

The storm that I mentioned in the last Weekly Report turned out as a very strong gale. Fortunately the weather forecast, issued by our ship's weather station, was as usual very reliable. Thus we decided in time to leave our working area in the middle of the Scotia Sea. We sailed southward to the South Orkney Islands where we found on the lee side of the islands and the icebergs a perfect location to master the stormy sea. With speeds of more than 130 km/h (12 bft), the gale raged over the Scotia Sea. These winds, the "roaring sixtieth", blew the snow horizontally over the ship. The temperatures dropped within a very short time from 0°C to -9°C. The next morning Polarstern was covered with a 5 cm thick ice crust, which again was another subject for photographs.

At this day our thoughts were of course with the two colleagues on Signy Island. However, the next day during our daily contact we were happy to hear that they are well but could not leave their igloo due to the extreme strong winds. The "Tomato"-igloos were perfectly moored and thus safe enough. During the rest of the week they had a good time with sunshine and from time to time snowfall. The temperature is now below -15°C, but the air is dry. Signy Island has changed to a wonderful winter scenery, still surrounded by hundreds of grounded icebergs. On Friday they were visited by hundreds of penguins, which observed the human activities with great interest. They spent some time at the station but later moved on to the other side of the island. Our two colleagues still have one more week to enjoy this wonderful silent and peaceful Antarctic winter scenario before Polarstern will pick them up and take down our observation station at Signy.

The marine geological program is another important field of study during our expedition. Subject of investigation for our marine geologists is the subsoil underneath the seafloor. The geological history of the opening process of the Scotia Sea and the corresponding development of the Antarctic circum-polar-current are stored in the sediments. The variability of this current during the past glacial and interglacial periods are of special interest since they are considered as environmental signals in the seafloor sediments, and which are subject of our investigations.

How can this be accomplished? At first, regions showing appropriate sediment coverage were selected and pre-surveyed utilizing multibeam and sub-bottom-profiling technologies. To study the sediment structures, a special survey system is installed on board of Polarstern, the sub-bottom profiler Parasound, which transmits special sonar signals to the sea floor. Some parts of the sonar waves are reflected by the shape of the sea floor, but another portion penetrates into the subsoil and is reflected by different sediment layers from where the signal return to the hydroacoustic receivers under the ship. These measurements supply useful information about the distribution and stratification of the sediments. Steep slopes and low penetration of the signals into the subsoil are mostly a clear indication

for compacted sediment or rock outcrop. Geologically younger sediments can be recognized from clear distinct, several hundred meters thick and parallel layered, pattern in the sediments. We use a special strengthened steel tube with a huge lead weight on top, the so-called piston corer, to recover cores of more than 20 m length from the upper parts of the sediment, the diameter of these cores is approx. 10 cm.

After this, the puzzling work starts for the marine geologist. Already on board the sediment core is investigated with different physical property sensor systems. Later in the laboratory it will be opened, described carefully and detailed sampled. The results, compositional variations of microfossil communities or terrestrial sediment components, together with age determination will provide a picture of the palaeoenvironment.

An additional undisturbed sample from the frequently very soft and watery sediment surface was taken with the multicorer. From these samples it is investigated which recent environmental signals are stored on the seafloor today. By comparison of recent depositional processes from different regions it will be possible to determine ocean currents, water temperatures, the amount of terrigenous input and the communities and amounts of skeleton forming microorganisms. It is planned to compare and interpret the sediment properties with ice core signals by temporal high-resolution investigations. Variations of these parameters may reflect climatic changes and may have different impacts on diverse ocean regions. The results could be used as input for future climate modelling.

We continued the geo-scientific surveying programs on Tuesday after arriving back in our working area, where a long swell, a lasting effect of the storm, still existed. However, it did not really impede our measurements. The helicopter magnetic program and the ship-borne measurements were continued with good success and progress. Kindly enough, due to the quiet weather, another six helicopter flights could be conducted. Preliminary results from a combined air-borne and ship-magnetic data solution prove the high accuracy and quality of the data. These data were used for preliminary comparison and interpretations including bathymetric and marine gravimetric data. The geological-geophysical complexity of this region is also represented in the small-scale structures and variations in the Earth magnetic field. It is obvious from the data that many different processes during the geological history have formed and structured the upper crust and have left their footprints in the magnetic potential field in form of the anomalies.

The bathymetric surveying program continues in the same form. Meanwhile we have covered an area of more than 44.000 sqkm. New bathymetric charts based on the actual measurements are prepared on a daily basis in order to optimize the cruise planning and sampling. We have discovered a large number of submarine features like seamounts, ridges, trenches, graben, etc. One of our tasks will be to name these new features on the seafloor so that they can unambiguously be addressed and described in publications, bathy---

metric maps and nautical charts.

Next weekend we will arrive at Signy Island in order to dismantle the geomagnetic and geodetic tracking station and to pick up our two colleagues before we start our transit to Bahia Blanca. However, until then we still have several program points ahead of us. Six survey lines in our investigation area remain and there are also some gaps to be filled within the Heli-Magnetic program.

Best regards from everyone on board and the scientific cruise leader
Hans Werner Schenke