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USE OF STABLE AND RADIOACTIVE ISOTOPES TO UNRAVEL SURFACE WATER GROUNDWATER INTERACTIONS IN A DEVELOPED CATCHMENT

Traditionally surface water groundwater interactions are estimated using hydrometric and water balance methods. However, the hydrometric methods, based on hydraulic gradients, have huge uncertainties related to the mostly unknown and often highly heterogeneous permeability distribution. Similarly, the surface water groundwater exchange can be relatively small compared to other components of the water balance (e.g. differential steam flow gauging) and consequently its estimation is associated with large uncertainties when using a water balance method. Environmental tracers such as isotopes on the other hand integrate what has actually taken place. However, each individual isotopic tracer has particular advantages and disadvantages and therefore limited use. For instance each radioactive isotope is limited to provide residence time estimations within a certain age range whereas stable isotopes only work when different water sources have distinctly different isotopic compositions. In this study, of a highly developed catchment subject to groundwater depletion it is demonstrated that by combining different tracers (14C, 3H, 2H and 18O) a more complete picture of the surface water groundwater interactions can be obtained.

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