

**SIO115 Ice and the Climate System  
Syllabus & Timetable 2014  
Monday/Wednesday/Friday 2pm in Revelle Conference  
Room (4301)**

***Please put your cell phones/iPhones etc away before coming into my classes. If you are a medical person on call, or if you have children or if there is some other legitimate reason why you might need to take a phone call during my class, then let me know. But otherwise, please do not text/surf the web/whatever during my classes!***

**Homework is given each Wednesday and collected the following Wednesday.**

*Week 1. Introduction to the Cryosphere in the Earth System*

- 31 March: Elements of the cryosphere; importance of the cryosphere [Lecture 1](#)
- 2 April: Role of the cryosphere in the climate system; sea-level change [Lecture 2](#)
- 4 April: Discussion papers: [Scambos et al. 2011](#); [Flanner et al., 2011](#)

**Homework 1 (due Wednesday 9 April): *The Cryosphere and its importance for climate***

*Suggested additional reading: (i) Chapter 1 of “The Cryosphere”; (ii) Chapters 1 & 2 of [UNEP report](#)*

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*Week 2. Past climate change and past climate records*

- 7 April: Ice ages (Jeff Severinghaus guest lecture) [Lecture 1](#)
- 9 April: Ice cores [Video](#) [Lecture 2](#)
- 11 April: Discussion paper: [NEEM, 2013](#) Eemian interglacial reconstructed from a Greenland folded ice core

**HELPFUL NOTES TO ASSIST IN PAPER READING AND DISCUSSION**

**Homework 2 (due Wednesday 16 April): *Ice ages and ice cores*** [Data for homework Icecore\\_data.txt](#)

*Suggested additional reading: (i) Chapter 5 of “The Cryosphere”; (ii) Chapter 6 of the IPCC (Palaeoclimate)*

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*Week 3. Snow, lake ice & permafrost*

- 14 April: Snow; lake ice; start permafrost [Lecture1](#)

- 16 April: Permafrost continued [Lecture2](#)
- 18 April: Discussion paper: [Minsley et al., 2006](#)

**Homework 3 (due Wednesday 23 April): *Lake ice and permafrost***

*Suggested additional reading: Chapter 7 of UNEP report*

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*Week 4. Sea-ice*

- 21 April: Sea-ice; ice-albedo feedback; sea-ice types [Lectures 1 and 2](#)
- 23 April: Monitoring sea-ice extent and thickness 1978-2012
- 25 April: Modelling sea-ice (guest lecture by Ian Eisenman) and discussion paper: [Kwok & Rothrock, 2009 \(GRL\)](#)

**Homework 4 (due Wednesday 30 April): *Sea-ice***

*Suggested additional reading: Chapter 5 of UNEP report, [24 April 2012 BBC story on ice thicknesses from CryoSat-2](#)*

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*Week 5. Land ice: Glaciers and ice caps (GIC)*

- 28 April: Introduction to glaciers; contribution of GIC to sea-level; transformation of snow to ice [Lecture 1](#) [Glacier animation shown in class](#)
- 30 April: Glacier mass balance; measuring glacier mass balance [Lecture 2](#)
- 2 May: Discussion paper:

**Homework 5 (due Wednesday 7 May): *Glacier mass balance***

*Suggested additional reading: relevant section of Chapter 6 of UNEP report*

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*Week 6. Land ice: Ice sheets (Greenland & Antarctica)*

- 5 May: Mass balance of ice sheets; ice streams; ice-ocean interaction; iceberg calving [Lecture 1](#)
- 7 May: Movie "The Life and Death of Glaciers" A new documentary takes the politics out of climate change to focus on the health of the world's glaciers. Award-winning documentary filmmaker and photojournalist [Chip Duncan](#) is the writer and director of *The Life & Death of Glaciers*, produced by The Duncan Group. The two-part classroom version will be shown in class on Wednesday.
- 9 May: Ablation: Surface melting [Lecture 2](#)

**Homework 6 (due Wednesday 14 May): *Ice sheet mass balance***

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*Week 7. Land ice: Ice sheets (Greenland & Antarctica)*

- 12 May: Surface melting -- Greenland and Antarctica (see Lecture 2 of Week 6)
- 14 May: Glacier dynamics: creep [Lecture 1 ice dynamics](#)
- 16 May: **NO CLASS -- SUN GOD FESTIVAL -- HAVE FUN!**

Homework 7 (due Wednesday 21 May): **Glacier dynamics & subglacial hydrology**

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Week 8. *Land ice: Ice sheets (Greenland & Antarctica)*

- 19 May: Glacier dynamics: flow-law; force balance (see Lecture 1 of Week 7)

**21 May 2pm Polar seminar Laurie Padman: Ice-2-O-A: Interactions between ice shelves, sea ice, oceans and atmosphere in Antarctica Same room as class is held in**

- 21 May: Subglacial water; subglacial processes; subglacial lakes [Lecture 2 ice dynamics](#)
- 23 May: Glacier surges; glacier changes (see Lecture 2 from 22 May) Discussion paper: [Joughin et al., 2012](#)

Homework 8 (due Wednesday 28 May): **Ice sheets and sea-level rise**

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Week 9. *The Changing Cryosphere*

**\*\*\*\* A FRIENDLY REMINDER TO PLEASE FILL IN YOUR CAPE EVALUATIONS <http://www.cape.ucsd.edu>\*\*\*\***

- 26 May: **NO CLASS -- MEMORIAL DAY HOLIDAY -- HAVE FUN!**
- 28 May: How are the glaciers sheets changing? [Lecture 1 glaciers](#)
- 30 May: How are the ice sheets changing? What is the IPCC? What might happen in the future? Discussion papers: [IPCC chapter 4](#) (glaciers & ice sheets sections) [Pritchard and others, 2012](#) [Lecture 2 ice sheets](#)

**No Homework: work on term project and review for final**

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Week 10. *Student presentations of term papers*

**\*\*\*\* PLEASE FILL IN YOUR CAPE EVALUATIONS <http://www.cape.ucsd.edu> \*\*\*\***

- 2 June: Group 1:
- 4 June: Group 2:
- 6 June: Group 3:

**Your final term paper is due on Wednesday 4th June, typed up and printed out as a hard-copy on both sides of the paper.**

**There will be no exceptions to this deadline unless there is a valid medical reason.**

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Week 11. Exam week

EXAM:

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### **Course texts**

[UNEP Report: Global Outlook for Snow and Ice](#)

CliC Intergrated Global Observing Strategy Report: