



GLANAM Newsletter



Dear followers,

the GLANAM network had its annual meeting and workshop last June in Svalbard, followed by a three-day course for the fellows on scientific writing and publishing held by Susan Mitchell and David Ross. We would like to thank Susan and David for the help and advice provided during the course.

A more detailed description of the GLANAM workshop and fieldtrip is presented on page 2 and a brief scientific review on the features (whose terrestrial counterparts were observed by the fellows on land in Ymersbukta) in Tempelfjorden studied by Anne Elina Flink is found on page 4.

The last article of this newsletter will feature Elena Grimoldi's experience with BRITICE-CHRONO on the RRS James Cook last July. As many of you will already know, BRITICE-CHRONO is a 5-years NERC-funded consortium with the aim of collecting and dating material to constrain the timing and rate of change of the collapsing British-Irish ice sheet (BIIS) (www.britice-chrono.org). The collaboration between GLANAM and BRITICE-CHRONO is a good example of the ongoing collective scientific effort in order to answer big questions.

Riccardo Arosio

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Fig. 1

GLANAM fellows and supervisors chillaxing around the fire during the icebreaker



GLANAM Annual meeting in Svalbard

This June, in the far North, on the not anymore totally frozen archipelago of Spitzbergen in the cosy city of Longyearbyen, the GLANAM network had its annual meeting and workshop. Most of the participants arrived safely in time to enjoy a pleasantly cold arctic BBQ “Icebreaker” on the beach in Adventdalen (Fig. 1). The following days were filled with presentations around the latest developments on the Svalbard-Barents Sea and Greenland margin. A special thanks goes to the guest lecturers Nina Kirchner from Stockholm University, who gave an interesting overview over Ice Sheet modelling efforts in the region and Heidi Sevestre from the University centre of Svalbard (UNIS). Heidi gave a very stimulating talk about the CRIOS-project (Calving Rates and Impact on Sea Level) with many stunning time lapses of calving glaciers. Accompanying these rather specialised talks and discussions were two group sessions on general long- and short-term climate forcings from all GLANAM members that are not working in the focus region of this meeting.

The meeting was then finalized by a whole day fieldtrip to Ymerbukta and Barentsburg on the old fishing vessel “Langøysund”. The day before the fieldtrip we were briefed in good old UNIS tradition by the logistics department and we were intimidated, ehm - warned about all the possible dangers we could encounter in the outdoors. The weather forecast suggested good conditions with strong winds and up to 2.5 m high waves on the way over to Ymerbukta on the northern side of Isfjorden, which has sounded like we would have had an interesting ride across the bay. We then left early in the morning on board of the small ship from Longyearbyen towards northwest towards Ymerbukta and Esmarkbreen (Fig. 3), which is part of Katharina Streuff’s project. This 15

km long glacier is calving into Ymerbukta and left a set of relatively recent recessional moraines on the side. We left the ship in a zodiac with the polar bear guards and discussed in the middle of the moraines the history of Esmarkbreen (Fig. 4).

Shortly before arriving at the glacier front we were actually disturbed by a sudden rescue training of the local authorities that were successfully lowering a person onto our ship from their helicopter while we were travelling. An entertaining sight for everyone and reassuring to know that we actually could get rescued – even out there.

The next destination was Barentsburg, the only active Russian mining settlement on Svalbard (Fig. 5). After a short trip over Isfjorden and quite a few photos of puffins we were already docking and starting a guided tour with a highly motivated guide, Natalia. Natalia seemed to be probably the largest fan of this not quite so beautiful settlement and presented all the newly renovated buildings with a lot of passion. Afterwards, for some reason, absolutely no one wanted to go into the hotel and buy postcards from Barentsburg. The group was meant to visit the local geology museum, but we discovered the local brewery and its “light” beers required by law. Oddly feeling like what we drank was not just a light beer, we rushed back on board for a pleasant dinner of Minke whale, pork ribs and chicken. In beautiful sunshine we headed home to Longyearbyen along the coast with no wind, thousands of birds on the cliff and nicely exposed bedrock cliffs.

Last but not least many thanks go from every one of us to Rico, Anne and Oscar for all the organisational effort.

Lukas Becker



Fig. 2 The Three Musketeers: Kathos (Kasper, left), Bjorthos (Björn, right) and Kevimis (Kevin, centre)



Fig. 3 GLANAM fellows exploring the landform association in front of Esmarkbreen



Fig. 4 Riko Noormets teaching the students from the commanding height of a crevasse-squeeze ridge



Fig. 5 Approaching the Russian mining town of Barentsburg

Annual moraine ridges in Tempelfjorden, Svalbard

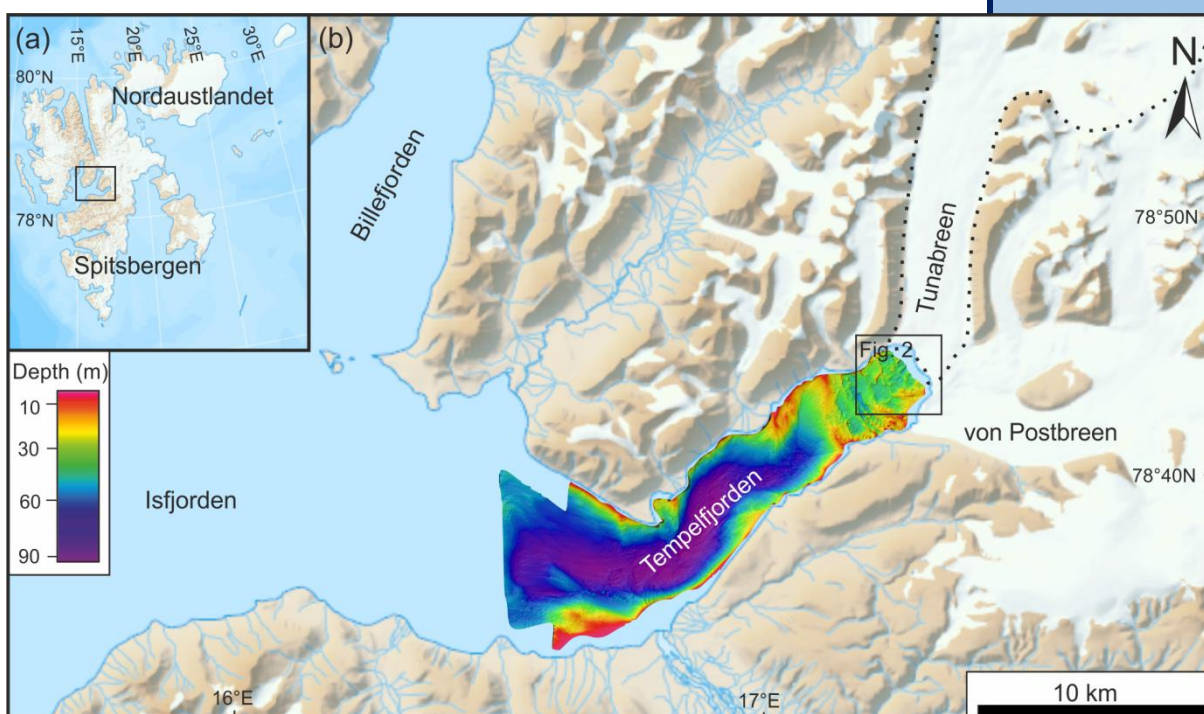


Fig. 6 (a) The location of Svalbard and the study area. (b) The location of Tunabreen and the extent of the bathymetric data. The black box outlines the main study area shown in Fig. 2. The background map is from Svalbardkartet, Norwegian Polar Institute (NPI). Permission to display the bathymetric data has been given by the Norwegian Hydrographic Institute, permission nr. 13/G706. (Modified after Flink *et al.* 2015).

The archipelago of Svalbard is situated between 74° to 81° north, about midway between the Norwegian mainland and the North Pole. Nearly 60% of Svalbard's land area is covered by glaciers. Many of these glaciers are so called surging glaciers, which implies that they can advance several Km in the course of one or a few years, driven by internal changes in their dynamics (Sund *et al.* 2009).

Most of the surging glaciers in Svalbard have been recorded to surge only once since the start of glaciological observations, but some of them display cyclical surge patterns. The calving glacier Tunabreen on the west coast of the main island Spitsbergen has surged three times since the end of the Little Ice Age in the late 19th century (Fig. 6). The oldest recorded surge took place in 1930, followed by another surge in 1970, while the latest surge took place between 2003-2005, giving the glacier a surge cycle of approximately 30-40 years. Each of the consecutive surges has created a set of glacial landforms on the seafloor of Tempelfjorden (Flink *et al.* 2015).

When a calving glacier surges it reshapes the sediments which have been accumulating on the seafloor for thousands of years. Different types of

landforms are created during different stages of the surge. During the advance phase the glacier moves quickly over the fjord floor, creating several Km-long glacial lineations. At its maximum stage it pushes up a large terminal moraine ridge. Smaller moraine ridges are created during the retreat phase (Fig. 7).

In figure 7 the large moraine ridges created during the maximum stages of the two latest surges in 1970 and 2004 are visible. Between the 2004 terminal ridge and the current glacier front smaller moraine ridges overriding the glacial lineations can be observed (Fig. 7). By combining bathymetric data and aerial images the smaller moraine ridges have been matched with the terminal positions of the glacier front during the retreat after the 2004 surge (Flink *et al.* 2015). The study demonstrates that the moraine ridges have been created annually since the surge stagnation. The ridges form during the winter when Tempelfjorden is covered by sea ice and calving is reduced. The glacier front experiences a minor re-advance during the winter months and pushes up the seafloor sediments to form the small moraine ridges.



In the Tempelfjorden study different data types have been used together to provide a comprehensive view of Tunabreen's recent glacial history. In many cases these data do not exist or are hard to obtain. In these cases a study of this type provides an important comparison, since surging tidewater glaciers create a characteristic landform assemblage. By studying bathymetric data we can reconstruct the dynamics of other glaciers in Svalbard, whose history is still unknown.

Anne E. Flink

References

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Sund, M., Eiken, T., Hagen, J. O., & Kääb, A. (2009). Svalbard surge dynamics derived from geometric changes. *Annals of glaciology*, 50, 50-59

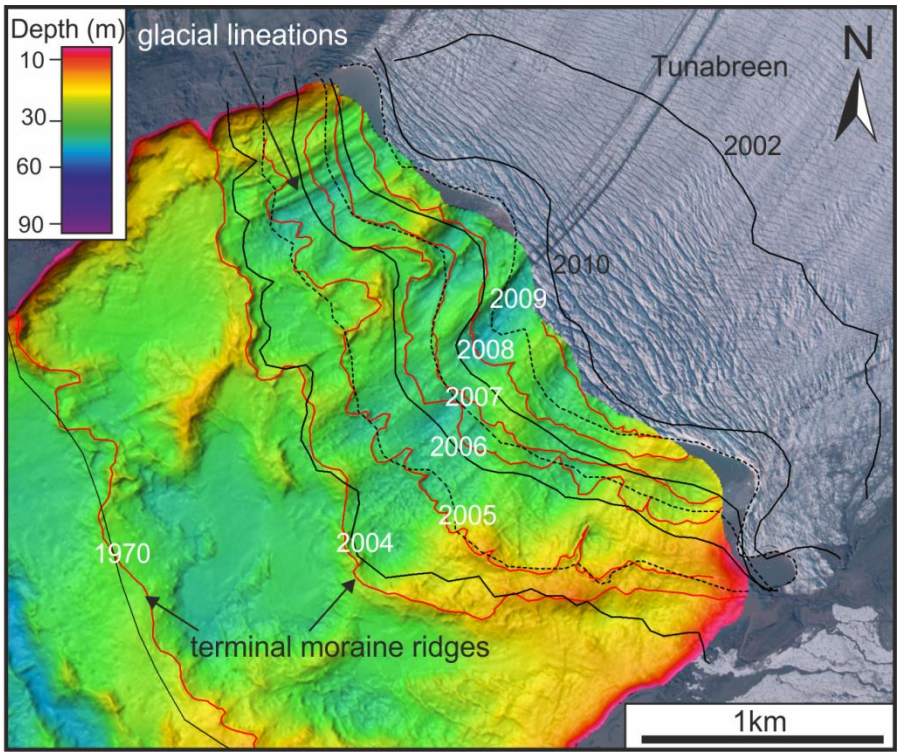


Fig. 7 Glacial landforms in the inner part of Tempelfjorden. Red lines outline the small moraine ridges, while black lines outline the glacial terminal positions after the 2004 surge maximum. The background comprises of an aerial image from 2009 (NPI) (modified after Flink *et al.* 2015).

A collaboration: GLANAM and BRITICE-CHRONO

How to live on a ship for 30 days

Working on a study area located offshore means that every now and then I get the opportunity to go on a boat for a while. After a few trips around the warm and sunny Mediterranean during my previous studies, the GLANAM Project brought me up to higher latitudes and into the North Sea. Last month I had the possibility and pleasure to be on the RRS James Cook for the BRITICE-CHRONO JC123 oceanographic cruise which took us all around the North Sea and beyond (check out our pink track in the map below)! My project focuses on the Western North Sea and on the Pleistocene Ice Sheet history of the region, this is why

I was part of the scientific crew of JC123 and collaborated with the BRITICE-CHRONO Project, whose aim consists on collecting and dating material in order to constrain the timing and rates of change of the collapsing British and Irish Ice Sheet (BIIS). After the very successful first cruise of the project around Ireland last year, this year the land, or better, water, to be conquered was the whole North Sea, plus The Minch and Shetlands! The plan once again was to collect geophysical data and precious sediment cores, hoping they will tell us something more about the last BIIS and when and how it retreated. So here is a peak of what it is like to be on a boat for 30 days, from everyday life to exiting science!



We sail – off to Scotland! From the National Oceanographic Centre (NOC) in Southampton, where our vessel was docked, we sailed all the way up to the Minch, a strait in north-west Scotland and our first target area.

I was on night shift, working 12 hours a day from 8pm to 8am and for the first couple of days tried, with the other night shifters, to adjust to the new lifestyle. After 3 days of transit, surveying and saying goodnight at unusual hours, we arrived in the Minch and the operations started.

Our strategy was to first acquire both multibeam bathymetry and seismic profiles along a chosen track line and then pick out the sites that could be good coring targets from our observations on the geophysics data. Once the sites were chosen, we would

go back along the line and core, hoping to recover a few metres of sediment.

Our job as the scientific crew was to be ready on deck when a core came up from the seafloor and cut it in 1 m sections, label each one and store them.

The core sections were then brought into the MSCL (Multi-Sensor-Core-Logger) container where they were left to acclimatize for 6 hours. Then they were scanned by the technician operating the MSCL, which measures a lot of physical properties including P-wave velocity, gamma density and magnetic susceptibility of the sediment. When the core comes out of the container, we took over again and split it, logged it and then packed and stored it in the freezer container at a temperature of 4°C.



Fig. 8 Dolphins and lighthouse off the Scottish coast



After a few successful days of coring (and also dolphin sighting!), the vibrocore mysteriously stopped working and we had to wait for the BGS (British Geological Survey) engineers on board with us to repair it. They worked very hard, day and night, to try to fix it and in the meantime we continued surveying for geophysics and splitting/logging/packing in the lab. You always need a Plan B on a boat, therefore, to avoid losing precious time while the vibrocore was under maintenance, we moved on to the shelf edge beyond the Isle of Lewis and surveyed there. And when everything was finally up and running again we went back to our normal routine until time had come for us to move to our next target area, Shetlands!

Same operations day and night... On the James Cook we worked 24/7 and with different shift hours between the scientific and vessel crew, there were people I did not even see for days (or ever). We kept on working in the night, having breakfast for dinner and dinner for lunch and we found new ways to entertain ourselves when we had some “slow” time during our shift, like learning how to play a few notes with the ukulele, having a 1k challenge on the treadmill and jumping around in excitement the first time we sailed on the 0°00'000"N longitude. And it was great to be so up North in this time of the year, where the sun sets at 10.30/11 pm in the evening and rises again at 1.30 am! By our 15th day, we finished T1 (transect 1) around Shetlands and we moved down into the North Sea. Here, we hoped to target interesting sites that still hold some secrets on ice retreat and sea level rise.



The distances between sites in this area was noticeably longer than in the previous areas, our transit and survey time was therefore much longer and we had more time to help out processing the multibeam data while becoming professional ukulelists. We went back and forth and up and down the basin, collecting between 8 to 10 cores per line and getting excited when we saw tunnel valleys and nice basin infills on the seismic screen. Bumpy sea, nippy nights and a technical issue with one of the vessel thrusters did not demoralize us and everyone kept working hard until we collected core nr. 179, the last one for the cruise! And with more than 8000 km sailed and a bit more than 500 m of sediment collected, we were ready to head back, rest for a few days only to re-open our datasets and our carefully-packed cores to start with the remaining part of the job: the analysis! I wonder if the GLANAM team will send me on another boat soon...! :D

Elena Grimoldi

Communications

- **Kevin Schiele** will participate to QRA Postgraduate Symposium in Cambridge, UK to be held from the 2nd to 4th September. The title of his talk is: “Stratigraphic Evidence for Glacial Sedimentation on the Western Irish Shelf during the Quaternary.”
- **Benjamin Bellwald** will participate to the 7th International Symposium on Submarine Mass Movements and Their Consequences (SMMTC), 1-4 November, Wellington, New Zealand. The title of his talk is: “Postglacial Mass Failures in the Inner Hardangerfjorden System, Western Norway.”

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