

EEPS1960 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 and undergraduate reading and writing seminar will emphasize study of the breakthrough science that has been published in the Intergovernmental Panel on Climate Change Assessment Reports. Focus will be on the physical science basis: past and future changes in the overall earth system; ocean circulation and properties, ice sheets, glaciers, sea ice, and sea level; evaluation of models and projection methods; detection and attribution; projections; abrupt change and long-term commitment; and extremes. Pre-requisite: any of EEPS 0850, EEPS 1430, EEPS 1510, EEPS 1520, EEPS 1820, or permission of instructor. Enrollment limited to 50. WRIT.

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

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 Tuesdays and Thursdays from 9:00 to 10:20PM in Smith-Buonanno Hall room G13 (Pembroke Campus). Office hours are Thursdays 2-3PM in GC133 or by

appointment. All classes will be recorded and archived (on canvas) and can be attended by teleconference if need be.

4. Goals

In this class you will:

1. Learn about many of the physical processes and feedbacks that control the Earth's climate, particularly those of the ocean and cryosphere impacting sea level rise.
2. Learn some direct and indirect effects of human impacts on the climate system.
3. Learn the standard experimental and conceptual approaches in climate science behind assessing (with certainty levels): observations, attribution of changes to human activities, and projections of future climates.
4. Get practice writing and thinking scientifically by summarizing peer-reviewed research for a broad audience.
5. Gain a broader perspective and practice by reviewing your peers' and international efforts.
6. Benefit from reviews of your writing by your peers.
7. Learn to associate values of climate equity, human rights, and sustainable development with scientific and decision-making practices.
8. Develop your communication skills in writing and conveyance of quantitative information through visualization.
9. Learn how you can become a part of the IPCC scientific enterprise, how your skills are needed, and what additional training would strengthen your impact.

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
 - The Current State of the Climate
 - Possible Climate Futures
 - Climate Information for Risk Assessment and Adaptation
 - Limiting Future Climate Change
 - Ocean Change
 - Cryosphere Change
 - Sea Level Change
3. Module 2: Engaging with Primary Sources
 - Ocean, Cryosphere, and Sea Level topics
 - Regular Writing Assignments: Assessments of Recent Papers
4. Module 3: Future Directions
 - Understudied Ocean, Cryosphere, and Sea Level topics
 - Project 1: A Research Proposal, Peer Reviewing 2 Others, and Responding to Reviews.
5. Module 4: Reviewing and Improving the Wikipedia Entries on Climate
 - Physical Science Basis
 - Oceans
 - Cryosphere
 - Sea Level
 - Scientists and Institutions
 - Project 2: Revising Wikipedia Pages

Over the course of the semester, each student will complete two large projects (a proposal and a wikipedia improvement project), and an assortment of smaller writing

and assessing projects (peer reviewing, class presentations, assessments on topics, weekly Table of Contents summaries).

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 relevant 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 ≤ 2 pages of writing covering 3 items per week. These summaries will be purposed toward focussing 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. *Reading Skills*

In this course, large reading assignments of materials with highly technical aspects but also structured formats (e.g., provision of summaries, abstracts, heading statements, glossaries, etc.) will be assigned. Much of the technical learning you will do will be grounded in this reading. However, you are *not expected* to fully absorb all that you read on this first pass, but instead are encouraged to read for *overarching concepts, key language, and organizing principles*, which is different from how you may have learned to read in the past. You can find a description on how to peer review here: http://fox-kemper.com/classes/EEPS1960_22/notes/readingprimer.pdf

5.3. *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#IIE1. Unlike RAPID proposals, it is not necessary for your proposal to be particularly urgent or based on a current geophysical event.

5.4. *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.
- Developing your skills in divining hypotheses and designing experiments to test them
- Developing scientific studies that inform societal needs

You can find a description on how to peer review here: http://fox-kemper.com/classes/EEPS1960_22/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.

5.4.1. 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.

5.5. Assessments

We will identify key topics to consider literature published within a limited timeframe. These will be contrasted against previous assessment report conclusions, to evaluate a “state of the science” assessment using *IPCC calibrated language* https://www.ipcc.ch/site/assets/uploads/2017/08/AR5_Uncertainty_Guidance_Note.pdf

5.6. Wikipedia Review

The IPCC has or will release eight reports in the Sixth Assessment Report Cycle. There are many topics assessed that are poorly represented in the public domain, with key results and concepts privy to only a privileged few. We will, as a class, find these outdated, missing, or incorrect public discussions (particularly through Wikipedia) and improve them. After the group identifies issues, teams or individuals will be tasked with taking on improving topics.

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.

We will discuss how we might self-govern, self-review, solicit input, etc., for our Wikipedia improvements.

5.7. 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://fox-kemper.com/classes/EEPS1960_22/notes/. Guidelines for how to read scientific papers and chapters are at http://fox-kemper.com/classes/EEPS1960_22/notes/readingprimer.pdf.

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

Week 0, 1) Syllabus, 2) IPCC AR6 FAQs

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

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

Week 1, 1) IPCC AR6 *Climate Change: The Physical Science Basis*, Policymaker Summary, 2) IPCC AR5. *Climate Change: The Physical Science Basis*, Policymaker Summary.

Week 2, 1) Technical Summary, 2) IPCC *Climate Change: The Physical Science Basis*, Chapter 1: Framing, Context, Methods.

Week 3, 1) IPCC AR6 *Climate Change: The Physical Science Basis*, Chapter 2: Changing State of the Climate System, 2) Selected papers.

Week 4, 1) IPCC AR6 *Climate Change: The Physical Science Basis*, Chapter 3: Human influence on the climate system, 2) IPCC AR6 *Climate Change: The Physical Science Basis*, Chapter 4: Future global climate: scenario-based projections and near-term information,

Week 5, 1) IPCC AR6 *Climate Change: The Physical Science Basis*, Chapter 7: The Earth's energy budget, climate feedbacks, and climate sensitivity, 2) Selected papers.

Week 6, 1) IPCC AR6 *Climate Change: The Physical Science Basis*, Chapter 9: Ocean, cryosphere, and sea level change, 2) Selected papers.

Week 7, 1) IPCC AR6 *Special Report on the Ocean and Cryosphere in a Changing Climate*, Selected sections, 2) Selected papers.

Week 8, 1) IPCC AR6 *Special Report on Global Warming of 1.5 °C*, Selected sections, 2) Selected papers.

Week 9, 1) Selected papers

Week 10, 1) Selected papers

(c)Module 2: Engaging with Primary Sources

Weeks 1-10, Reading selected papers from IPCC reading

Weeks 1-10, Reading and assessing selected papers from Table of Contents Summaries

Weeks 1-10, Up-to-the-Week Summaries.

(d)Module 3: Future Directions

Week 6, Proposal Thesis & Outline.

Week 8, Proposal Due.

Week 9, Peer Review of Proposal.

Week 10. Revised Proposal Due.

(e)Module 4: Reviewing and Improving the Wikipedia Entries on Climate

Week 1-3. Registration.

Week 10. Identification of Wikipedia entries of note.

Week 11. Formation of teams, identification of sources needed.

Week 12. Key revisions drafted.

Week 14. Key revisions reviewed and uploaded

5.8. 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 revisions which will be turned in directly to the Wikipedia!

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. (15 min)
- (b) Plenary discussion of top 1-3 topics from each group. (10 min)
- (c) Group breakout to discuss discussion questions. (15 min)
- (d) Plenary discussion of top 1-3 responses from each group. (10 min)
- (e) Break. (5 min)
- (f) Lecture to warm up ideas on topic for next class (25 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 (4 hours/week; 40 hours)
- Weekly summary assignments (1 hours/week; 10 hours) [Grading: 20%]
- 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]
- Wikipedia Updates (6×6 hours reading and 6×2 hours reviewing; 48 hours) [Grading: 30% wikipedia project]
- Total: 189 hours [Grading: 100%]

9. Policies

9.1. Deadlines

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

Your weekly summaries are due by 8AM on Thursdays, so they can be reviewed before class.

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 Baylor if you have any disabilities that require accommodation.