# *RV Maria S. Merian*

## *Cruise MSM-73*

### *06.04.-22.05.2018*

### *Cádiz – St. John's*


**5. Weekly Report**

**30.04.-06.05.2018**

During the fifth week of cruise MSM-73, our work led us far north into the Labrador Sea. After we left the bunker pier in St. John's, we sailed on a northeasterly course to about 51°30'N and started a CTD section across the deep western boundary current. We found the freshest Labrador Seawater (LSW), one of our "study objects" in the Labrador Sea, at the easternmost end of the section and not directly in the boundary current where we expected it.

On Tuesday, 01.05.2018, we headed along a northwestern course into the central Labrador Basin to measure the large-scale water mass properties in the Labrador Sea. Due to the seasonal weather and sea conditions, there are virtually no scientific cruises in this region in winter. Instead, Argo floats repeatedly deployed by different groups provide vertical temperature and salinity profiles for the upper 2000m of the ocean in winter. Some of the profiles measured so far had shown that vertical mixing must have reached a depth of up to 2000m. We found similar indication in our CTD data. A particular CTD profile even showed characteristics of a mixing depth of 2100 m.

Starting on Thursday, 03.05.2018, we made our way towards Greenland. Air temperatures occasionally reached -5°C, and we had some snow fall. We headed along the so-called AR7W line towards the Greenlandic 3-nautical mile zone and finished the shallowest station for the time being at a water depth of 110 m. The AR7W line crosses the Labrador Sea from the Hamilton Bank on the Canadian continental shelf to Cape Desolation on the Greenlandic shelf. Various international working groups team up and cover this line almost every year for nearly 30 years to determine the characteristics and remnants of winterly water masses formation. While our Canadian colleagues aboard the research vessel "Hudson" sampled the Canadian side of the AR7W line almost at the same time as our cruise, we worked on the Greenlandic side. Since the continental slope is very steep, our stations were sometimes only 2 nautical miles apart. Here we started to perform measurements related to the priority program "SeaLevel" funded by the German Research Foundation (DFG).

Due to global warming, the Greenland Ice Sheet is losing more and more mass. This happens

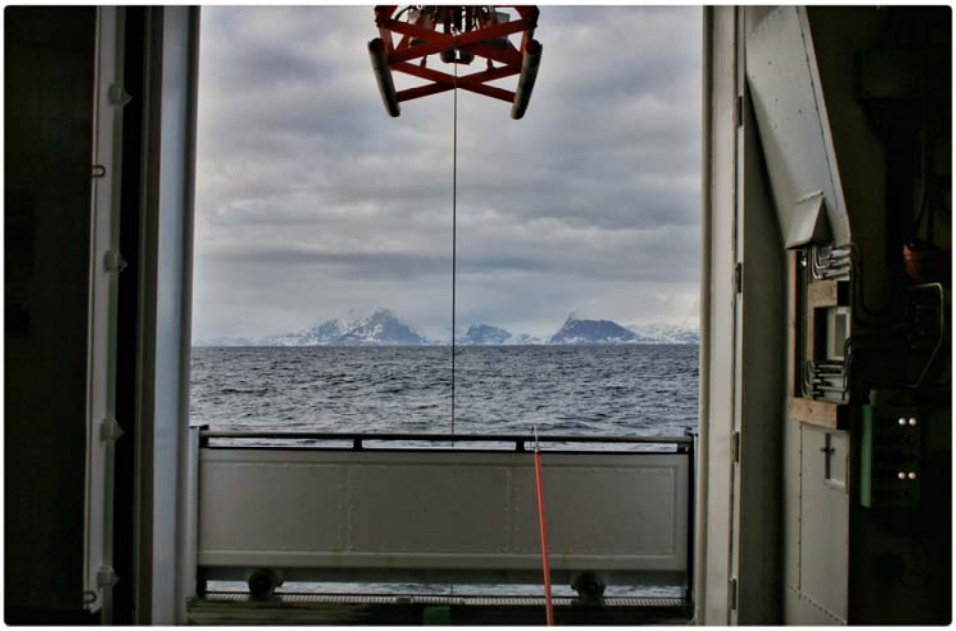
through increased melting on the surface, through the calving of icebergs, as well as where the ice masses flowing down from Greenland Ice Sheet come into contact with the warming ocean and increasingly melt off undersea. If this additional freshwater increasingly intrudes into the Labrador Sea via the current system, it may reduce the potential for deepwater formation there, as this freshwater is lighter than the ambient water and would rather stabilize the water mass stratification.
One of the many sub-projects of this expedition is to quantify the amount of marine meltwater in the Labrador Sea and south of Greenland. For this purpose, we carry out measurements of two different noble gases, helium and neon, which provide direct information on the amounts of meltwater in the ocean. Helium and neon are released from the atmosphere into the ocean at low concentrations because both gases are of low solubility in water. However, when the gas bubbles trapped in the former Greenland Ice Sheet ice open due to marine melting, the gases contained therein (oxygen, nitrogen, noble gases, etc.) are completely dissolved under the high hydrostatic pressure and thus massively increase the concentrations of helium and neon in this meltwater. Helium in particular is a very small atom and can diffuse through ordinary glass. Therefore, we fill our water samples for the determination of noble gases in copper tubes, which are closed at both ends by metal clamps. This is physically exhausting, but thus replaces the workout in the gym. In addition, there must not remain the smallest air bubble in the copper tubes as it would massively contaminate the samples. Therefore, prior to closing the metal clamps, we need to hammer frequently on the copper tube to release and rinse out bubbles sticking on the inside of the tube. From the hangar then a hammering sound is heard throughout the whole ship, - not always to the delight of those who are not at work. The samples thus obtained are later analyzed for their gas content with a mass spectrometer in the Bremen laboratory, so that we can calculate the contribution of meltwater.
On Saturday, 05.05.2018, we saw the first icebergs in the morning and had a nice sunny view of the coast of Greenland. The same evening, we finished work on the AR7W line. Since then we are on a southward course along 48°W and start shifting our working area towards the eastern exit of the Labrador Sea.

On behalf of all cruise participants,

Oliver Huhn und Dagmar Kieke

*O. Huhn introduces the scientific party to helium/neon sampling.*

*Helium/neon „work-out“ in the hangar of RV Maria S. Merian.*



*Station work off Greenland.*

Photos: F. Wischnewski, H. Nowitzki, D. Kieke