

Ohio State

Survey  
OSU ES2

**GEOGRAPHY 120  
EARTH SYSTEMS II: ATMOSPHERIC ENVIRONMENT  
(Spring Quarter, 1995)**

**Classes and Instructors**

Lectures: MW 9:30-10:50, MacQuigg Laboratory 264, Dr John Arnfield.

Recitation: R 7:30-8:50, McPherson Chemical Laboratory 110 (call number 08432-1), Mr Mark Johnson.

R 7:30-8:50, Denney Hall 259 (call number 08433-7), Ms Jennifer Miller.

F 7:30-8:50, Denney Hall 256 (call number 08434-2), Mr Mark Johnson.

F 7:30-8:50, Hagerty Hall 324 (call number 08435-8), Ms Jennifer Miller.

**Important: Geography 120 is a 5 credit hour class. Normally, such classes meet for five 48 minute classes or three 80 minute classes, both of which give a total of 4 hours per week. This class is on the 3 class schedule so each lecture ends at 10:50 and each recitation ends at 8:50. IGNORE THE BELLS AT 18 MINUTES PAST THE HOUR - they are not relevant to this class. If your schedule is such that you cannot attend the class for these officially-scheduled times, drop this class now!**

Contacting Your Instructor:

**John Arnfield**

Office: Derby Hall 1110

Hours: M 11:00-12:00, 1:00-2:00, T 2:00-3:00, W 3:00-5:00, R 11:00-12:00

or by appointment on MTWR only (292-7954)

or by electronic mail at [John.Arnfield@osu.edu](mailto:John.Arnfield@osu.edu)

**Mark Johnson**

Office: Derby Hall 1155

Office hours were not available when this syllabus was run. They will be distributed at the second lecture

**Jennifer Miller**

Office: Derby Hall 1169

Hours: MW 2:00-3:00, R 9:00-11:00

or by appointment (292-7518)

Students must attend the recitation class determined by the call number of the section in which they are enrolled.

### **Prerequisite**

Geological Sciences 100 (Earth Systems I: Geological Environment). Students whose roster data indicates no credit for Geological Sciences 100 will be required to furnish proof of successful completion of the course within one week of the first class to avoid being disenrolled.

There are no formal mathematics prerequisites for this course. However, in order to complete practical work, you will be expected to have a facility with mathematical techniques to the college entrance level.

### **Course Objectives**

The objectives of this course are as follows.

1. To introduce you to the nature of the atmosphere and to the processes by which it operates to produce the phenomena of weather and the global distributions of climatic elements and types.
2. To investigate the ways in which the systems of the atmosphere interact with those of the lithosphere and hydrosphere (covered in Geological Sciences 100), how materials and energy are cycled in ways which involve the total planetary system and how the methods and findings discussed in Earth Systems I can be used in the study of atmospheric history.
3. To discuss ways in which atmospheric systems interact with human systems. This includes both ways in which the atmosphere directly and indirectly influences human beings and ways in which human technology is playing a role in the functioning of the weather and climate system.
4. To provide students with a sense of the ways in which scientists studying the atmosphere go about their work, how they integrate different methodologies, and what tools and techniques they employ.
5. To emphasize that, because of the richness and complexity of the systems of the lithosphere, hydrosphere, atmosphere and biosphere, modern studies of global environment require the involvement of scientists trained in different disciplines.

### **Course Description**

This course is the second of a two-course sequence in Earth Systems offered cooperatively between the Departments of Geological Sciences and Geography. In Earth Systems I, you were introduced to various aspects of the geological environment of the Earth. In this course, your understanding of our planet's systems will be extended to encompass the atmospheric environment. These two courses must not be viewed in isolation from one another. The physical systems of the natural environment are characterized by an extraordinary richness and complexity involving exchanges of energy and matter among the components are the solid earth, the atmosphere, the oceans and living things (including humans). As a result, the processes of the global environment and the global distributions of phenomena which result from the operation of these processes, are linked in ways which transcend traditional disciplinary boundaries and the course offerings of individual departments. You will be expected to make use of concepts taught in Geology & Mineralogy 100

and will deal with systems in this course which interact significantly with those treated with in the preceding one.

Classes in Earth Systems II are of two types, lectures and recitations. Lectures (each 80 minutes in length) are of two types. "Fundamentals" (see "Course Outline" below) cover the basics of the functioning of the atmospheric system and their manifestation in the phenomena of "weather" and "climate". "Applications" treat some of the ways in which these phenomena interact with human systems. The specific topics included within each category are identified under "Course Outline" below.

In addition, a recitation class (also 80 minutes long) will provide opportunities to perform practical exercises (calculations, work with maps, charts etc) involving material covered in lectures and in the text. Exercises will be discussed in the recitation classes and will contribute to your overall performance in the course (see "Grading", below).

### **Required Reading**

Text: Ahrens, C. Donald. 1993. Essentials of Meteorology: An Invitation to the Atmosphere. West Publishing Co. See "Course Outline" at the end of this syllabus for information on which chapters should be read by which dates.

Additional Readings: These will be made available for copying at the Reserve Room, Main Library.

### **Grading**

Your course grade will depend upon your performance in the following:

- (1) Term Examination 1 (20%), Wednesday, April 12,
- (2) Term Examination 2 (20%), Monday, May 8,
- (3) Final Examination (40%), Tuesday, June 6, 7:30-9:18 a.m.,
- (4) Exercises (20%). There will be eight exercises distributed during the quarter. Your grade for this part of the course will be based on the best five of these. The first one will be assigned at your first recitation class and they will follow weekly thereafter.

Term examinations will be held from 9:50-10:50 on the days indicated, with the first 20 minutes of the class used for review or answering questions. **You should check with instructors in other courses now to ensure that there is no conflict with the final examination for Geography 120.** If a conflict results from the failure of the other instructor to follow the final exam schedule published by the Registrar, you will have to make arrangements with that instructor to take the final for that course at another time.

### Additional Comments

- (1) Makeup exams will not be given, except in the case where attendance at the scheduled exam was prevented by circumstances beyond your control. Appropriate documentary verification must be presented by students requesting a makeup examination. Makeup exams may be oral, administered by a panel consisting of Dr Arnfield and the class TAs.
- (2) The final examination must be taken at the scheduled time, with the sole exception of graduating seniors.
- (3) The grade of "incomplete" (I) will not be given, except in the case of extended, verifiable illness.
- (4) Graduating students will have to reschedule the final examination and must ensure that they have completed the required 5 exercises prior to the graduating students exam (which is held in the middle of the last week of classes). Please let the instructor know if you are planning to graduate this quarter (now and again after the second term exam).
- (5) Assignments should be your own work. If you are unsure of the approach to take to a particular problem, speak to your recitation or lecture instructor. Do not copy from, or even work with, another student. If you have any doubts about procedures which might be considered to be unethical, ask! While discussing in general terms the approach to an assignment may be acceptable, working together simultaneously on calculations and verbal answers will not be accepted. Marked similarities in layout, style, wording, working etc will be taken as prima-facie evidence of cheating. Such cases, and other forms of unethical behavior, will be dealt with following Faculty Rule 3335-5-54, which requires instructors to report to University Committee on Academic Misconduct all instances of suspected unethical academic activity. Do not assume that what is acceptable in another class is acceptable in this one!
- (6) Exercises will be distributed and collected at your recitation class on Thursday or Friday. You must hand in your work at the beginning of the class or earlier. No late exercises will be accepted for any reason, including illness, traffic accidents, family bereavements and similar factors. It is your job to get your exercises in by the beginning of your recitation class.
- (7) You will normally have one week to complete assignments.
- (8) Exercises will be graded on the basis of accuracy of content and matters of presentation (neatness, spelling, grammar etc).
- (9) Lecture class will not meet on Monday, May 29, which is an official university holiday. None of your instructors will have office hours on that day. The last day to withdraw from this class without a "W" on your transcript is Friday, April 14.

### Course Outline (With Text Reading)

In order to keep up with the work in this course, you should read the text chapters according to the following reading schedule, which is equivalent to about 37 pages per week. Do not put off your reading until immediately prior to the exam (although it would a good idea to read the required material a second time before an exam).

- Fundamentals 1: Earth Systems - the example of the global carbon cycle.
- Fundamentals 2: Introduction to the atmosphere (composition, origins, vertical structure). [Chapter 1: read by end of week 1]
- Fundamentals 3: Global energy budget (earth-sun relationships, solar radiation, terrestrial radiation, the heat budget for the globe and by latitude). [Chapter 2: read by end of week 2]
- ☞ Applications 3a: Ozone depletion in the stratosphere (human activities, the "ozone hole" and international cooperation)*
- ☞ Applications 3b: Global warming and the enhanced greenhouse effect.*
- Fundamentals 4: Air temperature (heat and temperature, scales and measurement, controls on temperature). [Chapter 3: read by end of week 2]
- Fundamentals 5: Atmospheric humidity, and the phenomena of condensation (the hydrologic cycle, change of state, humidity variables and saturation, dew, frost, fog, adiabatic temperature changes, atmospheric stability classes). [Chapter 4: read by end of week 3]
- ☞ Applications 5a: The human energy budget: weather and human comfort.*
- Fundamentals 6: Cloud development and precipitation (clouds, precipitation processes, types of precipitation). [Chapter 5: read by end of week 4]
- Fundamentals 7: Air pressure and winds (gas laws, the forces leading to atmospheric acceleration, relationship of horizontal and vertical winds). [Chapter 6: read by end of week 4]
- Fundamentals 8: Global circulation (idealized and observed circulations, the tropics, the extratropics, local winds, global precipitation patterns). [Chapter 7: read by end of week 5]
- ☞ Applications 8a: Times of feast, times of famine: atmospheric circulation and drought.*
- Fundamentals 9: Air masses, fronts and mid-latitude storms (air masses, air mass modification, properties of North American air masses, fronts, wave cyclones). [Chapter 8: read by end of week 6]
- Fundamentals 10: Weather forecasting. [Chapter 9: read by end of week 7]
- Fundamentals 11: Severe weather (thunderstorms, tornadoes, hurricanes). [Chapters 10 and 11: read by end of week 8]
- ☞ Applications 11a: Extreme weather events and risk.*
- Fundamentals 12: Air pollution. [Chapter 12: read by end of week 9]
- Fundamentals 13: Climate change (small scale changes, global scale changes, evidence and hypotheses). [Chapter 13: read by end of week 9]
- ☞ Applications 13a: The climates of cities.*
- Fundamentals 14: Global climate distribution (controls, climatic regions). [Chapter 14: read by end of week 10]

[Chapter 15 is not assigned and will not be examined.]

GEOGRAPHY 120

EARTH SYSTEMS II: THE ATMOSPHERIC ENVIRONMENT

WINTER QUARTER, 1994

Instructor: Prof. E. Mosley-Thompson Office: Derby Hall 1140  
Telephone: 292-2580 (please leave message on machine if not there)  
Office hours: Tue., Thurs.: 10:30 to 12:00 or by appointment

Course Prerequisite: Geology 100: Earth Systems I

Text: The Atmosphere: An Introduction to Meteorology, (5th Ed.) by F.K. Lutgens and E.J. Tarbuck, 1992, Prentice Hall.

Course structure:

Lectures: Tues., Thurs. 9:00 to 10:30 am Campbell 200 (Mosley-Thompson)

Recitation: Mon. 8:30 to 10:00 am in MP 310B (Mr. Song)  
Mon. 8:30 to 10:00 am in CC 358 (Ms. Rogers)  
Mon. 9:30 to 11:00 am in DE 256 (Mr. Mark)  
Wed. 8:30 to 10:00 am in JR 371 (Mr. Song)  
Wed. 8:30 to 10:00 am in CC 358 (Ms. Rogers)  
Wed. 9:30 to 11:00 am in MP 310B (Mr. Mark)

Course Objectives:

The atmosphere is the thin layer of gases which surrounds our home, Planet Earth, and makes all life here possible. We will examine the atmosphere by studying (1) its physical and chemical characteristics, (2) how it was formed, (3) how it moves, (4) its role in transporting of water (precipitation), heat, and energy, (5) how it controls both current weather and climate, (6) how it interacts with the other components of the Earth System, (7) how recent human activities have changed its composition and temperature, and (7) how these changes may affect the future of our environment. You will find that many of the concepts, ideas, and research to which you are exposed in this class will provide a better understanding of your environment and how your actions and responses may affect it.

This course is the second in a two-course sequence in Earth Systems. It builds upon your knowledge of the solid Earth introduced in Earth Systems I. As you study the role of the atmosphere as a component of the Earth's environment you will see that there are numerous complex exchanges of matter and energy between the atmosphere and the solid earth, hydrosphere, and biosphere.

You will attend two 90 minute lectures per week during which you will be introduced to basic concepts and phenomena inherent to the atmosphere, as well as the relationships between the atmosphere and other Earth System components. You will attend one recitation weekly during which these concepts and ideas will be emphasized in more detail and exercises will be assigned to develop your understanding of the concepts presented in class.

The recitation provides an opportunity for additional discussion of ideas and issues presented in the lecture. Additional material not covered in the lecture may be presented in the recitation.

Grading:

First mid-term exam: 20 percent  
 Second mid-term exam: 25 percent  
 Final exam: 30 percent  
 Recitation assignments: 25 percent

You are expected to work alone on all assignments. Cheating will result in failure. Assignments will not be accepted after the assigned due date. Written proof of a medical problem is required for acceptance of late assignments or administering a make-up exam. An incomplete will be given only in the advent of an extended illness for which a physician's statement is required. There is no class on Jan. 17 (Monday) due to Martin Luther King Day.

LECTURE OUTLINE AND ASSIGNED READINGS

DATE	LECTURE TOPIC	READINGS
1/4	The Earth System: an overview Managing Planet Earth (W.C. Clark)	1-5 (book) (1-11) reserve*
1/6	Composition and structure of the atmosphere	5-23; 145-149; 404-405
1/11	Changing composition of the atmosphere Changing atmosphere (Graedel and Crutzen)	reserve*
1/13	Sun/Earth relationships; heat transfer	25-37
1/18	Solar Radiation and Terrestrial Radiation	37-42
1/20	Terrestrial radiation; global heat budget The Changing Climate (S. Schneider)	42-45 reserve*
1/25	Atmospheric temperature; heat distribution	47-66
1/27	Mid-term examination #1 (20 percent)	
2/1	The hydrologic cycle; humidity	68-82
2/3	Atmospheric stability; adiabatic processes	82-93
2/8	Precipitation processes; clouds	112-143
2/10	Why the atmosphere moves	145-165
2/15	Global wind systems	167-194
2/17	Air masses and fronts	196-221
2/22	Cyclogenesis/Severe Storms	221-279
2/24	Mid-term exam #2 (25 percent)	
3/1	What causes the climate to change? Natural versus anthropogenic causes	320-346
3/3	How do we know that climate has changed?	reserve

3/8 Pollution of our air and water 95-110;  
3/10 Growing world population; Why does this  
affect our atmosphere? (Keyfitz) reserve\*  
Toward a sustainable world (Ruckelshaus) reserve\*

3/14 FINAL EXAM: MONDAY: 8:30 - 11:18 AM IN PA 103 220 (30 percent)

Note: \*Articles are found in folders on reserve under Geography 120 in the Science Engineering Library and are also found as chapters in the book Managing Planet Earth: Reading from Scientific American, 1990; W.H. Freeman and Co., several copies of which are on reserve).

Note: Buildings

CC - Central Classroom Building  
DE - Denney Hall  
JR - Journalism Building  
MP - McPherson Chemical Laboratory

Your teaching assistants are:

Mr. Paul Kinder: Derby Hall, Room 1145, 292-6127  
Mr. Mark: Office: Derby Hall, Room 1145, 292-6127  
Ms. Rogers: Office: Derby Hall, Room 1070, 292-2705  
Mr. Song: Office: Derby Hall, Room 1131, 292-1357