**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](#)*

**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)*

**Week 3. Snow, lake ice & permafrost**

- 14 April: Snow; lake ice; start permafrost  
  [Lecture 1](#)
• 16 April: Permafrost continued Lecture 2
• 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

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

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

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

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

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

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

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.

Week 11. Exam week

EXAM:

Course texts

- UNEP Report: Global Outlook for Snow and Ice
- CliC Intergrated Global Observing Strategy Report: