SIO115 Ice and the Climate System
Syllabus & Timetable 2019
Monday/Wednesday/Friday 9am 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 assigned each Friday and due the following Friday.

HELPFUL NOTES TO ASSIST IN PAPER READING AND DISCUSSION

Week 1. Introduction to the Cryosphere in the Earth System

- 7 January: Elements of the cryosphere; importance of the cryosphere ** WEEK 1 SLIDES **
- 9 January: Role of the cryosphere in the climate system; sea-level change
- 11 January: paper & book discussion

Discussion papers: Scambos et al. 2011; Barry, 2002
Guardian article 8 Jan 2019

Guidelines for paper discussions

Additional reading: *Chapter 1 of "The Cryosphere" by Shawn Marshall.*
Chapters 1, 2 and 3 of the UNEP Report

Homework 1 (due Friday 18 January): Cryosphere and its importance for climate

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Week 2. Past climate change and past climate records

- 14 January: Ice cores Video ** WEEK 2 SLIDES **
- 7pm Public talk by Helen at Birch Aquarium on the SALSA project
- 16 January: Ice ages (Jeff Severinghaus guest lecture)
- 18 January: Paper discussion for ice cores and ice ages (Lorius and Petit)

Discussion papers: Lorius et al. 1985 ; Petit et al. 1999
BBC Article 14 Nov 2016

Additional reading: *Ice cores sections of "The Cryosphere" by Shawn Marshall (see*

Index).

Ice cores and climate change fact sheet: British Antarctic Survey
van Ommen, The Conversation, 2016
Wolff, The Conversation, 2014

Homework 2 (due Friday 25 January): Ice Cores and Past Climate Data for homework Icecore_data.txt NHinso1.txt

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Week 3. Snow cover, river ice and lake ice

- 21 January: MARTIN LUTHER KING HOLIDAY -- NO CLASS
- 23 January: Snow cover All lecture slides
- 8:30am-12:15pm Scripps Polar Town Hall
- 25 January: River Ice and lake Ice

Discussion paper: Mackay and Swann, The Conversation, 2019; Reinmann and Templer, The Conversation, 2018; EGU Blog post on River Ice
Additional reading: Chapters 2, 3 and 4 of *The Cryosphere" by Shawn Marshall.*

Greenland Ice Sheet Ice Age video

Homework 3 (due Friday 1 Febuary): Snow cover and lake ice

Week 4. Lake ice & permafrost

- 28 January: Permafrost Lecture slides
- 30 January: Permafrost
- 1 February: 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

Suggested additional reading: Chapter 7 of "The Cryosphere" (~14 easy pages)

Chapter 7 of UNEP report NEW UNEP REPORT ON PERMAFROST

Duguay 2005 AGU book chapter

WATCH: AWI video on Permafrost
AGU 2015 Fall meeting press conference on Permafrost
Homework 4 (due Friday 8 February): *Permafrost*

Week 5. Sea ice

- 4 February: Sea ice; ice-albedo feedback; sea-ice types Lectures

- 6 February: Sea ice growth; monitoring sea-ice extent and thickness
- 8 February: Future projections; fast ice.

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)

Suggested additional reading: Chapter 5 of "The Cryosphere" (~20 easy pages) Chapter 5 of UNEP report Arctic Report Card 2014 (see 18 December item on class media page)

Homework 5 (due Friday 15 February): *Sea ice*

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

- 11 February: Introduction to glaciers; contribution of GIC to sea-level; transformation of snow to ice
- 13 February: Glacier mass balance
- 15 February: Glacier mass balance & measurement Discussion paper: Gardner et al., 2013, Maurer et al., 2016

Suggested additional reading: relevant section of Chapter 6 of UNEP report
World Glacier Monitoring Service
Huffington Post article about Maurer et al., Scientific American update on Alaskan Glaciers
Glacier animation shown in class

READ INSTRUCTIONS FOR TERM PAPER

Homework 6 (due Friday 22 February): ***Glacier mass budget***
Please research your term paper to the point that you can answer question 1 on next week's homework:
1. Term paper. By now you should have a topic picked out for your term paper. Please write a concise, clear paragraph (150-200 words) on what your topic is about, and provide three real peer-reviewed references that you have looked at on this topic. [10]

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

- 18 February: PRESIDENTS' DAY HOLIDAY - NO CLASS
- 20 February: Mass balance of ice sheets; ice streams
- 22 February: Ice-ocean interaction; basal melting; surface melting; iceberg calving -- Greenland and Antarctica

Homework 7 (due Friday 1 March): *Glaciers and ice sheets*

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

****** A FRIENDLY REMINDER TO PLEASE FILL IN YOUR CAPE FORMS :-) http://www.cape.ucsd.edu******

- 25 February: surface melting in Greenland Discussion paper: Rignot et al., 2002
- 27 February: Glacier dynamics: creep; flow-law; force balance ice dynamics Ice dynamics (Matt Siegfried)
- 1 March: Subglacial water; subglacial processes; subglacial lakes Discussion paper: Fenty et al. 2016

Homework 8 (due Friday 8 March): *Glacier and ice sheet dynamics & hydrology*

Week 9. Changes in glaciers and ice sheets

- 4 March: Subglacial lakes; glacier surges Lecture slides Discussion paper: Stearns et al., 2008
- 6 March: Marine ice sheet instability; ice sheet changes Discussion paper: Sundal et al., 2011
- 8 March: Ice sheet changes & future predictions Discussion paper: Joughin and others, 2014

Read 2014 media page about the West Antarctic Ice Sheet instability

Link to VICE program on Antarctic mass loss

****** PLEASE FILL IN YOUR CAPE FORMS** http://www.cape.ucsd.edu ********

No homework -- work on your presentation and term paper.

Week 10. Student lightning presentations of term papers (10 minutes each)
Please send me your presentation ahead of time so I can get them uploaded on my computer
****** PLEASE FILL IN YOUR CAPE FORMS** http://www.cape.ucsd.edu ********

- 11 March: Group A
- 13 March: Group B
- 15 March: Group C

Please show up to all term paper presentations to support your fellow students!

Final term papers are due in class on **Friday 15th 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.

Week 11. Exam week

EXAM STUDY GUIDE

Final Exam Monday 20th March 2017
SIO115 2017 EXAM **due by 3pm PDT (see below)**

*Email your exam to hafricker@ucsd.edu with the subject line "SIO115: Final Exam 2017" and name your file "Lastname-SIO115_Final2017.PDF or doc". The deadline is a **strict deadline with no excuses**!*

Good luck everyone !