

## Geology 109 Climate Change: Science and Rhetoric

Prof. Nick Holschuh  
9:00-9:50, M/W/F

Humankind is a major agent of environmental change. With each new hurricane, wildfire, and heat wave, discussion turns to the topic of anthropogenic climate change. Many questions persist in public conversation – “Is it happening? Is it us? Where are we headed? How fast? How do we know?” In this class, you will develop an interdisciplinary scientific understanding of Earth’s climate system. We will accomplish these goals using sources that span the increasingly complex information landscape.

The internet presents a double-edged sword for climate communication - it is our primary tool for sharing the data and models used to understand Earth's climate, but can be a platform for misinformation and mischaracterization of science for political ends. We will explore this dichotomy in detail, through both the direct download and interpretation of climate data and an evaluation of the way climate change is discussed in the public forum. We will meet three times a week with lecture, small group discussion, and an end goal of producing digital media to share our collective understanding of climate with a broader audience.

*[Given the unpredictability of the semester, some aspects of the syllabus are subject to change]*

### Required Course Textbook:

Dessler, A. (2019). *Introduction to Modern Climate Change* -- 3<sup>rd</sup> Edition

### Office Hours [Beneski 318]:

Wednesdays, from 3:00-4:00 pm

### Subject Matter to be Covered:

Unit 1 – The Fundamentals of Climate Dynamics

Unit 2 – Understanding the Rate and Causes of Climate Change

Unit 3 – The Impacts of Climate Change on Human Systems (Global and Local)

Unit 4 – Climate Opinions, Media Representation, Solutions, and Policy

### Classroom culture:

We continuously strive to be inclusive. Members of this class must recognize that we can all contribute in making our shared spaces welcoming. We will do this by listening deeply, and by staying engaged and curious in other's perspectives, even during challenging conversations. If you feel like this community standard is not met, please feel free to reach out to me, the geology department chair

([djones@amherst.edu](mailto:djones@amherst.edu)), or [the center for restorative practices](#).



*You’ve all likely talked about climate change before – but how clear is your mental picture of the issue? What’s the first thing you think of when the topic is raised?*

**Climate change crosses disciplines,** so together we will think about it through the lenses of physics and chemistry, ethics, psychology, economics, and policy.

### Course Goals and Learning Objectives:

- An understanding of the large-scale physics of climate, how Earth sets its temperature, and the drivers of change. This includes an understanding of the history of science for the discipline.
- An understanding of what we know with confidence, and where there is science left to be done.
- A sense for the publicly available data related to the climate and climate change impacts.
- An understanding of climate hazards and how they vary by country. There are unequal costs and unequal contributors, with climate change disproportionately affecting low emission countries.
- An exploration of the scholarship on climate communication. We will explore how culture affects climate opinions, climate conversations, and policy initiatives.
- Consideration of private and public approaches to mitigation and adaptation.

### Assignment Overview:

Building scientific and social perspective on climate change requires practice: practice engaging with climate quantitatively, and practice critically reading and reflecting on climate topics. Through that work you will produce amazing things – your own model of planetary temperature, your own synthesis of the costs of climate change globally, your own sense of public discourse. Details about assignment structure and expectations are provided on the individual prompts, but work will generally be assigned as follows:

[Mondays] You will be asked to submit a “summary sketch” capturing the ideas and motivation for the previous week’s content. This is your opportunity to reflect and make connections. You will also be asked to read and comment on popular press articles related to climate, and submit curiosity and comprehension questions.

[Fridays] Weekly homework, designed to build skills and reinforce content, will be due.

[At end of Unit] Units 1 and 2 will each end with a unit review, unit 3 will end with a video project, and the final assessment will be a written reflection spanning the whole course.

### Grade Breakdown:

| Participation + Metacognition |     | Unit Reviews [20% + 10%] |                       | Reflection |
|-------------------------------|-----|--------------------------|-----------------------|------------|
| 15%                           | 20% | 30%                      | 20%                   | 15%        |
| Homework                      |     |                          | Climate Impacts Video |            |

### Course Breakdown:

|        |                    |          |   |              |
|--------|--------------------|----------|---|--------------|
| Intro  | W1                 | [2 days] | <b>Introduction to Climate Science</b>  |              |
| Unit 1 | W2                 | [3 days] | <b>Energy</b> – what is it, how do we use it, and what role does it have for climate? |              |
|        | W3                 | [3 days] | <b>Radiation</b> – the physics of light and the global greenhouse                     |              |
|        | W4                 | [3 days] | <b>Fluids</b> – how does solar energy drive the winds and the rain?                   |              |
|        | W5                 | [3 days] | <b>The Atmosphere and Ocean</b> – Earth’s circulatory system                          | [Exam 10/07] |
| Unit 2 | W6                 | [3 days] | <b>Detection and Attribution</b> – how do we quantify climate change?                 |              |
|        | W7                 | [2 days] | <b>Forcings I</b> – human caused drivers of climate change                            |              |
|        | W8                 | [3 days] | <b>Forcings II + Feedbacks</b> – reinforced drivers of change                         | [Exam 10/28] |
| Unit 3 | W9                 | [3 days] | <b>Projecting Change</b> – how do we predict Earth’s future?                          |              |
|        | W10                | [3 days] | <b>Heat and Health</b> – how narrow is our climate niche?                             |              |
|        | W11                | [3 days] | <b>Fire and Ice</b> – changes to our most extreme environments                        |              |
| Unit 4 | W12                | [3 days] | <b>Public and Private Sector Action</b> – what should our strategy be? [Project]      |              |
|        | Thanksgiving Break |          |   |              |
|        | W13                | [3 days] | <b>Opinion Forming</b> – what is a “belief” in climate change?                        |              |
|        | W14                | [2 days] | <b>A Case for Optimism</b>  | [Reflection] |

**Course Policies and Campus Resources:**

Below are documented resources and policies that you can refer back to over the course of the semester. These are in place to standardize our practice, to make sure you all get equitable and fair treatment from me, and to make sure my expectations are as clear as possible. Don't hesitate to reach out if you have questions!

**Late Homework Policy:**

Homework is assigned on Fridays and can be submitted for full credit any time before class the following Friday. This homework schedule is designed to give you flexibility – you have a full week to complete any individual assignment, and they should each only take you a few hours. Please let me know in advance if there are circumstances that interfere with getting your homework turned in – I tend to be very flexible if you submit a request more than 48 hours ahead of the deadline. [To request a late submission without penalty, please use this form.](#) Work that is turned in late without talking to me will lose 10% for every calendar day it is late.

To ensure that late homework is received and your grade is updated, I require that you [submit late assignments using this form](#). It can be very difficult to keep track of late assignments, so I do this to standardize the process, and to ensure that you get the credit you deserve for the work you submit.

**Attendance Policy:**

I want you to have a rich experience in this class, which is best done by having all of us show up and actively engage during the lecture period. To incentivize this, in class activities will contribute to your participation grade. These cannot be made up after the fact, but can be waived for excused absences discussed with me in advance by email.

**Disability Accommodation:**

The office of Accessibility Services at Amherst College works hard to ensure equitable treatment for students by standardizing our accommodation practices. This process is designed to protect you, so that you are not forced to share personal or private information with your faculty in order to get the resources you need for success. To maintain that standard of care, please identify yourself to Accessibility Services if you need accommodation in this class, and I will make sure it is provided once logged in AC Data.

**Plagiarism and Intellectual Responsibility:**

My role as a professor is to emphasize the expectations for scholarly work, to set you up for success in the rest of your time here at Amherst and beyond. Much of what you learn in your life will take place through creation – writing, calculating, presenting your own ideas. When you miss out on that act of creation, you cheapen your own experience, and in the context of this class, you leave me in a position where I can't tell whether you've gotten what you need to out of any given exercise. You are welcome to work together and share thoughts on assignments, and even consult or ask questions of large language models like ChatGPT, but what you turn in must ultimately be your own version. If you submit work that is not your own (this includes either the words themselves or just ideas without citation), I cannot give you a grade for the associated assignment, and it will default to a zero. If you have questions about acceptable practices at any time, do not hesitate to ask, but do so *before* you submit your work.

Anybody can quote the internet -- leaving Amherst I want you to be able to be critical of what you read, make connections and find consistency across multiple sources, and be able to distill your own insights about climate and climate change. Push yourself to do more, I know that you can!

| Calendar |              |      |
|----------|--------------|------|
| W1       |              |      |
|          |              | HW1  |
| W2       |              | HW1  |
|          |              | HW2  |
| W3       | R3           | HW2  |
|          |              | HW3  |
| W4       | R4           | HW3  |
|          |              | HW4  |
| W5       | R5           | HW4  |
|          |              |      |
| W6       | Rev.         |      |
|          |              | HW6  |
| W7       |              | HW6  |
|          |              | HW7  |
| W8       | R8           | HW7  |
|          |              |      |
| W9       | Rev.         |      |
|          |              | HW9  |
| W10      | R9           | HW9  |
|          |              | HW10 |
| W11      | McK          | HW10 |
|          |              |      |
| W12      | R11          | HW12 |
|          |              |      |
|          | Thanksgiving |      |
| W13      |              | HW12 |
|          |              |      |
| W14      | R12          |      |
|          |              |      |
| Finals   |              |      |

| Weekly Deliverable |  |                          |
|--------------------|--|--------------------------|
| Homework Assigned  | Homework Due   | Reading / Reflection Due |
|                    | Homework 1 -- Guided Article Reading                 |                          |
|                    | Homework 2 -- Units and Energy                       |                          |
|                    | Homework 3 -- Planetary Temperatures                 |                          |
|                    | Homework 4 -- Evaporation, Precipitation, and Storms |                          |
|                    | <b>Exam 1 (Evening, 10/07, 7:00pm)</b>               |                          |
|                    | Homework 6 -- Temperature and Probability            |                          |
|                    | Homework 7 -- Measuring Emissions                    |                          |
|                    | <b>Exam2 (During Class)</b>                          |                          |
|                    | Homework 9 -- Getting to know your country           |                          |
|                    | Homework 10 -- Rough draft of your video script      |                          |
|                    | <b>Climate Impacts Project</b>                       |                          |
|                    | Homework 12 -- The Day After Tomorrow                |                          |
|                    | <b>Final Reflection</b>                              |                          |

| Reading                       |
|-------------------------------|
| Dessler Ch 1 + 3              |
| Dessler Ch 4 + 5.1/3          |
| Ruddiman                      |
| [None]                        |
| Dessler Ch 2                  |
| Dessler Ch 6 + 7              |
| [None]                        |
| Dessler Ch 8                  |
| Dessler Ch 9                  |
| McKinsey Report               |
| Dessler Ch 11 + 12            |
| Climate Change and Conspiracy |
| Project Drawdown              |