Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20696

Isotopic record of dissolved and suspended loads from rivers draining the eastern Sierra Nevada, California, over the last glacial-interglacial transition

BRIAN W. STEWART AND ROSEMARY C. CAPO

University of Pittsburgh

Presenting Author: bstewart@pitt.edu

A record of solute and suspended particle chemistry of streams draining the eastern Sierra Nevada batholith is preserved in Owens Lake, eastern California [1], the terminus of a currently closed ~8500 km^2 drainage basin. The streams drain bedrock composed primarily of Mesozoic granitoids with irregularly distributed roof pendants of Paleozoic metasediments. Mass balance modeling [2] indicates that plagioclase feldspar weathering and carbonate dissolution are the dominant contributors to solute budgets for most streams. Strontium isotope ($^{87}Sr/^{86}Sr$) ratios of the stream waters range from 0.7068 to 0.7196, with a flux-weighted mean of 0.7091. The overall stream Sr budget of the Owens Lake basin is controlled primarily by processes occurring in just two sub-basins: (1) sulfide oxidation and the resultant generation of acidic waters, followed by dissolution of metacarbonate roof pendant material; and (2) hydrothermal fluid input from the Long Valley caldera magmatic system. The impact of these processes should be weighted accordingly when modeling regional and global riverine Sr budgets.

To the extent that the flux-weighted mean stream $^{87}Sr/^{86}Sr$ represents the water that would be flowing into Owens Lake (were it not diverted by the Los Angeles Aqueduct), this value is consistent with $^{87}Sr/^{86}Sr$ ratios measured in Owens Lake lacustrine carbonates ranging in age from 25 to 7 ka. Despite the fact that the carbonate record encompasses a major climatic change from glacial (likely open lake) to interglacial (closed lake) conditions, the total range in $^{87}Sr/^{86}Sr$ is only 0.7091 to 0.7093. Offsets in $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ between the carbonate and clastic portions of the sediments [3] demonstrate the expected decoupling between dissolved and suspended (including eolian) sources. We argue that the two primary factors that control the present-day stream dissolved Sr budget have likely been dominant over at least the past ~25 ka. Climate-related shifts in the relative importance of silicate mineral weathering reactions appear to be only second-order effects at this temporal and spatial scale.

[1] Smith, Bischoff & Bradbury (1997) *Geological Society of Amrica Special Paper* 317, 143-160.

[2] Pretti & Stewart (2002) *Water Resources Research* 38(8), 1127.

[3] Minervini (2001) *M.S. Thesis, University of Pittsburgh*.