

Global Change

Senior
or
AZ Global Change

Geosciences 478/578
Spring 1994

Tues, Thurs 8:00-9:15
210 Franklin

This course examines the nature of human impact on the composition of the atmosphere and the consequences of the accumulation of trace gases for environmental change. Special attention will be given to the role of models in predicting global changes: their assumptions, sensitivities, deficiencies, and the role of paleoenvironmental data in model development and validation. After developing a scientific assessment of the nature of the risks imposed by global environmental change, we will assess the effectiveness of the current global change research program for developing public policies to cope with an uncertain climate.

Prof. Lisa J. Graumlich

Tree-Ring Lab: 105 W. Stadium (621-6465)

Institute for the Study of Planet Earth: 1439 E. Helen, corner Helen and Vine (621-9010)

Email: graumlich@ccit.arizona.edu

Office hours: T, Th 9:30-10:30 (Tree-Ring Lab); (other times by appointment)

Grading and Exams:

	Undergrads	Grad students
Midterm I and II	66%	50%
Final exam	34%	25%
Paper		25%

Exams are essay format. Essay questions will be handed out several days before each exam. Exams will be written in class without the use of notes or texts. A make-up exam will be arranged only if I am notified in person or by phone prior to the time of the scheduled exam with a verifiable excuse.

Extra credit will be given for a one page (single-spaced) summary of a Global Change Seminar (see schedule on p. 2). One point is given for each satisfactory lecture summary. A total of five points can be earned in this manner.

Details of the **grad student paper** assignment will be given in a separate handout.

Texts:

Houghton, J.T., G.J. Jenkins, and J.J. Ephraums. 1990. *Climatic Change: The IPCC Scientific Assessment*. Cambridge, Cambridge University Press. (CC in list below; purchase at bookstore)

Office of Technology Assessment. 1993. *Preparing for an Uncertain Climate: Summary*. Washington, D.C., United States Congress. (OTA in list below; will be handed out in class)

In addition, you will be responsible for other material handed out in class throughout the semester.

Lecture and Reading Schedule:

1/13 What defines global environmental change? How can global change be studied?
CC: Introduction (xxxv-xxxix)

Estimating past and predicting future emissions of greenhouse gases

1/18-1/25 Carbon dioxide: what we know and don't know about the carbon cycle; CC: sec 1.2; Post et al. 1990.
1/27-2/1 Balancing the global carbon budget: the missing gigaton question; Siegenthaler and Sarameinto 1993.
2/3-2/8 Other greenhouse gases and aerosols; CC: sec 1.3-1.8

2/10 Midterm I

The global climate system

- 2/15-2/17 The Earth's energy balance; radiative forcing of climate; CC: sec 2.1, 2.2
2/22 Components of the climate system; feedback mechanisms; CC: sec 3.2, 3.3

Assessing the impact of increasing trace gases on climate

- 2/24 Methods of predicting future climate; CC: sec 3.4, 3.5
3/1 Validation of global climate models--observational data; CC: sec 4.1-4.6
3/3 Guest lecture: TBA
3/8 Equilibrium climate change for 2xCO₂ experiments; CC: sec 5.1-5.4
3/10 Time-dependent results for 2xCO₂ experiments; CC: chap 6
3/22 Recent advances and current controversies in global climate modeling
3/24 Can we detect enhanced greenhouse effect in observational data? CC: sec 7.1, 7.4, chap. 8

3/29 Midterm II

Impact of increasing trace gases on environmental systems

- 3/31 Effects on sea level; CC: chap 9
4/5 Sea level case study: Egypt and Bangladesh
4/7-4/12 Guest lectures: TBA
4/14-4/19 Effects on the biosphere: unmanaged vegetation; CC: sec 10.0-10.2
4/21 Effects on agriculture
4/26 Case study: agriculture in Mexico

Preparing for an uncertain future

- 4/28-5/3 How can we best plan for an uncertain climate? Will we have the answers when we need them?
OTA: pp. 1-57

5/10 Final Exam, 8:00-10:00

Global Change Seminars (optional)

- 1/19 Dr. Steve Running, School of Forestry, University of Montana
Representing Vegetation in Global Biogeochemical Models
Center for Creative Photography, 3:00 pm
- 1/21 Dr. Judit Bartholy, Department of Meteorology, Eotvos Lorand University, Budapest, Hungary
Feedback Mechanisms of Climate Change
Center for Creative Photography, 3:00 pm
- 1/26 Dr. Larry L. Tieszen, Department of Biology, Augustana College, Sioux Falls, SD
Modern Distribution and Isotopic Record of C3 and C4 Grasses in the Great Plains - Climate Sensitivity?
Center for Creative Photography, 3:00 pm
- 2/16 Dr. Paul Mayewski, Institute for the Study of Earth, Oceans & Space, University of New Hampshire
The Greenland Ice Sheet Project 2 - A Climate Time Machine
Center for Creative Photography, 3:00 pm
- 4/7 Dr. Tom Karl, NOAA/National Climatic Data Center, Ashville, NC
Observed Climate Change
Biosciences East, Room 100