MSM130

RV MARIA S. MERIAN

Cruise MSM130 POLAR BEAST

9th July – 14th August 2024

Reykjavik (Iceland) – Reykjavik (Iceland)

1. Weekly Report

Reporting Period: 9th July – 14th July 2024

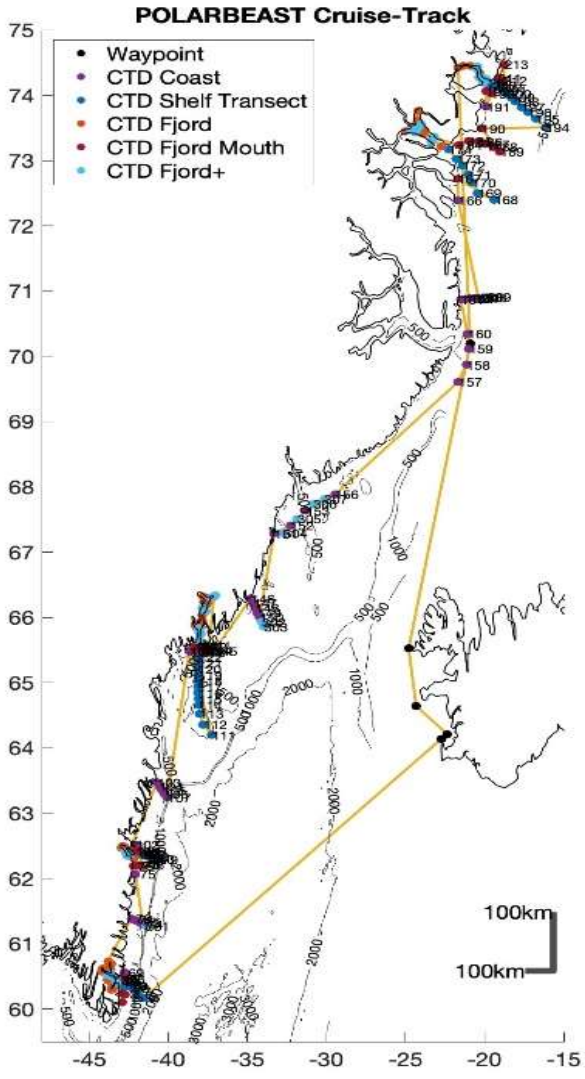

Fig. 1: Map of high latitude North Atlantic Ocean with our cruise track (yellow line) and planned stations.

Loading in Reykjavik and departure for east Greenland

Progress: We are 1 week into our cruise programme, and sailing at 60°34 N, 44°04 W in the Lindenow Fjord in southeast Greenland. We departed Reykjavik on Tuesday July 9th after setting up our equipment and installing our laboratories. We started sampling on Thursday night and have conducted detailed sampling in Lindenow Fjord (Fig. 2), which is the most southerly fjord that we will visit on this expedition. The sea conditions during our transit through the Irminger Basin to southeast Greenland were fine, and the conditions in the Lindenow Fjord are fine with a relatively small amount of ice (Figure 3). We have a total of 22 scientists on RV Merian, with 11 different nationalities. We have a 5 week cruise which will take us along the east Greenland coast up to 75°N, and into 5 fjord systems. The ice conditions will get more difficult whilst we will move further north, and this will make it more difficult to access the more northerly fjord systems.

Cruise synopsis: The high latitude North Atlantic and Arctic Oceans are visibly affected by anthropogenic climate change through ocean warming, freshening, acidification, increased cryosphere and river discharge, rapid acceleration of sea ice loss. The changing dynamics at polar ice-ocean-atmosphere interfaces have far-reaching implications for Earth's climate on diverse timescales through feedbacks on

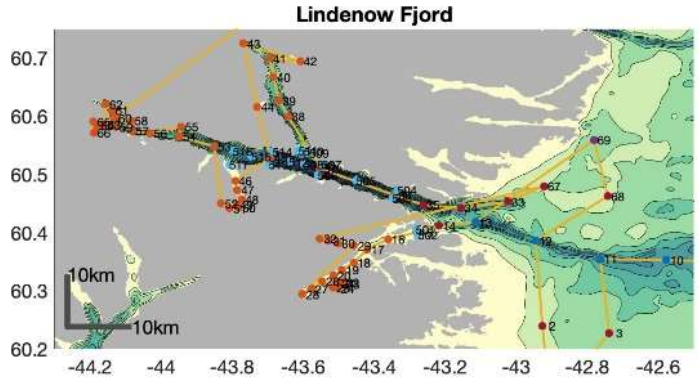

Figure 2: Lindenow fjord in south east Greenland

atmospheric circulation; oceanic mixing, circulation and carbon sequestration; and greenhouse gas sources and sinks. The overall goals of the POLAR BEAST cruise will be achieved through observations and modelling, and are: (i) to investigate the role of Arctic sea ice loss as a driver of global change, (ii) to quantify chemical and physical processes at the ice-ocean-atmosphere interface that may constitute poorly-characterized climatic feedbacks in the Earth system. We will investigate the key physical, chemical and biological factors determining salinity distribution, ocean productivity, sediment carbon and greenhouse gas exchange. The cruise will sail along the East Greenland coast and into fjord systems to capture land-ocean exchange, gradients in salinity, primary production and historical carbon export (from cores), with observations of water column biogeochemistry, ocean physics, in combination with satellite observations. Our improved understanding will be used to improve model projections of Arctic and low latitude systems under future climate scenarios.

Overall goals of POLARBEAST cruise: Overall goal 1. We will conduct a salinity census of the East Greenland System with concurrent biogeochemical measurements to constrain the fate of freshwater and understand the effects of Arctic freshwater outflow on circulation and biogeochemistry in the North Atlantic.

Figure 3. Lindenow Fjord (photo Eric Achterberg)

Overall goal 2. We will conduct underway surface ocean measurements of trace gases (CO_2, CH_4), pH, total alkalinity, nitrate and phosphate across the East Greenland system, alongside full depth profiles of nutrients, carbonate chemistry parameters (total alkalinity, dissolved inorganic carbon), CH4, and up to five intensive surveys of glacier-fjord systems (Lindenow, Morgens Heinesen, Sermilik, Kejser Franz Joseph, Young Sound). This compliments early/late season in shore surveys of the systems and moorings positioned in fjord mouths throughout the year.
Overall goal 3. We will collect sediment cores along the East Greenland shelf. These will be used to assess sediment-water fluxes of iron and manganese, and also to reconstruct past climate variability and changes as a result of shifts in sea ice cover, salinity and productivity in the East Greenland system over the past 2000 years.

RV Maria S. Merian at sea 60°34N/44°029 W

Eric Achterberg, GEOMAR Helmholtz Centre for Ocean Research Kiel/University of Kiel

You can follow our Ocean Blog at http://www.oceanblogs.org/msm130