AOS/IES 171 Lec 1 Spring 2009 3 credits

GLOBAL CHANGE: ATMOSPHERIC ISSUES AND PROBLEMS

TR 11:00 - 12:15 184 Russell Laboratories

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The primary material for this course is my lecture notes, downloadable from
http://www.aos.wisc.edu/~aos171/
I am turning them into a textbook this semester and would welcome useful feedback. The following are recommended for specific interests:

(1) *Earth in the Balance - Ecology and the Human Spirit*, Al Gore, 1993, Penguin, New York (an interesting earlier book on the topic).

(2) *Earth's Climate: Past and Future*, William F. Ruddiman, 2007, W. H. Freeman and Co., New York (an excellent text emphasizing paleoclimate and future climate).

In this course we will investigate a variety of global change issues. During the first part of the course we will study how the climate system works. The middle part will explore current issues and human impact on the environment. In the third part we will focus on underlying human issues which drive global change. Some sample questions that we will address include:

- How is fossil fuel burning related to reduced glaciers and sea ice?
- Are there more severe storms than there used to be?
- What causes the stratospheric ozone hole and why do we expect it to get better?
- How is acid rain related to regional cooling?
- How can cutting down forests change the global climate?
- Why are coral reefs important and why are scientists concerned about them?
- How can climate change affect human disease, food, and water supply?
- Is the fact that we are made from carbon from corn related to global warming?
- What is the relationship among energy consumption, environmental degradation and international conflict?
- What is the effect of a slow economy on the health of the earth's ecosystems?
- What is "geoengineering" and why do we think that it began about 6000 years ago?

By studying past climates we will gain insight into how the earth system works and how it might respond to anthropogenic influences. For example, changes in the North Atlantic ocean circulation can profoundly affect global climate. By studying past climates we also gain insight into the uncertainty in measuring climate change and predictability of climate change using numerical models. The cycling of water, carbon, and other nutrients will be explored, as they highlight the interdependence of life and the earth system. Other topics include biodiversity,

food crops, and genetic engineering; energy, water, and land; and alternative energy sources. Human psychological, social, and industrial factors are inextricably intertwined with global change issues. These factors guide which strategies might be best for society. During the last week we will have in-class debates on global change issues that you choose, and talk about what we can do to help humankind and our planet.

Grading:
25% - Four homework assignments, 10 points each.
25% - First Midterm, Thursday February 26, 40 points.
25% - Second Midterm, Thursday April 16, 40 points.
25% - Term Paper, due Thursday April 30, 40 points.

The tests will be based on my lectures and will focus on concepts and physical processes. This is a Comm-B course, for which you need to write about 35 pages, including revisions. The first three homework assignments will be ∼3-4 page response papers to special assigned readings. For each of these assignments you will receive detailed written comments from us, with an opportunity for revising your text. The fourth homework assignment will involve participation in The Debates, and you will write a few paragraphs summarizing your contribution. The term paper provides an opportunity for more in-depth exploration of a topic of interest to you and should be about 10 pages long. You will have the opportunity to meet with me to develop a term project topic, if you wish. The course Webography is useful for your term paper: http://www.wisc.edu/wendt/aos171/.

Week	Topics
1	The Earth System and Global Change
2	Evolution and Composition of the Earth System
3	Electromagnetic Radiation and the Greenhouse Effect
4	The General Circulation
5	The Oceans and ENSO
6	**1st Mid-Term Exam R February 26 **
7	Paleoclimate and Climate Dynamics
8	Stratospheric Ozone; Volcanoes and Climate
	Spring Break March 14 - 22
9	Anthropogenic Greenhouse Effect; Tropospheric Pollution
10	Coral Bleaching; Desertification
11	Carbon Cycle; Vegetation Changes
12	Biodiversity, Land, Food and Energy
13	Prediction Models and Future Scenarios
	**2nd Mid-Term Exam R April 16 **
14	Value Systems and Strategies; Environmental Engineering
14	Alternative Energy Sources **Term Paper Due R Apr 30 **
15	The “Great Debates”
	No Final Exam