

# GEOL2950 SYLLABUS

## Ocean, Cryosphere, and Sea Level Change

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Or IPCC and you can, too!

Interested in finding out how big climate science gets done? This graduate reading and writing seminar will emphasize study of the breakthrough science that has been published since the Intergovernmental Panel on Climate Change Fifth Assessment Report (i.e., accepted for publication since March 15, 2013). Focus will be on the physical science basis: past and future changes in ocean circulation and properties, marine and terrestrial cryosphere, and sea level; evaluation of models and projection methods; detection and attribution; projections of global and regional sea level change; abrupt change and long-term commitment; and extreme water levels. Pre-requisite: permission of instructor required. Enrollment limited to 30.

**Key Words:** Climate, Climate forcing, Climate Sensitivity, Ocean Data, Atmosphere Data, Research Projects

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### 1. Contacts

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The overall class info can be found at <http://fox-kemper.com/teaching>, <http://fox-kemper.com/ipcc>. Assignments will be turned in at: <http://canvas.brown.edu>. Where possible, I will just use ordinary links, but portions of the website are password-protected to ensure that fair use and copyrights are correctly obeyed as I share images from books, etc. You can access these restricted downloads using

username: io  
password: ocean

### 2. Getting Help!

I am usually available by email. You can make an appointment if needed. Just check Baylor's calendar at <http://fox-kemper.com/contact> and suggest a time that works for you at <mailto:baylor@brown.edu>.

### 3. Meetings and Places

We will meet Mondays and Wednesdays from 3:00 to 4:20PM in GeoChem039. Office hours are Tuesdays 4:30-5 in GC133 or by appointment.

#### 4. Goals

##### In this class you will:

1. Learn about many of the physical processes that control the Earth's climate, particularly those of the ocean and cryosphere and impacting sea level rise.
2. Learn some direct and indirect effects of human perturbations to the climate system.
3. Get practice writing and thinking scientifically by summarizing peer-reviewed research for a broad audience.
4. Gain a broader perspective and practice by reviewing your peers' and international efforts.
5. Benefit from reviews of your writing by your peers.

##### The topics we will cover are:

1. Module 0: Scientific Method, Institutional Science, and Scientific Consensus
2. Module 1: Physical Science Basis of Climate Change
  - Climate Change: The Physical Science Basis
  - Observations: Ocean
  - Observations: Cryosphere
  - Sea Level Change
  - Information from Paleoclimate Archives
  - Evaluation of Climate Models
  - Detection and Attribution of Climate Change: from Global to Regional
  - Long-term Climate Change: Projections, Commitments and Irreversibility
  - Assignments: ToC Alert, Summaries & Discussions.
3. Module 2: Primary Sources
  - Ocean, Cryosphere, and Sea Level topics
  - Assignments: Summaries and Op-Ed Coding.
4. Module 3: Future Directions
  - Ocean, Cryosphere, and Sea Level topics
  - Project 2: A Research Proposal, Peer Reviewing 2 Others, and Responding to Reviews.
5. Module 4: Reviewing the Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) (Access begins 16 Nov 2018, registration required)
  - Framing and Context
  - High Mountain Areas
  - Polar Regions
  - Sea Level Rise and Implications for Low Lying Islands, Coasts and Communities
  - Changing Ocean, Marine Ecosystems, and Dependent Communities
  - Extremes, Abrupt Changes and Managing Risks
  - Project 3: Expert Reviewing an Assessment Report

Over the course of the semester, each student will complete three large projects (a paper, a proposal, and an expert review), and an assortment of smaller projects (peer reviewing, class presentations, summaries of the weekly TOC alerts, etc.).

#### 5. Assignments and (lack of) Exams

##### 5.1. *Up-to-the-Week Results that are "Torn from the Headlines"*

OK, science publishing doesn't really have the same pace as keeping up with political news these days. But, the IPCC is an assessment on the state-of-consensus, and that's what we're going to emphasize. So, we'll mimic the John Oliver plan of "breaking news on a weekly basis". Once per week, each student will complete a short (< 1 page) quiz on canvas containing: 1) Summary of 2 papers from the preceding week (100 words per

paper), 2) Identification of papers in your assigned journal's Table of Contents and assessment bibliography (annotated list), 3) Brainstorm (100 words total) (i.e., connections to other reading, discussion, hopes, dreams, fears, etc.). There will be 1 of these quizzes each week, totaling  $\leq 2$  pages of writing covering 3 items per week. These summaries will be re-used to focus the discussions, so they will be read by classmates and posted to discussion boards on canvas. These will be due by 8AM Monday following the week where the papers were discussed and tables of contents were published.

### 5.2. Proposal

You will write a research proposal that describes a research project that would build upon the work of papers we have read, addresses a topic appropriate for inclusion in IPCC WGI Ocean, Cryosphere, or Sea Level reports, and thus builds on ideas discussed in class and your own research. You will select your own topic, but you will submit an outline including the project thesis and works to be expanded upon in advance to be reviewed by the professor. This project should actually be achievable, by you, within a **1 year timespan**. You will be provided guidelines and examples as to required sections, topics, budgets, etc. Your proposal will follow NSF RAPID practice, guidelines, and formatting and thus have a 5-page science description limit (not including references), an additional 1-page summary, and an additional 1 page budget and justification. [https://www.nsf.gov/pubs/policydocs/pappg18\\_1/pappg\\_2.jsp#IE1](https://www.nsf.gov/pubs/policydocs/pappg18_1/pappg_2.jsp#IE1). Unlike RAPID proposals, it is not necessary for your proposal to be particularly urgent or based on a current geophysical event.

### 5.3. Op-Ed Coding Week

One week, we will participate in a collaboration project with Timmons Roberts and Bob Brulle (Brexel University, visiting Brown this year). Robert J. Brulle is an American environmental sociologist, and Timmons Roberts is Ittleson Professor of Environmental Studies and Sociology at Brown University. The goal is to code, based on a developed rubric, one year of opinion pieces on climate change that appear in daily newspapers (probably the *Washington Post*, *New York Times*, and *Providence Journal*). This will provide an opportunity to experience the different writing styles, standards, and factual accuracy of these pieces. Each of you will code 10 pieces, and there will be duplication for robustness. We will discuss the outcome of this coding after they are joined together.

### 5.4. Expert Review

The IPCC will release the second order draft of the Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) on 16 Nov., 2018. From this date to the end of the semester, you will participate as expert reviewers in this process and you will be graded on the reviews you provide to the report. The review comments are uploaded via an Excel spreadsheet, so you will just turn in your excel spreadsheet along with a short description ( $\leq 2$  pages) of how you approached the review process.

According to the IPCC,

The IPCC is committed to preparing reports that aim for the highest standards of scientific excellence, balance, and clarity. The review process includes wide participation, with hundreds of reviewers critiquing the accuracy and completeness of the scientific assessment contained in the drafts.

Multiple stages of review are an essential part of the IPCC process to ensure a comprehensive, objective and transparent assessment of the current state of knowledge of the science related to climate change. There are two stages of review; an Expert Review of the First Order Draft, and a Government and Expert Review of the Second Order Draft.

At the beginning of each review period, the IPCC issues a press release with details of the duration of the review period and how to participate. Look out for these announcements on the IPCC website and volunteer as an Expert Reviewer.

Expert Reviewers must provide a self-declaration of expertise. No further qualifications, or publishing record, are required.

An Expert Reviewer may decide to comment on one section of the report, or a complete chapter, or the report as a whole, for instance looking at structural questions.

### 5.5. Reading by Week

We will read a lot of the IPCC assessment reports and other technical reports, as well as the primary peer-reviewed articles upon which they are based. The readings by week (and links) are listed here, but the class-by-class calendar is here: [http://www.geo.brown.edu/research/Fox-Kemper/classes/GEOL2950\\_18/notes/](http://www.geo.brown.edu/research/Fox-Kemper/classes/GEOL2950_18/notes/). Guidelines for how to read scientific papers and chapters are here.

#### (a) Module 0: Scientific Method, Institutional Science, and Consensus

Week 0, 9/5, 1) Syllabus, 2) IPCC Factsheets, 3) Lecture Slides

#### (b) Module 1: Physical Science Basis of Climate Change

Week 0, 9/5, 1) Charney Report, 2) Hansen Testimony, 3) Lecture Slides

Week 1, 9/10, 1) IPCC *Climate Change: The Physical Science Basis*, Policymaker Summary (Alexander et al. 2013), 2) IPCC Fifth Assessment. *Climate Change: The Physical Science Basis* Technical Summary (Stocker et al. 2013).

Week 2, 9/17, 1) IPCC *Climate Change: The Physical Science Basis*, Introduction (Cubasch et al. 2013), 2) Church et al. (2013b).

Week 3, 9/24, 1) IPCC *Climate Change: The Physical Science Basis*, Observations: Ocean (Rhein et al. 2013).

Week 4, 10/1, 1) IPCC *Climate Change: The Physical Science Basis*, Observations: Cryosphere (Vaughan et al. 2013), 2) Khatiwala et al. (2009), 3) Krinner and Flanner (2018)

Week 5, 10/8, 1) IPCC *Climate Change: The Physical Science Basis*, Sea Level Change (Church et al. 2013a), 2) Nowicki and Seroussi (2018)

Week 6, 10/15, 1) IPCC *Climate Change: The Physical Science Basis*, Information from Paleoclimate Archives (Masson-Delmotte et al. 2013), 2) Gray et al. (2018), 3) Schindelegger et al. (2018)

Week 7, 10/22, 1) IPCC *Climate Change: The Physical Science Basis*, Evaluation of Climate Models (Flato et al. 2013), 2) Papers identified from preceding week.

Week 8, 10/29, 1) Sections of IPCC *Climate Change: The Physical Science Basis*, Detection and Attribution of Climate Change: from Global to Regional (Bindoff et al. 2013), 2) Sections of IPCC *Climate Change: The Physical Science Basis*, Long-term Climate Change: Projections, Commitments and Irreversibility (Collins et al. 2013), 3) Papers identified from preceding week.

Week 9, 11/5, 1) Op-Ed Coding, 2) Papers identified from preceding week.

Week 10, 11/12, Papers identified from preceding week.

#### (c) Module 2: Primary Sources

Weeks 1-10, Papers identified from preceding week.

Weeks 0-12, Up-to-the-Week Summaries.

Week 9, 1) Op-Ed Coding

#### (d) Module 3: Future Directions

Week 8, Proposal Thesis & Outline.

Week 10, Proposal Due.

Weeks 10-11, Peer Review of Proposal.

Week 14, 12/17. Revise Proposal.

**(e)Module 4: Expert Review of Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)**

Week 10, 11/12. Registration, Receive Documents.

Week 11, 11/19. Review Chapter 1 (Framing and Context of the Report) & Chapter 2 (High Mountain Areas), Thanksgiving.

Week 12, 11/26. Review Chapter 3 (Polar Regions) & Chapter 4 (Sea Level Rise and Implications for Low Lying Islands, Coasts and Communities)

Week 13, 12/03. Review Chapter 5 (Changing Ocean, Marine Ecosystems, and Dependent Communities) & Chapter 6 (Extremes, Abrupt Changes and Managing Risks)

Week 13, 12/10. AGU.

Week 14, 12/17. Exams.

### 5.6. Calendar

The main webpage for the class <http://fox-kemper.com/ipcc> has the calendar with all assignment deadlines, readings, etc. There are four major modules, which each have multiple assignment stages.

## 6. Canvas and Websites

The primary resource for this class is the webpage: <http://fox-kemper.com/ipcc>. The class webpage is where all of your assignments will be announced, links to reading, etc. The second web resource is the canvas page for the class. All summaries, group projects, and peer reviews will be turned in through <http://canvas.brown.edu>, except your expert reviews which will be turned in directly to the IPCC!

You will want to familiarize yourself with Google Scholar (<http://scholar.google.com>) and the Web of Science (<http://apps.webofknowledge.com>). Both are free to you, and they will help you with your projects. There are many other useful websites linked to the class webpage, including e-textbooks that you can access through Brown's library.

## 7. Structure of Classtime

Each normal class will be broken down into three parts:

- (a) Group breakout to discuss readings and discussion questions. (20 min)
- (b) Plenary discussion of top 1-3 topics from each group. (20 min)
- (c) Lecture to warm up ideas on topic for next class (30 min).

## 8. Expected Time for Activities

There will be four module assignments for this class.

- Class meetings (3 hours/week; 39 hours) [Grading: 10% Attendance, participation, discussion]
- Reading and Paper Development (5 hours/week; 65 hours)
- Summary assignments (1 hours/week; 13 hours) [Grading: 15%]
- Op-Ed coding (10×0.5 hours; 5 hours) [Grading: 5%]
- Proposal (40 hours) [Grading: 10% outline & thesis; 15% proposal; 5% revisions]
- Peer reviews of 2 other proposals (2×6 hours; 12 hours) [Grading: 10% reviews of peers]

- Expert Reviews (6×6 hours reading and 6×2 hours reviewing; 48 hours) [Grading: 30% expert reviews]

- Total: 182 hours [Grading: 100%]

### 8.1. Peer review

You will peer review two other students' proposals, which gives you practice:

- Learning to spot unfounded claims
- Learning how to properly support claims
- Learning to distinguish poor writing from poor thinking
- Learning to label equations, graphs, and numerical information understandably
- Learning about a broader swath of climate sciences than those isolated topics you choose for your own papers.

You can find a description on how to peer review here: [http://www.geo.brown.edu/research/Fox-Kemper/classes/GEOL2950\\_18/notes/peerprimer.pdf](http://www.geo.brown.edu/research/Fox-Kemper/classes/GEOL2950_18/notes/peerprimer.pdf)

As your final major assignment, you will each perform an expert review of the SROCC. The peer reviewing of the proposals serves as practice, your close reading of the up-to-the-week papers and AR5 are also preparation for this task.

#### 8.1.1. Revisions and response to reviewers

You will have an opportunity to respond to the peer reviews and revise your proposals at the end of the semester.

## 9. Policies

### 9.1. Deadlines

Because of the reviewing process and trying to work alongside IPCC deadlines, the scheduling of assignments is strict. *Late assignments will not be accepted and cannot be made up unless by arrangement prior to the deadline.*

Here are some IPCC deadlines, which you can also think about and may be relevant. The Expert Review of Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) will occur from 16 Nov 2018 to 11 Jan 2019. Registration will open in October 2018 and a link be provided on the IPCC website. You will be a registered expert reviewer. The cut-off dates for literature included in SROCC are: papers in submission by 15 Oct 2018 and papers accepted for publication by 15 May 2019. The cut-off dates for papers to be included in the Sixth Assessment Report (AR6) of Working Group I (WGI): submitted by 30 Dec 2019 and accepted by 30 Sept 2020. Thus, we will be reading papers that are potentially covered by either the SROCC or AR6. There is considerable overlap between the two, although they have different missions. Baylor's IPCC schedule is very tight from Sept 16 to October 14, as this is the timing of the preparation of the "internal draft" for AR6.

Your weekly summaries are due by 8AM on Mondays or Wednesdays (if there is a holiday).

### 9.2. Collaboration

Some of the work will be group discussions, and you should feel free to discuss with Baylor if you think there are problematic group dynamics or the groups need to be shuffled. You will also have individual work in summarizing, presentations, a paper, a proposal, and reviewing. This work must be your own, although you will have ample opportunities to discuss the readings and presentations before writing.

## 9.3. Other items

- Attendance is expected. If you will miss a class, please let me know when and why so I can be sure you'll get any announcements, etc. Persistent late arrivals will be penalized.
- Clothing and behavior (e.g., phone use) will be appropriate to a learning environment.
- Discrimination and harassment will not be tolerated.
- Please contact me if you have any disabilities that require accommodation.

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