## METR 4533 / METR 5533 / GEOL 4533 / GEOL 5533 Earth's Past Climate Fall 2012

## Instructors:

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Meteorology 414 SEC; 325-1142

Office Hours: M/W 12:30-1:30 or appt

Lynn Soreghan (Isoreg@ou.edu)

Geology & Geophysics 868 SEC: 325-4482

Office Hours: Tu 3-4, W 10-11:30 or by appt

Text: Ruddiman, W.F., 2001, Earth's Climate: Past and Future, 1st edition: W.H. Freeman and Co, NY, 465 p.

**Prerequisite:** Introductory geology and meteorology or equivalent (or permission of instructor); senior undergraduate or graduate standing. Intended for students in both the geosciences and science education.

**Course Philosophy and Objectives:** Climate is interdisciplinary. Our goal is to provide you with a fundamental understanding of how Earth's climate system works, how climate has changed through geologic time, how to decipher climate archives from the geologic record, and practice in communication.

**Readings:** Readings are from Ruddiman text, and journal articles. You are responsible for material covered in all assigned readings. Journal readings will be uploaded as pdfs on D2L. Reading primary literature is an important component of advanced education because it requires you to absorb, synthesize and analyze research papers. An online exercise will accompany each non-text reading assignment, due 24 hours prior to the relevant lecture. Further details will be discussed in class.

**Term Project:** For your term project, you should focus on, and research extensively, a paleoclimatic topic selected by you and approved by us. Use existing literature. Project requirements for those enrolled in the graduate levels differ significantly from those enrolled in the undergraduate levels; undergraduates may work in teams of two, whereas graduates are expected to work independently. This is a semester-long project with components due throughout the semester; see syllabus for due dates. Our goal is to help you learn to write. For additional help (outside of class), please remember OU's writing center; for more information visit <a href="www.ou.edu/writingcenter">www.ou.edu/writingcenter</a>. Know the definition of plagiarism, and don't plagiarize. More instructions will follow soon.

A Note on Research: Your research on course projects should be extensive, given the level of this course. Go well beyond the web—i.e., to the professional literature (real books and journals). ALL sources, including web sources, must be cited—using uncited material is a form of plagiarism. Good starting points for literature searches are Georef, Web of Science, Geoscience World, and Google Scholar.

**Exams and Exercises:** There will be two exams; do not miss either (there will be no make-up exams). Exercises will be linked to lecture topics. More details will be provided later. All exercises must be uploaded to the D2L dropbox by the due date. Students who plan to observe a religious holiday that falls on an exam or due date should notify the professor as soon as possible to make appropriate arrangements for rescheduling of class work.

Field Trip: A field trip is planned to discuss climate proxies from field data. More details later.

Grading: 1000 points total: Exercises/Readings (35%), Exams (40%), Term Project (25%).

## **KNOW THE GEOLOGIC TIMESCALE!!!**

Any student in this course who has a disability that may prevent full demonstration of abilities should contact us personally as soon as possible to discuss accommodations necessary to ensure full participation and facilitate your educational opportunities. Also, it is the policy of the University to excuse the absences of students that result from

religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays.				

**Tentative Schedule** 

Neek   1	Week	Date	Lecture (with Ruddiman readings)	Projects (Point Totals)	
Week   1	PART I: In	troduction to Core G	eologic and Climatic Concepts		
Th 23	Week I	Tu 21 Aug			
		TI 22		(	
Week 2         Tu 28 Aug		Th 23			
Th 30	\A/I. 2	T 20 A		Radio-isotopic Dating Web Lab (10 pts)	
Th 30	vveek Z	Tu 28 Aug			
Week 3		TI- 20		ng	
Th 6		1 n 30			
Th 6   Lithologic Climate Proxies    Leaf Analysis Lab (25 pts)	Wook 3	Tu 4	Sed Rocks Review, Lithologic Climate Proxies I	Sed Rocks/Proxies Lab (25 pts)	
Week 4	TTCCK 3	iu i			
Neek 4		Th 6	Lithologic Climate Proxies II	Leaf Analysis Lab (25 pts)	
The 13		•	- / -		
Week 5	Week 4	Tu II	<u> </u>		
Week 5					
Chapter   1 - parts   [Lynn]   Intro to Climate System   Carbon Cycle Exercise (25 pts)		Th 13	•	Isotope Exercise (25 pts)	
Th 20	Week 5	Tu 18			
Week 6					
Week 6         Tu 25         Climate System Dynamics / Global Warming (Chapters 2, 18, 19) [Susan]           PART II:         Mojor Controls on the Climate System Evolution of Atmosphere, Faint Young Sun Paradox (Chapter 4) [Susan]         Evolution of Atmosphere, Faint Young Sun Paradox (Chapter 4) [Susan]           Week 7         Tu 2 Oct         Orbital Practicum         Orbital Exercise (30 pts)           Week 8         Tu 9         Orbital Controls on Climate (Chapters 8, 10, 11) [Susan]         Exam I (200 pts)           Week 8         Tu 9         Plate Tectonics and Climate I (Chapters 8, 15) [Susan]         Exam I (200 pts)           PART III:         Cose Studies of Past Climates         EXAM I         * Wiki Project Title DUE           Week 9         Tu 16         EXAM I         * Wiki Project Title DUE           Th 18         The Snowball Earth (Proterozoic) I (p. 89) [Susan]         * Wiki Project Annotated Biblio DUE           Week 10         Tu 23         The Snowball Earth (Paleocene-Eocene) [Susan]         * Wiki Project Annotated Biblio DUE           Week 11         Tu 30 Oct         The Hothouse Earth (Paleocene-Eocene) [Susan]         * Wiki Project Draft DUE I Nov (40 pts)           Week 12         Tu 6         Back into the Icehouse (Cenozoic) (p. 147-17) [Susan]         * Wiki Project Draft DUE I S Nov (100 pts)           Week 13         Tu 13         Millennial-Scale Climate Change (p. 340-34) [Susan]<		Th 20	•	Carbon Cycle Exercise (25 pts)	
Chapters 2, 18, 19   Susan   PART II:   Mojor Controls on the Climate System   Evolution of Atmosphere, Faint Young Sun   Paradox (Chapter 4) [Susan]   Sot 29   Fieldtrip [detail TBA]					
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Chapter 4) [Susan]   Fieldtrip [detail TBA]		Th 27			
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TTEEN I I I I I LACIII II (LUU PLS)	Week 14	Tu 20		Exam II (200 pts)	
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Th 22 THANKSGIVING—no class	\A/1-15			Wild Project Out Fresh visco /- vi	
Week 15 Tu 27 Project Presentations • Wiki Project Oral Evaluations (grads	vveek 15		·	• • • • • • • • • • • • • • • • • • • •	
Th 29 Project Presentations only; 40 points). Wiki final version DOE		Th 29	Project Presentations	only; 40 points). Wiki final version DUE	

Week I6 Tu 4 Dec Th 6 AGU [Work on finalizing & uploading Wiki]
AGU [Work on finalizing & uploading Wiki]

27 Nov 5 PM (50 pts grads/ 90 pts undergrads). Must upload final (corrected) version by Fri, Dec 7 to obtain full credit.