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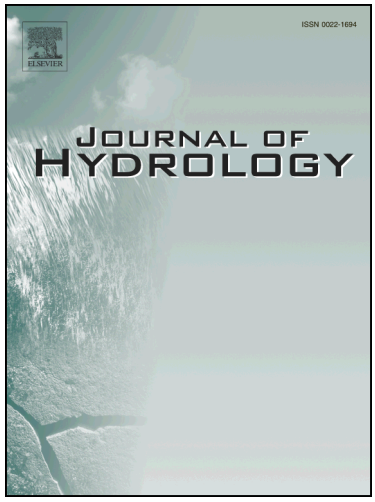

Research papers

Using repeat electrical resistivity surveys to assess heterogeneity in soil moisture dynamics under contrasting vegetation types

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PII: S0022-1694(18)30144-6
DOI: https://doi.org/10.1016/j.jhydrol.2018.02.062
Reference: HYDROL 22611

To appear in: *Journal of Hydrology*

Received Date: 14 June 2017
Revised Date: 19 February 2018
Accepted Date: 20 February 2018

Please cite this article as: Dick, J., Tetzlaff, D., Bradford, J., Soulsby, C., Using repeat electrical resistivity surveys to assess heterogeneity in soil moisture dynamics under contrasting vegetation types, *Journal of Hydrology* (2018), doi: https://doi.org/10.1016/j.jhydrol.2018.02.062

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ACCEPTED MANUSCRIPT

Using repeat electrical resistivity surveys to assess heterogeneity in soil moisture dynamics under contrasting vegetation types

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Abstract

As the relationship between vegetation and soil moisture is complex and reciprocal, there is a need to understand how spatial patterns in soil moisture influence the distribution of vegetation, and how the structure of vegetation canopies and root networks regulates the partitioning of precipitation. Spatial patterns of soil moisture are often difficult to visualise as usually, soil moisture is measured at point scales, and often difficult to extrapolate. Here, we address the difficulties in collecting large amounts of spatial soil moisture data through a study combining plot- and transect-scale electrical resistivity tomography (ERT) surveys to estimate soil moisture in a 3.2 km^2 upland catchment in the Scottish Highlands. The aim was to assess the spatio-temporal variability in soil moisture under Scots pine forest (*Pinus sylvestris*) and heather moorland shrubs (*Calluna* vulgaris); the two dominant vegetation types in the Scottish Highlands. The study focussed on one year of fortnightly ERT surveys. The surveyed resistivity data was inverted and Archie's law was used to calculate volumetric soil moisture by estimating parameters and comparing against field measured data. Results showed that spatial soil moisture patterns were more heterogeneous in the forest site, as were patterns of wetting and drying, which can be linked to vegetation distribution and canopy structure. The heather site showed a less heterogeneous response to wetting and drying, reflecting the more uniform vegetation cover of the shrubs. Comparing soil moisture temporal variability during growing and non-growing seasons revealed further contrasts: under the heather there was little change in

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