

#4. Climate Models

Summary: In this module you will learn how climate models are constructed, from basic to complex.

Goals: By the end of this module you will be able to evaluate outputs from different climate models and identify where to find reliable climate change model results for your region.

Required readings:

General Introduction -- <https://www.ipcc.ch/>

<https://www.climate.gov/maps-data/primer/climate-models>

<https://sos.noaa.gov/datasets/koppen-geiger-climate-changes-1901-2100/>

More detailed information -- https://cnx.org/contents/F0Hv_Zza@45.1:4o_glx6d@8/Climate-Projections

<https://ideas.ted.com/8-charts-show-how-climate-change-is-already-impacting-everything/>

Supplemental Content (review in class or assign directly):

These slides are a solid intro to the topic of climate modeling https://nas-sites.org/climate-change/climate-modeling/page_1_1.php (note: the video links don't work)

<https://www.biointeractive.org/classroom-resources/understanding-global-change> This interactive system modeling tool can be used in a class discussion to build a simple model and review important forcing functions.

Greta Thunberg's TED Talk (example of how complex model results can be used to make compelling and simple arguments):

https://www.ted.com/talks/greta_thunberg_the_disarming_case_to_act_right_now_on_climate_change

Key Vocabulary: GCM, grid, CO₂, IPCC, Gigatonne, simulation, anthropogenic, projection, Köppen-Geiger classification

Assessment Tools:

Discussion Questions (can be used in classroom or for on-line discussion board):

- What is the IPCC and what do they do?
- If there is a complete cessation of anthropogenic carbon emissions tomorrow, would there be an immediate cessation of global warming? Why or why not?
- What are the major advantages and disadvantages of simple climate models?
- What attributes of the Köppen-Geiger classification make it useful for predictive climate models?

Writing Assignment: Summarize predicted climate impacts on at least 5 factors in your community 50 years from now by using information available in this data gallery: <https://www.climate.gov/maps-data/datasets> . Provide full bibliographic citations and a brief description of the factors used in the models.

Writing Assignment: How big is a Gigatonne? <https://climate.nasa.gov/news/2933/visualizing-the-quantities-of-climate-change/> In your own words, define Gigatonne 3 different ways. Do your own calculations to describe a Gigatonne of *Fig Newtons*. How many packages would that be? And how many of your largest campus buildings would it take to house that inventory of cookies? Show your work.

Module 4 Climate Modeling Lab Activity

Pick one of the Climate related studies on Zooniverse (<https://www.zooniverse.org/>) & spend at least 2 hours generating data as a volunteer. Then write a standard “Lab Report” based upon the work you did on Zooniverse. Describe how the data you gathered can be used in a climate model in your report.

Follow the IMRAD method to prepare your lab report. This resource shows how to write a good lab report with IMRAD: <https://writingcenter.unc.edu/tips-and-tools/scientific-reports/> Note: this resource also shows the correct way to cite reference materials.