Geophysical Research Abstracts
Vol. 19, EGU2017-13142, 2017
EGU General Assembly 2017

Towards real time spatially resolved data on sediment transport: 1) tracing the motion of the fluorescent soil particles under rainfall

John Quinton, Rob Hardy, Jackie Pates, and Mike James
Lancaster University, Lancaster Environment Centre, Lancaster, United Kingdom (j.quinton@lancaster.ac.uk)

Understanding where sediment originates from and where it travels to, in what quantities and at which rate is at the heart of many questions surrounding sediment transport, including the connectivity problem. Progress towards unravelling these questions and deepening our understanding has come from a wide range of approaches, including laboratory and field experiments conducted at a variety of scales. In seeking to understand the connectivity of sources and sinks of sediment scientists have spent considerable energy in developing tracing technologies. These have included numerous studies that have relied on the chemical properties of the soil and sediment to establish source-sink connectivity, and the use of 137Ceasium, from radioactive fall-out, to map sediment redistribution. More recently there has been an upsurge in interest in the use of artificially applied soil tracers, including rare earth element oxides and magnetic minerals. However all these tracing methods have a significant drawback: they rely on the collection of samples to assess their concentration. This means that their spatial distribution cannot easily be established in situ and that the environment that is being studied is damaged by the sampling process; nor can data be collected in real time which allows a dynamic understanding of erosion and transport processes to be developed.
In this paper we present a methodology for use with a commercially available fluorescent tracer. The tracer is produced in a range of sizes and fluorescent signatures and can be applied to the soil surface. Here we report on an application that combines novel fluorescent videography techniques with custom image processing to trace the motion of the fluorescent soil particles under rainfall.

Here we demonstrate the tracking of multiple sub-millimetre particles simultaneously, establishing their position 50 times a second with submillimetre precision. From this we are able to visualise and quantify parameters such as distance and direction of travel.

In a second abstract we report on the field application of the tracer at the hillslope scale during a tillage erosion experiment. Here we trialled both intensity based and particle counting methodologies for tracer enumeration. After simulating seven years of tillage on a hillslope we were able to precisely determine the distribution of the fluorescent tracer and also its incorporation and distribution within the soil profile. Single grains of tracer could be found over 35 m from the insertion point.