Organic and inorganic long-term carbon budget of Himalayan erosion after the 2015 Gorkha earthquake

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The erosion of mountain ranges plays an important role in the carbon cycle by controlling the magnitude of the main geological carbon sinks namely silicate weathering and organic carbon export. Here, we investigate the impact of extreme and rare events on the carbon budget of continental erosion by quantifying the response of weathering and organic carbon fluxes to the April 2015 Gorkha earthquake (Mw 7.8) in central Nepal.

We acquired daily river suspended sediment and water samples during 3 post-earthquake monsoon seasons (2015-2017) from the Narayani River, a large trans-Himalayan tributary of the Ganges. Samples collected in 2010 from the same location provide a pre-earthquake comparison point. Organic carbon sources and fluxes are constrained using suspended sediment load estimates, the total organic carbon content and radiocarbon isotopic compositions of the sediments. Silicate weathering fluxes are constrained using river water dissolved elemental compositions. These two complementary datasets allow us to make a geological carbon budget of Himalayan erosion before and after the earthquake.

Our preliminary results confirm that carbon drawdown from the burial of organic carbon of the Central Himalaya is about 3 times more important than the silicate weathering carbon sink [1]. We show that co-seismic landsliding during the Gorkha earthquake did not significantly influence the cabon budget of erosion. However, the magnitudes of organic carbon export and of silicate weathering fluxes are strongly correlated to river discharge. We therefore suggest that the long-term carbon budget of this Himalayan catchment is mainly controlled by the monsoon intensity rather than by rare but intense co-seismic events as has been suggested in other systems.

[1] France-Lanord and Derry (1997), *Nature* **390**, 65-67.