

Creation, reshaping, and survival of subglacial bedrock forms in the Canadian Arctic: A contribution from cosmogenic nuclide exposure dating

Davis, P. Thompson, Department of Natural Sciences, Bentley College, Waltham, Massachusetts, 02154-4705 USA (pdavis@bentley.edu); **Marsella, Kimberly A. and Bierman, Paul R.**, Department of Geology, University of Vermont, Burlington, Vermont 05405; and **Caffee, Marc W.**, Lawrence Livermore National Laboratory, Livermore, California 94550

We have measured Al-26 and Be-10 abundances for over 140 samples of glacially molded bedrock and erratic boulders in the Pangnirtung Fjord area of Baffin Island to improve our understanding of the glacial history of the area. To evaluate whether cosmogenic nuclide inheritance from prior exposure might produce erroneously old ages and whether weathering of bedrock or till might produce erroneously young ages, we sampled glacially polished and striated tops of roches moutonnees paired with overlying boulders. Of these 64 sample pairs, we analyzed nine samples (see table below) from bedrock and boulders exposed some time after 1976 by retreat of Tumbling Glacier, which calves into Crater Lake in Pangnirtung Pass.

Three of the four bedrock samples are from tops of roches moutonnees with striae directions indicating last glacial erosion by the side-valley Tumbling Glacier, and one bedrock sample is from the top surface of a roche moutonnee with striae directions indicating last glacial erosion by the valley glacier flowing down Pangnirtung Pass (i.e., perpendicular to Tumbling Glacier). The Be-10 model age for this latter sample (#54) suggests late Wisconsinan erosion by the valley glacier, followed by exposure during the early part of the Holocene (i.e., ca. 8000 to 4000 yrs B.P.), then burial but not erosion by Tumbling Glacier during Neoglaciation. In contrast, an adjacent bedrock sample (#55) and two other bedrock samples (#50 and 51) suggest at least a meter of Neoglacial erosion by Tumbling Glacier. One boulder (#53) resting on a roches moutonnee eroded by Tumbling Glacier provides a concordant Be-10 model age. Two boulders resting on the most prominent left lateral moraine (dated to the Little Ice Age by lichenometry) also provide concordant Be-10 model ages. Only the two cobbles that lie on the roches moutonnees yield non-concordant Be-10 model ages, suggesting some limited cosmogenic nuclide inheritance. Finally, Al-26 model ages are robust and all but one of the nine are concordant with the Be-10 model ages.

Sample

Number	Latitude	Longitude	Type	Be-10 Age	Al-26 Age
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50	66 28'27.9"N	65 31'36.9"W	bedrock	0.2+/-1.4	0.4+/-0.0
51	66 28'27.9"N	65 31'36.9"W	bedrock	0.0+/-1.1	0.5+/-0.0
52	66 28'27.9"N	65 31'36.9"W	cobble	2.7+/-0.1	0.9+/-0.0
53	66 28'25.9"N	65 31'42.9"W	boulder	0.8+/-1.9	0.8+/-0.3
54	66 28'24.1"N	65 31'41.3"W	bedrock	4.2+/-1.5	1.7+/-0.4
55	66 28'24.1"N	65 31'41.3"W	bedrock	0.9+/-1.2	0.7+/-0.2
56	66 28'24.1"N	65 31'41.3"W	cobble	3.6+/-1.5	3.5+/-0.8
57	66 28'32.4"N	65 31'38.9"W	boulder	1.1+/-1.2	0.9+/-0.0
58	66 28'34.5"N	65 31'29.3"W	boulder	1.3+/-1.3	0.7+/-0.0
