Expectations and reality for high latitude versus high elevation global change (*Invited*)

A. G. Bunn[1]*; A. H. Lloyd*[2]
1. Environmenal Sciences, Western Washington University, Bellingham, WA, United States.
2. Biology, Middlebury College, Middlebury , VT, United States.

Arctic and alpine ecosystems are often treated as analogs of each other, in large part because they share a similar vegetation transition from forested to low-stature tundra communities. Despite the superficial similarities, the response of the two types of ecosystems to future climate change will likely differ because of differences in ecosystem history, function, and extent. The role of feedbacks differs substantially between the two as the Arctic terrestrial system is dominated by feedbacks which have the potential to significantly alter the rate and magnitude of future climate change. If invoked, these feedbacks will substantially alter and augment northern high latitude change far above the background forcing from increased greenhouse gas concentrations. The same is not obviously true for mountains, both because of the difference in areal extent and because of differences in soil characteristics that affect the potential for carbon cycle feedbacks. The climatic controls over biophysical processes may differ in subtle but important ways between the two systems despite the overriding importance of temperature as a control in both ecosystems. For example, changes in the position of the treeline ecotone in the Sierra Nevada during the late Holocene occurred in response to variation in both temperature and moisture, whereas treeline advance and retreat in Arctic regions appears to be primarily a function of temperature. Despite those differences, it appears likely that changes in Arctic and alpine ecosystems will have large influences on the global system. The consequences of changes in alpine ecosystems will be amplified by their large importance in controlling global water supplies. More than 50% of the world's freshwater supplies, for example, are derived from mountainous regions. Any change to those regions might have disastrous effects on human welfare. Global impacts of changes in Arctic regions are amplified by the aforementioned feedbacks on the climate system, which have the potential to increase the rate of warming in high latitudes by several fold, with cascading effects on the global climate system. We will review some of the similarities and differences in arctic and alpine systems by showing data on predicted changes to the physical, floral, and faunal aspects of both systems paying particular attention to the role of feedbacks and forcings.