Geophysical Research Abstracts
Vol. 16, EGU2014-15704-1, 2014
EGU General Assembly 2014

Time-integrated suspended sediment monitoring networks: Potential and implications for geomorphology

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Although there is a considerable knowledge base of the impacts of changing land-use on the magnitude and timing of erosion within catchments, much less is known about the dynamics of fine sediment transfer through the hydrological networks draining these areas. The dearth of information about fine fluvial sediment transfer and its properties, especially in headwater areas is to an extent, due to the various costs associated with generating the suspended sediment data. As the costs associated with monitoring escalate, low-cost tools and technologies that are able to deliver appropriate and reliable suspended sediment flux data at the required efficiency level are becoming increasingly advocated, with regulatory authorities in particular seeking to reduce costs where appropriate. This brings to the fore the question of whether low-cost devices are capable meeting recent calls for the enhanced characterisation of fluvial suspended sediment flux and to more closely specify provenance of sediment at enhanced spatiotemporal resolutions.

Various low-cost devices have been designed and used for monitoring purposes. Many share the basic characteristic of continuously capturing a sample of suspended sediment from the main flow of the river through principles of natural sedimentation. Recently however, the Time Integrated Mass-flux sampler (TIMS) designed by Phillips et al., (2000) has become increasingly adopted for collecting a bulk sample of fine sediment for; a) sediment fingerprinting purposes; b) assessing sediment fluxes and; c) model parameterisation. This is despite the device having undergone limited field testing. This paper addresses several key concerns about the devices competence when deployed in a fluvial environment, which have not previously been addressed:

(1) How does the inflow rate of the device compare with channel flow-rates?
(2) To what extent does the sampling efficiency bias the mass of sediment and properties of sediment captured, and what are the implications?
(3) Can any irregularities in potential sampling rate and actual sampling rate be attributed to sampler design, or hydraulic conditions?
(4) Should this device be used more widely to provide relative flux estimates and to characterise the properties of fine sediment?