

## GARP 0206-001 *Climate Change* (Spring 2013)

Location/Time: Monday/Wednesday, 15:10 to 16:25 in Wilson 211  
Instructor: Dr. Carsten Braun, office hours MWF 12:00 to 13:00, Wilson 201  
[cbraun@westfield.ma.edu](mailto:cbraun@westfield.ma.edu)

### What is Climate Change?

The United Nations Framework Convention on Climate Change (UNFCCC, signed and ratified by the U.S.) defined ‘Climate Change’ in 1992 as:

*“...a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.”*

Article 2 of the UNFCCC then calls for the:

*“stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”*

- ➔ What is a ‘dangerous anthropogenic interference’ with the climate system?
- ➔ What is a ‘safe’ anthropogenic interference’ with the climate system?

In this course, we explore climate change from a variety of angles. We begin by investigating the basics of our climate system, including the physics of the greenhouse effect and mechanisms (= forcings), both natural and human, of climate change.

The second part of the course focuses on climate change observed in the past, today, and in the future, including methods of (past) climate reconstruction and (future) climate prediction.

In the third part of the course we expand our discussions beyond the scientific basis and into questions of impacts, vulnerabilities, and suitable adaptation and mitigation strategies.

Each of the three parts includes a relevant ‘focus theme’ designed to emphasize a certain theme or question:

Focus Theme 1: An Inconvenient Truth  
Focus Theme 2: What caused the Ice Ages?  
Focus Theme 3: Sustainable Energy

**➔ *This course requires continuous active participation through reading, writing, in-class discussions, and presentations.***

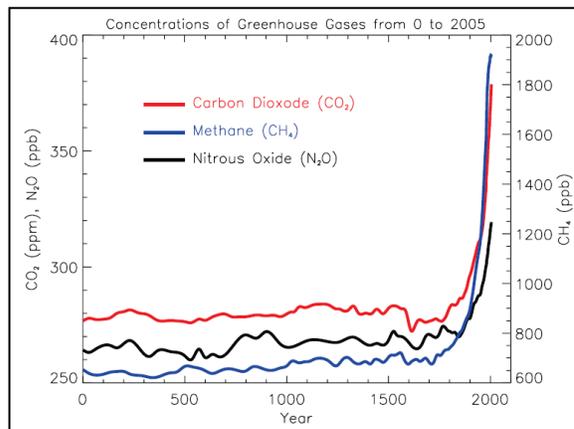


Figure 1: *Atmospheric concentrations of greenhouse gases over the last 2,000 years. Increases since ~1750 are attributed to human activities (Source IPCC 2007 WG I FAQ).*

**Learning Goals**

The fundamental objective of this course is to separate scientific facts from personal opinion and scientific uncertainty from political, moral, or ethical bias. About two-thirds of the course focuses directly on the scientific aspects of climate change and ‘Global Warming’, including issues of uncertainty, especially with respect to predictions of future climate change.

The last part explores more controversial topics, such as local, regional, and global impacts of climate change and associated natural and societal vulnerabilities/responsibilities. Finally, the course explores the ‘So what?’ or ‘Now what?’ questions, and discusses adaptation and mitigation strategies, especially those related to sustainable energy sources beyond fossil fuels.

Table1: *Learning Goals and Learning Outcomes*

<b>Learning Goals</b>	<b>Learning Outcomes – You will be able to:</b>
Knowledge Geographic Literacy	1) Identify and discuss facts and concepts of the climate system, paleoclimate, and climate change. 2) Understand systems thinking, processes, interactions, and feedbacks as related to the changing climate system. 3) Distinguish between natural and anthropogenic influences on the climate system and their interplay.
Critical Thinking Information Literacy Scientific Literacy	1) Effectively select appropriate modes of inquiry, analysis, interpretation, evaluation, synthesis, and communication. 2) Have confidence in your critical thinking skills despite uncertainty, ambiguity, or controversy. 3) Evaluate the quality, accuracy, reliability, objectivity, and timeliness of the information and sources. 4) Understand the role and limitations of science and the scientific method in public decision-making.
Perspective Implications	1) Understand space, time, and change as relevant global concepts. 2) Evaluate the interactions between human and environmental systems at a variety of scales (space and time). 3) Appreciate the interplay between science, public policy, values, and ethical considerations. 4) Recognize the global connections between climate change, impacts, energy use, sustainability, and equity.

In this course we untangle scientific facts from personal opinions and scientific uncertainty from political, moral, or ethical bias.

- Does uncertainty justify inaction?
- How much uncertainty justifies inaction?
- What types of action are justified or necessary today?

The public discourse about climate change and ‘Global Warming’ is highly polarized and thus fails to foster pragmatic, ‘no-regrets’ approaches and solutions. This course cannot offer simple answers, but we will separate scientific facts from personal/religious/special-interest opinion and engage in nuanced and informed discussions of what we can/should/must do/not do about these climate change.

## Course Logistics

We meet twice a week for 75 minutes. Classes will include lectures, readings, in-class projects, presentations, data collection/analysis, etc. Weekly homework assignments and readings are designed to reinforce the course material and/or to introduce additional concepts and related issues.

The course is broadly structured around three themes as summarized in Table 2: the scientific basis, climate change in the past, today, and in the future, and now what? The specific allocation of time and topics is somewhat flexible and depends on current events, student interest, the availability of guest speakers, and possible fieldwork/field trips.

**➔ *Missing class, for any reason, leaves you with a considerable gap in your learning!***

### Course Website

<http://www.westfield.ma.edu/cbraun/teaching/climate-change/>

### Climate Change Resources

<http://www.westfield.ma.edu/cbraun/resources/climate-change-resources/>

### Required Textbooks

- David Archer, *Global Warming: Understanding the Forecast*, 212 pp. Wiley, 2<sup>nd</sup> edition, ISBN-13: 978-0470943410, <http://forecast.uchicago.edu/>
- K. Emanuel, *What We Know About Climate Change*. 128 pp. The MIT Press, 2<sup>nd</sup> edition, ISBN-13: 978-0262018432

### Optional Books

- W.F. Ruddiman, *Earth's Climate: Past and Future*. W. H. Freeman, 2<sup>nd</sup> edition, ISBN-13: 9780716784906.
- Spencer T. Weart, *The Discovery of Global Warming: Revised and Expanded Edition*. Harvard University Press, ISBN-13: 978-0674031890, <http://www.aip.org/history/climate/index.htm>
- D. Archer and S. Rahmstorf, *The Climate Crisis: An Introductory Guide to Climate Change*. Cambridge University Press, ISBN-13: 978-0521732550.
- A. Dessler and E.A. Parson, *The Science and Politics of Global Climate Change: A Guide to the Debate*. Cambridge University Press, 2<sup>nd</sup> edition, ISBN-13: 978-0521737401.
- M. Hulme, *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge University Press, ISBN-13: 978-0521727327.
- N. Oreskes and E. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. Bloomsbury Press, ISBN-13: 978-1608193943.

### Required Resources

- Notebook, USB flash-drive, and a 3-ring binder for the hand-outs and materials

**➔ *If you feel that you are not progressing as well as you hoped, please feel free to talk to me during my office hours or a mutually convenient time – the sooner the better! Please do not wait until the end of the semester!***

## Assessment

Your course grade reflects your learning process throughout the entire semester and combines all grades. You cannot ‘flunk’ this course based on any one poor grade!

- If you are concerned about your grades or performance in the course – please talk to me.
- Please allow at least one week for grades to be ready.
- No make-up tests, homework assignments, etc. unless you are experiencing a documented emergency.
- No extra-credit assignments.
- Due dates and times are mandatory.
- Late policy: Immediate 10 point deduction, 10 point deduction for each day late, ‘skipped’ = zero.

Grade Conversion	
A	94-100
A-	90-93
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	60-66
F	0-59

**→ I expect highly-professional work all the time!  
Ask for help or clarification of my expectation as needed.**

Three take-home tests (40 percent)

- The tests will cover a selection of several pre-defined topics and may include quantitative data analysis and/or data collection. You will have about one week to complete each test.

Resource Portfolio (10 percent)

- You will compile an online resource portfolio (using a blog, website, or wiki) = a resource for yourself and others with information and resources related to climate change.
- This resource portfolio may include: useful websites with short descriptions, collections of papers and articles, listings of books and other materials, useful and interesting figures, graphs, pictures, data sets, case studies, contact information of local/regional experts, etc.
- You will add at least 5 sources per week for a total of at least 75 sources.

Homework Assignments (40 percent)

- Weekly homework assignments designed to offer reflection, additional in-depth study, interesting case studies, data analysis/collection, applications, relevant connections, or context for our in-class discussions.
- Assignments typically involve writing in connection with the assigned weekly reading, but can also include quantitative problem solving and data analysis.

Personal Action Plan with Action (5 percent)

- Here you plan and practice what you intend to do about climate change! This can include a variety of hands-on activities, projects, or lifestyle changes (with prior approval). Your report has to include a documentation of your activities, a critical evaluation, and a personal action plan for your future.

Lighting Talk (5 percent)

- We will present lighting talks (5 minutes, 10 MS PowerPoint slides) about what we think are the biggest challenges and most promising policy solutions related to climate change.

**→ I will provide detailed information about the specific requirements and expectations.**

### Academic Honesty and Disabilities

The University *Academic Honesty Policy* can be found on page 43 of the current Westfield State University Bulletin. Students are expected to do their own work. Plagiarism and cheating are inexcusable. Any instance of plagiarism or cheating will result in no credit for the assignment or failure of the course. The *University Classroom Student Conduct Policy* can be found on page 45 of the current Westfield State University Bulletin available online at <http://www.westfield.ma.edu/uploads/registrar/bulletin.pdf>.

It is the policy of Westfield State University to provide reasonable accommodations to students with documented disabilities.

Students, however, are responsible for registering with the Banacos Academic Center, in addition to making requests known to me in a timely manner. If you require accommodations in this class, please make an appointment with me as soon as possible, so that appropriate arrangements can be made. The procedures for registering your need for reasonable accommodations for disabilities can be discussed with staff at the Banacos Academic Center. Please write to [banacos@westfield.ma.edu](mailto:banacos@westfield.ma.edu).

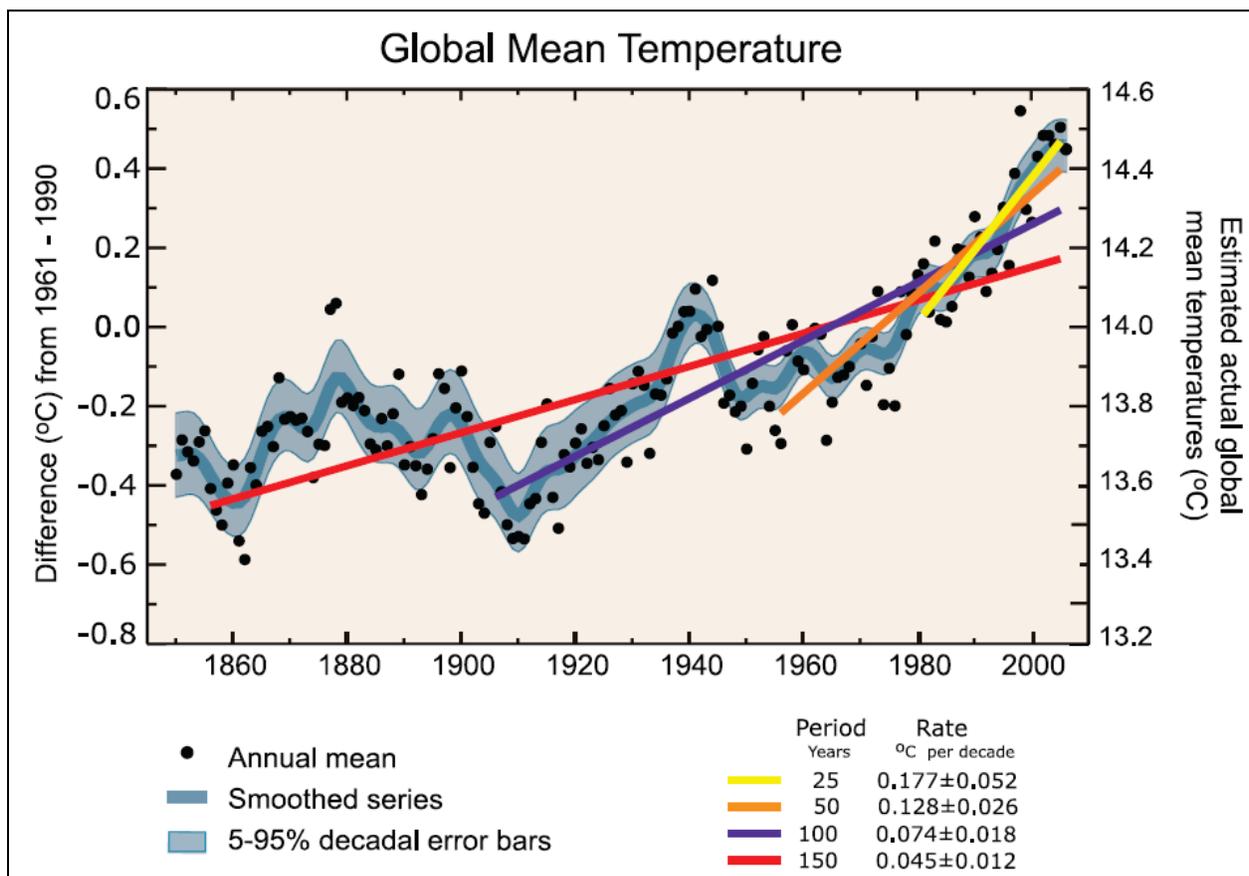


Figure 2: Annual global mean observed temperatures (black dots) along with simple fits to the data. Linear trend fits to the last 25 (yellow), 50 (orange), 100 (purple) and 150 years (red) are shown. Note that for shorter recent periods, the slope is greater, indicating accelerated warming. (Source: IPCC 2007 WGI FAQ)

Table 2: *Course Schedule*

<b>Course Schedule GARP 0206 (Spring 2013)</b>	
Week 1 (01/23)	<b>The Scientific Basis</b>  <i>The basics of the climate system and atmosphere</i> <i>Radiative forcing: greenhouse gases and greenhouse effect</i> <i>Mechanisms of climate change: forcings, feedbacks, tipping points</i> <i>Climate Change vs. Global Warming</i> <i>UNFCCC and IPCC</i> <i>The scientific process, uncertainty, and decision making</i> <i>Focus Theme I: An Inconvenient Truth</i>
Week 2 (01/28, 01/30)	
Week 3 (02/04, 02/06)	
Week 4 (02/11, 02/13)	
Week 5 (02/19, 02/20)	
Week 6 (02/25, 02/27)	<b>Climate Change</b>  <i>Studying past climates: paleoclimatology</i> <i>Climate change in the past</i> <i>Climate change today: instrumental record</i> <i>Climate change in the future: climate models</i> <i>Focus Theme II: What cause the ice ages?</i>
Week 7 (03/04, 03/08)	
Week 8 (Spring Break) (03/11, 03/13, no classes!)	
Week 9 (03/18)	
Week 10 (03/25, 03/27)	
Week 11 (04/01, 04/03)	
Week 12 (04/08, 04/10)	<b>Now What?</b>  <i>Impacts and Vulnerability</i> <i>Mitigation and Adaptation</i> <i>Policies and Politics</i> <i>Climate Neutrality, Cap-and-Trade</i> <i>Sustainability</i> <i>Focus Theme III: Sustainable Energy</i>
Week 13 (04/17)	
Week 14 (04/22)	
Week 15 (04/29, 05/01)	
Week 16 (05/06)	

**The Fine Print**

- Adjustments to the course schedule may be necessary to account for unforeseeable situations.
- Please be on-time (= get to class *before* class starts). Attendance is mandatory.
- If you have to miss a class, please inform me in advance to make arrangements.
- It is your responsibility to keep up with the course material, hand-outs, assignments, due dates, projects, grades etc... *I'm not your secretary!*
- It is your responsibility to seek additional help and support as needed.