Paper Number: 4694

Exhumation and weathering history of the Himalayan frontal system

McKenzie, N.R.[1], Planavsky, N.J.[1], Colleps, C.L.[2], Stockli, D.F.[2], Singh, B.P.[3], Kalderon-Asael, B.[1], Webb, A.A.G. [4], Horton, B.K.[2], Reinhard, C.T.[5]

1 Department of Geology and Geophysics, Yale University, New Haven CT 06511 (ryan.mckenzie@yale.edu)

2 Department of Geological Sciences, University of Texas at Austin, Austin TX 78712

3 Department of Geology, Panjab University, Chandigarh, 160014

4 Department of Earth Sciences, University of Hong Kong, China

5 Department of Earth and Atmospheric Sciences, Georgia Tech, Atlanta GA 30332

Tracking the variability of CO_2 inputs from volcanic-metamorphic outgassing and removal via silicate weathering is critical to understand the mechanisms that dictate Earth's baseline climate. While most researchers agree that high exhumation, erosion, and weathering rates from Himalayan uplift have profoundly impacted the Earth ocean+atmosphere system, debate exists on the exact nature of these influences. One major question centers on whether seawater isotopic records reflect overall increases in weathering rates, which are often used for carbon cycle modeling, or simply changes in the composition of source-rock being weathered. Here we integrate zircon U-Pb and (U-Th)/He geo-/thermochronometric data with trace element and isotopic (δ^7Li, $^{87}Sr/^{87}Sr$, and $^{187}Os/^{188}Os$) geochemical data from Himalayan bedrock and foreland basin deposits to examine the influence of Himalayan exhumation and weathering on Cenozoic seawater records. Our data show that shifts in exhumation of geochemically distinct bedrock directly corresponds with respective changes in seawater composition. Further, we find no obvious evidence for changes in weathering intensity associated with thrust propagation. Mass-balance modeling indicates that the Neogene seawater $^{87}Sr/^{86}Sr$ and $^{187}Os/^{188}Os$ records could be driven by compositional changes in Himalayan bedrock being weathered, rather than changes in global weathering rates, and our data support this hypothesis. Therefore, the $^{87}Sr/^{86}Sr$ and $^{187}Os/^{188}Os$ seawater records should not be used as reliable proxies for global weathering processes, given the propensity for regional source rock influences.