KARTHAUS-2019 / GLACIERS AND ICE SHEETS IN THE CLIMATE SYSTEM
Programme

Exercises, computer projects, workshop

The 36 participants are divided into 12 teams. In the first part of the afternoon, 6 teams do exercises, 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.

Tuesday 10

Afternoon	**Arrival / check-in**
19:30	DINNER

Wednesday 11

08:30 - 08:50	Welcome / practical announcements *(Oerlemans)*
08:50 - 09:30	Continuum mechanics-I *(Hewitt)*
09:40 - 10:30	Continuum mechanics-II *(Hewitt)*
10:30 - 10:50	coffee break
10:50 - 11:40	Rheology of ice *(Karlsson)*
11:50 - 12:40	Thermodynamics of ice *(Karlsson)*
13:00	LUNCH
14:00 - 15:30	4-min presentations by students
16:00 - 16:30	coffee break
16:30 - 18:00	4-min presentations by students
19:30	DINNER

Thursday 12

08:30 - 09:20	Commonly used approximations in ice flow modelling *(Pattyn)*
09:30 - 10:20	Analytical models of ice sheets *(Oerlemans)*
10:20 - 10:40	coffee break
10:40 - 11:30	Climates of ice sheets and glaciers *(Reijmer)*
11:40 - 12:30	Modelling glacier surface and near-surface processes *(Reijmer)*
12:45	LUNCH
14:00 - 15:30	Group I: exercises *(Hewitt)* / Group II: computer projects
15:30 - 16:00	coffee break
16:00 - 17:30	Group II: exercises *(Hewitt)* / Group I: computer projects
19:30	DINNER

Friday 13

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

Saturday 14

08:30 - 09:20	Ice sheet - ocean interaction - basics *(Winkelmann)*
09:30 - 10:20	Ice sheet - ocean interaction - modelling I *(Winkelmann)*
10:20 - 10:40	coffee break
10:40 - 11:30	Numerical modeling of ice sheets and ice shelves III *(Pattyn)*
11:40 - 12:30	Geophysical and remote-sensing methods in glaciology I *(Eisen)*
12:45	LUNCH
	FREE TIME
19:30	DINNER

Sunday 15

08:30 - 09:20	Ice sheet - ocean interaction - modelling II *(Winkelmann)*
09:30 - 10:20	Geophysical and remote-sensing methods in glaciology II *(Eisen)*
10:20 - 10:40	coffee break
10:40 - 11:30	Geophysical and remote-sensing methods in glaciology III *(Eisen)*
11:40 - 12:30	Introduction to glacial geomorphoplogy *(Stroeven)*
12:45	LUNCH
14:00 - 15:30	Group I: exercises *(Eisen)* / Group II: computer projects
15:30 - 16:00	coffee break
16:00 - 17:30	Group II: exercises *(Eisen)* / Group I: computer projects
19:30	DINNER

Monday 17

08:30 - 09:20	Basal processes and geomorphology *(Hewitt)*
09:30 - 10:20	Geomorphology and mapping of paleo-ice sheets I *(Stroeven)*
10:20 - 10:40	coffee break
10:40 - 11:30	The history of the Antarctic ice sheet *(Stroeven)*
11:40 - 12:30	Ice on Mars *(Karlsson)*
12:45	LUNCH
14:00 - 15:30	Group II: exercises *(Oerlemans)* / Group I: computer projects
15:30 - 16:00	coffee break
16:00 - 17:30	Group I: exercises *(Oerlemans)* / Group II: computer projects
19:30	DINNER

Tuesday 17 **Excursion to the glaciers of the Oetztal Alps** *(Grüner)*

19:30 DINNER

Wednesday 18

08:30 – 09:20	Ice cores I *(Svensson)*
09:30 – 10:20	Ice cores II *(Svensson)*
10:20 – 10:40	coffee break
10:40 – 11:30	Minimal glacier models *(Oerlemans)*
11:40 – 12:30	Calving glaciers *(Oerlemans)*
12:45	LUNCH
14:00 - 15:30	Group I: exercises *(Svensson)* / Group II: computer projects
15:30 - 16:00	coffee break
16:00 - 17:30	Group II: exercises *(Svensson)* / Group I: computer projects
19:30	DINNER

Thursday 19

08:30 - 09:20	Ice cores III *(Svensson)*
09:30 - 10:20	The response of glaciers to climate change *(Oerlemans)*
10:20 - 10:40	coffee break
10:40 - 11:30	Introduction to geodynamics *(Spada)*
11:40 - 12:30	Geodynamics, glacial isostacy and sea level I *(Spada)*
12:45	LUNCH
14:00 - 15:30	Group II: exercises *(Spada)* / Group I: computer projects
15:30 - 16:00	coffee break
16:00 - 17:30	Group I: exercises *(Spada)* / Group II: computer projects
19:30	DINNER

Friday 20

08:30 - 09:20	Geodynamics, glacial isostacy and sea level II *(Spada)*
09:30 - 10:20	The mass budget of the Greenland and Antarctic ice sheets *(Reijmer)*
10:20 - 10:40	coffee break
10:40 - 12:30	*working on project presentations*
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 21 **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 friday.
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. Practice has shown that these ties are not very fast.

GROUP I:

Project 1: Paleoglaciology of Tibet mountain glaciers *(Stroeven)*

Project 2: Paleoglaciology of the Fennoscandian ice sheet *(Stroeven)*

Project 3: Modelling Antarctic sub-shelf melt rates *(Winkelmann)*

Project 4: Ice-sheet response to surface and ocean warming *(Winkelmann)*

Project 5: Energy balance of a snow/ice surface *(Reijmer)*

Project 6: SIA glacier model *(Reijmer)*

GROUP II:

Project 7: Glacial isostatic adjustment modeling *(Spada)*

Project 8: How to determine crystal orientation fabric in an ice sheet from radar measurement? *(Eisen)*

Project 9: Basal roughness: an indicator for basal properties of ice sheets? *(Eisen)*

Project 10: Melting the ice on Mars *(Karlsson)*

Project 11: Using radar data to retrieve accumulation rates *(Karlsson)*

Project 12: Subglacial hydrology modelling *(Hewitt)*