

Global Climate Change

GLY 420 / PHY 420 / GLY 520	TTh 5-6:15	Room DL 105
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Office Hours:	Tu and Th 3:30-5	MWF 10-11, TR 11-12, 4-5

Home Page for this course:	www.gly420.com
Required Textbooks:	Kerry Emanuel, What We Know about Climate Change
	IPCC 4 th Assessment Report – available online at www.ipcc.ch

Exam Dates	Mid-term:	Tuesday September 29
	Final:	Tuesday December 8, 7-10 PM

About this course

Based on the analysis of the geologic record, it is well accepted that the Earth's climate is unstable. Understanding how climate has changed, what the impacts of these changes were and what caused these fluctuations is a fundamental goal of the earth and environmental sciences. Recently, this area of inquiry has taken on new significance with the recognition that global human-induced climate change is one of the greatest potential environmental problems of the coming century. This recognition has accelerated the scientific study of climate and the entire field has developed significantly over the past two decades. Furthermore, it promises to be an important area of inquiry with broad policy implications in the future. International, national, regional and local policies are being developed that are based on expectations of future anthropogenic climate change.

In this course we will introduce the scientific issues surrounding our planet's climate and potential human-induced changes. In particular, we will examine the scientific basis for climate change forecasts and learn how to interpret the geologic record of the earth's climate. The list of topics to be covered is below and will be discussed on the first day of class. You should note that what we are covering in this course is *scientific* issues. We are explicitly avoiding extensive discussion of the public policy implications of climate change, the economic and social impacts. This is due to a lack of time and expertise. If one of you wishes to explore this more thoroughly you can do so as part of your term paper.

Climatology as a field changes extremely quickly. Unlike many upper level science classes, what was barely understood 10 years ago may now have reached the level of textbook dogma. Climate change is obviously in the popular press a lot nowadays. It is also big in the scientific literature. There are whole journals devoted to technical articles on climate, and the volume of related material published every year could fill up many linear meters of shelf space in a library. For that reason, we can only scratch the surface and give you an introduction to some of the important topics people are interested in. We will address a small subset of the primary literature concerning climate change as part of class discussion. Your instructors have expertise in a couple of narrow areas related to climate change (ocean circulation and hydroclimatology). There are many areas where we know hardly any more than you as students do. This course will be as much an education for us as it will be for you.

In light of the wide-ranging nature of the subject of climate change, the main goal of this class is for you to be able to read, understand, and synthesize climate change research from the peer-reviewed literature.

Evaluation of Your Work

All work in this course will be officially handed in electronically via the class Moodle web page, which is accessed at gly420.com. You will need to create an account for yourself using your UNCW email address. In addition, for some longer assignments, the instructors may ask you to hand in a paper copy for their convenience. Copies of presentation Powerpoints will be uploaded to Moodle as well. **NO LATE WORK WILL BE ACCEPTED FOR ANY ASSIGNMENT.**

For the data analysis and term paper assignments, you may work alone or in groups of up to 3 students. All students in a group will get the same grade.

Your grade in this course will be based approximately on six items:

One mid-term (20%) and a final exam (20%): The exam dates are shown above and may consist of in-class or take home portions.

Term paper and oral presentation (20%) See below.

Literature synthesis assignments (10%) You will periodically be given articles from the primary literature and required to summarize the main findings of the work. These papers will be discussed in class and the summaries will typically be due the next class period. In addition, you will be asked to submit 3 discussion questions related to the paper before the class where the paper will be the topic. Students enrolled in this course at the 500 level will also be required to lead a class discussion for one paper. Discussion leadership will be evaluated the same as paper summaries.

Data analysis assignment (20%) See below.

Subjective evaluation (10%) This is used by the instructors to count such things as class participation, in-class discussion of papers, and preparation.

Term Paper

We are requiring that you select any topic of interest to you that relates to this course and prepare a 5-7 page (400-level students) or 8-10 page (500-level students) paper on that topic. As the course goes along, we will cover in more detail what the format of the paper should be, and what research materials you can find in the library and on the Internet.

In addition, you will present your findings in a 15-20 minute oral presentation to the class. The student presentations will take place during the last class of the semester and the final exam period.

This assignment is your opportunity to delve into the literature and learn something on your own. It can be a topic we cover in class, as long as you are learning about it in more depth and detail. The paper should include at least 5 major references from the peer-reviewed literature. **You are required to hand in a one page summary of your potential paper topic, a list of potential references and a detailed outline of**

your paper by October 15. This will provide approximately 1.5 months of preparation time for your presentation and final paper. The summary should include discussion from at least one of the references you plan to use in your final paper. The summary will be graded as part of your term paper, and factored into your subjective evaluation. The summaries may be handed out to the class for discussion. The instructors reserve the right to ask you to change your term paper topic based on our reading of the summary. **In order to get you started with your paper, the instructors will be available for meetings with students or groups the week of October 20 to discuss your term paper topic, research strategies and presentation.**

Your term papers are due December 1 (our last day of class). If you wish, you may hand a draft of your paper in early. We will comment on it without grading and hand it back to you. There is no due date for this, but we will ask for at least a week to look at it. You will then need to make changes in it. So if you wish to do this, we would advise handing it in *at least* two weeks before the due date.

Data Analysis Assignment

In order for you to get a sense of how climate change data are evaluated, we ask you to complete the following assignment. If you like, you may work on this assignment in groups of up to 3 students. All students in a group will get the same grade.

You will select two related time series datasets of climate significance and write a report on them. Call one the primary and the other the secondary for definition. Which datasets you choose is up to you, but they should measure some indication of climate change. There are zillions of them available. Examples include sea level, atmospheric pressure, surface temperature, rainfall, river discharge, ice cover, etc. Your instructors can help you find something suitable.

For each of your datasets, you should answer these questions. What do these datasets measure, and how do they indicate climate change? What agency or individual is responsible for the measurement and has this changed over the length of the record? Is time measured directly, or is there some proxy for it (i.e. core depth)? What instrumentation is used to make the measurement? Be as specific as possible, with instrument model numbers and any other detail you can find. How have measurement techniques changed over the length of the record and how might these changes have affected the accuracy of the measurement? Find peer-reviewed articles which use or reference your particular datasets (best), or similar alternative datasets (acceptable). What types of analyses do these authors do using the datasets and what conclusions do they draw?

Plot your datasets up as a function of time. Examining your data, identify a few specific events in the record, and associate these with some historical event as documented in another way. Identify a few different time scales of variability, i.e. daily, seasonal, decadal, etc. What might this variability be a result of?

Calculate the correlation between the primary and secondary datasets. (You may need to interpolate on of the time series onto a common time interval. Explain how you did this.) Give some interpretation of the correlation if possible. Make a scatterplot of one dataset against the other and interpret. For students at the 500-level, you should go beyond this to a deeper interpretation of the meaning of your datasets and what they tell us about the way climate change is measured, how it is interpreted or what it may mean to society. This part is of necessity open-ended, and what you do depends on what dataset you choose.

Write what you have done in a report and hand it in on **October 1**. There is no strict page number requirement for your report, but it should be no longer than 5 pages not including the figures you create. In addition, you are required to create a scientific poster based on your findings. Your poster will be shared with the class on **October 1**.