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A record of glacier length through the Holocene for a glacier in the Juneau Icefield, Alaska

ANDREW G JONES[1], JEREMY BROOKS[1], SHAUN A MARCOTT[1], NATHANIEL LIFTON[2], EMMA HIETPAS[1], GRETA SCHULTZ[1], DOUGAL HANSEN[1] AND LUCAS ZOET[1]

[1]University of Wisconsin-Madison
[2]Purdue University
Presenting Author: agjones3@wisc.edu

Whether North American glaciers disappeared during the so-called Holocene Thermal Maximum (~10–6 ka) remains debated. As numerous North American glaciers are projected to disappear this century, the answer has implications for measuring the human impact on the cryosphere and projecting future glacier change. Prior work in western Canada documents several glacier advances between ~8 ka and the end of the Little Ice Age in ~1880 CE, but many questions persist about the magnitude of advance and retreat during these episodes. *In situ* cosmogenic ^{14}C-^{10}Be concentrations in proglacial bedrock provide quantifiable constraints on bedrock exposure and burial that we apply in a novel sampling pattern to reconstruct glacier length through time.

We present a preliminary record of Holocene glacier length for a glacier in the Juneau Icefield, Alaska, USA. We measured ^{10}Be concentrations in bedrock samples (n=27) along a transect from the modern glacier terminus to its Holocene maximum (Little Ice Age) moraine, making paired *in situ* ^{14}C measurements on ten of those samples. Apparent ^{10}Be exposure ages generally increase down-valley from the glacier toward the Little Ice Age moraine, ranging from near-blank levels (60 ± 60 years) at the glacier's terminus to a maximum of 7,240 ± 410 years near the moraine. *In situ* ^{14}C-^{10}Be ratios, reflective of burial, are lower by the glacier and higher by the moraine. These two trends provide evidence of successively greater Holocene glacier expansion as predicted by decreasing summer insolation and regional proxy temperature reconstructions. Modeled exposure-burial histories and sample 'stratigraphic position' suggest the glacier has retreated to its smallest position of at least the past 7,000 years. This occurred despite only a 30% reduction in length, which we hypothesize is indicative of a persistent glacier over the Holocene.

We also calculate subglacial erosion rates by forward modeling our measured nuclide concentrations. Modeled erosion rates from five initial samples range from 0.05 to 0.3 mm yr^{-1}. We explore glacial erosion along a specific roche moutonnée from the glacier's forefield in a paired study that will be presented at the meeting.