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# HOW FAST DO ROCKS ERODE? NEW ANSWERS FROM ATOM COUNTING

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Measuring the rate at which siliceous bedrock erodes is tricky business. Extrapolating current rates of chemical and sediment transport from drainage basins is fraught with assumptions and heavily influenced by human impact on the landscape. Over the past decade, advances in mass spectrometry have allowed measurement of extremely rare isotopes ($^{3}$He, $^{10}$Be, $^{26}$Al, $^{36}$Cl) formed by the bombardment of cosmic rays. Because these isotopes are produced primarily in the uppermost meters Earth's surface, their abundance has been interpreted as a rate of erosion[1].

Several hundred new $^{10}$Be, $^{26}$Al, $^{36}$Cl data suggest that most outcrops of siliceous rocks, outside of orogenic belts, are eroding at rates between 0.1 and 100 m/My. Outcrops of sandstone in the cold desert of Antarctica[2] are the most stable land surfaces identified so far, eroding on the order of 0.1m/My. Samples we have collected from granitic domes in arid south central Australia[3], show that the tops of these domes are eroding <0.5 m/My. Our data also show that the tops of granitic outcrops in the tectonically active Alabama Hills of CA, the sub-humid Llano Uplift of central TX, and the humid GA Piedmont are eroding more quickly, 2, 3 and 8 m/My, respectively. Data from the wet tropics[4] suggest erosion rates on the order of 10s of m/My.

Recently, we[5] and others[4] have used measurements of $^{10}$Be and $^{26}$Al in sediments to estimate erosion rates of entire drainage basins ranging in size from <1 km to >500 km. The apparent success of these measurements suggests that for the first time cosmogenic isotopes may provide data useful to those studying the relationship and interaction between solid Earth processes and rates of landscape change.

[1]Bierman 1994, JGR, Lal, 1991, EPSL; [2]Nishiizumi et al., JGR, 1989; [3]Bierman and Turner, 1995, QR; [4]Brown et al., 1995, EPSL; [5]Bierman and Steig, 1995 ESPL.