Impact of Coseismic Landslides on Himalayan Chemical Weathering

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Chemical weathering of silicate rocks is a key regulatory process of atmospheric CO_2, over geological time. In large mountain belts such as the Himalaya, there is no limit on the supply of reactants. The 2015 Gorkha, Nepal earthquakes, magnitude 7.3 and 7.5, triggered thousands of coseismic landslides, affecting delivery of rock material to rivers. This study examines whether the increase in landslides resulting from major earthquakes perturbs sediment and chemical weathering fluxes, a connection which is difficult to establish owing to the infrequent nature of such events.

Depth profiles of suspended load samples were collected from the major rivers in the Nepal Himalaya immediately after the 2015 earthquakes and annually for each of the 4 following years. These rivers were affected by the earthquake and carry up to 40% carbon flux of the Himalayas.

The chemistry, mineralogy, grainsize and flux of the sediments from the Kosi and Sun Kosi Rivers will be presented. The sediment chemistry was partitioned into carbonate, silicate and Fe-oxide fractions using sequential extractions and sediment provenance was assessed using Nd isotopes.

Developing on pioneering work from [1&2], the degree of sediment weathering was investigated by plotting silicate mobile/immobile (molar) elemental ratios of K/Si and Na/Al. Na and silicate Ca increase below the Kosi confluence which is inconsistent with progressive depletion downstream. There is, however, no statistically significant increase in plagioclase Ca/Na ratios and changes in sediment provenance are not resolvable with εNd. The sediment silicate and plagioclase Ca/Na ratios are similar (0.45 & 0.33) but higher than those typically used to calculate silicate Ca in river waters. The implications for Himalayan silicate weathering fluxes will be discussed and compared to previous estimates [3].

[1] Lupker et al., (2012) *Geochim. Cosmochim. Acta.* 84, (410-432). [2] Bouchez et al., (2011) *Geochemistry Geophyscis Geosystems,* 12 (3). [3] Wu al., (2008) *Chemical Geology*, *249* (3-4), pp.307-320.