Idealized Models of Climate Processes

EESC 6926

Department of Earth and Environmental Science, Columbia University

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Meeting Times	W 10:10-12:55PM Comer Kennedy Conference Room, 4th floor (LDEO Campus)
Office hours	At LDEO, by appointment
Course website	Courseworks
Prerequisites	Previous graduate-level coursework in atmosphere and/or ocean physics and/or chemistry. One year of calculus. GR6901 or equivalent programming experience. Or permission of instructor.
Textbook	There is no textbook. Readings will be posted on Courseworks.

COURSE DESCRIPTION:

This course teaches students to design and apply idealized models of various levels of complexity to study fundamental properties of climate system processes and their interactions. Though these models typically are based in only a handful of interacting differential equations or highly simplified mechanisms, they can significantly advance process understanding. We cover three topical areas in Spring 2023: (1) what determines the vertical distribution of temperature and humidity in the atmosphere, and what this implies about the sensitivity of temperature to external forcing, (2) the role of the ocean in regulating atmospheric carbon dioxide on glacial-interglacial and historical timescales, and (3) the influence of climate system feedbacks on the Earth's energy balance. Throughout the course, emphasis is placed on identifying assumptions underlying conclusions drawn from simple models and the time scales over which different processes operate.

COURSE COMPONENTS:

Lecture: Lecture will be used to introduce basic principles of idealized modeling and to introduce each of the three modules.

Lab: Much class time will be devoted to working through modeling exercises relevant to each module. Students will run existing models and modify these models to add new processes and/or use observations to evaluate the model or add constraints from observations.

Discussion: Interspersed with lab sessions, discussions that integrate the models run in class and the peer-reviewed literature will be held.

Final Project: Students will propose a unique final project in which they will further explore an existing model or create their own new model. Students will prepare a presentation and short-format style paper to summarize their work.

GRADING:

1.	Labs		50%
2.	Final Project		30%
3.	Participation	(includes co-presenting a paper)	20%

LATE WORK:

Submitting work on time is critical so that you can stay fully engaged with our discussions. Work will receive a 10% reduction in credit for each day late.

ACADEMIC INTEGRITY:

Academic integrity is essential. Please make you are familiar with expectations and consequences as outlined in the Faculty Statement on Academic Integrity and Honor Code established by the students of Columbia College and the School of General Studies. If you have any further questions, please contact the Professors. In this course, all infractions will result in loss of credit for the assignment in question, and will be reported per University policy.