

Book

Series
PHY Modeling the Earth
System 1

Spring, 1994

FNR 498G or GEOS 391A

Modeling the Earth System

*A state-of-the-art course in understanding, monitoring
and modeling Global Change
Supported by USRA & NASA's Earth System Science
programs*

James OGG and Rob NEWMAN (Earth & Atmospheric), and Anne SPACIE
(Forestry & Natural Resources)

3 credits; TTh 1:30, Lab sections: T 9:30-11:20 or T 11:30-1:20

An asteroid hitting the Earth results in extinction of half of the animal life; a Volcano exploding in the Philippines contributes to flooding in the Midwest; reduced Sunspot activity on the Sun causes a hundred-year "Little Ice Age" that freezes the Dutch canals; Panama separates the oceans forcing African apes to walk on the ground and think about midterm exams; Refrigeration of food contributes to the destruction of the atmospheric ozone shield; and NASA begins a multi-decade program to monitor the changing Earth.

These are only a few of the case examples of the impacts of Global Change on the interrelated Earth systems to be explored in this course. Each lecture will be an in-depth treatment of the response of the Earth to a different geological, astronomical, biological, atmospheric, oceanographic, or societal impact. We will also examine how to predict and monitor future Global Change. A series of guest lecturers from NASA and other universities will explain the current frontiers and future goals.

The Laboratory portion of the course will be use of various modeling and monitoring computer software (STELLA, SimEarth, Geographical Information Systems, NASA satellite data acquisition and processing, Global Weather simulations, Energy Balance Models, Fisheries management scenarios, etc.).

This course is a combined offering of the departments of Earth & Atmospheric Sciences and Forestry & Natural Resources, but is applicable to all fields of science and technology. Please ask James Ogg, Anne Spacie, Rob Newman, or John Snow for further details.

Spring, 1994

PURDUE UNIVERSITY

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Supported by NASA's Earth System Science program*

James OGG (Earth & Atmos.) and Anne SPACIE (Forest. Nat. Res.)

Rob NEWMAN (Lab coordinator)

Lecture: TTh 1:30, Lab sections: T 9:30-11:20 or T 11:30-1:20; 3 credits

Tentative Lecture/Lab Schedule

<u>WEEK</u>	<u>TUES</u>	<u>THURS</u>	<u>Lab (Tues)</u>
<u>IMPACTS OF GEOLOGICAL PROCESSES</u>			
Jan. 11,13	Intro/Overview (Mesa Verde)	Gaia	<i>"After the Warming"</i>
Jan. 18,20	<i>Snow-Holiday</i>	Mass extinction (Permian)	<i>SimEarth & Gaia</i>
Jan. 25,27	Super-Greenhouse (Cret.)	Mountains and Man	<i>STELLA tutorial</i>
Feb. 1,3	Volcanic Winter	The 1000-Year Event	<i>Earth Process Models</i>
<u>IMPACTS OF BIOGEOCHEMICAL AND ATMOS-OCEAN PROCESSES</u>			
Feb. 8,10	BioGeoChem/Nutrient Cycles	El Niño	<i>Carbon cycle-1</i>
Feb. 15,17	Ozone	Atmospheric Gases	<i>Carbon cycle-2</i>
Feb. 22,24	Methane ?	Groundwater	<i>Ozone models</i>
Mar. 1,3	Zoogeography	Hurricanes; Coastlines	<i>Fisheries and El Niño</i>
Mar. 7-11	<i>Spring Break</i>	Midterm 3Ms	
Mar. 15,17	Ecosystem dynamics	Ecosystem adaption	<i>Modeling Project</i>
<u>IMPACTS OF HUMANS ON BIOSYSTEMS</u>			
Mar. 22,24	Mediterranean	Introduced Species	<i>GIS Africa</i>
<u>IMPACTS OF ASTRONOMICAL PROCESSES</u>			
Mar. 29,30	Death from the Heavens	Milankovitch Cycles	<i>Presentations of Models</i>
<u>NASA MONITORING OF GLOBAL CHANGE</u>			
Apr. 5,7	Sunspots and Little Ice Age	Monitoring from Space	<i>Energy Balance Model</i>
Apr. 12,14	NASA's EOS	<u>Easter Island</u>	<i>NASA satellite data</i>
<u>LARGE-SCALE IMPACTS OF HUMANS</u>			
Apr. 19,21	Ice Cores; Climate Pulses	Nepal-1	<i>Geoscope (Overview)</i>
Apr. 26,28	Nepal-2	The Big Picture/Review	<i>Geoscope (Brazil)</i>
May 3	--- FINALS --- (Test #3 -- 250 pts -- date = Final's schedule)		

Texts, Supplemental Reading:

Modeling the Earth System (D. Ojima) will be required (given out)

STELLA applications handbook (given out)

BioGeoChemistry -- An Analysis of Global Change (W.H. Schlesinger) -- optional

Patterns of Life (H. Mielke) -- optional

Consider a Spherical Cow -- optional

Atmospheric Change : An Earth System Perspective [T.E. Graedel & Paul J. Crutzen (1993)

Freeman publ., New York; 446 pp., \$42.95] -- optional

The Earth System (R. Crane, J. Kasting et al.; Penn State Univ. course notes) -- optional (may not yet be in print)

Other readings, as appropriate to lectures

Grading:

Total of 1000 pts: 850+ = **A**, 750-850 = **B**, 650-750 = **C**, 550-650 = **D**

Project on an Earth System, with class explanation This will require finding actual numbers, etc.	150
Lab exercises (10 graded labs)	350
Mid-term -- suite of factual and general questions	200
Final -- take-home, two-weeks before end of term; what-if questions	300
