AOS/GEOG/NIES 332 - Global Warming: Science & Impacts

Spring 2024

Instructor:	Dr Till Wagner (he/him/his); till.wagner@wisc.edu
Teaching Assistant:	Mr Aaron Gosch (he/him/his); agosch@wisc.edu
Office hours Wagner:	by appointment in AOSS 1153
Office hours Gosch:	Tues/Thurs 11am-12pm in AOSS 849E
Zoom:	https://uwmadison.zoom.us/my/tillwagner

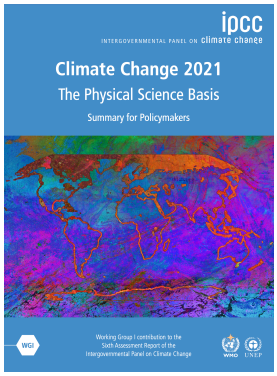
Course description

Earth's climate will continue to warm at least until greenhouse gas concentrations in the atmosphere are stabilized. Current climate trends are primarily caused by human alterations of the atmosphere, oceans, and global carbon cycle, with other natural and anthropogenic processes contributing. Because climate directly or indirectly affects all aspects of our lives (and vice versa), it is essential for 21st-century citizens to be knowledgeable about climate science and policy. This course offers a fundamental understanding of how and why global warming is happening, and what to expect in the future. Together, we will investigate and discuss the evidence for climate change, the interplay among human and physical drivers, the science that explains these observations, predicted impacts on humans and ecosystems, and proposed solutions.

The first half of this class reviews the science of global warming. In the second half, the focus shifts to climate-change impacts across scales from global to local. In the last several weeks, we turn to a review of technological solutions, policy options, and decision-making frameworks. Our goal is to help you develop a well-grounded understanding of why climate change is happening, how it is likely to impact your life, and how you can be part of solutions to this grand challenge in managing and stewarding our earth system.

Reading Materials

Our understanding of the climate system is evolving rapidly, and textbooks find themselves regularly in need of updating. We will draw broadly from the most recent **IPCC Assessment Report (AR6)**, as well as additional readings:



Climate Change 2021 - The Physical Science Basis, IPCC AR6 Working Group 1; WG 2-Impacts (2022) and *WG 3- Mitigation (2022).*

We will also at points draw on the classic textbook by Archer, D. (2012) **Global Warming: Understanding the Forecast**, 2nd ed., Wiley. Additional readings for each section (e.g., journal articles) will be posted on Canvas as the course unfolds. Note: you are NOT expected to purchase a copy of Archer.

Course time and location:

- Lectures: Tues/Thurs 1-2:15pm in AGR Hall 125
- Discussion Sections: TBD
- Course Website: https://canvas.wisc.edu

Grading

1. Exams (2)	40% (20% each)
2. Discussion Essays/ Exercises (6)	35% (7% each, lowest of 6 dropped)
3. Term project	15%
4. Participation and Attendance	10%

Grading scale

Grade	%	Grade	%
A	93-100	C	70-75
AB	86-92	CD	66-69
B	80-85	D	60-65
BC	76-79	F	below 60

I reserve the right to lower this scale under certain circumstances (meaning I may lower the cutoff percentages so you may get a higher grade than this scale indicates).

Discussions, Exercises, Essays

Throughout the semester, we will devote significant time to small-group discussion on a variety of topics. Each student will take a turn as discussion leader in their small group.

You will hand in 6 exercises/essays, one to accompany each Discussion. This written assignment will be due on the morning before Discussion occurs. Each will be 7% of the term grade, and the lowest graded assignment will be dropped. *Please note:* only assignments that are turned in and graded will be dropped. Zero grades resulting from missed assignments will not be dropped.

Policy on late submission of assignments

For each day late, including weekend days, 15% of the grade for that assignment will be penalized. After 1 week, the late assignment will not be accepted.

Approximate Course Schedule (subject to change)

Week	Date	Topic
1	23 Jan	Introduction & IPCC
	25 Jan	Energy, Blackbodies, Layer Model
2	30 Jan	Atmospheric Composition and Greenhouse Gases
	1 Feb	*Six Americas Discussion (D1)*
3	6 Feb	Planetary Energy Balance and Circulation
	8 Feb	Radiative Forcings
4	13 Feb	Climate Sensitivity & Climate Feedbacks
	15 Feb	Interlude - Guest Lecture by David Vitse (Outrider)
5	20 Feb	Carbon Cycle
	22 Feb	*Review of Layer Model Exercise (D2)*
6	27 Feb	Observing Climate Change
	29 Feb	Attribution to Human Activity, Climate Projections
7	5 Mar	Science Review
	7 Mar	*Detection of Trends Discussion (D3)*
8	12 Mar	**Mid-term Exam**
	14 Mar	Impacts: Cryosphere 1
9	19 Mar	Impacts: Cryosphere 2
	21 Mar	*Contrarians Discussion (D4)*
10	2 Apr	Impacts: Montreal Protocol (Guest: Prof David Kanter, *zoom*)
	4 Apr	Impacts: Hurricanes & Severe Weather
11	9 Apr	Impacts: Wisconsin (Guest: Prof Dan Vimont)
	11 Apr	*Carbon Footprint Discussion (D5)*
12	16 Apr	Geopolitics and National Security
	18 Apr	Mitigation and Geoengineering
13	23 Apr	Climate Startups (Guest: John McIntyre, AmFam Fund Director)
	25 Apr	*Climate Startups Discussion (D6)*
14	30 Apr	Presentation of selected student projects
	2 May	Summary and Review
15	8 May	**Final Exam (10:05am-12:05pm)**

University-wide Policies

Students' Rules, Rights & Responsibilities

For spring 2023, instructors and students should consult the following website for current campus health and safety guidance: https://covidresponse.wisc.edu/.

Academic Integrity

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

Accommodations for Students with Disabilities

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: McBurney Disability Resource Center)

Diversity and Inclusion

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

Religious Observances

UW faculty policy states that mandatory academic requirements should not be scheduled on days when religious observances may cause substantial numbers of students to be absent. Refer to the university's Academic Calendar for specific information.
https://secfac.wisc.edu/academic-calendar/