Geophysical Research Abstracts
Vol. 18, EGU2016-8497, 2016
EGU General Assembly 2016

Upscaling spatially heterogeneous parameterisations of soil compaction to investigate catchment scale flood risk.

Victoria Coates and Ian Pattison

Loughborough University, School of Civil and Building Engineering, Loughborough, United Kingdom
(v.l.coates@lboro.ac.uk)

Upscaling land management signals observed at the point scale to the regional scale is challenging for three reasons. Individual catchments are unique and at the point scale land management signals are spatially and temporally variable, depending on topography, soil characteristics and on the individual characteristics of a rainfall event. However at larger scales land management effects diffuse and climatic or human induced signals have a larger impact. This does not mean that there is no influence on river flows, just that the effect is not discernible. Land management practices in different areas of the catchment vary spatially and temporally and their influence on the flood hydrograph will be different at different points within the catchment. Once the water enters the river, the land management effects are disturbed further by hydrodynamic and geomorphological dispersion.

Pastoral agriculture is the dominant rural land cover in the UK (40% is classified as improved/ semi-natural grassland - Land Cover Map 2007). The intensification of agriculture has resulted in greater levels of soil compaction associated with higher stocking densities in fields. Natural flood management is the alteration, restoration or use of landscape features to reduce flood risk. Soil compaction has been shown to change the partitioning of rainfall into runoff. However the link between locally observed hydrological changes and catchment scale flood risk has not yet been proven.

This paper presents the results of a hydrological modelling study on the impact of soil compaction on downstream flood risk. Field experiments have been conducted in multiple fields in the River Skell catchment, in Yorkshire, UK (area of 120km2) to determine soil characteristics and compaction levels under different types of land-use. We use this data to parameterise and validate the Distributed Physically-based Connectivity of Runoff model. A number of compaction scenarios have been tested that represent different levels of realism within the catchment. This includes fully lumped with the whole catchment receiving one level of compaction, semi distributed, with 10-90% of the catchment compacted and fully distributed, where the catchment has been split on the field scale into specific land-uses and then each land-use assigned a value of compaction.