Geophysical Research Abstracts, Vol. 7, 08687, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08687

A laboratory investigation into within-hillslope and hillslope-floodplain sediment connectivity.

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The connectivity between hillslope and floodplain elements is of critical importance in controlling hydrological and sediment-transport processes of catchments. In recent years there has been an increasing interest in understanding these linkages and their effects on processes at all scales. However, despite the significant controls these linkages exert and the recent widespread recognition of their importance little process-based work has been carried out on how water and sediment move across the interface between elements. This paper presents a new project that uses a novel experimental setup and methodology to quantify the effects of inter-element connectivity on sediment transport and delivery across element boundaries. The experiments are carried out on a state-of-the-art artificial hillslope facility. The hillslope facility is a dual axis soil slope measuring 6m long $\times$ 2.5m wide $\times$ 0.3 m deep with a folding action about the centre line of the larger dimension. The soil slope is accompanied by a nozzle-type rainfall simulator that can produce rainfall intensities between 20 and 150 mm h^{-1}. The gradients of the two halves of the soil slope are independently tiltable between -15º and +15˚. The experiments are conducted on artificial coupling conditions, representing the interface between hillslope and floodplain, within the hillslope facility in order to evaluate the controls on the movement of particles across these boundaries under varying rainfall intensities, slope gradients and hydrological properties. Flow hydraulics on the surface of both of the elements of the soil slope are monitored to observe how they vary in response to changes in the connectivity between the elements as well as in relation to sediment transport and deposition through a rainfall event. A variety of tracers are used simultaneously in order to track particle fractions of different sizes across the element boundaries, including painted tracers for the larger fractions and fluorescent tracers and Rare Earth Elements (REE) for the finer fractions.

The data from these experiments have the potential to provide critical, process-based information into the movement of sediment across catchment elements.