Erosion and weathering in Taiwan

Systematic monitoring of river loads helps refine and extend the map of internal dynamics and external feedbacks in Earthís critical zone. Our focus is on Taiwan where hillslope mass wasting and fluvial sediment transport are driven by earthquakes and cyclonic storms. The biggest trigger events cause instantaneous erosion and seed a weakness in the landscape that is removed over time in predictable fashion. This gives rise to patterns of erosion that can not be understood in terms of bulk characteristics of climate, such as average annual precipitation, a result that is repeated elsewhere. Erosion harvests particulate organic carbon from rock outcrop, soil, and biomass. In Taiwan, most non-fossil POC is carried in hyperpycnal storm floods. This may promote rapid burial and preservation of POC in turbidites. Abundant POC in ancient turbidites has a distinct terrestrial signature, confirming the removal of carbon from short-term circulation by this mechanism. Silicate weathering too is facilitated by rapid erosion. However, weathering within the shallow subsurface, where the effects of erosion are most direct, only yields a part of the dissolved load of rivers. During and after heavy precipitation contributions from surface and shallow sources dominate, but the fraction of dissolved load derived from silicate weathering is relatively low in these conditions. At all other times the dissolved load of Taiwanís rivers is dominated by a weathering flux from deep within the rock mass. Erosion may facilitate this by perpetuating pervasive brittle deformation, opening pathways for deep groundwater.