High-precision ^{10}Be dating: A Community Effort

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^{10}Be accumulates in rocks from the time they are exposed to cosmic rays, and thus the challenge lies both in dating with high accuracy and in dating young samples, with very low ^{10}Be inventory. Over the last 5 years, community efforts have led to improvements in production rate calibration, and in the instrumental and geochemical aspects of ^{10}Be analyses [e.g., 1]. The impact of this increased sensitivity is illustrated by the recent publication of surface exposure ages of geologic formations of <1000 years [2], revealing immense potential for quantifying landscape change over the historical period, and for providing numerical models of erosion, hydrology, tectonics and glaciation with field measurements for calibration.

Over the last several years, the CAMS accelerator facility has established the capability for measuring ^{10}Be at high precision (1% or less) with very low background levels (~5 x 10^{-17} ^{10}Be/^{9}Be)[3]. Measurement of 370 individual cathodes of known a ^{10}Be standard with ^{10}Be/Be of 2.85x10^{-12} over the last two years shows average precision of 0.6%. It must be noted, however, that this does not capture the real precision of samples prepared from geological materials.

Carrier solution made from selected beryl has allowed many sample preparation labs to routinely produce ^{10}Be/^{9}Be process blanks between 5 x 10^{-16} – 4 x 10^{-15}. However, chemical separation of Be from geologic material remains a significant challenge for many labs. The maximum ^{9}Be currents measured on targets submitted to CAMS clearly illustrates this. Cathodes from 7 labs produce currents within +/-15% of the currents on standards, while samples from other labs are only 40-65% of the standards and quite variable. Key to improving the quality of ^{10}Be analyses and to providing a realistic assessment of the total precision and accuracy will be widespread preparation and measurement of process standards such as those offered through the CRONUS program [4].

[1] Hunt *et al* (2008) *Anal. Chem.,* **80**, 1656-1663; [2] Putnam *et al* 2012 *Nature Geosci.* **5**, 627-630; Licciardi *et al* 2009 *Science* **325**, 1677-1679; Kelly *et al* 2008 *QSR* **27**, 2273-2282; [3] Rood *et al* 2010 *NIM-B* **268**, 730-732; [4] Jull *et al* 2013 *Quat. Geochron.* in press.