Paper No. 8
Presentation Time: 3:15 PM

IDENTICAL EROSION RATES AND PROCESSES ACROSS THE PLEISTOCENE-HOLOCENE TRANSITION, WESTERN CORDILLERA, PERU: SINGLE-CLAST BE-10 RESULTS

MCPHILLIPS, Devin, Earth Sciences, Syracuse University, 204 Heroy Geology Lab, Syracuse, NY 13244, BIERMAN, Paul, Geology Department, University of Vermont, 180 Colchester Ave, Delahanty Hall, Burlington, VT 05405 and ROOD, Dylan H., AMS Laboratory, Scottish Universities Environmental Research Centre (SUERC), East Kilbride, G75 0QF, United Kingdom, devin.mcphillips@gmail.com

Cosmogenic nuclides such as Be-10 are routinely measured in detrital stream sediments, but the results are generally amalgamated to determine drainage-average erosion rates. This approach ignores additional information in the probability distribution of cosmogenic nuclide concentrations assembled from individual particles of sediment. Because Be-10 production declines rapidly with depth in the upper few meters of Earth's surface, the distribution of concentrations in individual grains is sensitive to the process of erosion as well as the rate. Different processes include shallow, grain-by-grain erosion and deep-seated landsliding. Here, we compare single-clast Be-10 distributions from Pleistocene and Holocene cobbles in order to investigate the response of erosion to climate change. Our field site is Quebrada Veladera, a moderately large (~300 km^2) tributary of the Pisco River, which drains the northern boundary of the Altiplano. Both drainages preserve a fill terrace deposited at ~16 ka. Paleolake levels on the Altiplano suggest the climate was substantially wetter between ~25 and 16 ka, but the variability of the climate and the size of the largest storms remain matters of debate. The extremely dry modern climate precludes mapping landslide scars, but the terraces contain a substantial fraction of debris flow deposits. We measured Be-10 concentrations in 35 cobbles collected from longitudinal bars in the modern channel and 33 cobbles excavated from the adjacent terrace fill. The distributions are statistically similar, indicating that the rates and processes of cobble erosion did not change across the Pleistocene-Holocene transition. We then compared the distributions with simple models of erosion and cosmogenic production. The observed distributions are highly skewed, consistent with erosion by landsliding. In contrast, models of slope-dependent erosion and erosion by surface stripping are unable to reproduce the observed distributions. We interpret these results to indicate the cobbles are eroded almost entirely by landsliding and debris flows, which scour deep into the regolith. Identical rates of landsliding suggest that the climate was not substantially stormier in the Pleistocene than in the Holocene, even though the climate was wetter in the Pleistocene.

Session No. 69

T27. Geomorphic Response to Quaternary Climate Change II: A Session in Memory of James C. Knox
Sunday, 27 October 2013: 1:00 PM-5:00 PM

Mile High Ballroom 2C (Colorado Convention Center)

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