

37/2024

Gathering data on climate change in the North Atlantic

MERIAN Expedition MSM129 continues long-term observations in the Labrador Sea

27 May 2024/Kiel/Rostock. As a crucial part of the global ocean conveyor belt, the Atlantic Ocean transports heat northwards - a process that stabilises the Earth's current climate. If this heat transport is reduced, a tipping point in the climate system could be crossed, leading to severe changes in global climate. A key region for the global conveyor belt is the North Atlantic, in particular the oceanic processes in the Labrador and Irminger Seas. On Saturday, an international expedition led by GEOMAR set out to obtain new measurements of the state of the deep currents in the North Atlantic. Through the online platform BELUGA the cruise progress can be followed live.

In the North Atlantic, surface water loses vast amounts of heat to the atmosphere – a process that gives us a mild climate in Europe. As a result, the increasingly cooled surface water becomes denser and sinks to greater depths, where it eventually flows as deep water towards the South Atlantic. These deep currents are influenced by the Earth's rotation and align along the western edges of the continents, forming flow bands known as the “Deep Western Boundary Current”.

The Labrador Sea is one of the few regions in the world where the Deep Western Boundary Current is close to the surface, making the region a gateway to the abyssal ocean. Changes in properties, such as temperature, oxygen or carbon dioxide levels, are exported to the deep sea where they can persist for centuries. Understanding the processes that lead to changes in the Deep Western Boundary Current is crucial for climate prediction using models.

Data indicate that changes are already occurring, and research has linked these changes to oceanic and atmospheric processes, such as the spread of temperature and salinity anomalies, and fluctuations in winds and heat fluxes. Long-term data series are needed to distinguish between climate and short-term variability, and to identify their oceanic and atmospheric drivers.

“Since last year, we have observed an unprecedented warming in the North Atlantic, with regions such as the Labrador Sea showing temperatures more than five degrees above average,” says Dr Johannes Karstensen, oceanographer at the GEOMAR Helmholtz Centre for Ocean Research Kiel and chief scientist of the international MSM129 expedition, which set out on Saturday on the MARIA S. MERIAN from Rostock to the North Atlantic. Karstensen adds: “A key question during our expedition will be whether this heat anomaly can also be detected in deeper layers of the North Atlantic and whether it is already affecting the currents.”

To find out, the researchers will collect data associated with a long-term climate observation programme. Since 1997, GEOMAR has been operating an ocean observatory off the coast of Labrador (Canada) with seven measuring stations over a length of 120 kilometres. Each station is equipped with a couple of instruments to continuously record data on currents, temperature, oxygen,

and salinity – from the seafloor to just below the sea surface. Every two years, researchers travel to the region to retrieve the data and collect additional samples along the way.

During the transit from Rostock to the first stop in St. John's, Canada, the MARIA S. MERIAN will also collect various types of underway data. It will be tested how quickly international data centers can access the data to enable its use for ocean and weather forecasts.

“The ocean has properties that have so far mitigated the effects of rapidly advancing climate warming,” says Karstensen. For example, because of its high heat capacity, the ocean has absorbed more than 90 per cent of the excess heat and stored it at increasing depths. However, as the deep sea changes, the ocean's ability to mitigate human-induced changes in the atmosphere, such as warming and increases in greenhouse gases, is diminishing. “At some point, even the deep sea's capacity will reach its limits.”

Expedition at a Glance:

Expedition Name: MARIA S. MERIAN Expedition MSM129

Project Name: LabSeaFlow2024

Chief Scientist: Dr Johannes Karstensen

Dates: 25.05.-06.07.2024

Departure: Rostock (Germany)

Arrival: Reykjavik (Iceland)

Study Area: North Atlantic/Labrador Sea

The ship's position and initial data can be tracked live online via the GEOMAR-developed BELUGA platform.

Links:

<https://beluga.geomar.de/msm129> BELUGA platform

Images:

Images are available for download at <http://www.geomar.de/n9446-e>

Contact:

Ilka Thomsen (GEOMAR, Communication & Media), Tel.: +49 431 600-2802, media@geomar.de