



Dominant runoff processes, stream water residence time and landscape organization in a mesoscale catchment

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Tracer studies, using Gran alkalinity and $\delta^{18}\text{O}$, in nested sub-basins of the 230km² Feshie catchment in the Cairngorm mountains, Scotland, were used to characterise hydrology in terms of groundwater contributions to annual runoff and mean residence times. Relationships between these fundamental hydrological descriptors and catchment landscape organization were explored with the use of a GIS. Catchment soil distribution – mapped by the UK's Hydrology Of Soil Type (HOST) digital data base - exerted a very strong influence on flow path partitioning and mean residence times. Smallest groundwater contributions (~30-40%) and shortest residence times (~3-6 months) were observed in catchments dominated by peat and/or shallow alpine soils and bedrock. Longer residence times (~12-15 months) and greater groundwater contributions (~45-55%) were observed in catchments dominated by more freely draining podzolic, sub-alpine and alluvial soils. The influence of topographic characteristics and catchment scale were indirect and appeared to be largely mediated by their influence on soil coverage and distribution. The study illustrates the utility of integrating digital soil data bases and terrain analysis with tracer studies to understand the influence of landscape organization on the hydrological functioning of mesoscale catchments.