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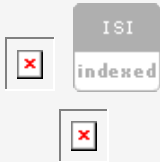
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Mixing and transport of water in a karst catchment: a case study from precipitation via seepage to the spring

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Abstract. One of the best-known and largest karst areas in Germany, the Blautopf Catchment, offers unique access to waters of the unsaturated zone through a large cave system. It was investigated with stable isotopes (¹⁸O/¹⁶O and D/H ratios expressed in permille = ‰) in precipitation, seepage- and groundwater as tracers for water flow, mixing, and storage. The precipitation showed a distinct seasonality with δ¹⁸O values between –2.9 and –24.6‰ during summer and winter, respectively. However, the isotope signals in seepage water in the caves as well as the discharge were almost completely buffered and ranged around an average δ¹⁸O value of –10‰. This value was also close to the long-term average value of local precipitation, –9.3‰. The homogeneous isotopic composition of the Blautopf Spring was unexpected, as its highly variable discharge (0.3 to 32 m³ s^{–1}) is typical for a fast responsive karst system. These isotopic similarities could be explained by nearly complete mixing of the water already in the vadose zone. The data set therefore presents a case study to narrow down zones of mixing in karst catchments. It also confirms the minor role of the fast conduit system in the water balance of the Blautopf Catchment.

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