

The Earth's Climate System (ENVI 240)

Macalester College – Spring 2022

Class meetings: MWF 10:50 – 11:50am

Labs: T 8 – 11:20am

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Office hours: M 1:30 – 2:30, W 9:15 – 10:15

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COVID Caveat

We begin this semester in yet another period of uncertainty that asks for our flexibility and resilience. I recognize the fatigue that we all feel, and also the intense desire to return to a semblance of normalcy. To that end, I have changed many things about the way I normally teach this course, and I am prepared to be flexible as the semester progresses. I will work with you if problems arise, and support each of you as people and students to the best of my ability. If your needs exceed my ability to help, I promise to connect you with someone who can. I also ask for your patience and good will as I will no doubt need to adapt to changing circumstances in an effort to serve everyone in our classroom community. Please foreground your health, take care of yourselves, and let me know as soon as possible if your physical or mental health is impeding your learning in this class.

Course description

The Earth's climate system is complex and dynamic, and a solid understanding of this system is crucial in order to address concerns about anthropogenic influences on climate. In this course we examine the basic physical and chemical processes that control the modern climate system, including the role of incoming solar radiation, the greenhouse effect, ocean and atmospheric circulation, and El Niño. We also look critically at the methods and archives used to reconstruct climate in the past, such as ice cores, marine and lake sediments, and cave deposits. We explore the possible effects of anthropogenic greenhouse gas emissions on modern and future climate by examining the models used in climate prediction, and discuss the challenges of modeling such a complex system. Although this course is taught from a primarily scientific perspective, it includes frequent discussions of the roles policy and economics play in the current dialogue on global climate change, and the inequities between the causes and effects of climate change between the global North and South.

Course organization

Class periods will be a mixture of lecture, discussion and group exercises. The latter two will count towards the course participation grade (see below). Lab exercises will consist of pair/group work using climate datasets and models. Each lab will have an accompanying assignment, due one week after the lab. There are four problem sets throughout the first half of the course. Revisions to problem sets (optional) are due within two days of their being returned to you.

Goals for students

By the end of this course, students should be able to demonstrate the ability to:

- Analyze data and draw reasonable inferences from it
- Communicate clearly and effectively through written and oral presentations of ideas
- Demonstrate a basic knowledge of important topics in climate science

Course Textbook

Schmittner, A. [Introduction to Climate Science](#). Oregon State University, 2018.

Available for free download at <https://open.oregonstate.education/climatechange/>

What to expect in class

Moodle

The class Moodle page will be updated regularly, and should be your first stop for information about readings, assignments, and what to expect in class on any given day. The page is color-coded: anything in green or a hyperlink is a reading you should complete before class on the day of the entry, and anything in purple is an assignment due that day. This will require some looking/thinking ahead on your part.

Attendance and participation

It is my hope that we can conduct most of this class synchronously and in person. Some of the best learning in this class will happen not with me, but with your fellow classmates in small groups or teams. This necessarily requires showing up at the same time, in the same place. That said, it is likely that some of us will need to quarantine/isolate at some point this semester. Depending on the circumstance, I will work with you to find ways for affected community members to continue to participate *so long as they feel well enough to do so*. So, in short, I ask that you attend class prepared to participate whenever possible. The participation portion of your grade will reflect your contributions to class activities, whether you complete them in person or not.

Half of the participation grade (40 points) will be based on team-led class sessions at the end of the course. I will work with groups to select a topic of interest, and provide guidance around choosing readings, presentations/activities/etc. Preparing class is a lot of work, and this part of your grade is meant to reflect that! Groups will self-evaluate to form the starting point for this portion of the grade, but I reserve the right to adjust scores up or down as needed.

Problem sets

There will be 4 problem sets designed to give you practice with the material and demonstrate your understanding of course content. You will have approximately a week and a half to complete each one from the time it is assigned. I encourage you to work in pairs/groups on these assignments. However, each student must turn in their own assignment, written in their own words. This means that you may discuss the answers together, but must write them out yourselves. See me with any questions about what this means- copying will not be tolerated.

You will also have the chance to revise your work after receiving an initial score. This is totally optional, and you may choose to revise any or all of the questions where you didn't receive full credit. Revised assignments are due two days after your work is initially returned.

Speaker summaries and reflection

I ask that you "attend" three ~hour-long talks this semester, related to any aspect of climate change science, climate policy, climate justice, etc. (but it really does have to be about climate change!). I will provide plenty of suggestions for talks, and you are welcome to find your own as well. In-person talks, such as EnviroThursdays, are great, but other online live or recorded lectures are ok provided that they are relatively recent (let's say recorded no earlier than 2021). For each talk, you should turn in a document that answers the following:

- 1) What was the talk about? Summarize the main points, and include details about parts you found especially confusing/interesting/motivating. Be sure to include the speaker's name, talk title, and date you attended.
- 2) How does the talk connect with our work in this class? Find as many ways as possible to connect the speaker's work with topics or ideas we have touched on.
- 3) How did the talk make you feel? This is a chance for me to hear a little bit about how you're doing during an unusual semester, framed through the lens of this topic.

The total document length should be between 500-750 words. You can turn these in at any time, but they will be less stressful if you space them out (and more helpful to me since I'll get to hear about how you're doing!).

Labs

Lab section will meet on Tuesday from 8 – 11:20am, though we will likely not use the earliest part of that time. We will use the weekly laboratory time to engage in a variety of activities including experiments, computer modeling, and data analysis. Because science is a collaborative venture, you should plan work in pairs/groups for lab reports (and turn in one report per group), and it is your responsibility to make sure that the work is divided equitably. See me with any problems. In the event that we need to remain in/return to distance learning, I recommend (but don't require) that you download Microsoft Excel, which is free from Macalester and runs on [Mac](#) or [Windows](#). I find it easier to use, especially for graphs, than Google Sheets.

Policy memo

Being able to communicate complex information to a non-technical audience is an increasingly important skill. This assignment is designed to let you practice those skills by writing an evidence-based letter about a topic relevant to climate science and climate justice. See Moodle for a more specific description of the assignment. **Due Monday, May 2 (last day of class).**

Grading

Your final grade for this course will be determined by the number of points you accumulate throughout the semester.

Point distribution	
Participation	80
Problem sets (4 @ 25 points each)	100
Policy memo	100
Labs (8 @ 20 points each)	160
Speaker reflections (3 @ 20 points each)	60
TOTAL	500

Other important information

Diversity

It is my intent that students from diverse backgrounds and perspectives be well served by this course, that students' learning needs are addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. I am committed to presenting materials and activities that are respectful of diversity: race, gender, sexuality, disability, age, socioeconomic status, ethnicity, and culture. I appreciate your feedback on this and every aspect of our course, and your suggestions for ways to improve the effectiveness of the course for you personally or for other students or student groups.

Health and wellbeing

I encourage you to be intentional about maintaining your physical and mental health during every semester at Macalester, but especially this one. Taking care of yourself in these ways will help you to be healthier, happier, and better able to focus on your academic work. It will also keep us safer as a community. Be aware of people, situations and circumstances that help you to feel focused and engaged, as well as those that cause you stress; try to maximize the former, and eliminate the latter as much as possible. While every person is different, for most of us regular and adequate sleep, healthy meals, regular exercise, and connecting with others are all ways to foster wellness. If you find that you are having trouble maintaining your health and wellbeing, please don't hesitate to set up a time to talk with me, or with one of the many individuals or programs in the Hamre Center for Health and Wellness.

Accommodations

Your experience in this class is important to me, and I am committed to creating an inclusive and accessible learning environment. If you have already established accommodations with the Disability Services office, please communicate your approved accommodations to me as soon as possible so that we can discuss your needs in this course. If you have not yet established accommodations, but have a temporary health condition or permanent disability that requires accommodations (this includes but is not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), please contact Disability Services to make an

appointment: disabilityservices@macalester.edu or 651-696-6974. Disability Services offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s), and the Disability Services staff.

Academic integrity

I take all instances of cheating and plagiarism very seriously. It is YOUR RESPONSIBILITY to become familiar with Macalester's policies on what constitutes each of these offenses and to behave accordingly. Instances of suspected academic dishonesty will be handled as outlined in college policies. <http://www.macalester.edu/academicprograms/integrity.html>

Recording policy

In order to accommodate students who will not be able to attend synchronous class meetings on zoom during this semester, I plan to record our synchronous class sessions in a manner consistent with [Macalester's classroom recording policy](#). I will share these recordings on Moodle as needed. If you download any class recordings, you must store them in a password-protected file or on a password-protected site. Please note that the recording policy clearly states that ***students may not share, replicate, or publish any class recording, in whole or in part, or use any of the recordings for any purpose besides knowing what happened during the class period, without my written approval.***