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# Estimation of temporal distribution of recharge from spring hydrographs on the example of a karst spring

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The presented work provides an approach for the estimation of the temporal distribution of recharge from spring hydrographs (Geyer et al. 2007). The approach is solely based on time derivative(s) of spring hydrographs and recession coefficient(s) of an aquifer. It employs aquifers as reservoirs which maintain water from recharge and generate discharge relating to their geometric and hydraulic characteristics. The first time derivative of the discharge curve of a reservoir describes the rate of change of the discharge curve. It reflects the temporal distribution of inflow and outflow from the reservoir. The recession coefficient of a reservoir is controlled by its geometric properties and diffusivity (ratio of transmissivity and storage). The approach was extended to karst aquifers which can be described as dual flow systems consisting of highly permeable conduit systems and low permeability fissured matrix blocks. Recharge occurs directly and rapidly via sinkholes and dry valleys in the conduit system as well as diffusely in fissured matrix blocks. As shown in principle studies with a serial two-reservoir model, direct recharge into the conduit system clearly dominates the early hydrograph response even if the fraction of the direct recharge component is only a few percent of total recharge. This characteristic behaviour can be employed to separate the direct recharge component from the spring hydrograph. The only parameter required for the separation procedure is the recession coefficient of the highly permeable conduit system of the karst aquifer. The methodology has been applied to quantify direct recharge into the conduit system of the Gallusquelle catchment (Swabian Alb,

Germany) after a storm event. The result is similar to that obtained from principle studies. It is also in agreement with the result from an independent isotope study. The recession coefficient of the conduit system was estimated by spring hydrograph recession analysis and corresponds to that obtained from an artificial tracer experiment covering the extent of the conduit system of the catchment.

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