SYLLABUS

EAS 4350/6136 Paleoclimatology and Paleoceanography
Spring 2021
MWF 9:30-10:20 Hybrid Mode
https://bluejeans.com/269581509
L1175 Ford ES&T

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Office Hours: by appointment via Bluejeans or phone

Course Description: The course will explore the history of the earth's climate and how paleoclimate studies can help us learn more about the workings of the climate system and associated biogeochemical cycles.

Objectives: By the end of the course, the student should have an understanding of the controls on the long-term climate evolution of the Earth and some of the main tools used in reconstructing past climate. Students will also improve their analytic and scientific writing skills.

Audience/Pre-requisites: This course is intended for advanced undergraduate and graduate students and is open to interested and motivated students from any undergraduate major or graduate field. There are no specific prerequisites, but some coursework in earth sciences, oceanography, and/or geochemistry is helpful.

Format: Lectures will be posted online for asynchronous viewing or reading. Students will have the opportunity to clarify concepts presented in the lectures and assigned readings and discuss the study questions in the Monday and Wednesday tutorial groups. The tutorial groups will meet in-person in L1175 whenever possible, but online participation will also be possible. The *Monday* tutorial group is for students in EAS4350 and the *Wednesday* tutorial group for students in EAS6136. On Fridays there will either be a discussion or a tutorial session related to the two class projects. These will take place online.

Projects: Two projects will be assigned during the semester. A write-up of each project must be submitted in *Geophysical Research Letters* journal article format (instructions provided). Projects are different for EAS 4350 and EAS 6136.

Discussions: Discussion preparation questions must be submitted (uploaded to Canvas) by 5pm on Thursday prior to the start of the discussion.

Exams: In lieu of exams, a subset of the study questions and the synthesis questions will be graded at the end of each unit. For EAS4350, these study questions are due each Friday.

Help: Office hours are by appointment and will take place on Bluejeans. Students should submit any questions about the course content, assignments and logistics to the appropriate Discussion in Canvas. Please email me with questions that are specific to you (excused absences, requests for office hours, etc.).

Required Texts:

Book Chapters and Review Papers as assigned. All readings will be supplied as pdf or web links on Canvas, no textbook purchase required.

Web Resources:

All assignments and class resources will be posted or linked from Canvas.

Grading:

50% Graded subset of study questions and integrative questions in lieu of exams
40% Projects
10% Preparation and participation in scheduled discussions. Lowest grade will be dropped.

Attendance: See catalog for institute policies for excused absences and make-up work: http://www.catalog.gatech.edu/rules/4/. Please attend remotely if you feel poorly for any reason.

Student-Faculty Expectations Agreement: Georgia Tech strives for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See http://www.catalog.gatech.edu/rules/22/ for an articulation of some basic expectations for both students and faculty.

Copyright: All course material, including lectures and lecture slides, is protected by copyright. Distribution or upload to sites such as CourseHero is illegal.

Academic Integrity: Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Collaboration and Group Work: No books, notes, or collaboration are allowed on exams. While collaboration is allowed on the homework, each student must submit their

own write-up in their own words. Students must write their own responses to the study questions that will be used in lieu of exams.

Accommodations for Students with Disabilities: If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Statement of Intent for Inclusivity: As a member of the Georgia Tech community, I am committed to creating a learning environment in which all of my students feel safe and included. Because we are individuals with varying needs, I am reliant on your feedback to achieve this goal. To that end, I invite you to enter into dialogue with me about the things I can stop, start, and continue doing to make my classroom an environment in which every student feels valued and can engage actively in our learning community.

Schedule:

Week 1 (Jan 15):

F: Introductions and Overview (synchronous online)
Optional Lectures (asynchronous): Global Climate Overview and Climate Change Overview
Optional readings:
Climate Change: Evidence and Causes (NAS/RS)
The Earth's Climate Chapter 2 (Ruddiman)
Note: Lectures and readings for those who have not yet taken EAS4300/6500 or who want a refresher

Unit 1: Warm Climates of the Geologic Past

Readings:
EAS4350 and 6136:
Paleoclimatology (Bradley), Chapter 6.1, 6.2, 6.3.1
Leavitt, "Carbon Isotopes, Stable" *in Encyclopedia of Paleoclimatology*
EAS6136:
Royer et al 2004, "CO_2 as a primary driver of Phanerozoic Climate"
McInerney and Wing, 2011, "The Paleocene-Eocene Thermal Maximum"

Week 2 (Jan 20):

Lectures (asynchronous): Phanerozoic CO_2 and Climate
W: EAS4350 Tutorial
F: EAS6136 Tutorial

Week 3 (Jan 25):

Lectures (asynchronous): Late Paleocene Thermal Maximum
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: EAS6136 Discussion
Unit 1 Study Questions Due Friday
Project 1 Assigned

Unit 2: Orbitally-driven Quaternary Climate Change

Readings:
EAS4350:
Paleoclimatology (Bradley), Chapter 6.3.2-6.3.5, Ch 5 Intro, 5.1, 5.2 (skip 5.2.4), Ch 5.4.2, 5.4.3, 5.4.4, Ch 8 Intro, 8.1,8.2,8.7
EAS6136:
Paleoclimatology (Bradley), Chapter 6.3.2-6.3.5, Ch 5 Intro, 5.1 5.2, 5.3, 5.4.2, 5.4.3, 5.4.4, Ch 8 Intro, 8.1,8.2,8.7

Week 4 (Feb 1):

Lectures (asynchronous): Milankovitch and Monsoons
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: Computational Tools Check-in

Week 5 (Feb 8):
Lectures (asynchronous): Glaciation, Ice Ages and Glacial Cycles
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: EAS4350 Discussion – How fast can ice sheets melt?

Week 6 (Feb 15):
Lectures (asynchronous): Ice Core Records of Atmospheric Composition
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: Project 1 Reference Checkup with Jean
Unit 2 Study Questions Due Friday

Week 7 (Feb 22):
Project 1 Work Week
Open Office Hours MWF during class time
Project 1 Due Friday

Unit 3: The Last Glacial Maximum

Readings:
Paleoclimatology (Bradley), Chapter 3.1, 3.2.1 (EAS4350 through 3.2.1.1 only)
Weinelt, "Ocean Paleotemperatures" *in Encyclopedia of Paleoclimatology*
McGee (2020) "Glacial-Interglacial Precipitation Changes"
Francois, "Ocean Paleocirculation" *in Encyclopedia of Paleoclimatology*

Week 8 (Mar 1):
Lectures (asynchronous): Last Glacial Maximum: Dating, Ice Sheets, and Sea Level
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: EAS6136 Discussion
Project 2 Assigned

Week 9 (Mar 8):
Lectures (asynchronous): LGM Temperature and Precipitation
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: EAS4350 Discussion

Week 10 (Mar 15):

Lectures (asynchronous): LGM Ocean Circulation and CO_2
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: Project 2 Re-write Workshop
Final Unit 3 Study Questions Due Friday

Unit 4: Abrupt Climate Change

Readings:
Peteet, "Younger Dryas" *in Encyclopedia of Paleoclimatology*
Paleoclimatology (Bradley) Ch 5.4.1, 6.10.1, 8.4

Week 11 (Mar 22):
Lectures (asynchronous): Abrupt Change: The Younger Dryas
M: EAS4350 Tutorial
F: EAS6136 Tutorial

Week 12 (Mar 29):
Lectures (asynchronous): Abrupt Climate Change: Heinrich Events
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: EAS6136 Lab Tours

Week 13 (Apr 5):
Lectures (asynchronous): Abrupt Change: Dansgaard-Oeschger Events
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: EAS4350 Lab Tours
Unit 4 Study Questions Due Friday

Week 14 (Apr 12): Project 2 Work Week
Open Office Hours MWF during class time
Project 2 Due Friday

Unit 5: Recent Climate Change

Readings:
Paleoclimatology (Bradley) Ch 13.1-13.3, 14.1, 14.4. 14.7, 14.8

Week 15 (Apr 19):
Lectures (asynchronous): Holocene Climate
M: EAS4350 Tutorial
W: EAS6136 Tutorial
F: EAS6136 Discussion
Unit 5 Study Questions Due Friday

Week 16 (Apr 26):

M: Synchronous Discussion: Lessons for Future Climate Change