EVSC 4452 Global Climate Variability Seminar (2 credits)
Fall 2016
Mondays 3:00-4:50 p.m.
New Cabell Hall 115

Instructor

Kevin Grise
Office: 380B Clark Hall
Email: kmg3r@virginia.edu
Phone: (434) 924-0433
Office Hours: Wednesdays and Fridays 1:30 p.m.–2:30 p.m., or by appointment

Prerequisite

EVSC 3300 (Atmosphere and Weather), or instructor permission

Why Should You Take This Course?

You've probably seen the news headlines: "Has global warming stopped?", "Is the Earth's climate getting more extreme?", or "Is climate change just a big hoax?" It seems that we are inundated daily with news reports linking recent weather events with global climate change. Are recent cold winters and the current California drought signs of human-induced climate change, or just part of the natural variability in the climate system? These are questions you likely have already been asked by family and friends, and will likely be asked in your future careers as environmental scientists.

As environmental scientists, our job requires us to objectively assess observations of Earth's climate system, discern the mechanisms responsible for observed climate variability and change, and then make educated projections about what might happen in the future. The goal of this course is to provide you with the skill set necessary to independently evaluate media reports and scientific literature concerning global climate variability and change to allow you to make informed decisions about this topic in your future career.

What Will You Get Out of This Course?

At the end of this course, you will be able to:

- Describe key physical processes that govern variability and change in Earth's climate system
- Evaluate the scientific arguments made in recent media and scientific journal articles about climate variability and change
- Compare and contrast the merits of opposing theories proposed to explain recent climate events
- Identify gaps and uncertainties in the current state of knowledge about the climate system
- Critically assess sources and resources necessary to make informed decisions about recent climate news

What Will We Do In This Course?

Studying climate is a humbling business! With each passing year, the climate continues to do unexpected things, which often causes us to question and re-think existing theories. So, unlike many courses you might have taken, the material for this class cannot easily be found in a textbook. Instead, we'll address recent news reports about climate, and then read and discuss related scientific journal articles. Weekly reading assignments will be posted on the course's Collab website.

During each week's class:

- We'll review and summarize the key points from the weekly reading assignments.
- We'll break up into groups to do interactive class activities and discussion, during which we'll compare and contrast the varying viewpoints in the readings, debate the scientific merits of the different hypotheses, and try to reach a consensus of understanding about that week's topic.
- Finally, in the second half of class, I'll introduce the topic for the following week, reviewing the physical processes of the climate system that are relevant for the next week's readings.

How Will You Be Evaluated?

Class Participation (15%): During class, we will have interactive class activities and discussions to learn how to evaluate and critique the scientific arguments made in recent media and scientific journal articles. In order for this to work, it requires active participation on your part, so you should come to class having completed any assigned reading and homework assignments and ready to contribute ideas, thoughts, and questions to the discussion. Unexcused absences will count against your class participation grade.

Reading Summary (10%): At the beginning of each class, one student will provide a 10-minute summary of our readings for the week to get the class discussion started. Each student is required to do at least one reading summary during the course of the semester. Students doing the week's reading summary will be exempt from that week's homework assignment.

Homework (40%): Accompanying each week's reading assignment, you will have a short homework assignment to prepare you to actively participate in each Monday's discussion. Homework is due before the start of class each Monday, and will be submitted via the Assignments tab on Collab. The homework assignments will:

- Reinforce key concepts from class to make sure you understand the physical processes of the climate system that are relevant for the required readings
- Guide you to find the key points in the required readings, evaluate the strengths and weaknesses of the arguments, and identify uncertainties that remain about the topic.
- Allow you to learn more about the week's topic through short Internet searches. It is important that you do the web searches independently, so that we each have different things to contribute to in-class discussions.

Final Project (35%): As a final project, you will be asked to find a recent climate news story that is of interest to you, and then dig deeper into the scientific literature to learn more about the topic. To do this, you'll use the same skill set you've practiced throughout the semester with our weekly readings.

Task: A major newspaper has asked you to write a 1500-2000-word article for their science page. Their readership is interested in a recent climate topic in the news, and would like an expert's viewpoint on the topic. In your article, you should explain and assess the leading hypotheses on the subject, making sure that the concepts are understandable for a general audience. Remember that newspaper articles are generally written at an 8th grade reading level! Your article must accurately describe **at least 5 concepts** that we have discussed in class over the course of the semester. You will be required to provide a list of your sources.

So, why are you doing this project?
This project is not just another "final paper" that summarizes facts taken from scientific articles. It's our job as environmental scientists to be able to communicate our scientific knowledge to people in terms that they can understand. Outside of class, we interact with many people who have questions about climate who don't understand the scientific theory or jargon. Explaining scientific concepts in language accessible to a non-scientist is challenging, and it really tests your understanding of the material! So, when you're writing this article, think about whether a friend or family member who is a non-science major can understand it.

Deadlines:

October 10	Project proposal due *The project proposal will include 1) one paragraph proposing a topic for your final project and 2) a short timeline with project milestones demonstrating how you plan to complete your project. You are encouraged to talk to me about potential topics for your project before writing your proposal paragraph.*
November 21	Rough drafts due *Bring a completed draft of your final paper to class. We will have a workshop to read over each other's rough drafts and offer feedback.*
December 5	In-class presentations *You will summarize the key findings of your project to the class in a 12-15 minute in-class PowerPoint presentation. You don't need to summarize all the material in your paper. Just pick some highlights!*
December 9	Final project due by 5 p.m. on Friday December 9

Grading Criteria for Final Project:
Projects will be graded out of 100 points:

5 points	Project proposal paragraph submitted on time
10 points	Rough draft completed in time for in-class workshop
10 points	In-class presentation
50 points	Article accurately describes at least 5 concepts that we have discussed in class this semester. (10 pts. per concept)
15 points	Article shows critical thinking and individual thought in assessing the material.
10 points	Article is of appropriate length (1500-2000 words), appropriately cites references, and is written in a logical and professional manner.

Grading

The final grade will be assigned based on the following scale:

A+: 99-100	A: 93-98	A-: 90-92
B+: 87-89	B: 83-86	B-: 80-82
C+: 77-79	C: 73-76	C-: 70-72
D+: 67-69	D: 63-66	D-: 60-62

F: Less than 60

Useful References

Meteorology Today: An Introduction to Weather, Climate, and the Environment, 10th Edition, by C. Donald Ahrens, Brooks/Cole, 2012

Atmospheric Science: An Introductory Survey by John M. Wallace and Peter V. Hobbs, Academic Press, 2006 (Second Edition)

Introduction to Modern Climate Change by Andrew Dessler, Cambridge University Press, 2015.

Climate Change 2013: The Physical Science Basis, 5th Assessment Report of the Intergovernmental Panel on Climate Change. (https://www.ipcc.ch/report/ar5/wg1/)

Preliminary Course Schedule

Please check the Activities tab on the Collab website for the latest updated schedule. Please check the outline regularly as it will be updated throughout the semester with readings, PowerPoint slides, and assignments.

August 29	Introduction
September 5	Crash Course on Climate Dynamics

Theme 1: Did Earth's climate warm over the last century?

September 12	How much do we trust the 20th century observed climate record?
September 19	Forget about thermometers! Evidence from sea level, sea ice, and glaciers

Theme 2: Are natural processes responsible for recent climate changes?

September 26	El Niño and the Record Warmth of 2015
October 10	Why is the North Atlantic Ocean getting colder and the rest of the globe getting warmer?

Theme 3: Are humans responsible for recent climate changes?

October 17	The ozone hole and its surprising effects on 20th century climate
October 24	Can aerosol pollution explain the "warming hole" over the southeastern United States?
October 31	Greenhouse gases and why "clouds" of uncertainty remain

Theme 4: What's going to happen to climate by the end of the 21st century?

November 7	Looking into the crystal ball: Global and regional predictions for the 21st century
November 14	Is the climate going to get more "extreme"?
November 21	Rough Drafts Workshop

Theme 5: Can we stop the climate from changing?

November 28	Global carbon cycle: Why CO_2 is here to stay, and what (if anything) we can do about it
December 5	Student Presentations