

**SIO115 Ice and the Climate System
Syllabus & Timetable 2015
Monday/Wednesday/Friday 11am 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

- 5 January: Elements of the cryosphere; importance of the cryosphere [All lecture slides](#)
- 7 January: Role of the cryosphere in the climate system; sea-level change
- 9 January: Discussion papers: [Scambos et al. 2011](#); [Flanner et al., 2011](#)

Please download this plug-in to run the quiz game on your computer: <https://unity3d.com/webplayer>
Link to the game (runs on Google Chrome): <http://siogames.ucsd.edu/Unity/sio115/week1/>

HELPFUL NOTES TO ASSIST IN PAPER READING AND DISCUSSION

Week 2. Past climate change and past climate records

- 12 January: Ice cores [Video](#) [All lecture slides](#)
- 14 January: Ice cores
- 16 January: Ice ages (Jeff Severinghaus guest lecture)

Discussion papers: [Lorius et al. 1985](#) [Petit et al. 1999](#)

Homework 1 (due Wednesday 14 January): [The cryosphere and its importance for climate](#)

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

Week 3. Past climate change and past climate records, contd - Snow cover

- 19 January: MARTIN LUTHER KING DAY
- 21 January: Paper discussion
- 23 January: Snow cover

[Greenland Ice Sheet Ice Age video](#)

Homework 2 (due Wednesday 21 January): [Ice ages and ice cores](#) Data for homework [Icecore_data.txt](#) [NHinso1.txt](#)

Week 4. Lake ice & permafrost

- 26 January: Lake ice [All lecture slides \(big file!\)](#)
- 28 January: Permafrost
- 30 January: Permafrost contd
Discussion papers on permafrost:
Airborne electromagnetic imaging of discontinuous permafrost [Minsley et al., 2012](#)
The impact of the permafrost carbon feedback on global climate [Schaefer et al., 2014](#)
Week 3 game

Homework 3 (due Friday 30 January): [Lake ice and permafrost](#)

Suggested additional reading: [Duguay 2005 AGU book chapter](#)
Chapter 7 of UNEP report [NEW UNEP REPORT ON PERMAFROST](#)

Week 5. Sea ice

- 2 February: Sea ice; ice-albedo feedback; sea-ice types
- 4 February: Sea ice growth and modelling (Ian Eisenman guest lecture)
- 6 February: Monitoring sea-ice extent and thickness 1978-2012. [Lecture 2](#) Discussion papers: article in the [Huffington Post](#)

[Laxon et al., 2013](#)
[Schroeder et al.,](#)

[2014](#)

[Interactive sea-ice map from NSIDC](#)
[Arctic Sea-ice 101 \(Program Manager Tom Wagner\)](#)

Homework 4 (due Friday 6 February): [Sea-ice](#)

[Model answers for homework](#)

Suggested additional reading: Chapter 5 of UNEP report [Arctic Report Card 2014](#) (see 18 December item on class media page)

Week 6. Land ice: Glaciers and ice caps (GIC)

- 9 February: Introduction to glaciers; contribution of GIC to sea-level; transformation of snow to ice [Lecture 1](#) [Glacier animation shown in class](#)
- 11 February: Glacier mass balance; measuring glacier mass balance [Lecture 2](#)
- 13 February: Glacier mass balance continued [Lecture 3](#) Discussion paper: [Gardner et al., 2013](#)

Homework 5 (due Wednesday): [Glacier mass balance](#)

[Model answers for homework](#)

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

Link to Matt's blog *Scripps on Ice*:

<http://scrippsonice.wordpress.com/2014/04/17/ground-truthin/>

[Link to class quiz](#)

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

- **16 February: PRESIDENTS DAY HOLIDAY - NO CLASS**
- 18 February: Mass balance of ice sheets; ice streams; [Lecture 1](#)
- 20 February: Ice-ocean interaction; basal melting; surface melting [Lecture 2](#)

Discussion paper: [Rignot et al., 2002](#)

Homework 6 (due Wednesday): [Ice sheet mass balance](#)

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

- 23 February: Surface melting and iceberg calving -- Greenland and Antarctica [Lecture 3](#)

Read [Recent media page](#) about the West Antarctic Ice Sheet instability

- 25 February: Glacier dynamics: creep; flow-law; force balance [Lecture 1](#) ice dynamics

- 27 February: Subglacial water; subglacial processes; subglacial lakes [Lecture 1](#)

Homework 7 (due Wednesday): [Glacier dynamics](#)

Week 9. Land ice: Ice sheets (Greenland & Antarctica)

- 2 March: Subglacial water; subglacial processes; subglacial lakes [Lecture 1](#)
- 4 March: Subglacial water; subglacial processes; subglacial lakes [Lecture 2](#)
- 6 March: Glacier surges; glacier changes Lecture 2 continued Discussion paper: [Fricker and others, 2007](#)

Homework 8 (due Wednesday): [Subglacial hydrology, sea-level rise](#)

Week 10. The Changing Cryosphere

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

- 2 March:
- 4 March: How are the ice sheets changing? Lecture 2 ice sheets
- 6 March: How are the glaciers & ice sheets changing? What is the IPCC? What might happen in the future?

Discussion papers: [IPCC chapter 4](#) (glaciers & ice sheets sections) [Rignot and others, 2014](#); [Joughin and others, 2014](#)

- [READ MEDIA ABOUT THESE PAPERS](#)

No Homework: work on term project and review for final [READ THESE INSTRUCTIONS FOR TERM PAPER](#)

Week 10. Student presentations of term papers

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

- 9 March: Group 1: Term paper presentation
- 11 March: Group 2: Term paper presentation:
- 13 March: Group 3: Term paper presentation:

Your final term paper is due on Wednesday 11th March, 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.