

CLIM 690: Scientific Basis of Climate Change

Lectures

Thursday 4:30-7:10pm, Innovation Hall 338

Instructors

James Kinter, Professor, Climate Dynamics
284 Research Hall, Mail Stop 6C5
Tel: 703-993-5700
Fax: 703-993-5773
ikinter at gmu.edu
<http://mason.gmu.edu/~ikinter>

J. Shukla, Professor, Climate Dynamics
105 Research Hall, Mail Stop 2B3
Tel: 703-993-1983
Fax: 703-993-5773
jshukla at gmu.edu
<http://www.iges.org/people/shukla.html>

Center for Ocean-Land-Atmosphere Studies
Dept. of Atmospheric, Oceanic & Earth Sciences
George Mason University
4400 University Drive
Fairfax, VA 22030 USA

Required Text

[The Intergovernmental Panel on Climate Change \(IPCC\) Assessment Report 5: *Climate Change 2013 Working Group I Report "The Physical Science Basis"*](#).

Other Relevant Texts

- Hartmann, D. L., 1994: *Global Physical Climatology*, Academic Press.
- Houghton, J., 2009: *Global Warming, The Complete Briefing*, Cambridge University Press.
- Peixoto, J. P., and A. H. Oort, 1992: *Physics of Climate*, American Institute of Physics.
- Trenberth, K. E. (ed.), 1992: *Climate System Modeling*, Cambridge University Press.
- IPCC Assessment Report 4: *Climate Change 2007 Working Group I Report "The Physical Science Basis"*.
- IPCC Assessment Report 4: *Climate Change 2007 Working Group II Report "Impacts, Adaptation, and Vulnerability"*.
- IPCC Assessment Report 4: *Climate Change 2007 Working Group III Report "Mitigation of Climate Change"*.

Course Description

This graduate course will survey the scientific issues associated with global climate change. The course will examine physical phenomena that determine the Earth's climate, its variability, and how it changes in response to changes in the external influences and the composition of the atmosphere. The course will cover the latest available scientific information about global climate change, using the Intergovernmental Panel on Climate Change Fifth Assessment Report as a primary source. The variability and change observed over the past 150 years and projected by climate model simulations for the next

century will be the main focus, although some attention will be paid to climates of the distant past (paleoclimate).

This class will discuss:

- how society has been changing the composition of Earth's atmosphere over the last century,
- how Earth's climate has warmed and otherwise changed during the same period,
- why scientists believe that this global warming is due to changes in atmospheric composition via the greenhouse effect
- how global warming fits into the context of other climate mechanisms and variability, and
- probable future climate change

The classes will consist of lectures and discussions, with additional presentations by students of current scientific literature. Students will have an opportunity to research recent findings in climate change, either by a review of the scientific literature or by analysis of observations and climate model output.

Tentative Course Schedule

23-Jan-14	Introduction to Global Climate Change (SPM; Technical Summary; Ch. 1)
30-Jan-14	Observed Changes in the Oceans & Cryosphere (Ch. 3; Ch. 4)
6-Feb-14	Observed Changes in the Atmosphere (Ch. 2)
13-Feb-14	Observed Changes in Atmospheric Composition (Ch. 2; Ch. 6)
20-Feb-14	Greenhouse Effect
27-Feb-14	Radiative Forcing since 1750 (Ch. 8)
6-Mar-14	Understanding and Attributing Climate Change (Ch. 10)
13-Mar-14	SPRING BREAK
20-Mar-14	MIDTERM; Paleoclimate (Ch. 5)
27-Mar-14	Climate Sensitivity
3-Apr-14	AR5: Evaluation of Climate Models (Ch. 9)
10-Apr-14	AR5: Near-Term Projections (Ch. 11)
17-Apr-14	AR5: Long-Term Projections (Ch. 12) and Sea Level Change (Ch. 13)
24-Apr-14	AR5: Climate Phenomena (Ch. 14) & Atlas of Projected Changes (Annex I)
1-May-14	Final Presentations

Communications

Students must use their MasonLive email account to receive important University information, including messages related to this class. See <http://masonlive.gmu.edu> for more information.

Grading and Course Requirements

The course focuses primarily on the *IPCC Fifth Assessment Report, Working Group I: The Scientific Basis*. Students will be expected to read the relevant chapter(s) of the report each week. The class grade will be based on:

- problem sets (20%)
- in-class presentations (20%)
- mid-term (30%)
- term project (30%)

The homework will consist of in-class presentations of papers and problem sets, with one presentation and one problem set due before the midterm and one presentation and one problem set due after the midterm. For the presentations, students will be expected to read sections of the *Intergovernmental Panel on Climate Change Fifth Assessment Report, Working Group I, The Scientific Basis* and/or selected papers from the scientific literature and present very brief summaries of those materials in class. A list of possible sections/papers from which students may choose will be made available for each half of the semester. The presentations should be brief summaries of the contents, including, as appropriate:

- Authors and Affiliations
- Data and Methods
- Hypothesis
- Experiments
- Results
- Conclusions
- Relevance, Importance, Impact (student's opinion)

The project will consist of either a report, based on a literature review, on a specific topic in climate change, or an analysis of model or observational data related to climate change. A prompt – including level and type of research expected, approximate length and criteria for grading – for the class project will be provided separately.

General Course Policies

- The [University Catalog](#) is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs.
- Students are expected to attend the lectures each week.
- Late assignments will receive a 10% deduction in score.
- Cell phones, pagers, and other communicative devices are not allowed in this class. Please keep them stowed away and out of sight. Laptops or tablets (e.g., iPads) may be permitted for the purpose of taking notes only – please inform the instructor if that is your preferred method. Please be respectful of your peers and your instructor and do not engage in activities that are unrelated to class. Such disruptions show a lack of professionalism.

Academic Integrity

GMU is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. Please do your own work and give full credit in the proper, accepted form if you use the work of others. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Disability Accommodations

Information about accommodations and other information related to students with disabilities is available from Mason's [Office of Disability Services](#). If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474, <http://ods.gmu.edu>. All academic accommodations must be arranged through the ODS.

Diversity

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed.