No 07

GLANAM Newsletter

Dear readers,

we are over two years in the GLANAM project now and the first results of the fellow's investigations are slowly and finally coming out. Many of us are participating to conferences and meetings – a taster for the next couple of months is in the Communications section below. We hope to meet you there.

On behalf of all the members of GLANAM I would like to congratulate Amandine Auriac

Our lovely Post-doc has completed her period in GLANAM and she is moving on towards new horizons.

Amandine was project fellow 13, dealing with modelling the long-term evolution of glaciated passive margins. She worked under the supervision of Mike Bentley and Pippa Whitehouse (University of Durham); Karin Andreassen (University of Tromsø); Berit Hjelstuen and Haflidi Haflidason (University of Bergen).
She is currently looking for another research position while completing multiple papers for the GLANAM project. Good luck Amandine!

In this issue of the newsletter we are going to present some practical experiences that our fellows have had in the past months.
Benjamin had to deal with media, Katrien with an expedition to Hyperborea and Katharina with the dynamic environment at GEOTEK.
Have a good read.

Riccardo Arosio

Communications

- **Kasper Weilbach** and **Riccardo Arosio** will participate to the BRITICE-CHRONO meeting in Buxton, UK, to be held 9th-10th November 2015. Kasper is going to present a poster with the title: "Initial Results and Interpretations of Sub-Bottom Profiler data collected on the BRITICE-CHRONO JC-106 cruise 2014."

- **Benjamin Bellwald** will participate to the 7th International Symposium on Submarine Mass Movements and Their Consequences (SMMTC), 1-4 November, Wellington, NZ. The title of his talk is: "Postglacial Mass Failures in the Inner Hardangerfjorden System, Western Norway."

- **Lukas Becker** is going to participate to AGU 2015 in December. The title of his poster is: "Ocean - ice sheet interaction along the NW European margin during the last glacial phases."

this issue:

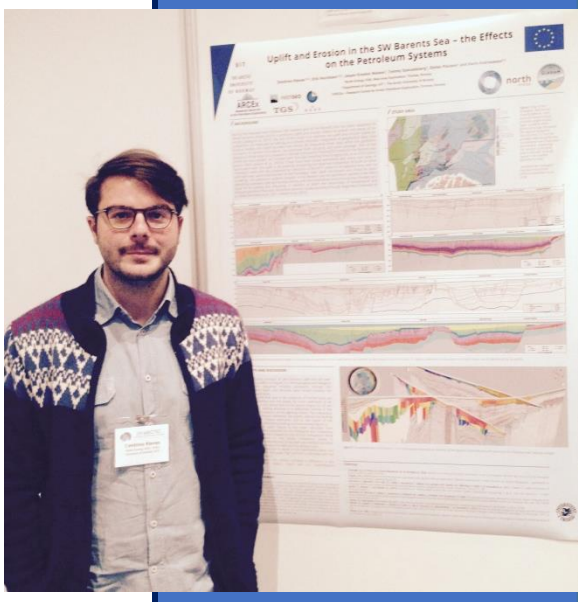
GLANAM around Europe

3P Arctic Conference & Exhibition – Dimitrios Ktenas

Dimitrios Ktenas participated to the 3PArctic Conference & Exhibition in Stavanger, Norway, 29th September – 2nd October 2015 . The conference was organized by the American Association of Petroleum Geologists (AAPG) and the title of his Poster presentation was Uplift and Erosion in the SW Barents Sea – the Effects on the Petroleum Systems. Erik Henriksen, exploration manager of North Energy and faculty member of GLANAM, was part of the conference committee and chairman of the session Barents Sea, Kara Sea & Northern West Siberia.

The 3P technical program consisted 18 sessions containing 120 oral presentations and more than 100 Poster presentations covering all the aspects of geology and geophysics of the Arctic sedimentary basins.

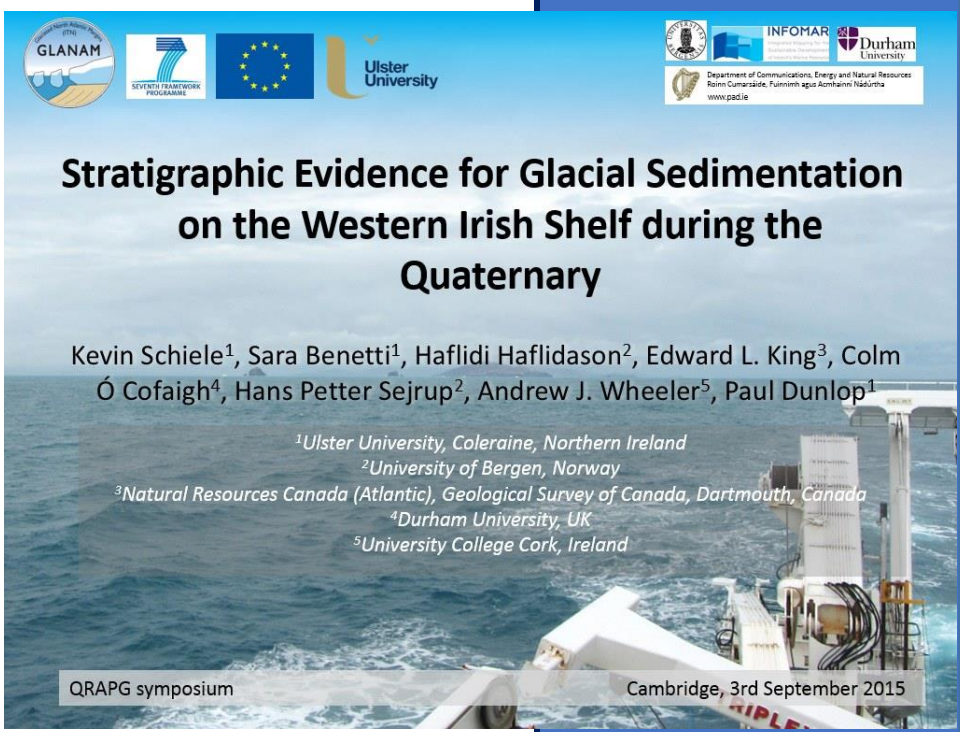
''The 3P Arctic Conference & Exhibition was a great opportunity for me to present my work, and I received very good feedback and comments from other experienced geoscientists coming from the petroleum industry'' Dimitrios said.



Ktenas, D., et al., (2015). Uplift and Erosion in the SW Barents Sea – the Effects on the Petroleum Systems. AAPG 3P Arctic 2015 – The Polar Petroleum Potential Conference & Exhibition, Stavanger, 29 September-2 October 2015, p. 26-27

QRA PG Symposium – Kevin Schiele

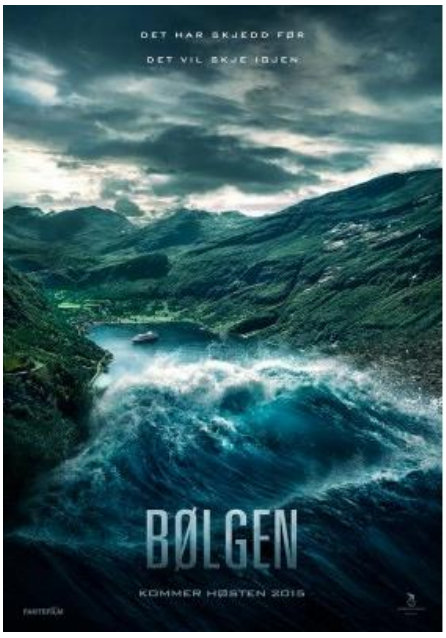
This year's QRA Postgraduate Symposium was held at the University of Cambridge, UK, from September 2nd to 4th. The QRAPGs address the academic community, especially post graduates and provide a platform for presenting any kind of Quaternary research ranging from the disciplines of ocean circulation and palaeoglaciology to terrestrial palaeoclimate reconstructions. The three day event started off with a guided tour of the British Antarctic Survey (BAS) which is also based in Cambridge. Scientists of different working groups at BAS walked us through the ice core laboratories, the aquarium, the vast collection of fossils and some typical rocks from Antarctica; and gave us an impression of the past and present efforts in mapping Antarctica's geosphere, cryosphere and biosphere. After a truly interesting insight into Antarctic research we checked in at Trinity College. The day ended well, with the group enjoying the atmosphere of the Sedgwick Museum of Earth Science and Cambridge's history in geological research while getting to know each other over some drinks and nibbles. The main conference started the next day at the Scott Polar Research Institute and the following two days were packed with presentations and poster sessions. As the local organisational committee had aimed to provide a relaxed and friendly environment for newcomers giving their first presentation the audience was predominantly made up of post graduates. Nevertheless, on occasion senior scientist sneaked in and attended a talk or two that related to their specific research interests.



This meant that some of us could get valuable additional constructive feedback on our research during coffee breaks and after the sessions. All in all it has been an interesting and well managed conference allowing post graduates to expand our international network and to also get valuable feedback on our research from scientists at different stages in their career. I would like to say a big thank you again to the local organisational committee at the University of Cambridge for all the effort they have put into this conference, and not to be forgotten, for feeding us so well during various coffee breaks, the icebreaker and the impressive conference dinner where they managed to have all the 40ish participants seated around one single giant oval table.

Geohazards in fjords: About outreach, state of knowledge and collaboration

Some months after Hollywood showed "San Andreas", Norway celebrated the premiere of its first natural disaster movie, Bølgen,"The Wave". The movie is about an unstable fjord flank in the scenic Geirangerfjorden, belonging to the UNESCO natural world heritage. One summer night, the rock masses collapse and trigger a large tsunami, which floods the coastlines of the narrow fjord. The fact that the movie has been shown in Norwegian cinemas since last August exciting thousands of Norwegians and earning rather good reviews proves that public attention is generally guaranteed producing this kind of movies.



Source: http://moviehooker.com/wp-content/uploads/2015/07/bolgen.jpg

As disaster movies tend to exaggerate and show worst-case scenarios, I was invited to give a series of talks about geohazards and tsunamis in Western Norway and interviewed by a journalist about the state of research. Norwegians are known to be rather modest, still the producers of Bølgen decided to go for the full-scale disaster, a scenario which is actually not so unrealistic in this part of the world. The audience I was informing about geohazards in Western Norway varied from well-informed geologists to laymen in the field of earth science. I was impressed by the degree in which these people are interested in geology, and overwhelmed about the thankfulness of the audience. Therefore, I think no scientist should underestimate the power of outreach, and if there is a chance such as Bølgen coming, you should ride it, aiming to communicate your science to a broad public. Collaborating with several industrial partners, I have likewise the impression that, beside society, also industry is highly interested in submarine geohazards, which are often linked to glacier-related processes. Another aspect that I appreciate about geohazards is its interdisciplinarity: in the example of Bølgen, engineering geologist, landslide modellers, geotechnologists, marine geologists and tsunami modellers are all highly involved in the risk assessment.

I congratulate and thank the producers for a well-done Bølgen; they made it easier for me to communicate the science I do. But what could the producers of Bølgen learn from GLANAM? One of GLANAM's objectives is "to identify the controlling factors and the role of submarine mass movements (with resulting tsunamis) on the glaciated North Atlantic margin" (objective No.5). So what is the state of research in the project at the moment? From Hardangerfjorden we know now that 19 submarine mass movements, involving up to 0.3 km3 of sediment and resulting in up to 14 m thick mass transport deposits, have occurred in the last 11000 years. Most of these postglacial mass movements might also have resulted in several 10s of metre high tsunami waves. Earthquakes linked to glacioisostatic readjustment have been suggested for mass failures in the Early Holocene. The well-known Storegga Slide tsunami, offshore Norway, has also been detected in Hardangerfjorden. In the late Holocene, four mass transport deposits, probably caused by earthquakes, climate and rockfalls, have been identified in Hardangerfjorden.

I am currently working on a compilation and review about postglacial mass failures in Norwegian fjords. I know from previous meetings and presentations that a lot of research has already been done or will be done in upcoming months in other "GLANAM-fjords" as well (Greenland, Svalbard, Scotland). Therefore, I think it would be very beneficial if we could strengthen our collaboration and significantly improve our knowledge about geohazards in fjords. In Bølgen, the characters had 10 minutes to evacuate the area after the rockfall release, in GLANAM we still have about a year to work together and contribute to objective No.5.

Benjamin Bellwald

Katrien on the Petermann expedition

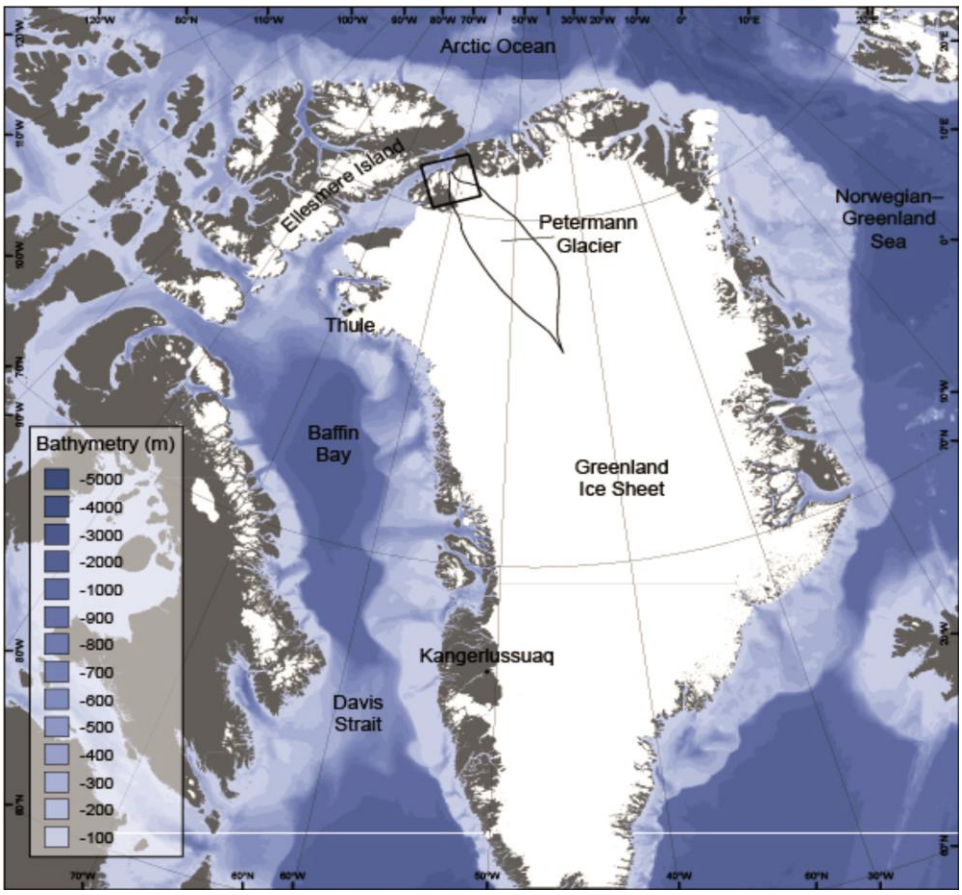


Figure 1: Location of Petermann Glacier and Fjord. Bathymetry from IBCAO v3 (*Jakobsson et al., 2012*). Petermann Glacier catchment from S. Bevan, Swansea University. Box shows extent of Figure 2.

Within GLANAM we study the impact and behaviour of ice on our environment. We all investigate past glacier and/or ice sheet growth and decay, mostly during time frames way beyond historic records. This summer I had the unique opportunity to be involved in a large international research expedition studying the behaviour of one specific Greenlandic glacier, Petermann glacier; not just its past geological behaviour, but also its recent past and modern behaviour. During six weeks (from the 29th of July until the 2nd of September 2015) I sailed with about 80 people on the Swedish ice breaker Oden within the framework of the international US-Swedish funded Petermann Expedition studying the Petermann Glacier and Fjord located in northern Greenland (Figure 1).

Petermann Glacier is one of the largest glaciers of the Greenland ice sheet, and yet, relatively little is known about it or the surrounding area. Petermann Fjord lies in an ice-choked and remote corner of northern Greenland, it is difficult to access by ship, even in the relatively benign summer months (Figure 1). Petermann Glacier is vast; it drains more than 4% of the total ice sheet. Once the glacier hits Petermann Fjord, the ice begins to float, forming an ice tongue which currently covers an area of 900 km^2. This ice shelf has changed drastically in the last 5 years. One-quarter of the floating ice shelf, about 251 square kilometres, broke off in August 2010 and half of the size of the ice island that calved off Petermann in 2010, tore off in July 2012 (Figure 2) (*Falkner et al., 2011; Johannessen et al., 2013*). These twin calving events resulted in a glacier retreat of 35 km, the most retreated position since the area was first surveyed in 1875 (*Münchow et al., 2014*).

Petermann Glacier is a scientist's treasure trove. It is a system of ice and sea that is responding radically to yet unidentified changes. It is measurable from top to bottom, from the ice to the seafloor. This holistic approach is what made this expedition so unique. A large, multidisciplinary team from both Europe and the US using a wide variety of techniques ranging from modern oceanography to ice cores to sediment cores to reflection seismics to cosmogenic dating of boulders, … collected all kinds of data to produce an understanding that will allow them to make more accurate predictions about responses to changes in the ocean and atmosphere. I was part of the Danish reflection seismics team. We collected almost 800 km of multichannel airgun data both in the Petermann Fjord, Hall Basin and Nares Strait

During six weeks the Oden was my home away from home (Figure 3). The Oden is the pride of the Swedish ice-breaking fleet and also one of world's most capable polar-class research vessels. From the outside it is not the most elegant looking ships. Some people say it looks like a Volvo from the 1980s, but it is comfortable, well-equipped and the two saunas, gym, movie theatre and bar make life on board very pleasant. The force of this ship was impressing, ploughing through metre thick slabs of ice as if they were butter. I spent hours just standing on the bow of the ship watching the ice splinter beneath my feet.

Greenland is majestic. It is one of the few places on Earth where you truly feel small and insignificant surrounded by the ice, mountains and ocean. Unfortunately the Nares Strait waters are not so productive, so there was not that much wildlife. However, one night we had a visitor which came actually a bit too close for comfort (Figure 6). The vastness of the landscape is almost impossible to capture. I was also completely thrown off by the eternal light. Spending six weeks around 82°N in August, meant not seeing any darkness for six weeks, but also not seeing any other colours then black, blue, brown and white. Observing the first sunset in weeks around the end of the cruise finally brought some diversity in the colour palette of my surroundings (Figure 5).

While on board, several of the scientists, including me, wrote down snapshots of our big adventure. You can read them on the Petermann blog:

https://petermannsglacialhistory.wordpress.com

Katrien An Heirman

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Figure 2: Before and after satellite images from the 2010 and 2012 calving events of the floating Petermann ice shelf (photos NASA)

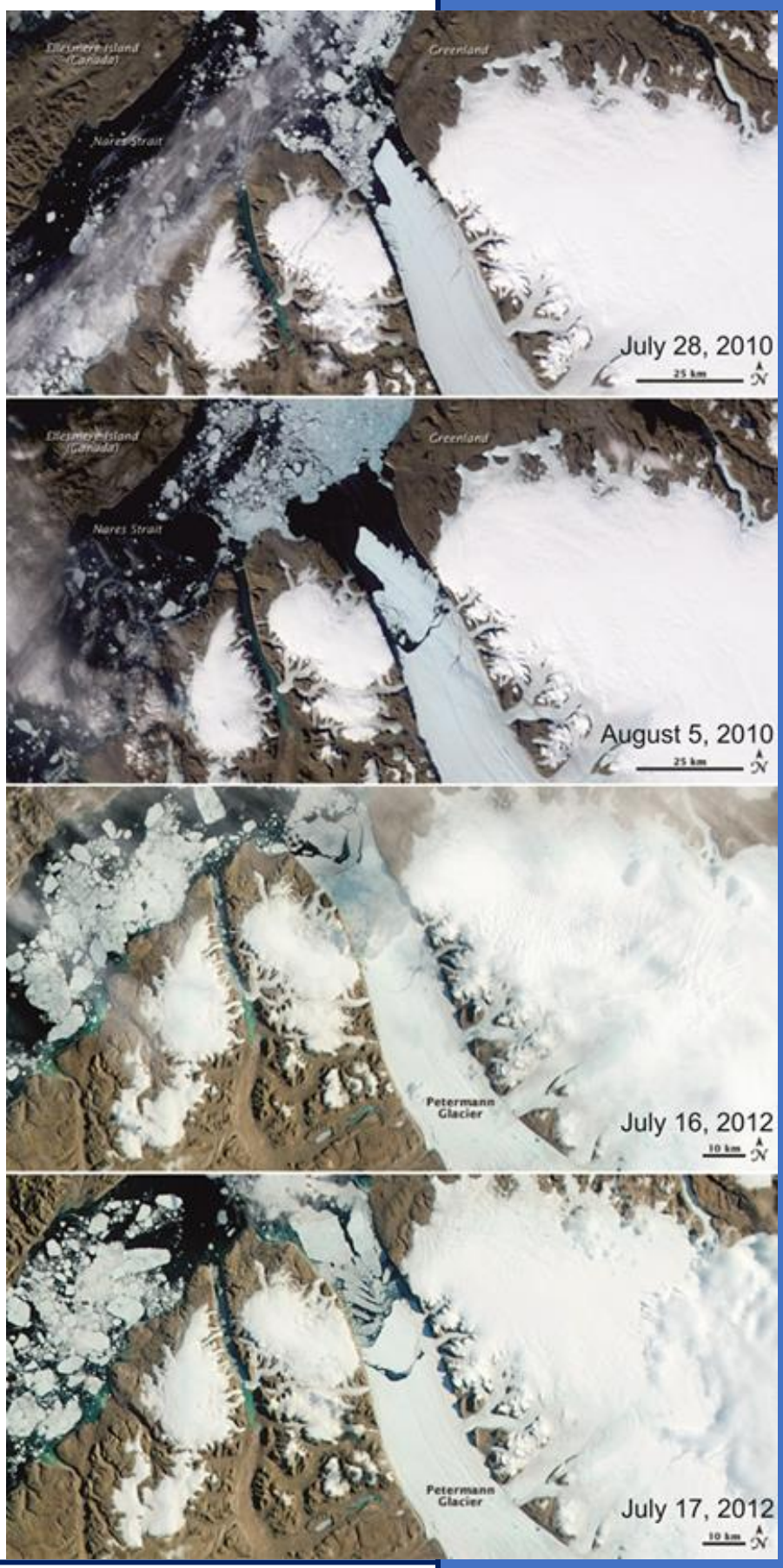

Figure 3: A helicopter perspective of the Oden at the transition of Petermann Fjord into Hall Basin. (photo by Martin Jakobsson)

Figure 5: The first sunset over Hall Basin after weeks of eternal light.

Figure 6: A polar bear visit which was a bit too close for comfort. (photo by Markus Karasti)

Visit to the industry - an adventure in the wonderland of geological logging

The sediment cores I work with during my PhD let me get a glimpse of a different kind of industry this summer. Sediment cores (essentially plastic tubes filled with soft seafloor sediments) can be analysed by a range of techniques, depending on their origin and the research objectives. In order to understand more of the glaciers I study, the kind of material deposited and by which processes it was brought there. The most obvious technique to investigate the type of sediment is core logging, which is done by splitting the core tubes in half and describing the sediments you see. However, as this method is restricted to the uppermost surface of the sediments, another core logging technique, commonly used in tandem with the visual description, is the analysis of x-ray imagery, which allows us to identify and distinguish structures and changes throughout the entire core. As we do not have an x-ray machine at University of Durham yet, I had the opportunity to travel to Daventry in Northamptonshire in July, to x-ray my cores at GEOTEK, a company with about 20 employers, which specialises in the development and distribution of high-resolution core logging devices. They are usually hired by the big companies to analyse their cores for a variety of purposes, so the equipment available at GEOTEK is not only of supreme quality but covers almost anything a geologist can dream of. Therefore, despite the fact that Daventry itself does not have much to offer (it does not even have its own train station!), the time at GEOTEK was very inspiring. Firstly, it was a lot of fun to handle big machinery like the core scanner taking the x-rays and to be able to learn how to use it properly. Secondly, it was very exciting to see the high quality data the GEOTEK equipment provides and what kind of methods there are to get the most out of your cores. Although some people may wonder about the relevance of x-raying or CT-ing mud, to me the possibility to see shells, (fossilised) worm feeding tubes and tiny, tiny lamination indicating sediment changes (Figure 7) in that much detail is seriously cool! The possibility to spend some time away from academia and to understand how the industry works was also a nice change. It was so refreshing to go to work and have colleagues that are engineers, designers, planners etc. The guy working next to me was taking apart and rebuilding computers, the one in the next room driving around with a forklift! In a PhD environment this diversity is somehow suppressed, as the division into departments groups together those with a similar background. Last, but not least, the helpfulness and passion of the two people "supervising" me is something I have not experienced often. Even though they were busy with their own work, they always had time to explain something, to check for faults in the machine and even to look at interesting finds in the sediment cores, which they got just as excited about as me. Although the most exciting thing was of course the cute little village pub they took me to on my last evening ☺

All jokes aside, I could never see myself working in the industry. Nevertheless, I really appreciated the opportunity to visit a company like GEOTEK because it showed me that there are very different ways of working in the industry and that it is not necessarily confined to spending your life on an oil rig. So who knows, maybe one day it will be an alternative for me as well…

References: www.geotek.co.uk

Katharina Streuff

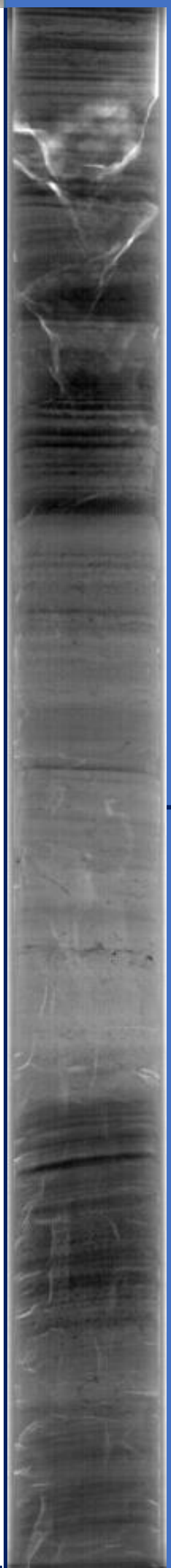

Figure 7: Examples of x-ray images obtained from sediment cores showing fine lamination due to density changes.

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