

AOS 801 - Ice And Climate Dynamics

Fall 2022

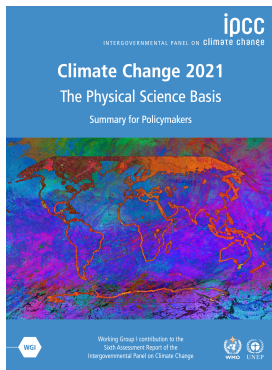
Instructor: Dr Till Wagner (till.wagner@wisc.edu)

Course description

Introduction to the role of ice in the climate system. We will review main components of the cryosphere (Arctic and Antarctic sea ice, Greenland and Antarctic ice sheets, mountain glaciers, snow cover, and permafrost), with particular focus on recent and future changes as documented by the IPCC 6th Assessment Report. We will consider different methods to study the cryosphere and its role in the climate system, such as remote sensing and in situ observations, state estimates and reanalyses, with a particular focus on idealized and comprehensive global climate models. The course covers fundamental physical concepts as well as unresolved research questions such as the debates surrounding potential instabilities in the climate system and uncertainties in future projections of ice loss, teleconnections, and sea level rise.

Reading Materials

Climate Change 2021 - The Physical Science Basis, IPCC AR6 WG1



We will motivate the different sections of this course with background reading of the latest IPCC Assessment Report - Working Group 1.

A 2nd core text for this course is the IPCC 2019 “Special Report on the Ocean and Cryosphere in a Changing Climate”

Additional readings for each section (predominantly journal articles) will be posted on Canvas as the course unfolds.

Course time and location:

- MW 1:00pm - 2:15pm in AOS 811
- In person, unless COVID-related (or other) issues force us to move to remote. Some remote components (eg. Guest lectures)
- Office Hours: by prior email arrangement
- Course Website: <https://canvas.wisc.edu>

Assessment

Course assessment will be conducted through:

- 1) 4 homework assignments. Assignments take different formats (e.g., literature review, coding exercises, traditional problem solving)
- 2) Short quizzes on canvas (typically in weeks without set homework)
- 3) A summary presentation of a science paper, followed by group discussion
- 4) "Mini" Research project to be conducted over the final 4 weeks of the semester, with a final written report. Project topic to be identified between student and instructor.

Grading

Homework Assignments (4*10%)	40%
Canvas Quizzes	15%
Article summary and discussion	15%
Research Project	30%
<i>Total</i>	<i>100%</i>

Grading scale

Grade	%
A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	below 60

I reserve the right to lower this scale under certain circumstances.

Approximate Course Schedule (subject to change)

Week	Starting	Lecture Topic
1	5 Sept	Introduction - IPCC & The Cryosphere
2	12 Sept	Arctic Sea Ice
3	19 Sept	Single Column Sea Ice Models
4	26 Sept	Energy Balance Models and Sea Ice Instability
5	3 Oct	Antarctic Sea Ice

6	10 Oct	Teleconnections
7	17 Oct	Snow Pack
8	24 Oct	Greenland Ice Sheet
9	31 Oct	Iceberg Calving and Meltwater Runoff
10	7 Nov	Impacts on Oceans (particularly AMOC)
11	14 Nov	Antarctic Ice Sheet
12	21 Nov	Marine Ice Sheet and Ice Cliff Instabilities
13	28 Nov	Wider Impacts of Cryospheric Changes
14	5 Dec	Discussion of Research Projects
15	12 Dec	Review

University-wide Policies

Students' Rules, Rights & Responsibilities

For fall 2022, instructors and students should consult the following website for current campus health and safety guidance: 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/>