

CLIM 759 Topics in Climate Dynamics: Earth System Modeling

Fall 2015

Class Day/Time: Mon 1:30-4:10 *Location:* TBD

Instructor: Dr. Kathy Pegion
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Course Credits: 3

Website: TBD

Office Hours: TBD

Overview & Motivation

Global models are the primary tools used to make predictions and projections of climate. A solid understanding of what is included and not included in these models, how they represent climate variability on a variety of space and timescales, and an introduction to how to run an Earth system model are basic skills needed to engage in climate research.

This class will be laboratory and discussion focused. Students will read and discuss sections of the IPCC report and relevant journal articles. Students will also learn how to run an earth system model and evaluate data from seasonal predictions and climate projections.

Goals

1. Students will learn the basic technical and scientific skill necessary to run an earth system model, evaluate its output, and compare with observations.
2. Students will understand how Earth system models are typically used for climate prediction and projections.
3. Students will understand the strengths and weaknesses of climate models so that they can critically assess Earth system model results from their own and other's work.

Grading

Class Participation (30%)

- Leading and participating in class discussion
- Presenting journal article/portion of IPCC report

Homework (30%)

- Computer/Data Analysis Lab (3 assignments)

Semester Project (40%)

- Written paper
- Oral presentation

Required Text

There is no required text for this course. All required readings will be provided and will consist of journal articles and parts of the IPCC report.

Course Outline

1. Introduction & Background
 - a) Climate Predictions & Projections
 - i) Review: what is the difference between weather and climate?
 - ii) What is the difference between weather and earth system models?
 - iii) What is the difference between predictions and projections?
 - b) What is an Earth System Model?
 - i) Introduction to NCAR/CESM
 - ii) Tutorial on how to run NCAR/CESM
2. Seasonal Climate Predictions
 - i) Introduction to seasonal prediction
 - ii) The National Multi-model Ensemble
 - iii) Seasonal prediction Skill
 - iv) How well do seasonal prediction models represent the mean climate and its variability?
3. Climate Projections
 - i) Introduction to IPCC and projection scenarios
 - ii) The CMIP5 Models
 - iii) How well do the CMIP5 models represent the mean climate and its variability in the 20th century?
 - iv) How similar or different are CMIP5 model projections of future climate?
4. Current Topics
 - i) Decadal Prediction
 - ii) Subseasonal Prediction
 - iii) High resolution modeling