Do weather changes matter?

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Contents

1 Introduction

1.1 Climate and the IPCC

According the the Inter-Governmental Panel on Climate Change or IPCC, the temperature has been changing about 0.85 degrees C since the 1880s – but this global average is not evenly distributed accross the globe.

1.2 Global and Regional Average Temperature Changes

How can we appreciate potential changes accross the whole globe? An average temperture increse for the globe is somewhat abstract. Perhaps, we should evaluate how temperature (and/or rainfall) might be changing on local scales.

Thus, for this project, we'll try to understand how temperature changes "map" onto a community that we care about? But to do this we need obtain and analyze tempterature data and determine if weather changes have compelling impacts on local communities.

In other words, do weather changes matter?

1.3 Goals of this Document

1. Describe the goals and approach for the project;
2. Provide or point to resources to prepare for and conduct the project; and
3. Describe how we will evaluate the project process and products.

2 Project Description

2.1 Driving Question(s)

Projects can often be structured as questions, but sometimes it it worth phrasing the questions in a number of ways – this might help you find ways that you might find the question more provactive and interesting, For example,

- Is my region's climate changing?
- How is climate change affecting my community?

But you can modify these questions to develop the project that you might find compelling.

In addition, we may develop "sub-questions" that can be developed or answered that might inform the main question or questions. For example,

- Are there biases in weather data? Can these biases be corrected? If so, how?
- How can we evaluate trends? What are the most appropriate statistical tools to test for trends?
- What is the best way to display visual data? Are there best practices to guide a public product to make it more compelling or interactive?

2.2 Public Products

Science is a social project. From the questions we ask, to the results and their presentation, science is embedded in a culture of norms. To frame our science within these norms, each of us will publish blogs to answer the question, "do weather changes matter?"

In addition, each student will write and submit an OpEd piece to a regional newspaper that frames regional climate issues into a newsworthy item.

Finally, we will hold a Q &A session with public school teachers to help them implement NGSS standards on weather and climate.

3 Directed Practice

3.1 Learning Goals

For this project, you will use weather data to the question "do weather changes matter." How you answer the question is largely up to you, however, to be successful students will demonstration compentency in some specific skills and knowledge.

Skills

- Ability to download and process weather data;
- evaluate temporal trends in weather data;

- research the environmental impacts on human or non-human communities; and
- communicate conclusions to the public with special attention to guide how data misinterpretations should be considered.

Knowledge

- Understand how data climate data is currated;
- Analyze climate impacts from around the world.

Throughout this project, your team and instructor will develop the strategies and skills to address this question and help you make some conclusions and present the results ot the public.

3.2 Resources

Students will have the following tools available:

- Servers where stored weather data can be downloaded;
- R Studio Server with some scripts & libraries to help develop analyses;
- Gighub to store project codes and as a platform to make the product public; and
- Lectures, reports, and presentations on climate change science, the social and ecological implications of climate change, and the polcies and politics of climate change.
- Shiny app templates that might be used as a container for interactive content.[1]

3.2.1 Software Guides

Much of the environmental data collected has become electronic. Thus, to access to and process these data, we need use tools to access, pre-process, and analyze these data using computer software. Below are resources that we have developed to assist you in this class (Table 3.2.1).

Table 1: Software guides developed for EA30/31. These SOPs have been developed by students and faculty over the years and are loaded on the github.com/SOPs repository.

SOP #	Description
06	An Introduction to R, Rstudio, Github
06b	Introduction to Markdown–Html

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[1]Currently under-development – We will likely skip this application since I not confident in using this particular tool.

3.2.2 Data Processing and Analysis Tools

Much of the environmental data collected has become electronic. Thus, to access to and process these data, we need use tools to access, pre-process, and analyze these data using computer software. Below are resources that we have developed to assist you in this class (Table 3.2.2).

Table 2: Resources to obtain, pre-process, and analyze NOAA climate data.

SOP #	Description
0X	Processing and analyzing NOAA climate data
0X	Analyzing time series data

3.2.3 Readings and Other Climate Change Resources

3.2.4 Writing Resources

Scientific writing is a skill that takes years to develop. Although there are many types of readings, scientific writing does have some unique characteristics that will seem a bit awkward. However, you might be surprised about how much you already know about technical writing. We have selected key resources that we think will help you further develop and improve your writing skills.

Below is my list of key concepts:

Clarity

Accuracy

However, specific genres require specific adjustments in our writing style. Please use the following to help in your writing process:

- "Writing an Op-Ed"

- "Scientific Blog Writing Guidelines"

- "Peer review writing – Dos and Don'ts"

4 Project Milestones

To complete the project in a timely fashion, we will be adhering to a rather strick schedule (Table 4).

5 Op Ed #1

6 Developing Expertize

To develop expertise, we will rely on teams of students to develop and evaluate various aspect of climate data. Each of us form an essential component for the

Table 3: Project milestones and point distribution.

Product	Launch	Due Date	%
Op-Ed #1	Aug 30	Sept 4	5
Expert Team Report	Sept 4	Sept 10	5
Background Presentation	Sept 4	Sept 11	5
Draft Figures & Analysis	Sept 11	Sept 17	5
Literature Review	Sept 11	Sept 24	10
Peer Review – Literature Review	Sept 24	Sept 30	10
Blog DRAFT	Sept 24	Oct 2	15
Peer Review – Blog	Oct 2	Oct 6	5
Blog FINAL	Oct 9	Oct 13	20
Op Ed #2 Draft	Oct 9	Oct 15	10
Op Ed #2 Submission	10	Sept 15	Oct 20

effort. Organized as teams and expert groups, we will disassemble the project into chunks that each of us will contribute in specific and effective ways. This expertise will be used to develop our Q & A sessions, as well as, to help us develop and write our op-ed and blogs. The experts should include areas of contravery and how scientists and non-scientists wressle over the data.

6.1   Topics of Expertise

We will will create expert groups on to present the following topics:

1. Radiative Gases – What are they and what do they do?

   List the major compounds categorized as radiative gases and describe how various processes determine their role as GHGs. Provide detail on how different wavelengths of light interact with the gases. Finally, a discussion of water is key, since it is one of the main sources of controversy.

2. GHG Emission Trends and Sources – Carbon Dioxode (CO_2), Nitrous Oxide (N_2O), and Methane (CH_4).

   Describe how carbon dioxide and other GHGs are emitted and remain in the atmosphere. Distinguish between natural and anthropogenic sources and why that distinction might be important. Desribe various type of sources and how these might be linked to certain types of economic development and activities. In addition, describe the role of vegetation and other forms of carbon sequestration.

3. Role of Water and Other Feedbacks

   Climate change feedback is important in the understanding of global warming because feedback processes may amplify or diminish the effect of each climate forcing, and so play an important part in determining the climate sensitivity and future climate state. Feedback in general is the process in

which changing one quantity changes a second quantity, and the change in the second quantity in turn changes the first. Positive feedback amplifies the change in the first quantity while negative feedback reduces it.

Clouds Gas release Ice-Albedo Carbon Water vapor

4. Terrestial Surface Temperature Records

    The instrumental temperature record provides the temperature of Earth's climate system from the historical network of in situ measurements of surface air temperatures and ocean surface temperatures. Data are collected at thousands of meteorological stations, buoys and ships around the globe. The longest-running temperature record is the Central England temperature data series, that starts in 1659. The longest-running quasi-global record starts in 1850.[1] In recent decades more extensive sampling of ocean temperatures at various depths have begun allowing estimates of ocean heat content but these do not form part of the global surface temperature datasets.

5. Ocean Tempertures and Sea Level

    Describe how ocean temperatures have been measured over time and how these have lead to a range of interpretations of the results. Disucss how the thermal expansion of water may influence sea leval rise. Discuss how sea temperature change may affect different parts of the world differently. Describe the methods to distinguish sea level rise and coastal elevation changes, including how satellites work to collect these data.

6. Satellite-based Temperature Measures

    Satellites can be used to measure outgoing radition. However, each atmospheric layer has different properties and is impacted by GHGs in differing ways. Describe how the satelite data has been used, how these instruments have changed and why there are several different methods to evalaute satellite data. Because satellite data has result results, describe how these methods have been used to support or limit our confidence in climate change.

7. Weather Extremes Trends Explained

    Weather and climate extremes such as hurricanes, tornadoes, heavy downpours, heat waves, and droughts affect all sectors of the economy and the environment, impacting people where they live and work.

6.2   Expert Team Assignments

For this project, the following students have been assigned to the teams below:

Topic	Team_A	Team_B	Presentation_Date
1	Brooke	Caroline	09/11/17
2	Mina	Kihara	09/11/17
3	Troy	Sarah	09/11/17
4	Kyle	Chris	09/18/17
5	Bebe	Katherine	09/18/17
6	Meily	Marc	09/18/17

6.3   Expert Team Presentation

In addition, each team will present (via open-source software, i.e. rPres) their results to the class. The presentation shall include the following:

- Historical development of the field/issue and methods;

- summary of IPCC information regarding the topic;

- List of researchers that have contributed to this topic in the last 20 years and a description of their contribution; and

- Describe existing areas of uncertainty.

Create a presentation as a R Presentation (.Rprs) and it each person should limit their presentation to 10 minutes.Longer presentations will be penalized. Ten minutes goes quickly, so I suggesty you practice a few times to ensure that you don't lose unnecessary points.

Table 4: Presentation Grading Criteria–F2017

Standard	Percent
Accuracy	20%
Completeness	20%
Clarity	20%
Timeliness	20%
Use of Technology	20%

6.4   Summary of Literature Review

Review regionally relative results and conclusions from peer reviewed climate science. See this document as a resource.

Submit a written summary of your research findings and their references. Be sure to include how data might be use to counter common arguments that critique climate change science. These summaries must be loaded on the Rstudio project page and in `.Rnw` and `.pdf` formats.

Submit via `Sakai`.

6.4.1 Grading of Literature Review

6.5 Peer Review of Literature Review

6.5.1 Grading of Peer Review

Table 5: Summary of Data Analysis grading standards.

Standard	Percent

7 Regional Climate Analysis

Each of us will select a region of interest. Perhaps, somewhere that you have spent a compelling time in or that you wish to know more about. Please select a region that has not been done by previous classes.

7.1 How to Conduct a Regional Climate Analysis?

Using R studio we will analyze a long-term climate record, create 3-4 figures that will be used to communicate climate records, e.g. 100-year temperature **and** precipitation record for a specific region.

7.2 Obtain, Process, and Analyze Data

Using the resources supplied, it will be up to you to download, pre-process, and analyze a trend analysis using R – where the slope, r^2, and probability are calculated[2] and explained.

As specified by the milestones, submit the draft analysis and results using R studio of a long-climate record.

The Rmd file should be compiled into an html that describes the methods (data sources), data quality, and trends. Be sure to include language about the "null" hypothesis for your trend analysis. Compiled into a html file, the text should describes the methods (data sources), data quality, and trends. Be sure to include language about the "null" hypothesis for your trend analysis. Load the html file to sakai. This document will become your "blog". Commit and push the html file to sakai in your directory with the following naming convention:

"/yourdirectory/draftanalysis.Rmd " and "/your directory/draftanalysis.Rmd"

Table 6: Summary of Data Analysis grading standards.

Standard	Percent

7.2.1 Data Analysis Grading

7.3 Regional Climate Impacts – Literature Review

Evaluate peer-reviewed articles to determine potential ecological, economic, and sociological implications of climate patterns;

Write a 5 page paper that summarizes your results and submit via `Sakai`.

8 Communicating Science

8.1 Comparing Prior Communication Edeavors

Review previously written EA 30 Blogs to evaluate which ones are effective and what you like about each one.

Select 4-5 blogs and write a summary for each one, describe three things that you like about each one and describe one thing you might improve. Finally, look up one topic for each one that you are more interested in learning and summarize what you find.

Here are some good examples of climate blogs:

- Accuweather

- Nature Magazine

- Think Progress

- Climate Four Future

Useful sites:

- Climate Central

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8.2 Draft Blog

Write blog to effectively and clearly describe results.

The blog shall be publish-ready and include the following:

- Describe the economic, cultural, and physical geography of the region (2-3 sentences);

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[2]We will have to learn what these are to be able to explain our results! Be sure to ask lots of questions about the statistics so you appreciate this important topic that nearly every scientific field relies!

- Describe climate patterns (1-2 sentances);
- Describe where the data were obtained and summarize how the data were processed and analzyed;
- Time series plots of temperture data using R (3-4 graphs, with several setences describing the results);
- Evaluation of data to determine if trends exists;
- Compare results to model predictions and possible ecological and economic implications to the region;
- description of what the data tells about about the region,
- a few short paragraphs describing how data can be interpretted; pitfalls of unintentional and intentional misinterpretations; and
- narrative that describes the climate and climate implications for a community that you care about.

8.3 Peer Review Blogs

Peer review is the evaluation of work by one or more people of similar competence to the producers of the work (peers). It constitutes a form of self-regulation by qualified members of a profession within the relevant field. Peer review methods are employed to maintain standards of quality, improve performance, and provide credibility. In academia, scholarly peer review is often used to determine an academic paper's suitability for publication. Peer review can be categorized by the type of activity and by the field or profession in which the activity occurs, e.g., medical peer review.

8.4 Publish Revised Blog

The Blog will be published online (via `Github.com`) and based on your data analysis results, combined with your literature review. If it helps, read the Project_Report.pdf on the Project Site for some helpful hints.

1. Download and analyze data (i.e. make inferences) to create an public product; I have uploaded all the climate data on a network drive, `//fargo/classes/EA30-LosHuertos`//fargo/classes/EA30-LosHuertos.[3]

8.5 Blog Grading

Your final products should include:

- Effectively display climate patterns from NOAA repositories, with at least 6 decades of data. Be sure all graphics are appropriate labeled and have captions that the reader can use to intrepret the data;

- Analyze the data using a linear model using R (i.e. lm);

- Describe the methods used to obtain and analyze the data; and

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[3] I haven't been able to get the directory working consistently, so stay tuned on this.

- Evaluate peer review literature to determine potential regional impacts from climate change – be sure to include ecological and economic impacts;

- Cite instances of how various scientific arguments have been distorted and politicized;

- Identify how conventional scientific standards have been compromised and how arguments that might be based on distortions can be countered.

8.6 Op-Ed 2

Using the Op-Ed guidelines, write an Op-Ed to summarize 2-3 salient points from your Blog where you should:

- Describe regional climate changes and predictions that include ecological impacts;

- Cite instances of how various scientific arguments have been distorted and politicized;

- Identify how conventional scientific standards have been compromised and how arguments that might be based on distortions can be countered.

Uses the Op-Ed guidelines, submit a draft Op-Ed via `Sakai`. Include a description of the local or regional papers that this Op-Ed might be submitted and several examples of Op-Eds that have discussed environmental issues.

Write an Op-Ed to propose what makes a good public product with respect to criticisms of climate science debates and criticisms. In other words, describe (2-3) ways that climate change skeptisism might misuse the data analysis and how one might prevent the misuse, be sure to cite your blog as an attepmpt to accomlish these goals.

Submit Op-Ed to the appropriate regional or local paper.
Assignment:

- Make an organized presentation that effectively communicates how various scientific arguments have been distorted and politicized;

- Identify how conventional scientific standards have been comprimised; and

- Use the allotted time (10 min) effectively. I suggest you practice, 10 mintues can go very quickly when presenting complex scientific data.

- Geographic description of region;

- Demographics and a brief history;

- Summary of economic geography;

- Available data records;

- Summary of data analysis;

- Climate model implications for the region; and

- Analysis of political-science debate in region.

9   Peer Evaluation Forms

9.1   Literature Review–Peer Evaluation

Evaluator: _____

Author: _____

1. Describe two items you learned.

2. Describe one concept or fact you would like to learn in more detail.

Table 7: Please circle the best response, where one is inadequate and five is outstanding—i.e. should be teaching the topic!

How clear was the presentation?	1	2	3	4	5
Suggestions:					
Did the analysis seem valid?	1	2	3	4	5
Suggestions:					
Was information complete enough?	1	2	3	4	5
Suggestions:					
To what extent could you use this example in climate discussions?	1	2	3	4	5
Suggestions:					

9.2   XX–Peer Evaluation

Evaluator: _____

Author: _____

1. Describe two items you learned.

2. Describe one concept or fact you would like to learn in more detail.

Table 8: Please circle the best response, where one is inadequate and five is outstanding—i.e. should be teaching the topic!

How clear was the presentation?	1	2	3	4	5
Suggestions:					
Did the analysis seem valid?	1	2	3	4	5
Suggestions:					
Was information complete enough?	1	2	3	4	5
Suggestions:					
To what extent could you use this example in climate discussions?	1	2	3	4	5
Suggestions:					

9.3 DRAFT Blog – Peer Evaluation

Evaluator: _____

Presenter: _____

1. Describe two items you learned.

2. Describe one concept or fact you would like to learn in more detail.

Table 9: Please circle the best response, where one is inadequate and five is outstanding—i.e. should be teaching the topic!

How clear was the presentation?	1	2	3	4	5
Suggestions:					
Did the analysis seem valid?	1	2	3	4	5
Suggestions:					
Was information complete enough?	1	2	3	4	5
Suggestions:					
To what extent could you use this example in climate discussions?	1	2	3	4	5
Suggestions:					