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Temporal response of mountain drainage basins in Taiwan to earthquake and typhoon perturbation.

S. Dadson (1), N. Hovius (2), H. Chen (3), M Horng (4)

(1)Centre for Ecology and Hydrology, Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire, OX10 8BB.Tel: +44 (0)1491 838800; Fax: +44 (0)1491 692424; (2) Department of Earth Sciences, University of Cambridge, Downing Street, Cambridge. CB2 3EQ. Tel: +44 (0)1223 333400; Fax +44 (0)1223 333450; (3) Department of Geosciences, National Taiwan University, No. 1 Sec. 4 Roosevelt Road, Taipei, Taiwan; (4) Water Resources Agency, Ministry of Economic Affairs, Hsin-Yi Road, Taipei, Taiwan.

In tectonically-active mountain belts, earthquake-triggered landslides deliver large amounts of sediment to rivers. In previous work, we have quantified the geomorphic impact of the 1999 Mw 7.6 Chi-Chi earthquake in Taiwan, which triggered >20,000 landslides and elevated suspended sediment loads in rivers by up to a factor of four. At the time, many coseismic landslides remained confined to hillslopes and, on the basis of four years of hydrometric data, we predicted that downslope transport of sediment would continue to occur during later storms. During the seven years since the Chi-Chi earthquake, several major typhoons storms have hit Taiwan (e.g., Typhoons Bilis, Toraji, Nari, Mindulle, Aere) and the Water Resources Agency of Taiwan has continued to monitor water discharge and suspended sediment concentration. Here we use these new data to refine the spatial and temporal pattern of the decaying geomorphic response to the Chi-Chi earthquake in the face of several large typhoons. Our results indicate that the broad pattern of exponential decay in sediment concentration for a given river discharge (prevalent in winter seasons without typhoons) is punctuated by markedly elevated periods associated with typhoon storms. However, our analyses show that the change in unit sediment concentration (i.e., suspended sediment concentration for a unit water discharge) associated with each storm depends more strongly on the length of time elapsed since the earthquake than it does on the magnitude of the storm itself.