

78/2023

Research vessel POLARSTERN sets course for the East Antarctic Expedition EASI-2 on ice sheet instabilities is led by GEOMAR

29.11.2023/Capetown/Bremerhaven/Kiel. Last night, the research vessel POLARSTERN set off from Cape Town for a special region: Two expeditions in East Antarctica will focus on the history of the instability of the ice sheet there and its interactions with ocean circulation. On the first leg, which will last around two months and be led by GEOMAR, the main focus will be on oceanographic, geoscientific and biological work; the second leg will be led by Kiel University and will have a geoscientific focus, with researchers from the Alfred Wegener Institute involved in both expeditions. The change of personnel and ship supply will take place in Hobart at the beginning of February. On the occasion of the POLARSTERN's first call in an Australian harbour, an exchange with representatives from science and politics is planned.

– Joint press release by Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), GEOMAR Helmholtz Centre for Ocean Research Kiel and Kiel University –

The East Antarctic ice sheet, which is up to several kilometres thick, stores freshwater that can cause sea level to rise by dozens of metres on time scales of centuries, as has already happened in past warm periods in Earth's history. However, the feedbacks between ice, ocean and atmosphere in this huge and globally significant region are still poorly understood. This lack of knowledge results in great uncertainty about the rate at which sea level could rise as a result of man-made global warming and how the Southern Ocean's ability to absorb heat and atmospheric carbon dioxide (CO₂) will change. In order to reduce these uncertainties, experts from several German and international research institutions have developed a coordinated programme. It consists of three POLARSTERN expeditions called EASI-1, EASI-2 and EASI-3 (East Antarctic Ice Sheet Instabilities). The first took place at the beginning of 2022 under the leadership of the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI). The two expeditions now beginning under the leadership of the GEOMAR Helmholtz Centre for Ocean Research Kiel and Kiel University (CAU) complete the planned scientific programme.

“Probably the most outstanding feature of the EASI-2 expedition is that we are closely linking modern observations from the water column with our knowledge of earlier circulation states of the Southern Ocean,” explains expedition leader Dr Marcus Gutjahr. The GEOMAR geochemist continues: “To this end, we are measuring and sampling the ocean along two transects, with a special focus on East Antarctic coastal sections that have so far been little affected by anthropogenic climate change. We investigate a variety of chemical and physical properties of seawater in the open ocean and Antarctic waters up to the ice shelf edge. Several of these parameters have never been recorded in this part of the Southern Ocean.” At the same stations, the geology team collects sediment cores up to 25 metres long from the sea floor. By linking the analyses of today's seawater properties with information that can be obtained from sediments, the team expects to gain a fundamental insight into the regional environmental conditions of past warm and cold periods.

“From the marine sediment cores, we can answer questions about climate and sea-ice dynamics in the Pleistocene - even up to 2.5 million years back in Earth's history,” says Vivian Sinnen. The AWI PhD student will be participating in a POLARSTERN expedition to the Antarctic for the first time and

is part of the Marine Geology team, which uses biogeochemical characteristics of the skeletons of diatoms, for example, to draw conclusions about temperatures or sea-ice extent in the past. Dr Lester Lembke-Jene is also part of the geology team. He explains: "These sediments represent one of the most important climate archives for reconstructing phases of natural past climate warming in the Southern Ocean and better understanding the associated processes. We are particularly interested in the profound physical and biogeochemical changes in the oceanic frontal systems and the Antarctic Circumpolar Current, the largest ocean current in the world ocean, which are closely linked to these changes." The study area has acted as a central interface for gas and heat exchange between the deep ocean and the atmosphere for more than 30 million years, and today it is one of the most important natural sinks for anthropogenic greenhouse gases and heat.

The EASI-3 expedition will focus on recording glacial structures on the shelf and the continental slope, for example the fossilised traces of ice masses on the sea floor. With geophysical measurements, the researchers led by expedition leader Prof Dr Sebastian Krastel from the Institute of Geosciences at Kiel University can look even further back into the Earth's history. The geophysicist explains: "By combining various geophysical systems from Kiel University, the AWI and Australian colleagues, we can map subsurface structures at different depths with the best possible resolution. This allows us to look as much as 1000 metres into the sea floor and identify characteristic structures that enable us to reconstruct different states of the ice sheets in the past." Based on the geophysical measurements, extensive marine geological work will also take place during the EASI-3 expedition. "There is very little information on the possible control mechanisms of ice instabilities from the working area so far, although it can be assumed that this region will react particularly sensitively to future climate change. This is what makes our interdisciplinary work so valuable," explains Prof Dr Julia Gottschalk from Kiel University.

The marine work during both expeditions will be complemented by land-based work by an international research team from the University of Cologne, the Technical University of Dresden and Australian colleagues. This will provide the researchers with a seamless connection to the Antarctic continent.

With fresh impressions of the sea or anticipation of the upcoming expedition, some of the POLARSTERN expedition participants will meet colleagues from Australian research in early February 2024. There will be a celebratory reception in Hobart, Tasmania, where there will be an exchange with scientific institutions and political interest groups to mark the first port call of the flagship of German polar research in Australia. After a stopover in South Africa, the POLARSTERN will then embark on its return transit and is expected back in its home port of Bremerhaven in mid-May.

The EASI expeditions are part of the Helmholtz Association's programme-oriented funding (PoF) in the research programme "Changing Earth - Sustaining our Future", in which AWI and GEOMAR are involved. For Kiel University, the expeditions provide important impetus for research within the university's research focus Kiel Marine Science (KMS). The researchers are funded by the priority programme "Antarctic Research" of the German Research Foundation (DFG), among others.

Links:

<https://follow-polarstern.awi.de> POLARSTERN App

<https://www.awi.de> Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI)

<https://www.kms.uni-kiel.de> Kiel Marine Science (KMS)

www.geomar.de GEOMAR Helmholtz Centre for Ocean Research Kiel

Images:

Images are available for download at <http://www.geomar.de/n9208-e>

Contact:

GEOMAR Communication and Media, [media\(at\)geomar.de](mailto:media(at)geomar.de)

AWI press office, [medien\(at\)awi.de](mailto:medien(at)awi.de)

Kiel Marine Sciences press office: [fbalzereit\(at\)uv.uni-kiel.de](mailto:fbalzereit(at)uv.uni-kiel.de)