this trip at all. Our measurements will be used for analyses that address questions about the role of the North Atlantic as part of the regional and global climate system. A central process taking place in the northern North Atlantic is the cooling of warm surface water flowing northward with the Gulf Stream/North Atlantic Current. Cooling makes water not only colder, but also heavier. Unlike fresh water, which has its maximum density at about 4°C, salt water (from a salinity of about 24 grams per kilogram of water) becomes denser the colder it gets. Therefore, in the North Atlantic, cooling causes sinking processes and "deep water" is formed, which flows southwards at the bottom at the western boundary as part of the global "circulation". We are particularly interested in the currents of the deep water during this expedition and are looking for answers to questions about the strength of the transport and the time scales of the fluctuations, which we derive, for example, from our theoretical understanding.



Schematic of the OSNAP Observations array of moorings. Yellow circles denote German contributions to the array **(schematic after OSNAP)**

To measure the transport we have been installing instruments in this region since 1997. Fluctuations on different time scales from days (tides) to decades are visible in the data. By far not all fluctuations can be assigned to the circulation, but especially the longer-term ones show interesting signals which we try to understand. Our work contributes to the BMBF collaborative project "Regional Atlantic Circulation and Global Change Synthesis", which aims to summarize the results of research on regional Atlantic circulation in global change and in which several marine research institutes in Germany are collaborating. In particular, however, the measurements are also very well interlinked with other measurements internationally. One flagship project here is OSNAP (Overturning in the Subpolar North Atlantic Program; www.o-snap.org), in which Canadians, Americans, British, Dutch, French, Chinese and Germans are jointly surveying the subpolar North Atlantic, from Canada to Great Britain, on a large scale and with many instrumentations.

We are now starting to recover and re-deploy the equipment. Usually an expedition like the MSM94 takes place every 1-2 years and the last time we were on site was in June 2018.



Maria S Merian heading into a bank of fog **(Photo: C. Lösel)**

Shortly after leaving St. Johns, the dense fog for which the region is famous, especially in summer, promptly set in. This fog accompanied us also the next day, so that the planned mooring work had to be postponed.

Operation of underway-CTD **(Photo: C. Posern)**

On the way we used the "underway CTD" again to measure the vertical structure of the water column. As the name suggests, it is used while the ship is in motion and therefore saves time. Nice stories about uCTD operations can also be found in our blog (www.oceanblogs.org/msm94/).

The atmosphere on board is still excellent and the work is progressing very well. It's good to know that the crew of the shipping company Briese under the direction of Captain Björn Maaß supports us in every respect in an absolutely professional way.

With greetings now from the Labrador Sea,
Johannes Karstensen (GEOMAR) for the participants of the MSM94