

Inferred paleoclimates from cosmogenic nuclide exposure dating and equilibrium line altitude reconstructions, Wind River Range, WY

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Wyoming's Wind River Range is host to the most complete record of latest Pleistocene and Holocene Rocky Mountain glacial moraine units. Here, we use cosmogenic nuclide ¹⁰Be analysis from boulder samples to estimate the ages of previous relatively dated till units in the upper Dinwoody Canyon. Cosmogenic nuclide samples verify the timing of these units, but also include boulders from local talus that do not represent the timing of the moraines. Probability distribution functions indicate that ¹⁰Be ages for 4 Gannett Peak formation samples cluster at 290 yr and 7 Temple Lake formation samples cluster at 11,720 yr. These are interpreted as the maximum ages of ice recession. The Holocene moraines in the study exhibit reworking during subsequent glacial advances as evident by a wide range of exposure ages and spatial distribution of the sampled boulders. The equilibrium line altitude (ELA) is the theoretical altitude at which a glacier's accumulation zone meets its ablation zone and can be estimated based on the location of glacial moraines. We calculate ELAs from glacier reconstruction tools in ArcScene using the accumulation area balance ratio method. Reconstructed steady state ELA's from the Temple Lake (11,500-12,800 yr) and the Gannett Peak (150-750 yr) Formations indicate a gradual rise in ELA over time from 3530 ±8m to 3632 ±6m, respectively. The calculated single year ELA for 2015 is 3742 ±6m, signifying a drastic change in the rate of glacial recession since the deposition of the Gannett Peak Formation. Numeric dating and paleoclimate reconstructions suggest that Wind River moraines may be correlated with the timing of Younger Dryas and Little Ice Age climate events.