

KARTHAUS-2009 / GLACIERS AND ICE SHEETS IN THE CLIMATE SYSTEM

Exercises and computer projects

The 36 participants are divided into 12 teams. In the first part of the afternoon, 6 teams do regular exercises, provided and supervised by the teacher indicated in the programme. Meanwhile, the other 6 teams work on computer projects. In the second half of the afternoon the teams switch. A particular team of 3 students works on the same project during the entire course, guided by a teacher. At the end of the course there will be 15-minute presentations on the outcome of the projects. **Lecturers:** E. Bueler, D. Dahl-Jensen, O. Eisen, H. Fischer, A. Fowler, H. Gudmundsson, I. Howat, A. Jenkins, G. Milne, M. Helsen, T. Moelg, J. Oerlemans, WJ. van den Berg, B. Vinther.

Tuesday 8

Afternoon	Arrival / check-in
19:30	DINNER

Wednesday 9

08:30 – 08:50	Welcome / practical announcements
08:50 – 09:20	Ice in the climate system - an introduction (<i>Oerlemans</i>)
09:30 – 10:20	Continuum mechanics-I (<i>Gudmundsson</i>)
10:20 – 10:40	coffee break
10:40 – 11:30	Continuum mechanics-II (<i>Gudmundsson</i>)
11:40 – 12:30	Continuum mechanics-III (<i>Gudmundsson</i>)
12:45	LUNCH
14:00 – 16:00	Exercises for all groups (<i>Gudmundsson</i>)
16:00 – 16:30	coffee break
16:30 – 17:30	5-min presentations by students
19:30	DINNER

Thursday 10

08:30 - 09:20	Ice as a material, rheology (<i>Dahl-Jensen</i>)
09:30 - 10:20	Modelling compaction of firn (<i>Helsen</i>)
10:20 - 10:40	coffee break
10:40 - 11:30	Analytical ice-sheet models (<i>Oerlemans</i>)
11:40 - 12:40	5-min presentations by students
13:00	LUNCH
14:00 - 15:30	Group I: exercises (<i>Dahl-Jensen</i>) / Group II: computer projects
15:30 - 16:00	coffee break
16:00 - 17:30	Group II: exercises (<i>Dahl-Jensen</i>) / Group I: computer projects
19:30	DINNER
21:00 - 22:00	5-min presentations by students

Friday 11

08:30 - 09:20	(Nearly) all you ever wanted to know about ice core records - I (<i>Fischer</i>)
09:30 - 10:20	Thermodynamics of ice sheets (<i>Dahl-Jensen</i>)
10:20 - 10:40	coffee break
10:40 - 11:30	Interaction of ice shelves with the ocean-I (<i>Jenkins</i>)
11:40 - 12:30	Interaction of ice shelves with the ocean-II (<i>Jenkins</i>)
12:45	LUNCH
14:00 - 15:30	Group II: exercises (<i>Jenkins</i>) / Group I: computer projects
15:30 - 16:00	coffee break
16:00 - 17:30	Group I: exercises (<i>Jenkins</i>) / Group II: computer projects
19:30	DINNER
21:30 – 22:30	<u>Special lectures</u> by <i>Micheal Kuhn</i> and <i>Jakob Abermann</i> (Research on the Oetztal glaciers / <i>Introduction to the excursion</i>)

Saturday 12

08:30 - 09:20	(Nearly) all you ever wanted to know about ice core records - II (<i>Fischer</i>)
09:30 - 10:20	(Nearly) all you ever wanted to know about ice core records - III (<i>Fischer</i>)
10:20 - 10:40	coffee break
10:40 - 11:30	Interaction of ice shelves with the ocean-III (<i>Jenkins</i>)
11:40 - 12:30	Remote sensing in glaciology (<i>Howat</i>)
12:45	LUNCH
14:00 - 14:50	Numerical modelling of ice sheets and ice shelves I (<i>Bueler</i>)
15:00 - 15:50	Extra-terrestrial ice (<i>Dahl-Jensen</i>)
19:30	DINNER

Sunday 13**Excursion to the glaciers of the Oetztal Alps (Abermann)****Monday 14**

08:30 - 09:20 Sliding (Fowler)
09:30 - 10:20 Glacier hydrology (Fowler)
10:20 - 10:40 coffee break
10:40 - 11:30 Numerical modelling of ice sheets and ice shelves II (Bueler)
11:40 - 12:30 Numerical modelling of ice sheets and ice shelves III (Bueler)
12:45 LUNCH
14:00 - 15:30 Group I: exercises (Fowler) / Group II: computer projects
15:30 - 16:00 coffee break
16:00 - 17:30 Group II: exercises (Fowler) / Group I: computer projects
19:30 DINNER

Tuesday 15

08:30 - 09:20 Basal processes and geomorphology (Fowler)
09:30 - 10:20 Polar meteorology (Van de Berg)
10:20 - 10:40 coffee break
10:40 - 11:30 Dating of ice cores I (Vinther)
11:40 - 12:30 Dating of ice cores II (Vinther)
12:45 LUNCH
14:00 - 15:30 Group II: exercises (Vinther) / Group I: computer projects
15:30 - 16:00 coffee break
16:00 - 17:30 Group I: exercises (Vinther) / Group II: computer projects
19:30 DINNER

Wednesday 16

08:30 - 09:20 Tidewater glaciers (Howat)
09:30 - 10:20 Tropical glaciers (Moelg)
10:20 - 10:40 coffee break
10:40 - 11:30 Geophysical methods in glaciology I (Eisen)
11:40 - 12:30 Geophysical methods in glaciology II (Eisen)
12:45 LUNCH
Afternoon free
19:30 DINNER

Thursday 17

08:30 - 09:20 The microclimate of glaciers (Oerlemans)
09:30 - 10:20 Introduction to geodynamics (Milne)
10:20 - 10:40 coffee break
10:40 - 11:30 Glacio-isostatic adjustment: introduction (Milne)
11:40 - 12:30 Glacio-isostatic adjustment: constraining changes in the cryosphere (Milne)
12:45 LUNCH
14:00 - 15:30 Group I: exercises (Milne) / Group II: computer projects
15:30 - 16:00 coffee break
16:00 - 17:30 Group II: exercises (Milne) / Group I: computer projects
19:30 DINNER

Friday 18

08:30 - 09:20 Inverse modelling (Gudmundsson)
09:30 - 10:20 The response of glaciers to climate change (Oerlemans)
10:20 - 10:40 coffee break
10:40 - 11:30 The current mass budget of the Greenland and Antarctic ice sheets (Van de Berg)
12:45 LUNCH
14:00 - 15:30 Presentation of computer projects (6x)
15:30 - 16:00 coffee break
16:00 - 17:30 Presentation of computer projects (6x)
17:30 - 18:00 Discussion
19:30 DINNER

Saturday 19**Departure**

Computer projects

The organizing committee will make a proposal about the distribution of students over the projects. The list will be posted on the first day of the course. Some (limited) changes can then be made before the projects start on thursday. A number of Mac's will be available in a local network. Participants may also bring their own laptops. We will have a wireless net to have ties with the outside world.

GROUP I:

- Project 1: Remote sensing I (*Howat*)
- Project 2: Remote sensing II (*Howat*)
- Project 3: Inverse modelling (*Gudmundsson*)
- Project 4: Ice-sheet model (*Bueler*)
- Project 5: Firn density model (*Van den Berg / Helsen*)
- Project 6: Greenland surface mass balance (*Van den Berg / Helsen*)

GROUP II:

- Project 7: Dating of an ice core (*Dahl Jensen / Vinther*)
- Project 8: Ice shelf – ocean interaction (*Jenkins*)
- Project 9: Mass balance modelling I (*Moelg*)
- Project 10: Glacial isostasy (*Milne*)
- Project 11: Interpretation of a radar survey (*Eisen / Fischer*)
- Project 12: Interpretation of firn-core data (*Eisen / Fischer*)