Weathering through weather: Extreme events as distinct chemical weathering drivers

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In erosionally active mountain belts, individual, stochastic drivers of erosion such as intense rain storms or earthquakes can have observable effects on the sediment budgets of affected catchments. However, the chemical weathering impact of these events is often difficult to disentangle from a background signal. In this contribution, we demonstrate that the landslides generated by Typhoon Morakot in 2009 in Southern Taiwan systematically increase the solute outputs of affected catchments as a result of rapid weathering within the landslide deposits.

Previous work in Taiwan and New Zealand has demonstrated the role of landslide deposits as sites of rapid weathering; the geometry of the landslide scars and deposits acts to collect and funnel water into the deposits, which have high internal surface areas composed primarily of fresh material, resulting in rapid weathering. The large scale effect of this weathering in many cases results from long term accumulation of landslide deposits, rather than a single event.

Typhoon Morakot, however, generated approximately 25000 landslides, totalling 274km^2 in a 7811km^2 study area (Lin et al. 2011), and represents one of the most dramatic erosional events of recent times. We sampled major rivers in the Southern part of Taiwan with variable landslide erosion resulting from the typhoon to assess the affect of the landslides on the solute budgets on a large scale. We also sampled seepage from 32 individual landslide bodies to assess the role of landslide size on chemical output. Using examples from the Taimali river in South-East Taiwan, we show that the impact of a single erosive event on dissolved loads can be distinguished at a range of scales, from individual landslides to streams of both small (1-10km^2) and large (>100km^2) upstream area.

Linking *average* climatic conditions and weathering may occlude the ties between these extreme weather events that often drive erosion and the resultant weathering, and we suggest that observation of rapidly-eroding catchments over a full range of climatic variability is important to characterise weathering.