



Testing modelled hillslope sediment production using a low cost sediment trap

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This presentation seeks to describe the design and evaluation of a simple, low cost Hillslope Sediment Trap (HST) suitable for deployment in remote arid and semi-arid environments as detailed in a paired submission by Brooks et al. (currently under review, Catena S-13-00775 and S-13-00776). The HSTs consist of a robust, fenced enclosure from which a geofabric barrier is hung and attached to the ground, forming a wall and apron section, which is extended upslope in a U or V shape, depending on slope angle. Key considerations of the HST design include cost, ease of field transportation and construction, and low maintenance during deployment, as well as hydraulic considerations such as conductivity, effective filtration threshold for single and consecutive events, and overall sediment retention within the traps. The sediment trapping efficiency of the HSTs was tested through a series of laboratory flume experiments which showed that the traps will accurately sample the full particle size distribution of sediment mobilised on a given hillslope, with a suspended sediment ($<63\mu\text{m}$) trapping efficiency conservatively estimated to be 50%.

The HSTs were used to measure sediment generated through hillslope erosion processes in the wet-dry tropics of Cape York, northern Australia, in a catchment where extremely high rates of hillslope erosion are predicted, producing extremely high modelled suspended sediment loads in streams which drain into the Great Barrier Reef Lagoon. Using the empirical sediment yield data collected by the HSTs allowed the development of a locally calibrated hillslope erosion model, providing far more realistic predictions of erosion than have previously been employed.

Total sediment yield was measured in 11 plots ranging in size from 0.1 to 1.9 ha across four main geologies in the Normanby catchment, with results ranging between 0.03 - 256 kg/ha/yr across two distinctly different wet seasons. When compared to the RUSLE modelled sediment yields determined for the same sites, plot scale metrics together provided values ranging from 1550 - 331730 kg/ha/yr. Depending on which modelled data is used, this represents an average ratio of over prediction by the RUSLE model (cf the measured rates for the same period) of between 12 to 13333 times. Reasons for the over-prediction are discussed in Brooks et al. (Subm. Catena S-13-00776).

References

Brooks, P.A., Borombovits, D.K., Spencer, J., Pietsch, T. and Olley, J. (Subm. – Catena S-13-00775). Measured hillslope erosion rates in the wet-dry tropics of Cape York, northern Australia: Part 1, A low cost sediment trap for measuring hillslope erosion in remote areas - trap design and evaluation

Brooks, P.A., Spencer, J., Borombovits, D.K., Pietsch, T. and Olley, J. (Subm. – Catena S-13-00776). Measured hillslope erosion rates in the wet-dry tropics of Cape York, northern Australia: Part 2, RUSLE-based modelling significantly over-predicts hillslope sediment production