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INVESTIGATING GLACIAL HISTORY AND LANDSCAPE CHRONOLOGY WITH COSMOGENIC ^{10}BE AND ^{26}AL IN THULE, NORTHWESTERN GREENLAND

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To study the Pleistocene and Holocene history of glaciation in Thule, northwest Greenland, we measured cosmogenic ^{10}Be and ^{26}Al in glacially deposited boulders.

The majority of the Thule landscape is covered by a dense, clay-rich diamict. We sampled boulders (n = 13) from this diamict in a 20 km transect stretching from the modern ice margin to the coast. Calculated ^{10}Be ages range from 10.7-78.4 ka. There are two distinct age groups: the first, with an average of 10.8 ka, ranges in age from 10.7-10.9 ka (n = 3); the second more diffuse group, with an average of 25.0 ka, ranges in age from 18.9-29.7 ka (n = 9). A single older sample is 78.4 ka. Two-isotope (^{26}Al/^{10}Be) ratios suggest that the Holocene-aged samples have been continuously exposed (ratios of ~7), while older samples have ratios as low as 5.3 that are indicative of prior exposure followed by burial. Modeled minimum limiting burial durations are several hundred ka.

A second diamict covers a small area of land (~20 km^2) north of Thule, near the Harald Moltke Brae outlet glacier. This diamict has a sandy matrix and contains numerous sharp-crested moraines. Sampled boulders from these moraine crests (n = 15) have ^{10}Be ages that range from 12.2-28.6 ka. The age distribution is similar to that on the outlying landscape, with a young pair of samples with ages of 12.2 and 12.4 ka (n = 2) and a second more diffuse group with an average of 23.2 ka and a range of ages from 16.8-28.6 ka (n = 13).

The presence of young cosmogenic ages suggests that regional deglaciation of the Thule landscape occurred ~10.8 ka (the average age of the youngest boulders in the clay-rich diamict). This also serves as a maximum limit for the age of the subsequent re-advance that deposited the sandy diamict and moraines. The large number of boulder ages clustered in the ~20-30 ka range is consistent with cosmogenic nuclides inherited from prior periods of exposure due to the presence of weakly-erosive, cold-based ice that would have buried but not eroded the boulders. However, the clustering of the ages below 30 ka may reflect a systematic process that limits the inherited nuclides each boulder can carry. For example, the boulders may have been plucked from bedrock during a glacial period with warm-based, erosive ice and then reworked but not eroded during subsequent glacial periods with cold-based ice.

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