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Multi-dimensional Soil Erosion and Associated Chemical Transport: Experiments, Mathematical Modelling and Field Evaluation (MultiSEM)

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The transport of eroded agricultural soil and associated pollutants from farmlands results in the eutrophication of surface waters, damage to freshwater ecosystems, the microbial contamination of surface water sources, and it is a major pollutant source responsible for the reduction of water quality in UK beaches and coastal environments. Pollutants are transported in dissolved form in the runoff water, or in particulate form by attachment to soil particles. Predicting the movement of these diffuse pollutants, especially nitrate (N) and phosphorus (P), from land to water is becoming increasingly important.

Pollutants bind preferentially to different sized soil particles so, in order to improve current predictions of soil erosion and N and P transfer, MultiSEM examines the contribution of different particle sizes. This will be accomplished by developing and calibrating the multi-particle size class soil erosion model of Hairsine and Rose in conjunction with a transport equation for the dissolved pollutants in overland flow.

It is well documented that the scale of study can have significant influences on soil erosion studies. Consequently, MultiSEM adopts a hierarchical programme examining soil erosion and N and P transfer in controlled laboratory experiments, at the plot scale on a natural hillslope, and finally within a small catchment. These data will then be used to assess the Hairsine and Rose model at each of these scales.

This poster details the approaches MultiSEM uses to advance the physical understanding of the transfer of diffuse pollutants from soils to waters. Furthermore, some preliminary results from the laboratory flume experiments are given.