

Phosphorus, sediment and colloid transfers from grasslands – the GRASP project

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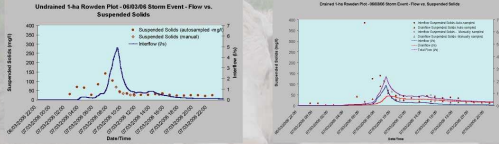
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Objective One

Aims -

- To monitor sediment, colloid and P transfers from intensively managed grasslands, from the plot scale to the small catchment scale.
- To provide novel and detailed information on the erosional processes operating in these environments.
- To examine how these processes are influenced by land management options, such as the installation of subsurface drainage, and variation in stocking density.

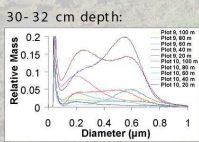
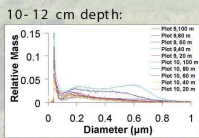
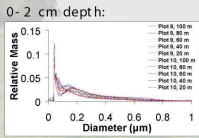
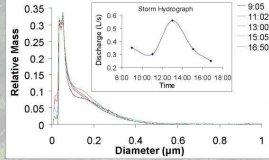


Flow Field-Flow Fractionation (FIFFF) can separate colloidal material in the size range 1 nm to 1 μm.

FIFFF has been applied to soil sampled along two 100 m transects at Rowden (plot 9 drained and plot 10 undrained) to investigate particle size distribution with depth.

The colloidal profile for each plot was similar at 0-2 and 10-12 cm depth, however the profile differed widely for the 30-32 cm soil samples (results shown right).

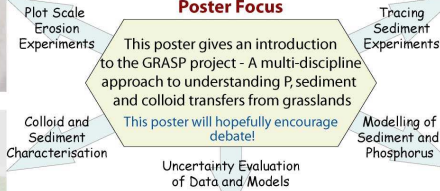
FIFFF can also be applied to storm run-off samples (shown below).



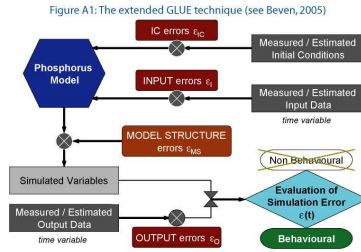
Introduction and Main Points

"The objective is to provide mechanistic and fundamental knowledge that contributes to the Defra P programme through adopting a multidisciplinary team approach focussed around three platform sites"

- Specifically, the project will
- contribute fundamental knowledge to help budget losses
 - define new techniques for identification of colloids and sediment
 - improve mechanistic understanding of sediment, colloid and P transport
 - contribute to new models for understanding P transport through grassland soils



Generalised Likelihood Uncertainty Estimation (GLUE) allows for the introduction of error terms into the assessment of models in an informal Bayesian framework (see figure A1). We can therefore include an evaluation of input and output observational uncertainties as well as the model structural errors and associated parameters - improving the uncertainty assessment dialogue between experimentalists and modellers

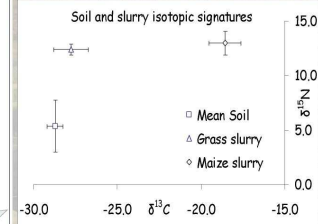


Tracing Sediment and Organic Matter from Grassland Systems

Agricultural grasslands present a potentially significant but poorly understood source of organic-matter and sediment that may contribute to undermining downstream water-quality (Haygarth et al., in press).

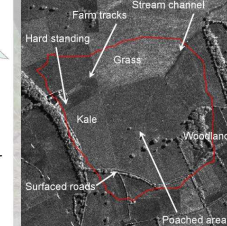
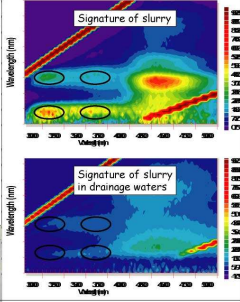
Natural and anthropogenic tracers provide a range of new opportunities that may help contribute to new or improved understandings. Two are presented below:

Stable Carbon Isotopes



- The $\delta^{13}C$ of maize slurry is significantly different to that of grass slurry and native soil.
- Material derived from maize slurry can be traced.

Natural Fluorescence



Modelling strategy

- Uncertainty estimation framework
- Capture dominant modes
- Modelling experiments: Test competing model formulations with available data

Learn from plot scale



Sort out sub-surface pathways (interception of overland flow):

- Map drainage network (anecdotal evidence, geophysical methods)
- Map topsoil depth (soil coring, geophysical methods)

Sort out overland flow network (surface connectivity of sources with stream):

- Digital Elevation Models
- Map transport features (traminles, eroded channels ...)

