Fall 9-1-2021

GEO 488.01: Snow, Ice, and Climate Change

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Snow, Ice and Climate Change (GEOS 488), 3 credits

Tuesdays and Thursdays, 11:00-12:15, SC304

Note: *This course has a fully-developed Moodle site with a day-by-day class schedule, other resources and information, and assignments and activities. The Moodle site is updated frequently, so make sure to check the site prior to each class meeting.*

Instructor information

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Course description

Frozen water (i.e., glaciers, ice sheets, seasonal snow, and sea ice) is a primary component of Earth's climate system that both drives and responds to climate change. This course examines the role of snow and ice in four key aspects of climate change, highlighting unsolved problems and current research: 1) global sea level rise *and stability of ice sheets*; 2) Arctic amplification of climate change *and sea ice processes*; 3) climate system feedbacks *revealed by ice cores*; and, 4) water supply *and mountain snowpack dynamics*.

Learning outcomes

Specific:

• synthesize the processes in the cryosphere controlling rates of future sea level rise.
• describe how sea ice processes drive planetary albedo and the implications for enhanced climate change at the poles.
• explain the importance of climate change feedbacks as revealed by ice core time series of temperature, precipitation, and greenhouse gas concentration.
• integrate understanding of the snow processes to evaluate the implications of warming climate on snow-water runoff.

Overarching:

• interpret and reconcile how the Earth's cryosphere both drives climate change through couplings and feedbacks, and responds to climate change in ways that have strong societal impacts.

Course text

No formal text required. Reading assignments will be distributed via Moodle.

Emailing

I may occasionally conduct email correspondence with class members and I will use official UM email addresses. All email sent to me must originate from your official UM email address (email originating from non-UM addresses will not be read or responded to). Sorry, but this is the law I am required to follow.

Format

Classes will consist of lectures and discussions, in-class exercises, and out-of-class exercises. A major component of this course is completing the assigned reading and preparing for class discussions. Lectures will not necessarily cover all material presented in the reading, nor will all material presented in the lectures be replicated by the reading material. However, exams will cover material from both the lectures, assigned reading, and discussions.

Prerequisites

Junior standing; Preferably Math 151 (very basic algebra will occasionally be used in lectures). Familiarity and comfort with computers will be necessary.

Evaluation criteria for letter grade

-Three exams (2 midterms and a final, equally weighted): 35%
-One written research proposal and group presentation: 20%
-Reading assignments and in-class participation: 15%
-Data assignments: 30%

Graduate Increment

The research proposal will be crafted and presented as an individual rather as part of a group. The proposal will longer (>10 pages) and must include an exhaustive synthesis of prior research on the topic, outlining what is known about the topic and clearly identifying the scientific problems remaining to be solved.

Other Policies

>All homework assignments are due at the start of class on designated due date.
>Because this course has a relatively large enrollment, and because we will attempt to grade and return homework assignments rapidly, late work cannot be accepted.
>The format of this course requires class attendance. Substantial course content and information transfer will only occur in class. Because of the relatively large enrollment, we cannot accommodate individual make-ups for missed classes. This is not a good course for you if it is not possible for you to always attend class sessions.

Course Accommodations

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you have a disability that adversely affects your academic performance, and you have not already registered with Disability Services, please contact Disability Services at 406-243-2243. I will work with you and Disability Services to provide an appropriate accommodation.

Schedule

A tentative schedule has been posted on the Moodle site. Note that this schedule is subject to change as the course progresses. The course topics and dates of homework assignments in particular may be adjusted. However the following dates will not be changed.

-Midterm-1: *Tuesday October 5*

-Midterm-2: *Thursday October 28*
-Midterm-3 (*Final*): *Thursday Dec 16, 10:10-12:10*

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at: http://life.umt.edu/vpsa/student_conduct.php

UM regulations are that:

1. Face masks are required to be worn in the classroom at all times until further notice. *This is necessary to limit the spread of the Covid-19 virus.*

2. Students must always sit in assigned seating locations.
This is necessary for contact tracing of infectious disease cases.