

English version of our article in the “Bündner Woche”, November 18, 2020

Research in Graubünden

Polar bears, et cetera

MOSAiC expedition part II



A typical commute: SLF snow physicist Amy Macfarlane and a colleague transport their sled on the kayak. Photo: Ian Raphael

On October 12, 2020, after 389 days, the German research vessel “Polarstern” returned from its largest expedition to date to explore the Arctic to its home port of Bremerhaven/Germany. SLF snow physicist Amy Macfarlane spent six months on the “Polarstern”. Her goal was to study the changes in the snow cover on the sea ice that occur during winter and the transition to summer: “The snow cover on the sea ice has a significant influence on the thermal energy and mass distribution in the Arctic. The

Arctic climate change in turn has an impact on the global climate. The questions I ask in my project are very general: How does the snow cover change between winter and summer? How does the thermal conductivity of the snow affect the ice growth?”

Macfarlane describes the approach: “Other teams had measuring towers and tents installed on the ice to measure atmospheric temperatures, wind speeds, and ocean currents. Our team, on the other hand, had a portable sled with instruments, including for instance the SnowMicroPen®. This is a kind of highly sensitive and automatic probe that measures the resistance of the snow to penetration. Throughout the expedition we took five thousand measurements with the SnowMicroPen®. We also used infrared cameras to image different layers in the snow.”

For Macfarlane, however, the most important instrument was a micro-computer tomograph (Micro-CT): “The CT device is similar to the ones we know from hospitals. In principle, it produces an X-ray image. In order to obtain images of snow structures using micro-CT, we had to set up a cold laboratory on the “Polarstern”. The temperature had to be a constant minus 15 degrees Celsius. The laboratory needed a constant power supply, which is not easy on a ship because of the engine

fluctuations. In addition, a very stable platform was needed to counteract the engine vibrations that would otherwise disturb the very high resolution of the scans. I was able to create a time series with high-resolution data of the snow structure.”

“From the outside perspective, it is quite funny to watch a woman sitting in the snow all day long looking at snow crystals. But every day was different. Because there is a lot of moisture in the air and large temperature gradients in the snow, the crystals were really huge. I have never seen crystals like those in the Arctic before. After working in the Alps for a few years, I know the processes that create the crystals. However, when I was in the Arctic, I was amazed. The next steps are organizing and analyzing the data and writing publications. I still have three years to complete my doctoral thesis.”

Regular sightings of polar bears were also part of Macfarlane’s daily routine: “We met polar bears with different characters. Most of them do not care about us and move on. But especially for the younger, male polar bears, the setup of the instruments was like Disneyland. They were very interested in our ship with strange smelling equipment. However, there was never a direct encounter between humans and polar bears. All researchers immediately retreated to the ship when a polar bear was sighted. The polar bears are extremely sensitive to noise and they could be frightened away by loud calls or the ship’s horn.”

Amy Macfarlane und Daniela Heinen

*MOSAIC = Multidisciplinary drifting Observatory for the Study of Arctic Climate. MOSAIC expedition: <https://mosaic-expedition.org>.

Find out more about research in Graubünden: www.academiaractica.ch, www.graduateschool.ch.



Daniela Heinen. Image: N. Willi