
GC030-06 - How Does the Proximity of Mountain Glaciers Affect the Microclimates of Adjacent Forests in Southeast Alaska?



Tuesday, 8 December 2020



13:50 - 13:54

Abstract

The advance and retreat of glaciers accentuate shifts in regional climate by altering the microclimate in their immediate vicinity. Observing how ecosystem responses like tree growth rates respond to large changes in periglacial microclimate can help us better understand how mountain ecosystems may respond to rapid and pronounced warming in the future. Glaciers cool the air temperatures around them, and, because most glaciers are currently in retreat, rates of anthropogenic climate warming in glaciated valleys are being amplified by the retraction of these cold microclimates. Such situations provide a natural experiment to test how ecosystems respond to different rates of long-term climate change. Despite the scientific value of these shifting microclimates, there has been limited description of how glaciers affect periglacial ecosystems. Here, we quantify the extent and the magnitude of a cold halo bordering the terminus of the La Perouse Glacier in Southeast, Alaska using data from a transect of automated temperature sensors and remotely sensed surface temperature estimates from Landsat imagery. Our goal is to use dendrochronology to test how the old-growth temperate rainforest growing on the La Perouse Glacier foreland has responded to the accentuated climatic changes caused by the shifting glacier microclimate as the glacier advanced and retreated over the past 300 years. La Perouse Glacier's summer cooling effects extend 0.5 km away from the ice margin, and the degree of local cooling varies by season and weather conditions. In summer, air temperatures in forests ~100 meters away from the glacier's margin were ~2.75°C cooler than temperatures in unglaciated valleys. Based on historical observations and glacial geologic data that delineate past glacier positions, we estimate that a glacier advance in the mid-19th century and a subsequent retreat in the 20th century caused a 3°C climate oscillation experienced by these periglacial forests. This pronounced climate oscillation caused growth slowdowns and tree death of Alaska Yellow Cedar in the adjacent forest. Ongoing work that we will present includes comparing observed air temperature data with remotely sensed estimates using Landsat data and developing tree-ring records to quantify ecosystem responses to these microclimate shifts.

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