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165-6 Look Again: Meteoric 10-Be Is a Useful Tracer of Hillslope and Basin-Scale Process

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After its hay-day in the 1980s, tracing sediment down rivers, dating Mn-nodules, and following sediment through subduction zones, meteoric or garden variety 10-Be produced in the atmosphere and rained out on the landscape, has largely been forgotten. It's lurked in the shadows behind its more famous but harder to measure identical twin, 10-Be produced in quartz by in situ spallation reactions. Picking up where several research groups left off in the 1980s and early 1990s, we examine the utility of 10-Be produced in the atmosphere and delivered in precipitation as a tracer of watershed and hillslope sediment transport processes at a variety of spatial scales.

Both new and existing datasets indicate that the concentration of 10-Be adhered to sediment can be used to estimate basin scale rates of denudation as well as to trace, through mixing models, the source of sediment in a watershed. The approach is founded on the work of Brown et al. (1988) and employs similar thinking to the approach taken when in situ 10-Be is used to estimate basin scale rates of erosion (Bierman and Steig, 1996; Granger et al., 1996; Brown et al., 1995) and mixing at tributary junctions.

New data from a series of soil pits on hillslopes from around the world suggest that meteoric 10-Be is mobile in the soil column moving from the more acidic, organic-rich A-horizon to the B-horizon. Meteoric 10-Be concentrations are well correlated with both soil pH and extractable Al suggesting that Be is retained in Al-rich grain coatings which we know, from numerous attempts to purify riverine quartz, survive fluvial transport all too well.

Lingering uncertainties (and significant opportunities for research) include poorly constrained delivery rates of 10-Be from the atmosphere over both time and space as well the effect of sediment grain size on meteoric 10-Be concentration.

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