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Spatiotemporal variation of stable isotopes in river water of the Weser basin, Germany

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Isotope studies of river water were so far mostly conducted on temporal resolution to gain information on runoff processes and residence times of runoff components. This study shows an approach to gain information from spatial variations to identify a seasonal-, elevation- and continental effect and sea water influence from river water samples. Spatiotemporal variations of stable isotopes (^{18}H, ^{2}O) in river runoff were studied from water samples collected during three field campaigns in the Weser basin in Germany (46.200 km^2) during spring 2008 (25.05. to 03.06.2008, 78 samples), winter 2009 (17.01. to 26.01.2009, 38 samples) and summer 2009 (17.08. to 24.08.2009, 40 samples). All samples were taken primarily at discharge stations were continuous flow observations, coordinates and mean elevation of the catchment were available. Additionally, temperature, conductivity and pH-values as well as climate conditions were recorded.

The samples collected during the field campaigns ranged between -9.73‰ and -3.03‰ for δ^{18}O and between -68.3‰ and -25.2‰ for δ^{2}H, respectively. Seasonal patterns of isotope concentrations in precipitation lead to depleted winter values in river water during winter and spring. Summer values collected during low flow conditions are enriched compared to long-term mean values. An interpretation of the data set allows a description of an elevation effect and marine influence for sites under tidal influence as well as first assumptions on contributing groundwater on a sub-catchment scale.