Geophysical Research Abstracts,
Vol. 11, EGU2009-13462, 2009
EGU General Assembly 2009

Incorporating a Spatially Dynamic Conceptualization of Dominant Processes into Hydrological Models

C. Birkel (1), D. Tetzlaff (2), S.M. Dunn (1), and C. Soulsby (2)

(1) The Macaulay Institute, Aberdeen, Scotland, (2) School of Geosciences, University of Aberdeen, Scotland

In certain applications of hydrological models, such as the prediction of diffuse pollution transfers, the spatial distribution of hydrological processes need to be conceptualized in a physical meaningful way. In this study, results from GPS-based field mapping were used to conceptualize spatially distributed processes that control the dynamics of fast, near-surface runoff generation processes, which dominate the hydrological response of a mesoscale catchment in the Scottish Highlands. The catchment is dominated by responsive soils such as histosols and gleysols in wide valley bottom saturated areas that are characterized by their dynamic expansion and contraction. We observed a maximum expansion of up to 30 % of the total catchment area under wet conditions when the catchment is highly connected and less than 5 % during prolonged dry periods. The conceptualization of such processes formed the basis for the implementation of simple low-parameterized model approaches highlighting the need for a spatially dynamic representation of the catchment functioning. Preliminary results for wet and dry extreme periods indicate that the model agrees well with the observed dynamics of saturated zones hydrologically connected to the stream channel network and their subsequent disconnection. We conclude that such characterization of hydrological process heterogeneity is important for an improved understanding of these catchment systems and predicting water and solute fluxes.