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CONSTRAINING LANDSCAPE HISTORY AND GLACIAL EROSIVITY USING PAIRED COSMOGENIC NUCLIDES IN UPERNAVIK, NORTHWEST GREENLAND
Online Data Repository

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1. Isotopic analysis

For Be analysis, samples were processed in five separate batches, two of which were prepared with SPEX Be carrier and three of which were prepared with beryl carrier. The process blanks for these five batches contained $2.1 \cdot 10^5$ (average, n = 2, SPEX carrier), $3.3 \cdot 10^5$ (n = 1, SPEX carrier), $4.0 \cdot 10^3$ (average, n = 2, beryl carrier), $4.7 \cdot 10^3$ (n = 1, beryl carrier), and $5.2 \cdot 10^3$ (n = 1, beryl carrier) ^{10}Be atoms, respectively. The blank ^{10}Be/^{9}Be ratios were $1.2 \pm 0.2 \cdot 10^{-14}$ (average, 1SD, n = 2), $2.0 \pm 0.7 \cdot 10^{-14}$ (1σ, n = 1), $2.4 \pm 1.2 \cdot 10^{-16}$ (average, 1SD, n = 2), $2.9 \pm 1.1 \cdot 10^{-16}$ (1σ, n = 1), and $3.2 \pm 1.1 \cdot 10^{-16}$ (1σ, n = 1). For the first two batches, processed with commercial Be carrier, we applied a long-term average blank correction equal to a ratio of $1.2 \pm 0.2 \cdot 10^{-14}$ (1SD, n = 19 batches). For the remaining three batches, processed with beryl carrier, we applied the average blank for the three batches, equal to a ratio of $2.71 \pm 0.76 \cdot 10^{-16}$ (1SD, n = 4). For samples prepared with the commercial carrier, blanks amounted to 1 to 24% of the total sample ratios. For samples prepared with the beryl carrier, blanks amounted to <1% of the total sample ratios.

For Al analysis, samples were processed in five separate batches. The process blanks for these five batches contained $6.9 \cdot 10^4$ (n = 1), $6.9 \cdot 10^4$ (n = 1), $2.7 \cdot 10^4$ (average, n = 2), $7.8 \cdot 10^4$ (n =

1), and $2.9 \cdot 10^4$ (n = 1) ^{26}Al atoms, respectively. The blank $^{26}Al/^{27}Al$ ratios were $1.6 \cdot 10^{-15}$ (n = 1), $1.5 \cdot 10^{-15}$ (n = 1), $6.0 \cdot 10^{-16}$ (average, n = 2), $1.8 \cdot 10^{-15}$ (n = 1), and $6.6 \cdot 10^{-16}$ (n = 1). Blanks amounted to <0.5% of the total sample ratios. Blank corrections were performed with the average blank for the five batches (equal to a ratio of $1.1 \pm 0.6 \cdot 10^{-15}$, 1SD).

2. Retreat rate simulations

To estimate the rate of latest Pleistocene ice sheet retreat along the sample transect, we considered only the youngest, inheritance-free boulder samples. We systematically simulated potential linear retreat patterns based on the location and uncertainty of each age measurement. The six youngest ^{10}Be measurements and their distances from the present margin were fit to the curve $Y=B_0+B_1 \bullet X/T$, where Y is ^{10}Be age (years), X is distance from the present margin (km), T is the transect length (km), B_0 is the time at which the present margin was reached during ice sheet retreat (years), and B_1 is the total duration of ice sheet retreat along the transect (years). For each total duration of ice sheet retreat (B_1) between 0 and 3000 years, B_0 was varied between values of 8500 and 12000 years. The probability that each set of parameters fits the data was calculated from the normal distributions of error in the ^{10}Be measurements, resulting in a two-dimensional normal distribution over B_0-B_1 space. By summing the probabilities for each value of B_1, this distribution can be collapsed into a normal distribution of B_1 values. The maximum of this distribution is the statistically most likely retreat rate.

TABLE 1. ISOTOPIC INFORMATION FOR SAMPLES FROM UPERNAVIK, NW GREENLAND

Sample Name	Quartz Mass (g)	Total Be Spike (μg)*	$^{10}Be/^{9}Be$ Ratio†	$^{10}Be/^{9}Be$ Ratio Uncertainty§	Total Al (μg)**	$^{26}Al/^{27}Al$ Ratio†	$^{26}Al/^{27}Al$ Ratio Uncertainty§
GU091	21.76	251	7.81×10^{-14}	3.08×10^{-15}	----	----	----
GU092	17.41	252	5.15×10^{-14}	2.76×10^{-15}	----	----	----
GU093	22.85	248	1.00×10^{-13}	2.99×10^{-15}	----	----	----
GU094	11.57	247	3.60×10^{-14}	1.30×10^{-15}	----	----	----
GU095	22.11	247	8.85×10^{-14}	2.03×10^{-15}	----	----	----
GU096	16.87	248	9.23×10^{-13}	2.09×10^{-14}	2429	1.62×10^{-12}	3.89×10^{-14}
GU097	20.49	248	2.18×10^{-13}	4.95×10^{-15}	3858	2.82×10^{-13}	1.48×10^{-14}
GU098	20.45	248	1.03×10^{-13}	2.35×10^{-15}	3257	1.65×10^{-13}	1.45×10^{-14}
GU099	20.09	248	8.58×10^{-14}	1.95×10^{-15}	----	----	----
GU100	20.83	246	1.28×10^{-13}	2.92×10^{-15}	3699	1.82×10^{-13}	8.17×10^{-15}
GU101	8.75	247	2.63×10^{-14}	1.10×10^{-15}	----	----	----
GU102	14.85	253	4.18×10^{-13}	1.26×10^{-14}	2493	7.20×10^{-13}	6.99×10^{-14}
GU103	16.69	252	8.84×10^{-13}	2.47×10^{-14}	2229	1.73×10^{-12}	5.14×10^{-14}
GU106	18.81	248	2.58×10^{-13}	5.86×10^{-15}	3512	3.52×10^{-13}	1.22×10^{-14}
GU107	5.43	248	3.18×10^{-14}	1.37×10^{-15}	----	----	----
GU104	21.03	248	7.63×10^{-14}	1.48×10^{-15}	3085	1.31×10^{-13}	1.67×10^{-14}
GU105	23.25	247	3.32×10^{-13}	7.56×10^{-15}	3484	4.48×10^{-13}	1.50×10^{-14}
GU108	17.81	246	8.04×10^{-14}	2.83×10^{-15}	----	----	----
GU109	17.61	258	5.88×10^{-14}	2.85×10^{-15}	----	----	----
GU110	17.86	248	6.10×10^{-13}	1.60×10^{-14}	11120	1.91×10^{-13}	8.37×10^{-15}
GU111	15.65	244	4.09×10^{-13}	9.31×10^{-15}	3289	5.04×10^{-13}	1.63×10^{-14}
GU112	16.25	248	1.18×10^{-13}	2.70×10^{-15}	2764	2.03×10^{-13}	9.85×10^{-15}
GU113	21.51	248	3.08×10^{-13}	7.04×10^{-15}	4515	3.23×10^{-13}	1.16×10^{-14}
GU114	14.60	247	4.90×10^{-14}	1.46×10^{-15}	----	----	----
GU001	21.16	248	1.31×10^{-13}	3.09×10^{-15}	3854	1.66×10^{-13}	7.97×10^{-15}
GU002	21.28	248	1.03×10^{-13}	2.44×10^{-15}	4214	1.25×10^{-13}	9.66×10^{-15}
GU006	11.09	248	7.86×10^{-14}	1.87×10^{-15}	----	----	----
GU017	8.14	248	4.55×10^{-14}	1.40×10^{-15}	----	----	----
GU041	21.42	245	1.02×10^{-12}	2.41×10^{-14}	2749	1.53×10^{-12}	4.06×10^{-14}
GU042	21.04	249	6.34×10^{-13}	1.49×10^{-14}	3023	9.29×10^{-13}	2.91×10^{-14}
GU043	20.02	248	5.96×10^{-13}	1.47×10^{-14}	3535	7.92×10^{-13}	2.27×10^{-14}
GU044	20.48	248	7.14×10^{-13}	1.62×10^{-14}	3759	8.66×10^{-13}	2.77×10^{-14}
GU045	19.33	248	4.45×10^{-13}	1.01×10^{-14}	3793	4.83×10^{-13}	1.71×10^{-14}

*Refers to the Be spike added through carrier.

†Ratios were measured at Lawrence Livermore National Laboratory and have already been blank corrected.

§Reported uncertainties are internal AMS uncertainties.

**Refers to the cumulative quantified Al, including both Al spike added through carrier and native Al in the quartz.