Quantitative tests of cosmogenic nuclide burial dating accuracy

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Cosmogenic nuclide burial dating by the radioactive decay of ^{26}Al and ^{10}Be in quartz can be extended to 5 million years. Reliable dating requires attention to several complications, including cosmogenic nuclide production at depth by muons and reworking of older sediment into younger deposits. Postburial production can be accounted for by a variety of methods, including depth profiles and sampling across erosional unconformities. Additional systematic uncertainties may arise due to errors in radioactive decay constants and production rates.

We will present new results from a variety of settings where burial dating can be compared to independently known sediment ages. These examples illustrate both the potential accuracy as well as some pitfalls of the dating method

1) **Bishop Tuff, California.** The Bishop Tuff has been securely dated to 0.78 Ma. Reworked glacial till beneath the ash is exposed at the Big Pumice Road Cut. ^{26}Al and ^{10}Be in four samples from granitic boulders and sand give a burial age of 0.74 +/- 0.08 Ma, in good agreement with the known age, and confirming the ^{10}Be half-life of 1.34 My.

2) **Nearshore sands, Romagna Italy.** Two nearshore marine sands are constrained by biostratigraphy to a Sicilian age of ca. 0.8 Ma and an Emilian age of ca. 1.6 Ma. ^{26}Al and ^{10}Be in two samples from the upper Sicilian sand give an age of 1.66 +/- 0.28 Ma, nearly a factor of two older than the age of the sand, but matching that of the underlying Emilian package. This suggests that the upper sands were reworked from previous deposits in the nearshore environment without re-exposure necessary to reset the cosmogenic nuclide burial clock.

3) **Langebaanweg Fossil Beds.** These richly fossiliferous estuarine sediments were emplaced during a Mio-Pliocene marine transgression, most likely at 5.2 Ma. and were later capped by Pliocene aeolian sands. Ten samples in progress were collected in an 18-meter-deep profile. Two important unconformities are used to bracket postburial production.