# Expanded glaciers during a dry and cold Last Glacial Maximum in equatorial East Africa

**Meredith A. Kelly[1*], James M. Russell[2], Margaret B. Baber[1], Jennifer A. Howley[1], Shannon E. Loomis[2], Susan Zimmerman[3], Bob Nakileza[4], and Joshua Lukaye[5]**

[1]*Department of Earth Sciences, Dartmouth College, Hanover, New Hampshire, USA 03750*

[2]*Department of Geological Sciences, Brown University, Providence, Rhode Island, USA 02912*

[3]*Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory, Livermore, California, USA 94550*

[4]*Mountain Resource Centre, Makerere University, Kampala, Uganda*

[5]*Petroleum Exploration and Production Department, Entebbe, Uganda*

*Corresponding Author

**DATA REPOSITORY (Table DR1)**

Table DR1.

| CAMS number | Sample name | Lat. (°) | Long. (°) | Elev. (m asl) | Sample thick. (cm) | Shld. corr. | Quartz wt. (g) | $^{9}Be$ carrier (mg) | AMS Standard | $^{10}Be/^{9}Be$ ± 1σ ($10^{-13}$) | $^{10}Be$ ± 1σ ($10^{5}$ at $g^{-1}$) | $^{10}Be$ age ± 1σ (yrs ago) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BE34425 | RZ-1 | 0.3583 | 29.9791 | 2635 | 2.14 | 0.994 | 6.0131 | 0.1915 | 07KNSTD 3110 | 1.255± 0.024 | 2.674± 0.051 | 20,410± 390 |
| BE34430 | RZ-7 | 0.3503 | 29.9681 | 2955 | 1.00 | 0.978 | 5.9925 | 0.1955 | 07KNSTD 3110 | 1.458± 0.049 | 3.182± 0.108 | 20,520± 700 |
| BE34431 | RZ-8 | 0.3499 | 29.9680 | 2953 | 2.13 | 0.978 | 5.9983 | 0.1966 | 07KNSTD 3110 | 1.428± 0.029 | 3.132± 0.064 | 20,410± 420 |
| BE34432 | RZ-9 | 0.3521 | 29.9693 | 2922 | 1.00 | 1.000 | 6.0115 | 0.1931 | 07KNSTD 3110 | 1.394± 0.027 | 2.996± 0.057 | 19,240± 370 |
| BE34426 | RZ-2 | 0.3469 | 29.9680 | 2988 | 2.26 | 1.000 | 6.0026 | 0.1934 | 07KNSTD 3110 | 1.697± 0.032 | 3.659± 0.070 | 22,930± 440 |
| BE34427 | RZ-3 | 0.3460 | 29.9680 | 2988 | 1.79 | 1.000 | 6.0282 | 0.1926 | 07KNSTD 3110 | 1.740± 0.033 | 3.720± 0.071 | 23,230± 440 |
| BE34428 | RZ-4 | 0.3450 | 29.9690 | 2986 | 2.32 | 1.000 | 6.0002 | 0.1952 | 07KNSTD 3110 | 1.758± 0.039 | 3.827± 0.085 | 24,040± 540 |
| BE34429 | RZ-5 | 0.3441 | 29.9686 | 2989 | 2.89 | 1.000 | 5.9939 | 0.1939 | 07KNSTD 3110 | 1.708± 0.033 | 3.696± 0.071 | 23,280± 450 |

*Note:* Samples were prepared at Dartmouth College using the Beryllium carrier "Dartmouth 4G Beryl" with a concentration of 1.209 ppm. Beryllium ratios were measured at CAMS LLNL.

**TABLE CAPTION**

Table DR1. $^{10}$Be sample data and calculated $^{10}$Be surface exposure ages. Shown are sample latitudes (Lat.), longitudes (Long.) and elevations (Elev.), sample thicknesses (Sample thick.), correction factors for sample surface slopes and topographic shielding (Shld. corr.), sample quartz amounts (Quartz wt.), $^{9}$Be carrier amounts, accelerator mass spectrometer (AMS) standards used, AMS measured $^{10}$Be/$^{9}$Be ratios and 1σ uncertainties, calculated $^{10}$Be concentrations (in $10^5$ atoms per gram [$10^5$ at $g^{-1}$]), and calculated $^{10}$Be ages.

We collected samples for $^{10}$Be dating from the top center surfaces of flat-lying and low-sloping, large, quartz-rich boulders in stable positions on the crests of Lake Mahoma Stage moraines using a hammer, hammer drill and chisel. In the field, we recorded sample locations using a handheld global positioning system unit. To determine shielding corrections, we measured the slope of the sample surface using a compass and determined the azimuthal elevations of the horizon using a clinometer. In the cosmogenic nuclide laboratory at Dartmouth College, we measured the thicknesses of whole rock samples using millimeter-scale precision calipers and then calculated average mass-weighted sample thicknesses.

We crushed and sieved whole rock samples and used the 250-750 μm fraction for quartz purification. We used a series of chemical leaching methods to obtain pure quartz and isolate beryllium from this quartz following the methodology described in Schaefer et al. (2009). $^{10}$Be/$^{9}$Be ratios were measured relative to the 07KNSTD3110 standard (Nishiizumi et al., 2007) at the Center for Accelerator Mass Spectrometry at Lawrence Livermore National Laboratory (CAMS LLNL). All ratios were corrected for residual boron concentrations (<1%). The procedural blank had a $^{10}Be/^{9}Be$ ratio of ~2.5 x $10^{-16}$ and blank corrections were less than 1%.

We used the Cosmic-Ray Produced Nuclide Systematics on Earth Project (CRONUS-Earth Project) online calculator (Balco et al., 2008) to calculate $^{10}Be$ ages. We report $^{10}Be$ ages calculated using a $^{10}Be$ production rate that was determined for a low-latitude, high-altitude location (i.e., $P_{Quel}$; 3.78±0.09 [with time-invariant scaling after Lal, 1991 and Stone, 2000; i.e., "St"] atoms $g^{-1}$ $yr^{-1}$; Kelly et al., 2013). We assumed the default height-pressure relationship (i.e., Balco et al., 2008) for all samples.

$^{10}Be$ age uncertainties shown are those associated with AMS measurement and do not take into account $^{10}Be$ production rate or geological uncertainties. We estimate that the production rate uncertainty is ~6% (http://cosmognosis.wordpress.com/). Shielding corrections were all less than 3%. We did not correct the $^{10}Be$ ages for the influence of snow or vegetation cover or for boulder surface erosion. Snow cover would be extremely rare or short-lived at the sample sites, where mean annual temperature is ~10° C. The sampled boulders are currently located in a mixed forest zone with dominant vegetation types of *Podocarpus* and bamboo. Vegetation and loosely compacted organic debris covered all boulder surfaces and ranged in thickness between ~0.15 and 0.5 m. A study by Plug et al. (2007) indicates that cover of rock surfaces by temperate forest vegetation may reduce the $^{10}Be$ production rate by ~2-7%. Granular erosion of some surfaces was observed. Based on the excellent internal consistency of $^{10}Be$ ages from individual landforms, and agreement with a previously published radiocarbon age, we assume that the vegetation cover and minor erosion have had negligible influences on the $^{10}Be$ ages.

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