F25.033 Understanding past and future climate change

Overview

The Paleoclimate Dynamics Laboratory is actively involved with a variety of projects that aim to better understand how and why climate changed in the past to better understand how climate will change in the future. These projects in type and scope, although most involve working with large and complex datasets to better understand past and future climate variability. For some of the projects students will use analytical methods in the Sedimentary Records of Environmental Change Lab to collect data from sediment cores related to environmental changes. These methods quantify various physical, biological and geochemical properties of lake sediment in Alaska and elsewhere. Other projects focus on collecting and analyzing large datasets to investigate climate changes over large spatial regions or even the entire planet. Lastly, we also develop and explore innovative quantitative methods and computer programs to better explore past, present and future climate variability. For all of the projects, the resulting datasets are used to understand the causes and effects of past climate variability, information needed to place current global warming into a longer-term context.

What the student will DO and LEARN

If the student takes on a project focusing on analyzing a sediment core, they will learn and perform laboratory procedures involving one or more of the following methods as applied to sediment or soil cores: particle-size distribution; biogenic silica abundance; carbon and nitrogen abundance; particle shape; visible reflectance spectroscopy; amino acid composition; radiocarbon dating. Alternatively, if the student takes on a project focused more on data analysis, they will learn and perform scientific coding in R and/or python, and perform analytical procedures involving one or more of the following methods: data cleaning and wrangling; modeling; Bayesian statistics; machine learning; data visualization. For both project types, the student will integrate their dataset with other relevant data, many of which have been generated by graduate students. They will use a spreadsheet or scientific code to analyze and visualize the data. They will prepare a written report describing the methods and results, and interpreting alternative explanations for the changes measured through time. The number of hours per week that the student dedicates to this project can be flexible, depending on the specific dataset and resolution of the sampling.

Additional benefits

The dataset(s) and scientific report generated by the student will be integrated into a larger manuscript led by a graduate student and guided by the faculty advisor. The goal is to publish a peer-reviewed journal article, with the undergraduate student as coauthor, featuring multiple datasets that together provide a multi-facetted reconstruction of past environmental and climate changes at the study site. Students will also have the opportunity to engage with the broader research program of the Past and Present Climate Change Group in the School of Earth and Sustainability. This includes weekly lab group meetings with graduate students, postdocs and research faculty. Following successful completion of the I2S internship, opportunities may be available to extend the project.

Additional qualifications

Some coursework in natural sciences, especially earth science is helpful. For data analysis focused

projects, courses in math, data science, and/or computer science is also helpful

Time commitment

6 hrs/week for 30 weeks