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NRSM 281.01: Science of Climate Change

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Science of Climate Change (NRSM 281/CCS 295) – Fall 2021

MWF 11:10 AM -12:00 PM, Clapp Science Complex 121

Instructor

Dr. Ash Ballantyne

Office: CHCB 435

Office Hours: W 1:00-2:00 (or by appointment)

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Motivation

Human induced global warming is perhaps the defining challenge of our generation and generations to come. However, climate has been changing throughout Earth's history. In this course we will explore how Earth's climate system has undergone a fundamental shift from a system dominated by natural perturbations to one driven by human perturbations. Research indicates that climate change will have profound environmental and economic impacts, both good and bad, in the coming decades. Thus, every human should have a basic working knowledge of the Earth's climate system so that they can critically assess climate information and make well-informed decisions.

Observed change in surface temperature 1901–2012

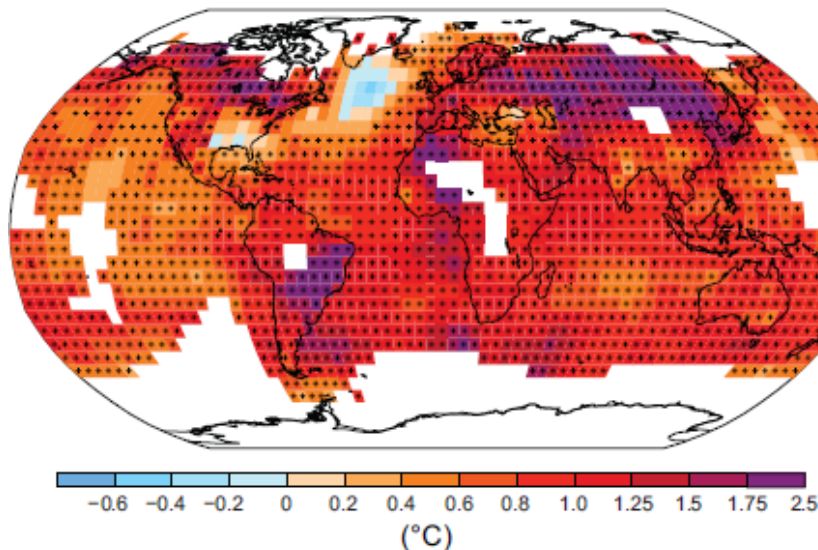


Figure showing observed changes in surface temperature from the Intergovernmental Panel on Climate Change (AR5, Summary for Policy Makers).

Learning Outcomes

The primary goal of this course is for students to gain a broad understanding of the Earth as a system and how the components of this system interact to affect climate. In this course we will:

- 1.) Explore the evolution of Earth's climate through reconstructions of past climate, observations of modern climate, and predictions of future climate.

- 2.) Through the critical analysis of scientific observations and simulations, students will gain a conceptual understanding of the underlying physical mechanisms that regulate Earth's changing climate over time.
- 3.) Once we understand how Earth's climate system operates, then we will investigate how humans have perturbed the climate system.
- 4.) Lastly, we will look at unresolved questions in climate science and briefly discuss potential climate change impacts and solutions.

Prerequisites

A curious and critical mind.

Course Readings

Climate Change: The Science of Global Warming and Our Energy Future, Mathez & Smerdon, 2018, Columbia University Press; 2nd Edition (March 31, 2018), ISBN-13: 978-0231146425. The textbook is good and it is required, so read it! If you want your own copy it is available from Amazon for ~ \$44, or it is available through e-reserves at the library.

Supplemental Readings from the current literature will be posted on Moodle and can be accessed online (<http://umonline.umt.edu/>)

Course Grading Policy

- Two exams: 50%
- Research topic presentation: 20%
- Written discussion questions: 20%
- Attendance and participation: 10% (evaluated twice a year)

The learning material for this course will come from a combination of lectures, reading assignments, and discussion questions. The lectures are designed to complement the course readings, so both are essential for thoroughly comprehending concepts. ***Course attendance is critical! Unexcused absences are not acceptable. Late assignments will only be accepted with a legitimate excuse and 10% will be deducted for each day late.***

How to do well in this class

- 1) Come to class every day and participate. This is 10% of the course grade.
- 2) Do the readings before class and understand the concepts that are covered in the discussion questions. This is 20% of the course grade.
- 3) Talk to me about the research presentation topic.
- 4) Do well on exams (If you follow steps 1 to 3 you should do well on the exams step 4).

UM's Academic honesty policy

All course activities are governed by the Student Conduct Code, which embodies the ideals of academic honesty, integrity, human rights, and individual responsibility. It is your responsibility to read, understand and adhere to the student conduct code. See Student Conduct Code Link for more information.

UM's disability services

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at: (406) 243-2243, ode@umontana.edu, or visit www.umt.edu/disability for more information. Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.