ANT XXII/2
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The helicopter crew has been very busy during the past days. They dispatched the biologist to their broken piece of the ice floe, which has begun slowly drifting away from our first position. They were in the air to measure ice thicknesses over a large area and started first reconnaissance flights to the north in order to judge the ice conditions so that we could calculate our return trip.

A minor incident happened last Sunday evening. One of our helicopters was on the way to a buoy 30 miles from the ship when a light freezing rain began. The helicopter could not return for more than two hours, but eventually landed safely back on the ship.

The departure from our floe was set on the 2nd of January 2005, in order to reach Cape Town in the morning of the 19th January. We changed our plans for the polar baptism, since all programmes wanted to use the last few days prior to the departure for intensive sampling.

One of the groups working busily is the one of our Dutch and Belgian colleagues. Their interest is whether the Antarctic Ocean plays a significant role in controlling climatically significant biogases that are involved in the metabolism of plants and animals. During the last decades, there has been growing evidence that mankind is affecting the climate by the release of climatically active gases into the atmosphere. The most prominent is carbon dioxide (CO2) resulting from fossil fuel burning, which favours the rise of atmospheric temperatures through the so-called “greenhouse effect”. There is a major concern to know, how the earth system will be able to cope with a large increase of CO2. A general consensus amongst the scientists is that the answer probably lies in the world’s oceans, which have the potential for being a CO2 sink. Field observations and numerical simulations suggest that the polar oceans might well be the most efficient sink. These data, however, mainly rely on open ocean observations, and very little is known on the role of sea ice. Biological processes occurring in the ice and in the surface water during ice melting are key elements to answer these questions. Sea ice algae not only use CO2 for photosynthesis, but they also release sulphur compounds (DMS, dimethylsulfide) into the atmosphere that act as cloud condensation nuclei. Their climatic effect is opposite to the one of greenhouse gases, since DMS will favour the return of solar energy to space, therefore lowering the Earth’s temperature.

Another interesting aspect is that the overall productivity of the Antarctic Ocean appears to be somewhat limited by the input of an essential nutrient: iron. Therefore ice cores, snow and water samples are collected from our floe and will be analysed to answer the following questions: Does sea ice act as a lid for gas exchange between the ocean and the atmosphere? Does biological activity affect the fluxes of carbon dioxide at the ice-

ocean and ice-atmosphere interfaces? Is sea ice richer in iron than the underlying sea water and does this therefore trigger biological activity? Where does this iron originally come from? Does the snow accumulating on top of the ice act as an “iron collector” during the winter months? Does sea ice act as an “iron seeding factor” on melting?

Most of the results will emerge from work back home, but exciting findings are already evident. Iron is more concentrated in the sea ice by sometimes 2 orders of magnitude than in the underlying water, and higher iron levels are also seen in some of the snow samples. Biological activity leads to a drastic reduction of the CO2 concentration in the sea ice down to 30 ppmV, compared to values of 375 ppmV and 400 ppmV in the atmosphere and in the ocean surface respectively. CO2 fluxes were observed from the atmosphere into the sea ice, therefore acting as a sink, and not behaving as an impermeable material.
The transition of the years was already noticeable Thursday afternoon. “Berliner“ cakes were served and traditionally some contained mustard instead of jam. A barbecue was followed by a short movie and popcorn and the evening culminated at the bridge around midnight when a glass of sparkling wine was served.

Our ship’s horns greeted the year 2005. The first day in the New Year was a normal working day with last samples taken and the start of dissembling some measuring systems. The ship left the floe punctually on Sunday at noon and picked up a sediment trap close by. This trap could not be retrieved otherwise, because it got stuck underneath a newly developed pressure ridge. However, after some elegant manoeuvres of the ship the trap was freed. From then on Polarstern is heading north towards the ice edge.

We left our floe with some wistful nostalgia but the enjoyment of an approaching meeting with our beloved back home predominated.

With the best regards from all expedition members.

Michael Spindler