Title:

River response to Greenland deglaciation monitored with cosmogenic 10-Be: a new way of detecting and quantifying post-glacial emergence

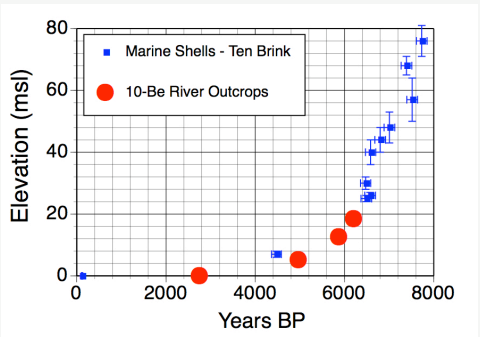
Authors & affiliations:

P. Bierman[1], A. B. Corbett[1], L. Reusser[1], J. Graly[1], R. Finkel[2], D. Rood[3] ,T. Neumann[4],
[1]Geology Department, University of Vermont, Burlington, Vermont USA
[2]CEREGE, Aix en Provence, France
[3]Livermore National Laboratory, California, USA
[4]NASA, Goddard,, Maryland, USA
pbierman@uvm.edu

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

When ice sheets shrink, sea- and land-levels change and the arctic landscape responds. Using cosmogenic exposure ages of bedrock surfaces along the Watson River (N67°) in Kangerlussuaq, western Greenland, we demonstrate a new method for measuring rates and dates of river incision in response relative sea-level change caused by the retreat of the Greenland Ice Sheet after the last glacial maximum.

We collected seven samples from bedrock surfaces along the Watson River; all of these surfaces were covered and eroded by the Greenland Ice Sheet during the last glacial maximum. After local deglaciation <8.5 ky, the surfaces we sampled were covered by outwash gravels deposited by the paleo-Watson River – part of a large, continuous gravel terrace at an elevation of ~90 m at Kangerlussuaq. As post-glacial uplift continued and local sea level in Sondrestrom Fjord fell, the gravel terrace was easily incised, sequentially exposing four samples (001-004) on a bedrock rib. The rate of terrace incision (gravel stripping and exposure of our sample sites) matched the rate of relative sea-level fall until a bedrock sill downstream was exposed 4500+/- 200 years ago (samples 005-007) providing a local base-level for the river. From then on, the Watson River incised through rock slowly cutting down only several meters and leaving a distinct strath terrace.



The Watson River ^{10}Be data confirm the inner Sondrestrom Fjord emergence curve of Ten Brink (1974) (which we calibrated for changes in marine ^{14}C over time) and provide critical control for the mid-Holocene (2-7 ky) when emergence rates slowed and shell dating becomes less certain. The agreement of emergence data based on shell ^{14}C dating of marine terraces and cosmogenic dating of river-exposed rock suggests that ^{10}Be can be a robust means of understanding rates of relative sea-level change over time in response to glacial comings and goings.

Important notes:

Do **NOT** write outside the grey boxes. Any text or images outside the boxes **will** be deleted.

Do **NOT** alter the structure of this form. Simply enter your information into the boxes. The form will be automatically processed – if you alter its structure your submission will not be processed correctly.