

# KARTHAUS-2007 / GLACIERS AND ICE SHEETS IN THE CLIMATE SYSTEM PROGRAMME, update 1 September, 2007

## Exercises and computer projects

The 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:** H. Fischer, A. Fowler, A. Jenkins, H. Gudmundsson, G. Milne, J. van den Berg, T. Moelg, H. Rott, M. van den Broeke, A. Stroeven, T. Payne, J. Oerlemans

### Tuesday 11

| Afternoon | Arrival / check-in |
|-----------|--------------------|
| 19:00     | DINNER             |

### Wednesday 12

|               |  |
|---------------|--|
| 09:00 – 09:30 | Welcome / practical announcements ( <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 | The microclimate of glaciers ( <i>Oerlemans</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                        |
| 19:00         | DINNER   |

### Thursday 13

|               |   |
|---------------|---|
| 08:30 - 09:20 | Rheology / simple flows (plane shear) ( <i>Gudmundsson</i> )          |
| 09:30 - 10:20 | Analytical ice sheet models ( <i>Oerlemans</i> )                      |
| 10:20 - 10:40 | coffee break  |
| 10:40 - 11:30 | Polar regions in the climate system ( <i>Van den Broeke</i> )         |
| 11:40 - 12:40 | 5-min presentations by students                                       |
| 13:00         | LUNCH   |
| 14:00 - 15:30 | Group I: exercises ( <i>Oerlemans</i> ) / Group II: computer projects |
| 15:30 - 16:00 | coffee break  |
| 16:00 - 17:30 | Group II: exercises ( <i>Oerlemans</i> ) / Group I: computer projects |
| 19:30         | DINNER  |
| 21:00 - 22:00 | 5-min presentations by students                                       |

### Friday 14

|               |  |
|---------------|--|
| 08:30 - 09:20 | Polar meteorology ( <i>Van den Broeke</i> )                                |
| 09:30 - 10:20 | Thermodynamics of ice sheets ( <i>Van den Berg</i> )                       |
| 10:20 - 10:40 | coffee break   |
| 10:40 - 11:30 | Sliding ( <i>Fowler</i> )  |
| 11:40 - 12:30 | Numerical modelling of ice sheets and ice shelves-I ( <i>Payne</i> )       |
| 12:45         | LUNCH  |
| 14:00 - 15:30 | Group II: exercises ( <i>Van den Broeke</i> ) / Group I: computer projects |
| 15:30 - 16:00 | coffee break   |
| 16:00 - 17:30 | Group I: exercises ( <i>Van den Broeke</i> ) / Group II: computer projects |
| 19:30         | DINNER   |

### Saturday 15

|               |  |
|---------------|--|
| 08:30 - 09:20 | Numerical modelling of ice sheets and ice shelves-II ( <i>Payne</i> )  |
| 09:30 - 10:20 | Numerical modelling of ice sheets and ice shelves-III ( <i>Payne</i> ) |
| 10:20 - 10:40 | coffee break   |
| 10:40 - 11:30 | Remote sensing of glaciers and ice sheets I ( <i>Rott</i> )            |
| 11:40 - 12:30 | Remote sensing of glaciers and ice sheets II ( <i>Rott</i> )           |
| 12:45         | LUNCH  |
| 14:00 - 14:50 | Introduction to glacial geomorphology ( <i>Stroeven</i> )              |
| 15:00 - 15:50 | Geomorphology and mapping of paleo-ice sheets ( <i>Stroeven</i> )      |
| 19:30         | DINNER   |

## Sunday 16

## Excursion to the glaciers of the Oetztal Alps

### Monday 17

|               |   |
|---------------|---|
| 08:30 - 09:20 | Glacier hydrology ( <i>Fowler</i> )   |
| 09:30 - 10:20 | Basal processes and geomorphology ( <i>Fowler</i> )                                     |
| 10:20 - 10:40 | coffee break  |
| 10:40 - 11:30 | Introduction to geodynamics ( <i>Milne</i> )  |
| 11:40 - 12:30 | Interaction between ice sheets and the solid earth ( <i>Milne</i> )                     |
| 12:45         | LUNCH   |
| 14:00 - 15:30 | Group I: exercises ( <i>Milne</i> ) / Group II: computer projects                       |
| 15:30 - 16:00 | coffee break  |
| 16:00 - 17:30 | Group II: exercises ( <i>Milne</i> ) / Group I: computer projects                       |
| 19:00         | DINNER  |
| 21:00-22:00   | <b>Evening lecture</b> by <i>H. Rott</i> : Exploring the glaciers of southern Patagonia |

### Tuesday 18

|               |   |
|---------------|---|
| 08:30 - 09:20 | Interaction of ice shelves with the ocean-I ( <i>Jenkins</i> )      |
| 09:30 - 10:20 | Interaction of ice shelves with the ocean-II ( <i>Jenkins</i> )     |
| 10:20 - 10:40 | coffee break  |
| 10:40 - 11:30 | What can we learn from glacial rebound? ( <i>Milne</i> )            |
| 11:40 - 12:30 | Ice cores: An introduction ( <i>Fischer</i> )                       |
| 12:45         | LUNCH   |
| 14:00 - 15:30 | Group II: exercises ( <i>Fowler</i> ) / Group II: computer projects |
| 15:30 - 16:00 | coffee break  |
| 16:00 - 17:30 | Group I: exercises ( <i>Fowler</i> ) / Group I: computer projects   |
| 19:00         | DINNER  |

### Wednesday 19

|               |  |
|---------------|--|
| 08:30 - 09:20 | Stable water isotopes in ice: New results from old ice ( <i>Fischer</i> )            |
| 09:30 - 10:20 | Aerosol in ice: Key to paleoenvironmental changes ( <i>Fischer</i> )                 |
| 10:20 - 10:40 | coffee break   |
| 10:40 - 11:30 | The mass balance of the Greenland and Antarctic ice sheets ( <i>Van den Broeke</i> ) |
| 11:40 - 12:30 | Inverse modelling ( <i>Gudmundsson</i> )   |
| 12:45         | LUNCH  |
|               | Afternoon free   |
| 19:00         | DINNER   |

### Thursday 20

|               |  |
|---------------|--|
| 08:30 - 09:20 | Gases in ice cores: The past atmosphere ( <i>Fischer</i> )           |
| 09:30 - 10:20 | Simple models of glaciers ( <i>Oerlemans</i> )                       |
| 10:20 - 10:40 | coffee break   |
| 10:40 - 11:30 | The response of glaciers to climate change ( <i>Oerlemans</i> )      |
| 11:40 - 12:30 | Tropical glaciers ( <i>Moelg</i> )                                   |
| 12:45         | LUNCH  |
| 14:00 - 15:30 | Group II: exercises ( <i>Fischer</i> ) / Group II: computer projects |
| 15:30 - 16:00 | coffee break   |
| 16:00 - 17:30 | Group I: exercises ( <i>Fischer</i> ) / Group I: computer projects   |
| 19:00         | DINNER   |

### Friday 21

|               |  |
|---------------|--|
| 08:30 - 09:20 | Snowball earth ( <i>Oerlemans</i> )                                    |
| 09:30 - 10:20 | Cenozoic history of the Antarctic ice sheet ( <i>Stroeven</i> )        |
| 10:20 - 10:40 | coffee break   |
| 10:40 - 11:30 | Ice sheets, greenhouse warming and sea level ( <i>Van den Broeke</i> ) |
| 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   |
| 19:00         | DINNER   |

### Saturday 22

### 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 hope to have a wireless net with substantial capacity to have some ties with the outside world.

- Project 1: Ice shelf - ocean interaction I ([Jenkins](#))
- Project 2: Ice shelf - ocean interaction II ([Jenkins](#))
- Project 3: Inverse modelling ([Gudmundsson](#))
- Project 4: Ice-sheet model I ([Van den Berg](#))
- Project 5: Ice-sheet model II ([Van den Berg](#))
- Project 6: Atmospheric boundary-layer over an ice sheet I ([Van den Broeke](#))
- Project 7: Glacial geomorphology ([Stroeven](#))
- Project 8: Remote sensing I ([Rott](#))
- Project 9: Remote sensing II ([Rott](#))
- Project 10: Mass-balance modelling I ([Moelg](#))
- Project 11: Mass-balance modelling II ([Moelg](#))
- Project 12: Modelling jokulhlaups ([Fowler](#))