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Repeated preparation of CRONUS-N quartz standard for 10-Be and 26-Al at the University of Vermont and analysis at four different AMS laboratories

Although the precision of 10-Be and 26-Al AMS analyses is routinely stated along with results and although secondary standards quantify the linearity of AMS measurement systems, the reproducibility of nuclide concentrations measured in actual samples is rarely tested.

In order to assess the long-term variance in measured 10-Be and 26-Al concentrations in a single, presumably homogeneous material, we have at the University of Vermont, since 2013, processed ~ 10 g of the "CRONUS N" quartz standard as part of most batches of samples. The standard was established as part of the CRONUS-Earth Project. All materials we converted to oxides and loaded into cathodes for analysis at one of four AMS laboratories (ANSTO, LLNL, PRIME, and SUERC). AMS analysis for the CRONUS N material was conducted in the same fashion as for other unknowns measured at the same time. No attempt was made to standardize measurement or data reduction procedures between AMS laboratories.

So far, our experiment has yielded 58 10-Be analyses and 47 26-Al analyses between the four AMS labs with more samples in process at the time of abstract submission. Each lab has made at least 6 analyses of each isotope. For 10-Be, our grand mean is 224,400±14,000 atoms/g. For 26-Al, the grand mean is 1,000,000±81,000 atoms/g. The average analytical precision for 10-Be and 26-Al are 2.8% and 7.0% respectively, while the percent standard deviations of the datasets are higher, 6.3% and 8.1% respectively suggesting significant excess scatter of so far unknown origin in the 10-Be data.

Our results compare favorably with the mean concentrations of CRONUS-N reported by Jull et al. (2015). Their paper includes (for 10-Be) 23 analyses of aliquots prepared in 11 different laboratories with a mean of 217,000 ± 9100 atoms/g (1SD); the mean 26-Al concentration, analyzed ten times and prepared in five different laboratories, is 1,050,000±110,000 atoms/g (1SD).

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