

# How is the Arctic Ocean changing?

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On coming Wednesday, 15 June, the research vessel Polarstern of the German Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association will set off on its 26th arctic expedition. Over 130 scientists from research institutions in six countries will take part in three legs of the voyage. First of all, at long-term stations oceanographers and biologists will investigate how oceanic currents as well as the animal and plant world are changing between Spitsbergen and Greenland. Beginning in August, physical, biological and chemical changes in the central Arctic will be recorded. RV Polarstern is expected back in Bremerhaven on 7 October.

In the Fram Strait between Spitsbergen and Greenland oceanographic measuring devices have been continuously recording temperature, [salt concentration](#), flow speed and direction for 14 years. Moorings with the sensors that have to be replaced after one or two years extend down to a depth of over 2,500 metres. To supplement these stationary measurements, a free-floating device will now be additionally employed for three months. The so-called Seaglider submerges down to a depth of 1,000 metres along its course line in order to carry out measurements. In between it regularly returns to the surface, transmits the data via satellite and receives new position coordinates. The recorded data show how the exchange of water masses and heat changes between the [Arctic Ocean](#) and the North Atlantic. The Fram Strait is the only deepwater connection between the two marine areas and therefore permits conclusions regarding the influence of the polar marine regions on the [global ocean](#).

The second area under study is the so-called AWI HAUSGARTEN. It is

the northernmost of ten observatories altogether in the European network ESONET (European Seafloor Observatory Network). Using this deep-sea long-term observatory of the Alfred Wegener Institute, biologists want to examine how communities of organisms in the open water and on the bottom of the deep sea react to the progressive warming of the nordic seas. In this context they will investigate the critical physiological and ecological limits of selected species. This makes it possible to draw conclusions as to whether organisms are able to tolerate increasing temperatures, for example, or whether they withdraw from the region as warming progresses. With the help of a remotely operated vehicle (ROV) chartered from the IFM-GEOMAR marine research institute in Kiel experiments will also be conducted on the floor of the deep sea. Another underwater vehicle (AUV), which has a length of around five metres, is also unmanned, but operates autonomously, will be used at water depths down to approx. 600 metres as well as just under the Arctic [sea ice](#). By means of measuring instruments that were newly developed at the Alfred Wegener Institute, it records, among other things, the distribution of unicellular algae and the carbon dioxide concentration near the water surface. Furthermore, the scientists plan to take seafloor samples from a marine area in which fishery echosounders recently detected numerous gas flares. They indicate that probably enormous quantities of methane, a greenhouse gas with certain relevance for the climate, are released from the seafloor at water depths of around 400 metres west of Svalbard.

As of the beginning of August, the research vessel Polarstern will then set course for the Arctic Ocean. The focus will be on physical, biological and chemical changes in the central Arctic. The reduction of sea ice and the variability of ocean circulation and its heat and fresh water budgets are tightly linked with changes in the gas exchange as well as with biogeochemical and ecosystem processes in the sea ice and in the entire water column. To understand these interrelations better, the members of the expedition will take water and ice samples from the shallow Eurasian

shelf seas all the way to the deep Canadian Basin and from the open sea to the pack ice. In addition, the researchers will install measuring devices that drift through the Arctic Ocean on ice floes for months and thus supply valuable data from this not easily accessible region. They then transmit these data to land via satellite. A subsequent comparison of the data to measurements from previous expeditions may indicate how the climate is changing in the Arctic. To continuously monitor the further progress of the changes, the researchers will moor measuring devices and sample-taking equipment, which will be picked up during another expedition to this marine region in the coming year.

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