

Sampling treeline trees to develop a temperature reconstruction using quantitative wood anatomy

Summary

The North American Arctic is one of the fastest warming regions in the world, and scientists expect temperatures to continue rising at more than twice the rate of the global average over the next 100 years. Greenhouse gases aren't the whole story, though. Past volcanic eruptions have caused periods of cooler temperatures in North America, so it is important to study both natural and human drivers of changes in the climate. However, the short length of temperature records in this area make it difficult to observe long-term variability in temperature or the impacts of volcanic eruptions in the distant past. This project aims to reconstruct records of past climate from the North American treeline by examining tree rings collected by obtaining tree cores from spruce trees in northern Alaska and Canada to understand and record detailed temperature variations over long time periods. Tree core samples will be studied using a method called "quantitative wood anatomy", where project scientists will take detailed measurements and use information about the thickness and shape of individual cell walls in the tree rings to tell a story of what the climate was like in the past. By conducting this research, scientists at the University of Arizona and the University of Nevada, Reno will be able to fill gaps in the current record of historical summer temperatures and identify the timing and strength of periods when volcanic eruptions contributed to periods of colder than normal summer temperatures. The findings of the research will then be used to contribute to a better overall understanding of what the climate was like in North America many, many years ago before we had weather stations. The project will involve collaboration with undergraduate and graduate students, and will involve discussions with teachers and the community in Kugluktuk, which will bring together a diverse group of voices interested in understanding the past climate in the North American Arctic.

To carry out this project will require a team of 3-4 scientists to travel to a location at the northern edge of treeline on the banks of the Coppermine River. The team will use a local guide company to fly us to the nearest location to our proposed sampling site that can be accessed by float plane. We will then travel by raft along the Coppermine River until we get to the site. We will sample 30-40 trees using increment borers, a non-destructive technique that takes a small core sample from each living tree. Coring trees does not cause any lasting harm to living trees. We will also be collecting cross-sections from any dead wood that is present in the same area as the trees we sample. We aim to carry out this sampling during the summer of 2024.