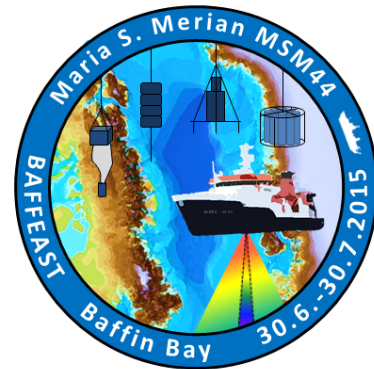




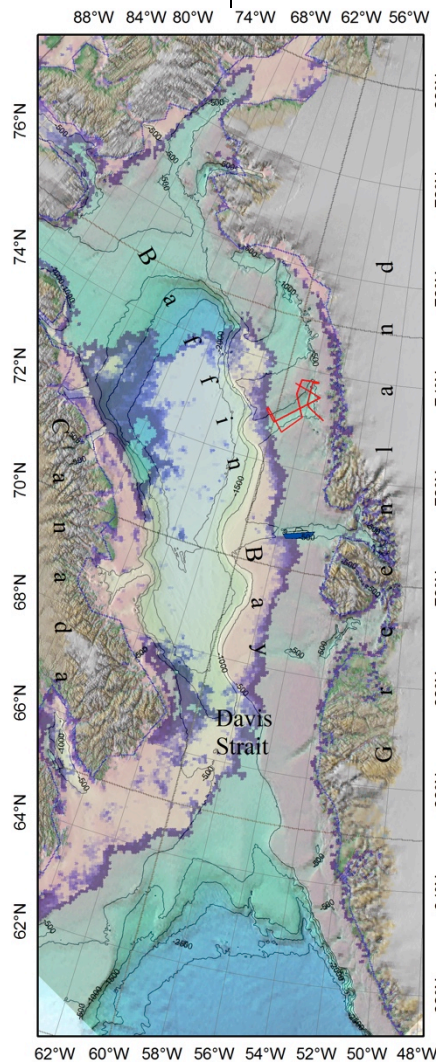
MSM 44
 Nuuk – Nuuk
 30.06.2015 – 30.07.2015



1. Wochenbericht | 1st Weekly report

Am Dienstag den 30.06.2015 ist die FS MARIA S. MERIAN von Nuuk aus zu ihrer 44. Reise aufgebrochen. Das Zielgebiet liegt in der Baffin Bay einem nördlichen Randmeer des Atlantik zwischen Grönland und Kanada. An Bord sind 24 Besatzungsmitglieder und 22 Wissenschaftlerinnen und Wissenschaftler. Die Forschungsgruppen setzen sich hauptsächlich aus Meeresboden-Vermessern, Palaeo-Ozeanographen und Proxi-Analitikern des Alfred-Wegener-Instituts, Helmholtz-Zentrum für Polar- und Meeresforschung (AWI) und des MARUM - Zentrum für Marine Umweltwissenschaften der Universität Bremen zusammen. Zusätzlich sind Wissenschaftlerinnen und Wissenschaftler des Geologischen

On Tuesday the 30th of June 2015, the RV MARIA S. MERIAN left the Port of Nuuk to start her 44th expedition bringing her to the Baffin Bay, a marginal sea of the Atlantic located between Canada and Green-land. In total 24 crew and 22 scientists join the cruise. The working groups on board mostly comprise hydrogra- phers and palae-oceanographers from the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) and the MARUM Centre for Marine and Environ- mental Sciences at the University of Bremen. Furthermore, scientists from the Geological Survey of Denmark (GEUS), the University of Århus (GEO AU) and the University of Québec à Montréal (UQAM) are on board. The objectives of the Expedition are: 1) to map



Dienstes Dänemarks (GEUS), der Universität Århus (GEO AU) und der Universität Québec à Montréal (UQAM) mit an Bord. Die Forschungsarbeiten und Forschungsschwerpunkte dieser Expedition sind: 1) das Auskartieren und Vermessen eiszeitlicher Strukturen wie z.B. Moränen, Drumlins und Pingos, um die Rückzugsgeschichte der grönländischen Gletscher seit der letzten Eiszeit zu rekonstruieren, 2) das Gewinnen von Oberflächensedimentproben und langer Sedimentkerne zur Rekonstruktion der palaeo-ozeanographischen Verhältnisse in der westlichen Baffin Bay und 3) das Gewinnen von Planktonproben, um palaeo-ozeanographische und palaeoklimatische Proxies für die Baffin Bay weiter zu entwickeln und zu kalibrieren.

Die Baffin Bay ist ein wichtiges Gebiet für den Austausch von warmen atlantischem Salzwasser und kalten arktischem Frischwasser. In die nordöstliche Baffin Bay entwässert circa ein Viertel des westgrönlandischen Eisschildes. Trotz ihrer Bedeutung gibt es gerade aus dieser Region nur sehr wenig palaeo-ozeanographische und palaeoklimatische Informationen. Um das zu ändern, führt die Expedition MSM44 in die Melville Bucht in der nordöstlichen Baffin Bay.

Nach zwei schönen sonnigen Tagen in Nuuk, die einige der Expeditionsteilnehmer sogar zu einem Bad im Arktischen Ozean nutzten, liefen wir am Dienstag den 30.06. Nachmittags gegen 14:00 aus. Die Revierfahrt führte durch eine Schärenlandschaft geprägt von sie im Lehrbuch stehen - eine sehr

glacial features such as moraines, drumlins and pingos in order to study the history of the Greenland glaciers since the last glaciation, 2) to recover surface sediments and long sediment cores to reconstruct the palaeoceanography of the western Baffin Bay and 3) to sample the water column for plankton to develop and calibrate palae-oceanographic and palaeo-climatic proxies.

The Baffin Bay is an important area for the exchange of warm Atlantic saltwater and arctic freshwater. Approximately a quarter of the west Greenland ice sheet discharges into the northeast Baffin Bay. Although, these are relevant palaeoceanographic and palaeoclimatic processes, only very little information exist from this area with regards to these topics. In order to change this, Expedition MSM 44 targets the Melville Bay in the northeast Baffin Bay

After two nice and sunny days in Nuuk – some of the scientists even took a chance for a dip in the Arctic Ocean – the RV MARIA S. MERIAN left port at about 14:00. During the journey through the archipelago offshore Nuuk, we already saw the types of glaciated landscapes we hope to later discover with our multibeam echosounders on the seabed. This followed the calibration of the multibeam echosounders and initial sampling stations close to Nuuk and in the Davis Strait. During the first days, however, we were busy finding our way around the ship, getting to know each other, setting up the labs and enjoying the sights of the first icebergs.

With Greenland and the ice edge in within sight, we travelled further

eiszeitlichen Landschaftsformen, wie nette Einstimmung auf all das, was wir hoffen mit unseren Fächerecholoten auch am Meeresboden zu finden. Danach folgten Kalibrierfahrten für die Flach- und Tiefwasserfächerecholote und erste Sedimentbeprobungen nördlich von Nuuk und in der zentralen Davis Straße. Allgemein waren die ersten Tage an Bord davon geprägt, sich zu orientieren und kennen zu lernen, die Labore vorzubereiten und die Faszination der Eisberge auf sich wirken zu lassen. Für einen Transekt der Proxi-Gruppe waren wir bereits bis in die äußeren Bereiche des Meereises gefahren.

Mit Grönland und der Eiskante ins Sicht arbeiteten wir uns weiter nach Norden vor. Um uns herum trieben, teilweise zu organischen Formen geschmolzene, Eisberge, die sich in einer bleiernen See spiegelten. Es war absolut windstill. Bei der Station im äußeren Meereis kam dichter Nebel auf, in dem immer wieder schemenhaft Eisberge auftauchen – ein fast gespenstisches Szenario. Die Mitternachtssonne ließ die Eislandschaft in Rottönen erscheinen und erzeugte ein faszinierendes kontrastreiches Farbspiel aus Licht und Schatten. Wir haben auch bereits erste Wale und Robben gesehen.

Im Moment befinden wir uns auf dem Transit zu unserem ersten großen Arbeitsgebiet. Es handelt sich dabei um einen alten Gletschertrog, der sich bis zu 400 m tief in den Schelf der südlichen Melville Bucht geschnitten hat. Die Stimmung an Bord ist gut, und wir hoffen, das es weiterhin so windstill und sonnig bleibt.

northwards. Around us floated icebergs partly melted into almost organic shapes and the sea was like a mirror. At one point during a station within the sea ice, fog came up in which it was only possible to see the silhouettes of icebergs – an almost unearthly atmosphere. Later, the midnight sun turned the ice landscape pale red creating amazing contrast of light and shadow. We also had our first encounters with wales and seals.

At the moment, we are on transit the our first large research area, an glacial trough that has been carved 400 m deep into the shelf of the southern Melville Bay. People on board are in good spirits and we hope the wind and weather stays as nice as it is.

Im Namen aller Fahrtteilnehmerinnen und Fahrtteilnehmer wünsche ich viele Grüße von Bord der FS MARIA S. MERIAN,

On behave of the cruise participants, I send best regards from board of the RV MARIA S. MERIAN,

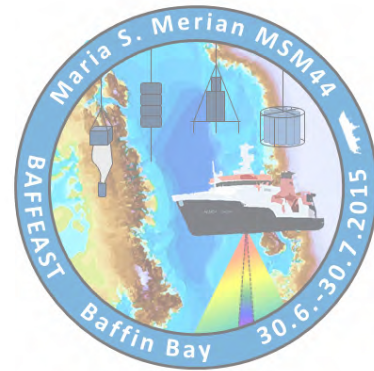
Boris Dorschel



Picture © Simon Dreutter



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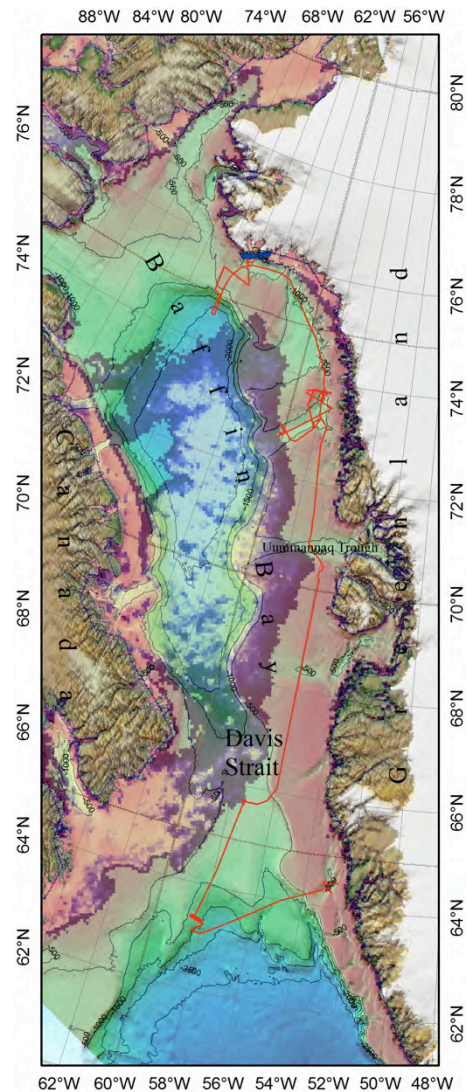


2nd Weekly Report

It is now close to two weeks on board the RV MARIA S. MERIAN and nobody is showing any sign of boredom. We have, however, adapted to a kind of routine. Working teams have developed, workflows have become smoother and everybody has found her or his place on board. But the nice weather, the breath-taking scenery, the entertainment during our time off and ever more oddly-shaped icebergs ensure that nobody gets bored.

At the start of the week, we commenced our transit to the Melville Bay. On the way, we briefly stopped to collect a sediment core from the Ummannaq Trough northwest off Disko Island. This trough is interesting for paleoceanographic studies; containing sediments from which the past development of the West Greenland Current can be reconstructed. By bringing warm Atlantic waters to the Baffin Bay, the intensity of the West Greenland Current influences the waning and waxing of the glaciers in west Greenland. After this, we have continued our northward journey.

We have now finished the reconnaissance work in the southernmost trough of the Melville Bay. We crossed the trough lengthwise and across with several transects. We now have a pretty good idea of the past advances and retreats of glaciers through this trough during the last glaciation. Drumlins, mega-scale glacial lineations and long elongated furrows in the seabed show up nicely in the multibeam echosounder data, especially in basins close to the shore. These features develop at the base of glaciers and indicate its flow direction. The balance of the flow velocity and the calving rate of a glacier determine



if a glacier advances across the shelf or retreats towards the land. These advances and retreats are often oscillating movements the timing of which are driven by climatic changes. So in order to understand these movements, we need stratigraphic information to date the sediments from the trough. As long as an ice shelf covers the seafloor, no marine sediments are deposited. So if we can recover marine sediments from the shelf and date them, we receive a minimum age from when back in the past, this area of the seabed was free of glaciers. However, a lack of dateable material in the sediments makes this particularly challenging in the Baffin Bay.. For this reason, we have often taken two parallel sediment cores in order to have more material for analysis.

In the meantime, we have also collected more plankton samples with the multinet. They often contain an extremely large amount of material. Besides copepods and ostracods, the dominant components are unicellular algae such as diatoms and dinoflagellates. The tireless plankton-team has then the difficult task to extract foraminifers from among the algae, which they often depreciatively referred to as 'green soup'. After a long day over the microscope you can see all these tiny green, red and white creatures even with your eyes closed.

Also from a socio-cultural and touristic point, this week has offered quite a lot. Even after two weeks, the icebergs still have not lost much of their fascination. In the southern Melville Bay is an area that is referred to iceberg graveyard. In this area, due to wind and currents, icebergs ground on the seabed where they get stuck until they disintegrate and melt. Furthermore, the play-offs for the in-official Greenland offshore table-soccer championships have started. And although the scientists have put up a decent fight, in the end, they stand little chance against the hyper-trained teams from the crew. Another touristic highlight was when we crossed an area of sea ice where seals were basking in the sun. In the meantime the atmosphere on board is very good and we slowly survey and sample our way homeward in south-easterly direction.

On behalf of all scientists and crew on board, I send greeting back home from a brilliant Arctic summer,

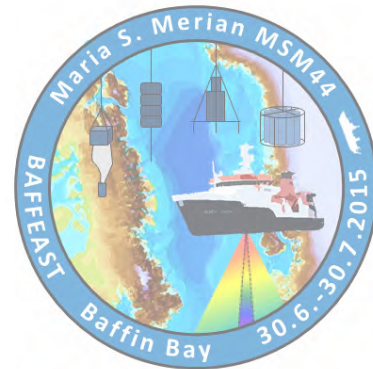
Boris Dorschel



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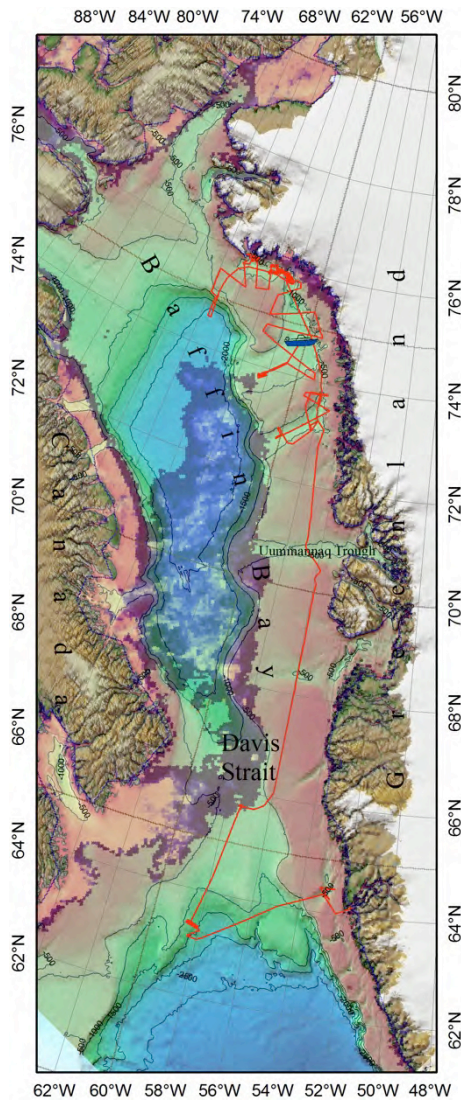
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3rd Weekly Report

Our third week on board of the RV MARIA S. MERIAN was characterised by detailed bathymetric surveying, sediment sampling and yet another turning point of the cruise. All teams on deck and in the labs work very smoothly together helping each other out if needs be. In addition to the amazing scenery of ice and rocks above the water, we now have very good picture of the at least as incredible landscapes under water.

In the northern Melville Bay, our second main working area, we performed detailed bathymetric surveys in the De Dødes and Sidebrinks Fjords. Thus, we gained the first-ever detailed image of this submerged glaciated landscape. In order to systematically map the seafloor, usually a series of parallel survey-lines is planned in a way that the outer parts of the multibeam echosounder swath overlap. This results in an area of seafloor fully covered by depth soundings. Under normal conditions, this is no challenge. Under ice conditions, this is a totally different kettle of fish. Icebergs forced us to divert from our envisaged tracks and the always-shifting ice floes required quite a spontaneous and creative track planning. But with support from the very helpful nautical officers on the bridge, in the end, we managed to produce a very nice map of the seafloor in the study area showing, as we had hoped, moraines and other glacial features that will allow us to reconstruct the history of the Northwest Greenland ice sheets since the last Glacial. Plotting our actual cruise track however, showed that we did not survey in nicely parallel lines. In fact, our track could rather be called spaghetti-like and I am sure that at least some of the nautical offices must



have smirked about our, never the less methodical, straying...

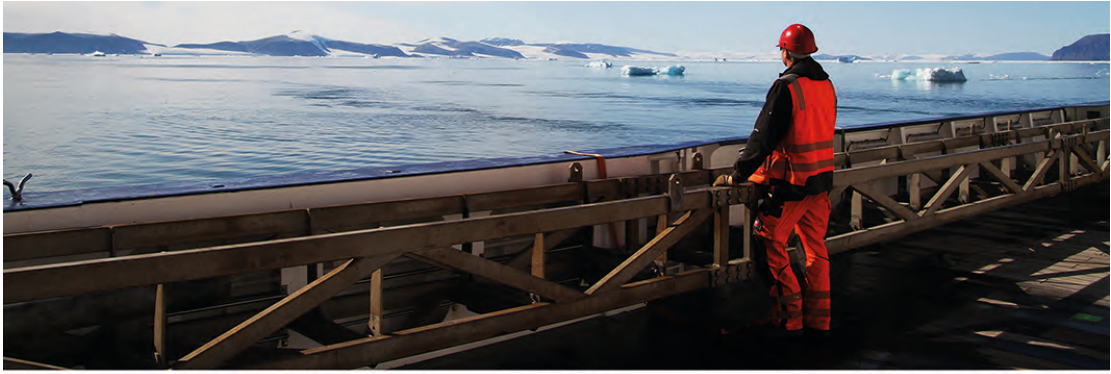
Once the moraines and other glacial features were mapped, we started our sampling programme. The aim was to hit sediments that allow for dating of the identified seafloor structures. But like the mapping, sampling is also a bit different in ice conditions. In addition to wind waves and currents, we have to watch out for icebergs and floes. In the end, the samples we managed to collect with the box and gravity corer mostly contained coarse gravel-sized material. It will be interesting to see if there is enough carbonate for dating among all these large rocks.

After four days, the work in the northwest Melville Bay was successfully concluded and we continued with a reconnaissance survey in the middle trough in the Melville Bay. By now, the trough has been crossed by several profiles. Another plankton sampling transect brought us, for the last time, all the way west to the ice edge in the central Baffin Bay. We were quite lucky that the ice edge was still within our reach. It is quite amazing to see on satellite images and in real time how fast the sea ice has retracted since the beginning of our expedition.

The big turning point of the cruise, mentioned earlier, was the '*Bergfest*' marking the middle of the cruise. In order to honour the day, a big BBQ on the working deck in Arctic sunshine replaced our normal dinner. It is hard to imagine that half of the expedition is already over. And although we are heading north at the moment, one may start thinking of the way home. Another highlight of the week was to see a piece of an iceberg break apart. The large remaining part slowly started to move up and down and to turn. This was an amazing sight that gave a feeling for the enormous masses of these icebergs.

On behalf of the scientists and crew I sent my regards from our last visit to the edge of the sea ice.

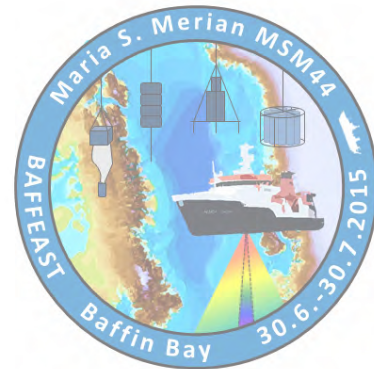
Boris Dorschel



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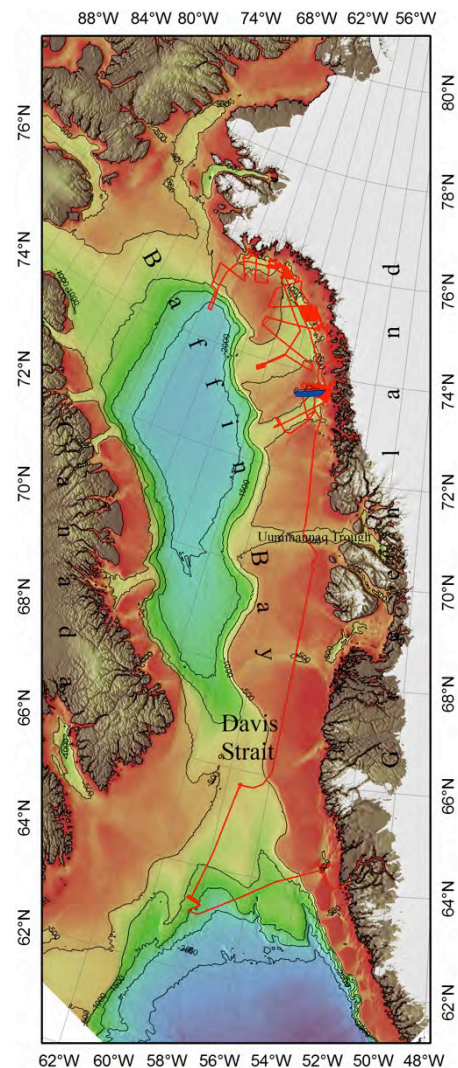
4th Weekly Report

By now, our fourth week on board of the RV MARIA S. MERIAN is almost over. Until the 27th we are still busy continuing watches, collecting gravity cores, sampling box cores and counting plankton. After this, there will be 3 days of transit until the pilot will pick us up on the 30th at 08:00.

On Sunday, we finished exploring the middle one of the three shelf-troughs in the Melville Bay. In order to get a comprehensive understanding of the movement of the glaciers in the area, we extended our search for glaciogenic seafloor features to the inshore areas of the large shelf-troughs and to troughs locally formed by in the seaward extension of glaciers. There, we did several detailed bathymetric surveys from the bottom of the troughs towards the shore.

The maps based on these data nicely show various glaciogenic landscapes in association with the underlying geology. In the middle shelf-trough for example, glaciers have carved out faults and folds by removing softer rocks leaving the harder rocks to stick out. This has created a relief that gives us a glimpse of the geology at the seafloor. Later at home, it will be very interesting to compare the seafloor structures to those nearby on land. In addition to the tectonic elements, we have found glaciogenic features in this area, which we mapped to understand the local ice movements.

To gain additional, more inshore information on the past movements of glaciers, we mapped out several troughs these glaciers have formed, which we crossed during the transfer from the middle to the southern shelf-trough in the Melville Bay. We followed the glacier



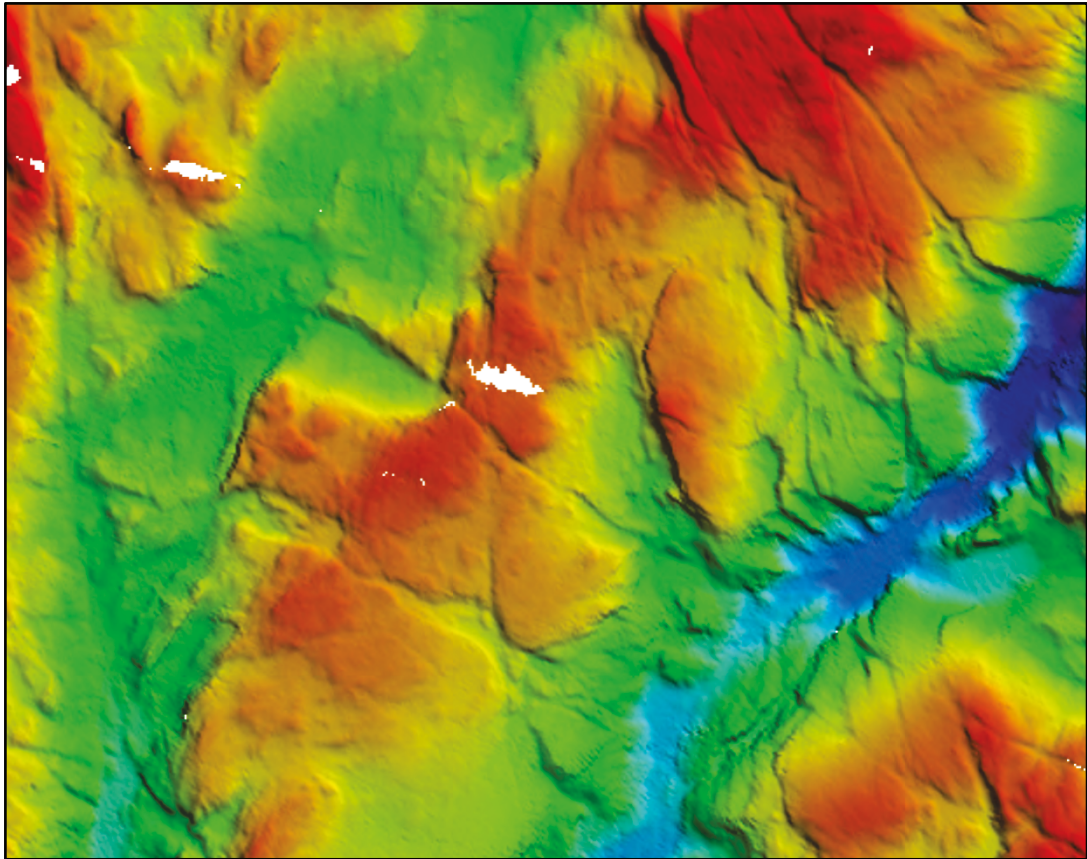
related troughs towards the coast as far as sea ice and icebergs allowed. While doing so, sediments were sampled wherever the seafloor was suitable. In this way sediments from interesting sites were sampled for potential high-resolution palaeo-climatic studies for the Holocene.

By now, detailed bathymetric surveys are completed for the southern shelf-trough of. In this area, again, nice glaciogenic seafloor features were found overprinting the exposed geological structures. And the geologists on board have found promising sampling targets.

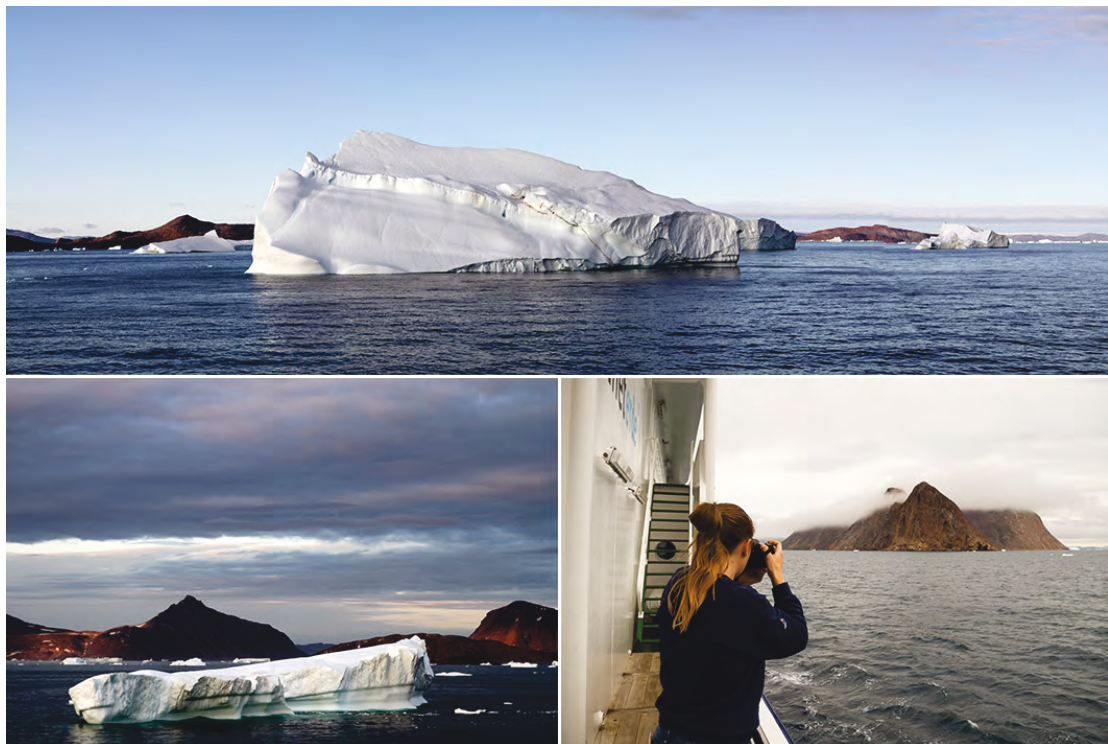
After almost four weeks now, work on board is very routine and one may get the feeling that we have never done anything but mapping the seafloor, determining sampling sites, recovering sediment cores, sampling the water column and counting plankton. But I am confident that at least some of us would like to continue this life for a while. After all, it is impressions, like the ship moving between icebergs with the Greenland ice sheet in sight, which create priceless memories. Never the less, on Monday, she will turn her bow south starting the transit to Nuuk. With our working programme almost completed, the last things to do will be to clean the labs and back-up and store data and samples.

On behalf of the scientists and crew I sent my regards from the southern Melville Bay.

Boris Dorschel



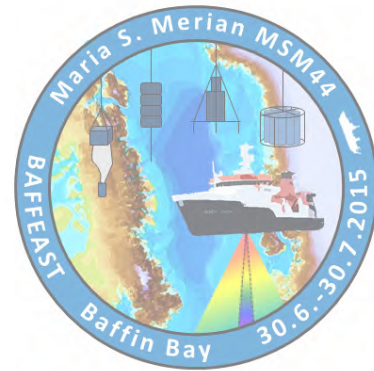
First impressions of a newly mapped area of seafloor in the Melville Bay. To the right, the blue colours show the start canyon extending towards the coast.



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5th and last Weekly Report

With a last successful coring station on Monday morning, the scientific programme was completed and the MARIA S. MERIAN started her transit to Nuuk. Three days later, she was anchored in the roadstead. So all that remains is to sum up and bring everything together...

When we reached Nuuk, we had travelled almost 4800 nautical miles or 8900 km and had crossed almost 13 latitudes while continuously recording bathymetric and sedimentological data. Furthermore, scientific equipment was deployed at 48 stations to sample plankton, water and sediment.

All this was only possible due to the cooperation between the ship and the scientists. For this reason, at this point, I would like to say a big 'THANK YOU!' to captain Maaß and his crew for the really excellent cooperation. And I am certain that many members of the scientific party look forward to future expeditions on the MARIA S. MERIAN.

On behalf of scientists and crew, I send, for the last time, many greetings back home and say goodbye from Nuuk.

Boris Dorschel

