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### GEO 595.03: ST: Dynamics of a Changing Climate System

Joel T. Harper

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## ***Dynamics of a Changing Climate System (Geo 595)***

3 credits, time TBD

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Note: *This Course has a Moodle Site. A detailed class schedule and other information will be posted there with frequent updates, so check the site regularly.*

### **Instructor information**

Dr. Joel Harper

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Office ph: 4062436245

e-mail: [Joel@mso.umt.edu](mailto:Joel@mso.umt.edu) (email is the best way to reach me; I check often)

### **Course objective**

This course will place ongoing anthropogenic climate change within the context of Earth's climate system dynamics. The course will begin with an overview of Earth's energy balance and components for circulating heat and water. We will examine connections between components, and the system's internal feedbacks that can propagate, amplify, or dampen change. Finally, we will utilize past climate change events to reveal how Earth's climate system responds to forcings to undergo change. The course will consist of lectures, readings, discussions, and small projects.

### **Learning outcomes**

*Students will be able to:*

- illustrate earth's energy balance and its major components through conceptualization and simple analytic and numerical models.
- describe the physical processes governing global heat flow through oceans and atmosphere.
- integrate and explain global energy feedbacks, couplings, and imbalances over a range of scales.
- describe historical climate variability and change, the forcings which caused them, and their implications for climate sensitivity and future climate change.

### **Format**

Classes will consist of lectures, readings and discussions, and occasional small problem sets. 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. Some assignments will require Python programming language.

### **Prerequisites**

Graduate standing in a science discipline.

### **Course text**

Climate System Dynamics and Modelling, Hugues Goosse, 2015, Cambridge University Press, New York, NY, ISBN 978-1-107-44583-3 (Paperback). Who would buy this book when it is available free of charge in HTML or PDF? Go here:

<http://www.climate.be/textbook/symbols.xml>

### **Evaluation criteria for letter grade**

1. Attendance and engagement in discussions
2. Paper reviews
3. Mini lectures and mini problems
4. One major lecture exercise

### **Schedule**

A tentative schedule with detailed topics has been posted on the Moodle site. Note that this schedule is subject to updating as the course progresses based on feedback from course participants.

### **Policies**

#### **Emailing**

I will occasionally conduct email correspondence with class members and will use official UM email addresses. Check this account! All email sent to me must originate from your official UM email address. Email originating from non-UM addresses cannot be read or responded to (Sorry, but this is a University rule we are required to follow).

#### **Attendance**

No formal attendance will be taken. However, the format of this course requires class attendance for success. Substantial course content (i.e., lectures and in-class discussions) as well as most information transfer will only occur in class. This is not a good course for you if you expect to miss class more than very rarely.

#### **Due dates**

All assignments are due at the start of class on designated due date.

#### **Disabilities**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

#### **Conduct Code**

*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:* <https://www.umt.edu/safety/policies/default.php>