



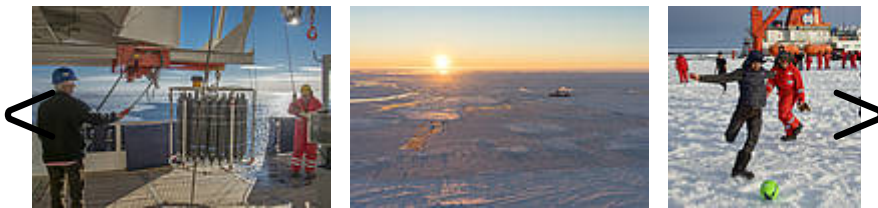
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Polarstern Expedition

Unique Insights into the Antarctic Ice Shelf System

Data collected on ocean-ice interactions in the little-researched regions of the far so

[13. March 2018] The world's second-largest ice shelf was the destination for a Polarstern expedition that ended in Punta Arenas, Chile on 14th March 2018. Oceanographers from the Alfred Wegener Institute, together with German and international colleagues, have collected important data along the entire glacier front of the Filchner-Ronne ice shelf, which will help them investigate the melting of the Antarctic Ice Sheet in an important region in the context of global sea-level rise from a multi-disciplinary perspective.



Just like any other ship, the research icebreaker Polarstern is exposed to the weather and other forces of nature. Thanks to the intensive use of high-definition satellite data, excellent weather forecasts by the ship's meteorologists and the option of surveying the sea ice by helicopter, the crew and scientists successfully navigated the Antarctic ice, enabling the scientists around expedition leader Dr Michael Schröder from the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) to explore the entire 800-kilometre-long front of the Filchner-Ronne ice shelf.

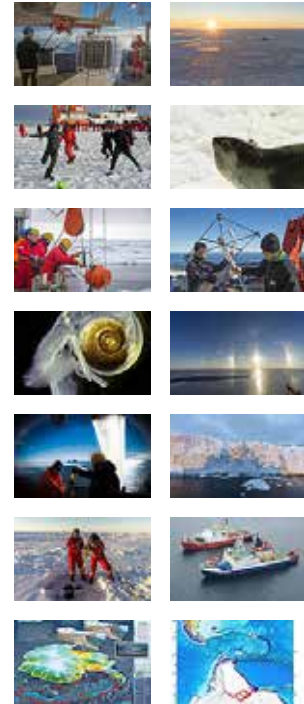


Table iceberg (Photo: Yannick Kern)

The scientific objective of the so-called FROST (Filchner-Ronne Outflow System Tomorrow) expedition was to gather data and samples so as to gain a better understanding of the interactions between ocean water and the


Antarctic ice sheet. Inland of the enormous, floating Filchner-Ronne ice shelf lie the glaciers of Eastern Antarctica, whose ice masses flow northward into the Weddell Sea. A number of factors dictate the flow rate, and therefore how much the glacial melt contributes to the global sea level rise. These factors include temperature and the amount of seawater that flows beneath the shelf.

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The ground topography determines how far the water can penetrate and spread, and the presence or absence of sea ice can reduce or increase the level of interaction with the open sea. The members of the expedition have now assessed all these factors using various scientific methods.

“The hydrographic sections are particularly valuable, as they provide data and samples that enable us to determine the age and distribution of the water masses, the diffusion path, and the amount of meltwater in the vicinity of the Filchner Trough. To date, no other ship

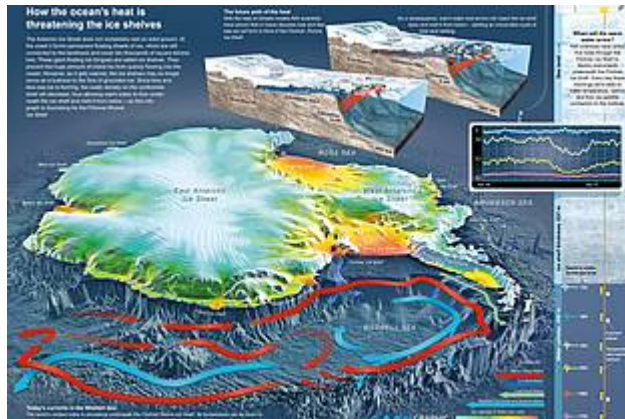
has managed to do this in the space of one season,” enthuses AWI Oceanographer Michael Schröder from on board the ship. The scientists were able to collect samples from the entire front of the Filchner-Ronne ice shelf, spanning from 61° West on the Antarctic Peninsula to 35° 30' West in the southeast corner of the Filchner Trough. That’s an impressive 438 nautical miles, in the course of which they deployed their instruments at intervals of 15 to 20 kilometres and a total of 48 stations.

Under particular scrutiny was the Filchner Trough itself, an ocean trench in the southwest Weddell Sea: a region characterised by an intensive influx of warm water and outflow of cold water masses, which have an impact on the interaction between the shelf ice and the ocean. Here the researchers carried out a comprehensive measuring programme on sections throughout the Trough: a west-east section at 76° south, north of the A23A iceberg, which hadn’t been possible in the past due to the adverse ice conditions. These measurements will now supplement the data from moorings that have constantly recorded the temperature, depth, salinity and flow speed of water masses in the southern Weddell Sea for the past four years. “We were also able to repeat measurements taken during the Polarstern expeditions in 2014 and 2016 at the northern edge of the Filchner Trough, at 75° South. Comparing the results for the different years will allow us to draw conclusions on changes in the outflow system over time,” says expedition leader Schröder.



Ross Seal (Photo: Mia Wege)

those from other moorings and hydrographic sections in front of the ice shelf. In this way, the researchers can compare their measurements taken directly at the source with those taken downstream. “At both sites we now have time series on



Info graph: Antarctic – How the ocean's heat is threatening the ice shelves (Photo: Martin Künsting)



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the physical parameters for at least four years, and we plan to continue them for at least another four years. Then we'll be able to make longer-term forecasts on the melting processes at the Filchner-Ronne ice shelf," explains Dr Hartmut Hellmer, who coordinates the oceanographic section of the FISP at the Alfred Wegener Institute.

During the expedition, for the first time a specially designed remotely operated vehicle from the British National Oceanography Centre (NOC) and British Antarctic Survey (BAS) was used under the Antarctic ice shelf. With its help, the scientists were able to measure the temperature, salinity and depth of the water in a cavern hidden under 550-metre-thick ice (<http://noc.ac.uk/news/alr-boaty-completes-first-under-ice-antarctic-mission>). The 52 researchers on the interdisciplinary expedition team also included researchers from geology, sea-ice physics, geochemistry and biology working groups. In addition to scientific endeavours, the Polarstern also performed important logistical duties: from 28 to 30 January, the icebreaker stopped at the Alfred Wegener Institute's Neumayer III research station to drop off fuel, scientific and logistical supplies. In early March, Polarstern continued on to the British Halley VI Research Station, where she took on cargo and passengers before heading for South America.

After entering port at Punta Arenas (Chile), the ship will change crews and be restocked with fresh provisions, fuel and scientific equipment. On 17 March the Polarstern and her new crew will embark on a seven-week expedition to the Antarctic Peninsula. Following the expedition, she'll make another stop at Punta Arenas before returning to her homeport in Bremerhaven, tentatively on 11 June.



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