Geophysical Research Abstracts
Vol. 14, EGU2012-2493, 2012
EGU General Assembly 2012

An integrated approach for determining sources and residence times of fine sediment transported through a river network

H.G. Smith and W.H. Blake

School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth, UK (hugh.smith@plymouth.ac.uk)

Fine sediment and associated contaminants transported through river networks can have important impacts on water quality, aquatic habitat and ecosystem function long after catchment remediation measures have been implemented. In this context, the potential role of fine sediment as a secondary source of pollution requires attention. Knowledge of fine sediment transfer and storage in river basins is essential for predicting recovery times of rivers affected by historic or contemporary industrial pollution e.g. mining. It is also vital for determining the effectiveness of management actions in reducing the supply of contaminated sediment to coastal ecosystems. Against this background, we aim to determine the residence/travel times of fine sediment through a river network in south-west England. The approach utilises fallout radionuclides (Cs-137, excess Pb-210, Be-7) to (i) infer diffuse sources of sediment and associated contaminants transported in suspension over event and seasonal timescales and (ii) estimate fine sediment residence times based on differences in radioactive decay rates. Information on downstream changes in sediment sources within basins is critical for interpreting residence times using fallout radionuclide data since changes in source type (e.g. surface versus subsurface) may influence residence time signals. Consequently, analysis of sediment sources for a set of nested monitoring sites is coupled with methods for estimating residence time e.g. comparison of Be-7/excess Pb-210 ratios and a two-compartment radionuclide mass balance model comprising slow and rapid transport components. The present study focuses on the River Tamar (917 km2), an agricultural basin with an extensive history of metal mining and legacy of fine sediment contamination. Sampling of land use and channel bank source material across the basin has been undertaken for the sediment source analysis in conjunction with integrated suspended sediment sampling over monthly intervals at seven monitoring sites and flood event sampling at the basin outlet. Data generated by this sampling program will be coupled with long-term rainfall and streamflow records, existing measurements of radionuclide fallout, and sediment budget modelling to estimate sediment residence times for the river network. Preliminary results from the sampling program will be presented.