Geophysical Research Abstracts
Vol. 18, EGU2016-279, 2016
EGU General Assembly 2016

Integrated assessment of groundwater – surface water exchange in the hillslope – riparian interface of a montane catchment

Bernhard Scheliga (1), Doerthe Tetzlaff (1), Gunnar Nuetzmann (2), and Chris Soulsby (1)

(1) Northern Rivers Institute (NRI), University of Aberdeen, Aberdeen, United Kingdom (b.scheliga@abdn.ac.uk), (2) Department of Ecohydrology, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany

Groundwater-surface water dynamics play an important role in runoff generation and the hydrologic connectivity between hillslopes and streams. Here, we present findings from a suite of integrated, empirical approaches to increase our understanding of groundwater-surface water interlinkages in a 3.2 km^2 experimental catchment in the Scottish Highlands. The montane catchment is mainly underlain by granite and has extensive (70%) cover of glacial drift deposits which are up to 40 m deep and form the main aquifer in the catchment. Flat valley bottom areas fringe the stream channel and are characterised by peaty soils (0.5-4 m deep) which cover about 10% of the catchment and receive drainage from upslope areas. The transition between the hillslopes and riparian zone forms a critical interface for groundwater-surface water interactions that controls both the dynamics of riparian saturation and stream flow generation. We nested observations using wells to assess the groundwater – surface water transition, LiDAR surveys to explore the influence of micro-topography on shallow groundwater efflux and riparian wells to examine the magnitude and flux rates of deeper groundwater sources. We also used electrical resistivity surveys to assess the architecture and storage properties of drift aquifers. Finally, we used isotopic tracers to differentiate recharge sources and associated residence times as well as quantifying how groundwater dynamics affect stream flow. These new data have provided a novel conceptual framework for local groundwater – surface water exchange that is informing the development of new deterministic models for the site.