

**AOS/IES 171 Lec 1 Spring 2017 3 credits Comm-B**  
**GLOBAL CHANGE: ATMOSPHERIC ISSUES AND PROBLEMS**

T R 11:00 - 12:15 811 AOSS Building

Professor Matt Hitchman 262-4653 1303 AO&SS Building (1225 W. Dayton St.)  
email: matt@aos.wisc.edu  
Office Hours: T R 12:30-1:30, and by appointment

Teaching Assistant Molly Aufforth 1547 AO&SS Building  
email: aufforth@wisc.edu  
Office Hours: W F 9:30-10:30, and by appointment

The textbook which I developed for this course  
*Global Change: Humans in the Earth System*  
is available online at <http://www.aos.wisc.edu/~aos171/>  
Login “book”; password “globalchange”.

Recommended Reading (not required):

*Earth in the Balance - Ecology and the Human Spirit*, Al Gore, 1993, Penguin, New York  
*Earth's Climate: Past and Future*, William F. Ruddiman, 2007, W. H. Freeman and Co., New York

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. In the middle part we will explore current issues and human impact on the environment. In the final 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 sea ice?
- Are there more severe storms than there used to be?
- What causes the stratospheric ozone hole and what do we expect for the future?
- What are the main features of our present climate system and how are they changing?
- 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?
- What is the relationship among energy consumption, environmental degradation and international conflict?
- What is the effect of the strength of the economy on the health of the earth's ecosystems?
- What is “geoengineering” and did it begin as early as 6000 years ago?
- Should we embrace nuclear power, transgenic crops, and geoengineering to avoid too much global warming?

We will study the primary features of the present climate variability, such as the El Nino Southern Oscillation, the Northern Annular Mode, the Atlantic Meridional Overturning Circulation, and the effects of volcanic eruptions and solar variability. By studying past climates we will gain insight into how the earth system works and how it might respond to anthropogenic influences. We will investigate how climate models are built and examine what climate models forecast. 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.

Your grade for the course will be determined by your score out of 160 points for the semester. Half of the grading will be based on writing. The other half will be based on two mid-terms near the 6th and 12th weeks. The exam material will be from my lectures and will focus on concepts and physical processes. We will have an in-class review session before each exam.

25% - Five short assignments: 2 oral 5 pts each; 3 written, 10 pts each, 40 points.

25% - Term Paper, 40 points.

25% - First Midterm, 40 points.

25% - Second Midterm, 40 points.

For a Comm-B course one should write approximately 35 pages of material, including revisions, and there should be significant opportunity for oral presentation experience. For the three short written assignments you will write ~3-5 page response papers to special assigned readings. For the first two of these assignments you will receive detailed written comments from the Writing Fellows. For the third assignment you will receive initial feedback from the professor or TA, and you will be able to revise your text for a final draft.

Regarding the oral component of a Comm-B course, early in the semester we will spend some class time on short group presentations. 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.

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. Near the middle of the semester you will have the opportunity to meet with us to develop a term paper topic, if you wish.

<u>Week</u>	<u>Topics</u>
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 23 **
7	Paleoclimate and Climate Dynamics
8	Stratospheric Ozone; Volcanoes and Climate
9	Anthropogenic Greenhouse Effect; Tropospheric Pollution
10	Coral Bleaching; Desertification
	Spring Break March 18 - 26
11	Carbon Cycle; Vegetation Changes
12	Biodiversity, Land, Food and Energy
13	Prediction Models and Future Scenarios
	**2nd Mid-Term Exam R April 20 **
14	Value Systems and Strategies; Environmental Engineering
14	Alternative Energy Sources **Term Paper Due R April 27 **
15	The "Great Debates"
	No Final Exam