

Pressemitteilung

Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung

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How climate change is altering the Arctic Ocean

On 29 May 2025, the Polarstern research vessel set sail from Bremerhaven for the Arctic. The destination of the 95 expedition participants, led by the Alfred Wegener Institute, is the AWI Hausgarten, a long-term observatory situated between Svalbard and Greenland. There they will investigate how the ecosystems of the Arctic deep sea are reacting to changing environmental conditions as a result of rapid climate change. The month-long expedition, which is scheduled to finish in Tromsø, Norway, at the end of June, will focus on benthic and plankton communities in the open water and physical changes in the ocean.

The AWI-Hausgarten deep-sea observatory has been in existence since 1999 and is the only one of its kind, allowing scientists to continuously collect vital physical, chemical, oceanographic and biological data for over 25 years. There are moorings at 21 stations between 250 and 5,500 metres water depth and from the open ocean to the sea ice edge, which record water temperature, the current speed and direction and particles sinking through the water column all year round. So-called crawlers (autonomous tracked vehicles) are making their way along the seabed, while even measuring oxygen consumption by microbes in the seabed and photographing the surroundings. Researchers from the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) travel to their so-called Hausgarten observatory every summer to maintain these systems and equip them with new batteries.

“This year, we're placing a special emphasis on investigating the biological systems on the seafloor more closely,” as Dr Jennifer Dannheim reports. The AWI biologist is leading the expedition and explains: “Meanwhile, both our OFOBS ocean floor observation system and our autonomous underwater robot, the AUV, have sonars on board that allow us to map the sea floor far more precisely than previously. This allows us to record large spatial Hausgarten areas using imaging techniques in order to recognise spatial patterns in the structure of the biotic communities in the entire region surveyed. OFOBS also takes high-resolution photos and videos of the seabed. We then supplement these imaging methods with point sampling devices such as the box-grab, multicorer, and further devices, which provide us with soil samples and the species they contain, i.e. microorganisms from the deep sea. We are investigating the occurrence of species and their numbers in relation to various environmental conditions as temperature, salinity and organic material in the sediment as a food source.” By this, the team cannot only recognise larger bottom-dwelling species such as sponges, crabs or starfish and determine their occurrence and frequency, but also investigate the biodiversity and the contribution of microorganisms to ecological processes under the influence of changing environmental conditions in the Hausgarten area over time.

In the water column, the team is investigating how climate change impacts on phytoplankton. It is generally assumed that microalgae will become more productive in the Arctic, for example because less sea ice cover makes more light available for photosynthesis. Whether this will lead to an increased export of particulate organic carbon compared to the conditions 20 years ago, however, or whether the organic carbon will remain on the surface and be metabolised by bacteria will be investigated during the expedition. Such analyses will improve our knowledge of biogeochemical cycles, which, for example, determine the conditions under which nutrients are available for algal bloom or sink to the sea floor, where deep-sea organisms feed on them.

The expedition team comprises 52 scientific participants and 43 crew members, who are scheduled to arrive in Tromsø in northern Norway on 29 June. After a short stay at the harbour there, a two-month expedition to the Central Arctic region will commence with a new team, and, after another stopover on Svalbard, the almost two-month expedition to northern Greenland will be underway. The Polarstern is expected to return to its home port of Bremerhaven at the end of October.

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Polarstern in the harbour pulled by a tug
Nina Machner
Alfred Wegener Institute / Nina Machner