

GEOG/AOS/IES
332: THE GLOBAL WARMING DEBATE
SPRING 2012

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Office Hours: Thurs 10am-noon or by appointment

TA: *Leslie Sinak*, Graduate Student, Department of Geography

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Office Hours: Wed 1-3pm or by appointment

Lectures: Education Building L196, Tuesday/Thursday 1:00-2:15 pm

Discussion Sections:

Weds 9:50-10:45am, 188 Science Hall (Sections 301, 304)

Weds 11:00-11:50am, 188 Science Hall (Sections 302, 305)

Thurs, 9:55-10:45am, 450 Science Hall (Sections 303, 306)

Each discussion section will meet every other week. See Discussion Schedule for more information

Course Websites

Learn@UW: learnuw.wisc.edu (requires NetID)

Public website: www.geography.wisc.edu/courses/geog332/

INTRODUCTION

This is an intermediate course targeted to undergraduate students with an introductory background in earth system or atmospheric science (Geography/IES 120, 127; AOS 100, 101, or equivalent). The central thesis of this class is that as our understanding of the climate system improves, the real debate over global warming is shifting from questions of detection and attribution (whether warming is occurring and whether we're responsible?) to questions of impact and response (what are the consequences and what should we do?). Because climate directly or indirectly affects almost everything we do (and vice versa), the 21st-century citizen simply must have an understanding of the fundamentals of climate science and policy. The goal of this class is to provide that understanding.

The first half of this class reviews the fundamentals of climate-change science, while the second half explores 1) the possible impacts, risks, and benefits associated with climate change, and 2) possible solutions, including options for mitigation, adaptation, and geoengineering. This course draws heavily on the findings from the most recent Intergovernmental Panel on Climate Change report (IPCC 2007) and consists of a mixture of lectures, discussions, and self-directed exploration of on-line and published resources.

COURSE POLICIES

GRADE COMPONENTS

Discussion Exercises	30% (i.e. each discussion exercise is 5%)
Discussion and Class Participation	10%
Exam I	20%
Exam II	20%
Exam III	20%

DISCUSSION SECTIONS AND EXERCISES

This course has six discussion sections, with three sections meeting each week. Students not meeting in discussion section will have additional readings or other homework in off weeks. See Discussion Syllabus for more information.

Each discussion meeting will have an accompanying exercise, usually a set of readings, an essay, or other assignment that must be completed in advance of the discussion meeting. This will be handed in and evaluated, and will be critical preparation for the discussion, so it's essential that they get done! Discussion exercises will be distributed using the Learn@UW course website (in the Content tab). Exercises are due by the end of the corresponding discussion meeting. Overdue assignments will be penalized by a set amount per day after the due date. Exceptions can be made if emergencies arise, but must be approved by instructor.

EXAMINATIONS

There will be three exams that will mostly have a short-answer format. They will be non-cumulative, meaning that each will test to the material covered since the prior exam.

LEARN@UW

Learn@UW will be used to post news items, readings, assignments, and powerpoint slides from lecture. A copy of this syllabus can also be found there. There is also a public course website at www.geography.wisc.edu/courses/geog332/ but this is mainly for advertising purposes.

TWITTER

We're experimenting this year with Twitter as a forum for questions and discussion of course material – both during lecture and outside. The course hashtag is **#uwg332**

MISSED LECTURES AND MEDICAL ABSENCES

Campus policy with respect to flu and other contagious diseases places a premium on minimizing the risk of spreading disease. Specifically, **if you are running a fever over 100°F with a cough or sore throat, stay home!** Wait until 24 hours after your fever breaks before returning to class. The flu usually takes 3 to 5 days to run its course.

If you miss a lecture for any reason, and would like to learn about what you missed, either visit me or the TA during office hours or talk to a classmate. I will not respond to email queries or LearnUW-posted queries about missed lecture content. The TA will set his/her own policy. All lecture slides will be available at Learn@UW.

Geography/AOS/NIES 332 Lecture Schedule, Spring 2012

Week	Date	#	Lecture Topic
1	1/24	1	Introduction, The IPCC
	1/26	2	Energy, Blackbodies & The Layer Model
2	1/31	3	Atmospheric Composition & Greenhouse Gases
	2/2	4	Planetary Energy Balance & Circulation
3	2/7	5	Radiative Forcings
	2/9	6	Global Carbon Cycle
4	2/14	7	Global Carbon Cycle
	2/16	8	Climate Sensitivity and Climate Feedbacks
5	2/21	9	Climate Sensitivity and Climate Feedbacks
	2/23	10	Global Climate Models (GCMs)
6	2/28	11	Exam I
	3/1	12	Past Climate Variability
7	3/6	13	Detection: Is the Earth Warming?
	3/8	14	Attribution: Are Humans Responsible?
8	3/13	15	Projection: What Will Happen in the Future?
	3/15	16	Contrarian Perspectives
9	3/20	17	Contrarian Perspectives
	3/22	18	Impacts: Ice Sheets & Sea Level Rise
10	3/27	19	Impacts: Ocean Acidification
	3/29	20	Impacts: Extreme Events
	4/3		<i>Spring Break</i>
	4/5		<i>Spring Break</i>
11	4/10	21	Exam II
	4/12	22	Impacts: Terrestrial Ecosystems
12	4/17	23	Impacts: Terrestrial Ecosystems
	4/19	24	Impacts: Water Resources & Agriculture
13	4/24	25	Impacts: Human Health
	4/26	26	Solutions: Overview
14	5/1	27	Solutions: Mitigation
	5/3	28	Solutions: Terrestrial Carbon Sequestration and REDD
15	5/8	29	Solutions: Adaptation
	5/10	30	Solutions: Geoengineering
	5/13	31	Exam III (10:05am - 12:05pm, room TBD)

Lecture Readings

Geography/AOS/NIES 332, Spring, 2012

These readings supplement the lecture material, and I expect you to do these readings, preferably before class and definitely the week of that class. The discussion sections will have a separate (but complementary) set of readings and activities, which will be described elsewhere.

All readings except for the textbook are available as PDFs on LearnUW, or as weblinks. We are working on getting additional copies of the textbook on reserve in the library. For some topics, I note “Bonus Readings,” which aren’t required, but might also be of interest. Some common abbreviations:

- Archer refers to the course textbook, David Archer’s *Global Warming, Understanding the Forecast* (2011), 2nd Edition.
- USGCRP2009 refers to the US Global Change Research Program
- IPCC07 refers to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, published in 2007.
 - WG1, WG2, WG3 refer to the three major working groups within IPCC (WG1: Physical System, WG2: Vulnerability of Socio-Economic and Natural Systems, WG3: Mitigation Options), each of which published a report
 - TS refers to the 2007 Technical Summary
 - SPM refers to the 2007 Summary for Policymakers

Week 1: Introduction, The IPCC

- Archer, Chapter 1

Week 1: Blackbody Radiation and The Layer Model

- Archer, Chapter 2 and 3

Week 2: Atmospheric Composition & Greenhouse Gases

- Archer, Chapter 3 and 4
- IPCC07 WG1 TS pp21-27

Week 2: Planetary Energy Balance and Circulation

- Archer, Chapters 5 and 6

Week 3: Radiative Forcings

- IPCC07 WG1 TS pp28-35 (Skip Table TS.2 for now)

Bonus Readings

- Trenberth & Fasullo 2010 Science

Week 3-4: Global Carbon Cycle (2 Lectures)

- Archer, Chapters 8,9,10

Bonus Readings

- Schlesinger Ch5 pp. 134-152, Ch9 301-316, Ch11 356-377

Week 4-5: Climate Sensitivity and Climate Feedbacks (2 Lectures)

- Archer, Chapter 7
- Colose, C. "Introduction to Feedbacks" on RealClimate.org, posted Sept 23 2010
<http://www.realclimate.org/index.php/archives/2010/09/introduction-to-feedbacks/#more-4993>
- Colose, C. "More on Feedbacks" on RealClimate.org, posted Sept 23 2010
<http://www.realclimate.org/index.php/archives/2010/11/more-on-feedbacks/>

Week 5: Global Climate Models

- Kolbert, E. 2006. *Field Notes from a Catastrophe*, pp. 97-110
- Neelin J. D. pp. 145-158, 175-179

Week 6: Past Climate Variability

- IPCC AR4 WG1 Chapter 6

Week 7: Detection: Is the Earth Warming?

- Archer, Chapter 11
- IPCC07 WG1 TS pp35-58

Week 7: Attribution: Are Humans Responsible?

- IPCC07 WG1 TS pp58-66

Week 8: Projection: What Will Happen in the Future?

- IPCC07 WG1 TS 66-80

Week 8-9: Contrarian Perspectives (2 Lectures)

- Achenbach, May 28, 2006, The Tempest, Washington Post.
http://www.washingtonpost.com/wp-dyn/content/article/2006/05/23/AR2006052301305_pf.html
- Inhofe Sept. 28, 2003 Floor Statement (famous for the quote “could it be that man-made global warming is the greatest hoax ever perpetrated on the American people?)
- Singer & Avery 2007 Chapter 3: Shattered Glass in the Greenhouse Theory, in *Unstoppable Global Warming Every 1,500 Years*. Rowman and Littlefield Publishers, Inc. Plymouth, UK
- Oreskes&Conway 2010, Nature

Bonus Readings

- Oreskes and Conway (2010) The Denial of Global Warming, in *Merchants of Doubt*, Bloomsbury Press, New York.
- Schiermeier 2010 Nature

Bonus Contrarian (and Contra-Contrarian) Websites

- www.climatedepot.com Mark Morano et al.’s contrarian website
- www.climateaudit.org Steve McIntyre et al.’s contrarian website
- www.skepticalscience.com/ John Cook et al.’s contra-contrarian website

Week 9: Impacts: Ice Sheets & Sea Level Rise

- Archer, Chapter 12
- IPCC WG2 TS pp26-58
- Witze 2008 Nature

Week 10: Impacts: Ocean Acidification

- Doney 2006 Scientific American
- Pelejero et al 2010 TREE

Week 10: Impacts: Extreme Events

- US Climate Change Science Program. 2008. Weather and Climate Extremes in a Changing Climate. Synthesis and Assessment Product 3.3. pp 1-34

Bonus Readings

- Kerr 2010 Science

Week 11-12: Impacts: Terrestrial Ecosystems (2 Lectures)

- USGCRP2009 pp 79-88
- Kolbert *Climates of Man*

Week 12: Impacts: Water Resources & Agriculture

- USGCRP2009 pp41-52 & 71-78

Week 13: Impacts: Human Health

- USGCRP2009, pp89-98

Week 13: Solutions: Overview

Primary Readings

- Archer, Chapter 13

Bonus Readings

- Lomborg, Cool It, Chapter 1

Week 14: Solutions: Mitigation

- IPCC07 WG3 SPM
- Pacala and Sokolow, 2006

Week 14: Solutions: Terrestrial Carbon Sequestration & REDD

TBA

Week 15: Solutions: Adaptation

- IPCC07 WGII SPM
- WICCI. 2011. Wisconsin's Changing Climate: Impacts and Adaptation. Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, Wisconsin. pp 6-41

Week 15: Solutions: Geoengineering

- Levitt & Dubner Superfreakonomics
- Royal Society. 2009. Geoengineering the climate: Science, governance, and uncertainty. RS Policy document 10/09.

Additional Readings and Resources

WEBSITES

- RealClimate: <http://www.realclimate.org/> Commentary on climate science by climate scientists. My go-to website when a new climate story hits the news.
- Dot Earth: <http://dotearth.blogs.nytimes.com/> Blog by New York Time's Andy Revkin, one of the best reporters on the climate-change beat.

OTHER GOOD BOOKS

- *Climate Modeling Primer (2nd ed.)*, by Kendal McGuffie and A. Henderson-Sellers. John Wiley and Sons, 1997
- *Earth's Climate: Past and Future* by William F. Ruddiman. W. H. Freeman and Company, New York, 2001.

- *The Discovery of Global Warming* by Spencer R. Weart, Harvard University Press, Cambridge, 2003. Authoritative account of the development of climate science over the last 100 years.
- *Field Notes from a Catastrophe* by Elizabeth Kolbert. Bloomsbury Press, 2006.
- *Six Degrees: Our Future on a Hotter Planet* by Mark Lynas. Fourth Estate Press, 2007.

PEER-REVIEWED JOURNALS PUBLISHING CLIMATE-CHANGE RESEARCH (A PARTIAL LIST...)

Nature, Science, Proceedings of the National Academy of Sciences (PNAS), Climatic Change, Global Change Biology, Global and Planetary Change

ELECTRONIC RESOURCES FOR LITERATURE SEARCHING

- *Google Scholar* – easy to use and a good starting point for finding papers on a topic. Often links to PDFs posted on the web. However, its coverage of the peer-reviewed literature is fairly spotty coverage. Best to begin here then move to the other databases.
- *Web of Knowledge* – massive database of the scientific peer-reviewed literature. Once you find a paper of interest, you can search Web of Knowledge to find papers that cite or are cited by the paper of interest. My primary search tool when I'm digging deeper into the peer-reviewed scientific literature.
- *LexisNexis* – database of newspaper and magazine articles. See also ProQuest.
- *MadCat* – UW search engine for books.