Geophysical Research Abstracts
Vol. 17, EGU2015-12745, 2015
EGU General Assembly 2015

Quantifying conceptual hydrological flow paths across heterogeneous conditions using a tailored catchment model

Eva M. Mockler and Michael Bruen
UCD Dooge Centre for Water Resources Research, University College Dublin, Ireland (eva.mockler@ucd.ie)

As hydrology drives the nutrient and sediment processes at catchment scale, the hydrological processes in a model must be adequately represented in order for water quality simulations to be meaningful. Focus is increasingly turning to the internal movement of water within conceptual rainfall runoff models to investigate if the simulated processes contributing to the total flows are realistic. Difficulty arises when defining two or more flow paths that are conceptually distinct in relation to nutrient and sediment signatures, but have similar or overlapping discharge hydrograph responses. When this occurs, methods relating to physical hydrograph separation cannot be expected to distinguish between the different responses.

There is a wealth of knowledge and conceptual understanding of hydrological and hydrogeological processes across Ireland. This knowledge has been incorporated into several spatial datasets of catchment characteristics including the Geological Survey of Ireland Groundwater Vulnerability Map and National Recharge Map. A tailored conceptual model for simulating flows in Irish catchments was developed that is linked with catchment characteristics to constrain internal flow paths and guide parameterisation. Simulations for 31 catchments were compared with output from two established models. The additional process information in the new model structure resulted in an improved or equalled performance in most catchment, with an increase in overall average performance criteria. This was attributed to the tailored model structure that more closely reflects the dominant hydrological processes in Irish catchments.

The proportion of flow through groundwater or ‘quick’ flow paths varies considerably depending on catchment settings, with examples of groundwater dominated and ‘flashy’ catchments included in the study. In contrast to earlier studies, results showed interflow, as opposed to overland flow, as the dominant flow path in Irish catchments. This new finding was influenced by the inclusion of artificial land drains in the conceptual model, which is an important flow path in low permeability agricultural areas. Work is on-going to couple the hydrological model with water quality components so these results can inform the simulation of nutrients and sediments.