

Nordqua excursion 2018, 5-7 October

The 2018 NORDQUA Excursion was held in Denmark from 5th to 7th of October. The excursion was led by professor Anders Shomacker from UiT The Arctic University of Norway, Tromsø, and professor Nicolaj Krogh Larsen from University of Aarhus. Thirty-three participants; a mix of professors, emeriti, people from the industry and PhD-students, attended from Denmark, Iceland, Sweden and Norway. The excursion leaders guided us through a large part of Denmark. We explored numerous coastal sections with exposures of Holocene and Quaternary sediments, interesting glacial landforms and we expanded the Quaternary focus a bit and inspected the Eocene Fur Formation consisting of tephtras and diatomite. The latter has been greatly affected by glacial deformation during the Quaternary, resulting in beautiful glacial tectonics. We were encouraged to download hill shade digital elevation models (DEM) and geomorphological maps of Denmark on our devices (bad news for the none-smartphone-people), which could be viewed 'on the go' on board the bus. This was extremely useful and improved the understanding of the landscape!



Excursion guides, Nicolaj Krogh Larsen and Anders Schomacker.

On our first day, we made our way from Kastrup airport to the island of Møn and visited the coastal sections at Hvideklint. Late Weichselian deposits were studied, where we could see evidence of ice advances both from the north-east and from the south with lacustrine sediments from Bølling and Allerød between. The next stop was at Tøvelde, a little further east of Hvideklint, where we had a look at a Late Glacial section exposing an Allerød – Younger Dryas – Holocene sequence. At stop 2 we also enjoyed a classic Danish lunch, served outside, consisting of rye bread, 'rundstykker' (buns) with a various selection of cold cuts and cheese.



Tøvelde. Jan Mangerud and Svend Funder in action, clearing up lacustrine sediments from Bølling and Allerød.

Thereafter, we drove southwards across the islands of Falster and Lolland and did some 'bus geology' on the way to Langeland. We crossed subglacial till plains (on Lolland), and observed the streamlined features on the DEM. The landforms have NW-SE orientation, indicating ice flow from the SE during the Bælthav (re-)advance, 18-17 ka BP. The ferry (Tårs – Spodsbjerg) took us to Langeland, where dead-ice landscape is prominent with numerous dislocated kames. The dislocated kames occur in two north-south trending zones/bands parallel to the long-axis of Langeland. We stopped at a gravel pit that was dug into one of these features and investigated the sediments. We finished the first day with a little hike to the top of one of the hills, from where we had a good view of hilly landscape of dislocated kames in the late afternoon sun. The term 'dislocated kame' was heavily discussed by the participants, and not everyone was convinced that the hills had been dislocated. As we could not visit the site of Ristinge Klint due to contamination of biological character, we went to our hotel for the night in Rudkøbing. There, we enjoyed a lovely dinner with lots of networking and discussions about the sites we had experienced during the day and got a nice lecture from Joakim Korshøj about GEO.



Esther Ruth Guðmundsdóttir on the ferry from Tårs on Lolland to Spodsbjerg on Langeland.



Overview of the dislocated kames from top of one of them.

The second day, we started by driving across the islands of Tåsinge and Fyn all the way to Trelde Næs located at the southern coast of the mouth of Vejle Fjord in Jylland. The high tide was challenging our investigations, but all the participants made it down to the beach. At Trelde Næs new interglacial sequence has been described based on pollen, plant macrofossil and charcoal record. The most striking deposit at that site was some very black and compressed/consolidated? gyttja with high minerogenic content – several of us were a bit puzzled by this. After a couple of hours, we jumped back on the bus and drove to north-western Jylland to Knud Strand on the southern coast of Limfjorden. Knud Strand is one the most complete glacial-interglacial succession in Denmark with deposits from three glacial and interglacials. Glaciotectonics have led to the repetition of the succession along the beach.



Knud Strand, Limfjorden

The last island of the day was Fur, located in Limfjorden. After a short bus ride and a (very) short ferry ride, we drove to the 'Moler-museum', where we had 20 minutes to investigate the many beautiful fossils found in the Fur Formation. The last stop of the day was on the northern coast of Fur, where impressive coastal sections with glaciotectionized tephra and diatomites could be seen. The Fur Formation originates from the opening of the North Atlantic, 55-56 Ma. As soon as we reached the beach below the sections, all of us went treasure hunting for fossils and tephra. Lots of rocks were crushed and a few lucky ones found a small souvenir to bring home. It was also tested, if the light-coloured diatomite could float – it was true. Our hotel for the night was in Viborg. We reached the hotel at 19:15 and after a very quick check-in the dinner was enjoyed.



Glaciotectonized tephra and diatomite from the Fur formation

The last day, we drove to Hald Sø at the Main Stationary Line, where the Last Glacial Maximum reached. It was a sunny and warm autumn day. We looked at tunnel valleys formed underneath the ice-sheet and the flat outwash plains outside it. A section in a new gravel pit showed a very good example of braided river deposits. We drove to Aarhus where we enjoyed our packed lunches at the harbour. Some people jumped off the bus in Århus, but the ferry took the rest of us back to Sjælland and ended the trip by looking at impressive end moraines from the Bælthav advance before driving back to Kastrup.



Hald Sø, looking at tunnel valley associated with the main stationary line



Participants of the 2018 NORDQUA Excursion in Denmark, at the Main Stationary Line in Jylland.

Thank you all for a very good excursion, showing us all the interesting Quaternary geology Denmark has to offer!

Lis Allaart and Nína Aradóttir