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Expedition investigates the effects of climate change off Greenland

MERIAN expedition MSM130 investigates meltwater runoff from Greenland glaciers, the loss of Arctic sea ice and the interfaces of ice, ocean and atmosphere off the east coast of Greenland

16.07.2024/Kiel/Reykjavik. Greenland is surrounded by the North Atlantic and Arctic Oceans - both oceans are significantly affected by climate change. The consequences are warmer, less salty and more acidic waters, an increased input of melt and river water and a rapid decline in sea ice. The international team of the MSM130 expedition, led by GEOMAR, is investigating these effects off the east coast of Greenland with the research vessel **MARIA S. MERIAN**. The focus is on research and modelling on the role of Arctic sea ice loss as a driving force of global climate change, as well as chemical and physical processes at the interface of ice, ocean and atmosphere.

The region around Greenland is surrounded by the North Atlantic and Arctic Oceans. Effects such as warmer water or an increased input of melt and river water clearly show that both oceans are affected by climate change. The five-week expedition MSM130 has now set off with the German research vessel **MARIA S. MERIAN** to the east coast of Greenland to investigate the effects of climate change. The route will take the researchers along the Greenland coast from Cape Farvel to Cape Young, past 150 measuring stations and through five fjords. The expedition, led by Professor Dr Eric Achterberg, chemical oceanographer at GEOMAR Helmholtz Centre for Ocean Research Kiel, is called "Investigating the relationship between Arctic freshwater discharge, Atlantic biogeochemistry and Atlantic Meridional Overturning Circulation (AMOC)", or "POLAR BEAST" for short.

During the expedition, the scientists want to focus on three research projects in particular: Firstly, they will take sediment cores along the East Greenland shelf. This will allow them to reconstruct past climate changes and carbon storage in fjord sediments. "The sediment cores serve as a climate archive and are used to reconstruct the variability of the climate in the past and the changes that have resulted from shifts in sea ice cover, salinity and productivity in the East Greenland system over the last 2000 years," explains cruise leader Professor Dr Eric Achterberg. In addition, the scientists are measuring the iron and manganese fluxes from the sediments into the overlying water in order to assess the effects of these micronutrients on primary production along the East Greenland coast. Primary production describes the process by which microscopic plant organisms, mainly phytoplankton, produce organic material from inorganic substances (such as carbon dioxide and nitrogen) and light through photosynthesis. This is the basis of the marine food web.

The researchers also want to understand the effects of meltwater runoff from Greenland glaciers and Arctic freshwater runoff on the circulation and biogeochemistry of the North Atlantic. Increasing amounts of freshwater inputs are observed in the East Greenland Current (EGC), which is related to the increasing sea ice melt in the Arctic Ocean, melting of Greenland glaciers and the increasing

discharge of European and Asian rivers into the Arctic Ocean. The East Greenland Current therefore leads to a freshening of the North Atlantic with possible consequences for the climate through changes in the AMOC and increases in sea surface temperatures. The freshwater inputs may also affect the primary productivity in the North Atlantic and consequently the uptake of carbon dioxide (CO₂) by the ocean.

The international research team is therefore also measuring carbon dioxide (CO₂), pH, alkalinity, nitrate, phosphate, methane and primary productivity at the sea surface. These surveys complement data from surveys and moorings in the fjord systems, which are collected by Greenlandic scientists throughout the year.

"Our data and improved understanding will be used to improve model projections for the Arctic and low latitudes under future climate scenarios, assess the impact of climate change on society and inform stakeholders," says Dr Achterberg. At the beginning of the expedition, increased temperatures were detected in the North Atlantic near Iceland and a significantly stronger ice cover on the coast of East Greenland in the East Greenland Current compared to recent years. The causes of this contrast are not clear yet.

Expedition at a Glance:

MARIA S: MERIAN Expedition MSM130

Project Name: POLAR BEAST

Chief Scientist: Prof Dr Eric Achterberg

Dates: 09.07.2024 – 14.08.2024

Departure: Reykjavik, Iceland

Arrival: Reykjavik, Iceland

Study Area: East coast of Greenland

Funding:

The MERIAN expedition MSM130 is funded by the German Research Foundation (DFG) and the Federal Ministry of Education and Research (BMBF) under the name "Investigation of the relationship between Arctic freshwater discharge, Atlantic biogeochemistry and Atlantic Meridional Overturning Circulation (AMOC)", or "POLAR BEAST" for short.

Links:

<https://www.geomar.de/en/research/expeditions/detail-view/exp/368807?cHash=262eff97ae7881491eb5b8d4219fead> Expedition MSM130

<https://www.oceanblogs.org/msm130/> Blog posts from the crew on OceanBlogs.org

Images:

Images are available for download at <http://www.geomar.de/n9524-e>

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