ANT XXIII/4 Weekly Report No. 2 (to the Amundsen Sea, West Antarctica)
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We left a very exciting second expedition week behind us. After we departed from Peter I Island, we mapped submarine ridges and seamounts north of the island with our multi-beam echosounding system. This echosounder scans a swath of the seafloor which has approximately the width of the water depth under the ship, meaning that at 3000 m water depth the swath mapped has also 3000 m width. With several profiles in parallel, the seafloor can efficiently be mapped in good detail. The seamounts and ridges are mostly of volcanic origin and rise steeply up to 2-3 km above the seafloor. In cases where seamounts don't exhibit peaks but flat plateaus on top, they erupted as volcanoes above the sea level millions of years ago. After the end of eruption the exposed cone began to erode back to sea level, and the seamount sank down at the same time, resulting in a flat-topped feature named guyot. In the western Bellingshausen Sea, these seamounts and ridges follow an old tectonic suture which was formed an even longer time ago, at about 60 million years before present. One of the scientific goals of our investigations last week was to find an answer to the question why there has been volcanism until very recent geological times or why this is even active at present times as seen on Peter I Island.

These seamounts are also of great interest for research on the history of the Earth's climate, the so-called palaeo-climatology. If the tops or slopes of such a seamount contain small plateaus or pockets filled with sediments, they can be sampled with a piston-coring device. Because of their elevated position, sediments in these pockets cannot be transported from the continental slopes but consists of micro-fossils of microbial falling off the water column when they die. Analyses in the lab reveal the species and age, and with that information living conditions, temperature and salinity of the former ocean of this region can be determined, allowing the reconstruction of former ocean currents. Our sedimentary geologists sampled promising two 17 m long sediment cores with the piston corer from pockets of the seamount slopes.

On Thursday, we reached our main area of investigation, the Pine Island Bay, belonging to the southern Amundsen Sea. The satellite images we receive daily already gave us a hint of what we have to expect in terms of sea-ice coverage in the bay. But they do not give much of a clue under what condition the ice is. For many on board who come to Antarctica the first time it was quite exciting to watch Polarstern breaking through meter-thick ice. The sea-ice cover consists of countless single ice-floes which are continuously driven by the wind and current forces. Then, on Thursday night it happened .... Polarstern got stuck in the ice. With a lot of effort, only a few meters were made in an hour. The best in such a situation is to wait until the so-called press-ice conditions change under which the ice cover is compressed by wind and current. On the following day, the ship was able to move again. A reconnaissance helicopter flight revealed an ice-free part of the Pine Island Bay, but about 80 km of massive ice cover lied in

between. We decided to conduct sampling and surveying of the seafloor in the ice-free outer bay while we kept observing whether an ice-free polynya opened along the eastern shoreline into the inner bay while wind direction was changing. The swath-echosounder recordings again proved to generate exciting images from the seafloor. The bottoms of enormous icebergs carved linear scours into the seafloor hundreds of meters deep. Below these fea---tures, erosional traces or so-called mega-scale lineations are iden-ti-fied, possibly coming from a West Antarctic ice-sheet which advanced to the outer continental shelf during the last ice age. In the meantime, the earth magnetic field of a good part of the outer Pine Island Bay was mapped using our helicopter-mounted magnetometer.

We flew another reconnaissance survey on Sunday morning, but our hopes of moving into the inner Pine Island Bay were disappointed. Perhaps, the situation may change throughout the second half of our expedition and we might try it again. We are now on our way into the western Pine Island Bay which appears to be much better accessible according to the satellite images.

Very best wishes and regards from all expeditioners. It is carnival season, and last Saturday night, our carnivalists on board showed their very best!

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