ACDC
- Advanced Climate Dynamic Courses

Advanced Climate Dynamics Course – ACDC2014

August 15th – 30th, 2014

Disko Island, Greenland

Dynamics of the Greenland Ice Sheet

We thank the Norwegian Centre for International Cooperation in Higher Education (SIU), the Norwegian Research School in Climate Dynamics, the Bjerknes Centre for Climate Research, the University of Bergen, Massachusetts Institute of Technology (MIT) and the University of Washington for supporting this summer school.

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Advanced Climate Dynamics Course (ACDC2014)
Disko Island, Greenland, 15th – 30th August, 2013

Dear participants!

Welcome to the Advanced Climate Dynamics Course (ACDC2014) on Disko Island!

The summer school is the sixth summer school organized jointly by the Bjerknes Centre for Climate Research in collaboration with North American Universities.

The main focus will be on understanding the dynamics of the Greenland Ice Sheet, based on theory, models, observations, and proxy data. This will be achieved through a mixture of fundamental and advanced lectures together with student presentations and discussions.

This year the school is based on Disko Island, providing a unique location for field excursions and sightseeing.

We hope that you will enjoy your stay, and have a stimulating, fun and interesting summer school!

Sincerely,
Kerim Nisancioglu (University of Bergen)

On behalf of the organizing committee:
David Battisti, Tore Furevik, Patrick Heimbach, and Jake Gebbie.

Disko Island

Disko Island is the second largest island on Greenland, after the main island. It is also the 100th biggest island in the world. It is located approximately 100 km off the western coast of mainland Greenland, north of the Arctic Circle. The port of Qeqertarsuaq (formerly known as Godhavn) lies on the southern coast.

The first recorded visit to the island was done by Eric the Red some time between 982 and 985. The island is assumed to have been used as a base for summer hunting and fishing by Viking colonists after Eric the Red's visit.

The population of the island is steadily decreasing, and at the latest census the population totalled 845 people (2013), which is centred in Qeqertarsuaq and in a smaller village, Kangerluk (less than 50 people). The highest point on the island is 1919 m.a.s.l.

Source: Wikipedia

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SUMMER SCHOOL PROGRAMME

Friday 15th of August

Most participants will arrive on flight NY 439 from Reykjavik to Ilulissat Airport at 12:30 PM. The hotels will organize the transport from the airport to the center of Ilulissat, where the participants will stay for the first weekend.

Contact acdc@uib.no for details on transportation arrangements.

Saturday 16th of August

A group of 10 students will participate in field work on-board R/V Porsild with departure from Ilulissat early in the morning to do measurements in Disko bay, returning to Ilulissat in the afternoon.

Sunday 17th of August

Another group of 10 students will participate in field work on-board R/V Porsild starting from Ilulissat early in the morning, and continuing to Qeqetarsuaq with arrival in the afternoon/evening.

The rest of the group not on Porsild will take a Disko Line ferry from Ilulissat to Qeqertarsuaq with departure at 7AM,. The ferry crossing will take about four and a half hours.

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GENERAL INFO:

Each day will start with summaries of the previous days lectures prepared by groups of students. This ensures that the main topics are understood and give the opportunity to pick up on any unanswered questions/topics.

In the first week we will also have time slots for short presentations by each student, where you can show a few slides (10 minutes and maximum 8 slides) describing your PhD work or current research topic.

Part of the time during the last two days of the summer school will be used to prepare a written summary/discussion of the main findings/conclusions of the summer school. This will later be submitted to an appropriate journal by the students.

You can find all the daily summaries and the final submitted paper from previous summer schools on the ACDC www site.

First week:

	Monday 18th	Tuesday 19th	Wednesday 20th	Thursday 21st	Friday 22nd	Saturday 23rd
Morning	Core	Core	Core	Core	Core	Field
Afternoon	Core	Core	Groups	Core	Intro to field	Field

Second week:

	Sunday 24th	Monday 25th	Tuesday 26th	Wednesday 27th	Thursday 28th	Friday 29th
Morning	Field	Topical	Topical	Topical	Topical	Discussion
Afternoon	Field	Topical	Topical	Topical	Topical	Summary

Security:

Please be aware that each participant is responsible for bring appropriate personal gear for hiking and camping (see ACDC www site). Each day we will have sign up sheets where you are required to note your destination and estimated return when out hiking. Remember to always bring a partner and emergency gear.

18th – 22nd August: *Fundamental lectures on core topics*

2 x 45 min lectures with 30 min for coffee break, questions and discussion.

Monday 18th of August (day 1)

8:30-9:30: Breakfast (and preparation of packed lunch)

10:00-11:00: **Opening of summer school, presentation of program, as well as introduction of students and lecturers – Kerim H. Nisancioglu (University of Bergen)**

11:00-13:00: Core Lecture 1

Core Lecture – "Short intro to the problem"
Kerim/Fiamma/Patrick

- State of the Greenland and Antarctic ice sheets – observations of rapid changes
- How old is the Greenland ice sheet? Why is there ice on Greenland today?
- Introduction of student projects

13:00-16:00: Lunch and free time

16:00-18:00: Core Lecture 2

Core Lecture: - "Introduction to ice sheet physics"
Richard Hindmarsh (British Antarctic Survey)

- Ice sheets, Ice streams, and ice shelves in the climate system – Basic concepts
- Greenland – a phenomenological primer

19:00: Dinner

Tuesday 19th of August (day 2)

7:30-8:30: Breakfast

9:00-10:00: **Short summaries of previous days lectures by students**

10:00-10:15: Coffee break

10:15-12:15: Core Lecture 3

Core Lecture: - "Ice/Ocean exchanges at the margins of marine terminating glaciers"
Fiamma Straneo (WHOI)

- Submarine melting
- Ice/ocean boundary layer dynamics (ocean side)
- Freshwater export into the ocean

12:15-15:00: Lunch and free time

15:00-17:00: Core Lecture 4

Core Lecture – "Introduction to glaciology – from ice sheets to glaciers"
Andreas Vieli (University of Zürich)

- Introduction to marine terminating glaciers
- Dynamics of tidewater glaciers versus glaciers with floating tongues
- The ice-margin/ocean boundary – dynamical view (from the ice)
- Sub-glacial hydrology, channels and sliding
- Calving physics, ice melange

17:00-18:00: **Short research presentations by summer school students (5 x 10min)**

19:00: Dinner

Wednesday 20th of August (day 3)

7:30-8:30: Breakfast

9:00-10:00: **Short summaries of previous days lectures by students**

10:00-12:00: Core Lecture 5

Core Lecture – "Intro to proxies and reconstructions of past changes in ocean and ice"
Camilla Snowman Andresen (GEUS)

- Paleoceanography – proxy archives from fjord sediments, water mass properties and ice calving
- Paleo reconstruction of outlet glacier positions
- Rapid outlet glacier retreat – evidence from episodes during the Last Deglaciation

12:00-15:00: Lunch and free time

15:00-17:00: Project work

"Suggested project topics"

- Analysing sediment cores (Camilla)
- Analysing hydrographic data (Fiamma)
- Ice flow modelling (Andreas)
- ISSM modelling (Helene)
- Radar glaciology (Richard)
- Outreach project (Kerim/Iselin)

17:00-18:00: **Short research presentations by summer school students (5 x 10min)**

19:00: Dinner

Thursday 21st of August (day 4)

7:30-8:30: Breakfast

9:00-10:00: **Short summaries of previous days lecture by students**

10:00-12:00: Core lecture 6

Core lecture - "Ice sheet modelling – a primer"
Helene Seroussi (NASA JPL)

- The observational record
- Equations for ice flow
- Dynamics and modelling of ice shelves and ice streams

12:00-15:00: Lunch and free time

15:00-17:00: Core lecture 7

Core lecture - "Introduction to large-scale North Atlantic/ Subpolar gyre circulation"
Tore Furevik (University of Bergen)

- The North Atlantic, subpolar gyre, and Arctic Ocean – an overview
- North Atlantic ocean circulation – from subtropics to subpolar
- Connections to models of coupled atmospheric – oceanic variability

17:00-18:00: **Short research presentations by summer school students (5 x 10min)**

19:00: Dinner

Friday 22nd of August (day 5)

7:30-8:30: Breakfast

9:00-10:00: **Short summaries of previous days lectures by students**

10:00-12:00: Core Lecture 8

Core Lecture – "North Atlantic atmospheric variability and the Greenland ice sheet"
David Battsiti (University of Washington)

- Atmospheric dynamics, jets, storm tracks
- Where does Greenland moisture come from?
- Low-high latitude teleconnections

12:00-15:00: Lunch and free time

15:00-17:00: Intro to field

"Intro to glacial morphology and the field trip"
Øyvind Paasche (University of Bergen)

- Terrestrial archives of glacier variability
- Reading the landscape (geomorphology)

17:00-18:00: **Short research presentations by summer school students (5 x 10min)**

19:00: Dinner

End of core lectures

Saturday and Sunday: Overnight hiking trip to Blæsedalen

Saturday 23rd of August (day 6):

7:30-8:30: Breakfast

Overnight hiking trip to Blæsedalen

We will leave Saturday morning 09:00 for an overnight trip to Blæsedalen. All gear and equipment must be packed and ready prior to breakfast. We will hike up-valley where we will strike a camp. We will explore the area around camp the first and the following day before returning

During this trip we will do some basic mapping of quaternary deposits and landforms that can teach us about past glacier and ice sheet activity. We will during our stay in Blæsedalen also visit one of the local glaciers and its foreland.

Please prepare lunch for the first day (including coffee or the and water). Make sure to bring everything you need for a night in a tent (sleeping bag/ + sunglasses, hat, and sunscreen, and wear layered clothing.

We will be back at the field station late Sunday (around 09:00 PM)


Qaarajuttog
Itinneq Kangilleq
(Blæsedalen)
Tunusua
Innarsuaq
(Skarve fjeld)
Apostelfjeld
Lyngmarksfjeld
Lyngmarksdalen
Nakkarnersuit
Qeqertaluk
Kuannit
Qorlortotsuaq
Niuusarsuit
Sanningassup Isua
Qunnersuaq
QEQERTARSUAQ
(Godhavn)
Kedaen
Qaqqaliaq
(Udskæren)
53° 30'
53° 20'

25th – 29th August: *Topical Lectures (subject to changes)*

1 x 60 min lectures with 30 min for questions and discussion.

Monday 25th of August (day 8)

7:30-8:30: Breakfast

9:00-10:00: **Short summaries of previous days lectures and field trip by students**

10:00-10:30: Coffee

11:00-12:30: Topical Lecture 1

Topical Lecture – "History of the Greenland ice sheet from internal radar layers"
Richard Hindmarsh (BAS)

- Radar layers – a primer

12:30-15:00: Lunch

15:00-16:30: Topical Lecture 2

Topical Lecture – "The paleo ocean: observational evidence and concepts"
Jake Gebbie (WHOI)

- Integrating paleoclimate data and dynamics
- Proxies of freshwater and the fate of Greenland meltwater

16:30-17:00: Coffee

17:00-18:30: Topical lecture 3

Topical Lecture – "Atmosphere – Ice interactions"
Gerard Roe (University of Washington)

- Atmosphere – ice interactions
- Mass balance observations and modeling

19:00: Dinner

Tuesday 26th of August (day 9)

9:00-10:00: **Short summaries of previous days lectures by students**

10:00-10:30: Coffee

10:30-12:00: Topical Lecture 4

Topical Lecture – "The physics of glacier-fjord interactions in Greenland"
Fiamma Straneo (WHOI)

- Fjord circulation
- Fjord/shelf/large scale ocean connection

12:00-15:00: Lunch and free time

15:00-16:30: Topical Lecture 5

Topical Lecture – " Marine ice sheet instability"
Andreas Vieli (University of Zürich)

- Marine ice sheet instability – theories
- Greenland outlet glaciers
- Present analogues for Greenland ice streams (Alaska, Svalbard, AIS)?

16:30-17:00: Coffee

17:00-18:30: Topical Lecture 6

Topical Lecture – "Ice sheets and sea level – some geodynamical effects"
Patrick Heimbach (MIT)

- Absolute vs relative sea level
- Glacial Isostatic Adjustment (GIA)
- Gravitational self-attraction and loading
- Sea level fingerprints

19:00: Dinner

Wednesday 27th of August (day 10)

7:30-8:30: Breakfast

9:00-10:30: **Short summaries of previous days lectures by students**

10:30-11:00: Coffee

11:00-12:30: Topical Lecture 7

Topical Lecture – "Arctic sea ice and atmospheric circulation"
David Battisti (University of Washington)

- Impact of Arctic sea ice on atmospheric circulation and variability
- Sea ice and changes to Greenland surface mass balance

12:30-15:00: Lunch

15:00-16:30: Topical Lecture 8

Topical Lecture – "Ice sheet variability: weather or climate"
Gerard Roe (University of Washington)

- Ice sheet weather
- What can make an ice sheet move on various time scales

16:30-17:00: Coffee

17:00-18:30: Group projects

Dedicated time to work in groups on project topics.

19:00: Dinner

Thursday 28th of August (day 11):

7:30-8:30: Breakfast

9:00-10:30: **Short summaries of previous days lectures by students**

10:30-11:00: Coffee

11:00-12:30: Topical Lecture 9

Topical Lecture – "Modeling the Greenland ice sheet"
Helene Seroussi (NASA JPL)

- Inverse methods applied to ice sheets
- Response of the Greenland ice sheet to climate change

12:30-15:00: Lunch

15:00-16:30: Topical Lecture 10

Topical Lecture – "Paleoclimate modeling"
Kerim Nisancioglu (University of Bergen)

- Millennial scale variability of ice sheets
- Greenland during the Last Interglacial, deglaciation and Holocene
- Are there past analogues for the Greenland ice streams?

16:30-: Group projects

Dedicated time to work in groups on project topics.

19:00: Dinner

Friday 29th of August (day 12)

7:30-8:30: Breakfast

9:00-10:30: **Short summaries of previous days lectures by students**

10:30-12:30:

Presentation of group projects

- Students present their group projects.
- Discussion, feedback and outlook.

12:30-14:00: Lunch

14:00-16:00:

Preparation of short summary article (e.g. EOS)
Everyone!

- Students will be in charge of preparing an article summarizing the main findings and conclusions of the summer school (see previous years for examples).

16:00-17:00: Summary and Evaluation (David Battisti and Kerim Nisancioglu)

18:30: Departure with Diskoline from Disko Island to Ilulissat (arrival 23:00)

Accommodation for Friday night will be in Ilulissat.

Saturday 30th of August

Checkout and departure

The hotel will organize transport to the airport. The group flights will leave Iliulissat at 12:45 (NY 442) / 13:15 (NY 440).

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Living quarters Ilulissat:

Hotel Icefjord

Hotel Hvide Falk (Including restaurant 15. August)

Hotel Avannaa

Other venues in Ilulissat:

Dinner Venue - Restaurant Mamartut (16. August)

Harbor – Diskoline (Ferry Ilulissat – Qeqertarsuaq/Disko Island)

Living quarters Qeqertarsuaq (Disko Island):

Arctic Station

Hotel Disko

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