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An innovative experiment for modelling hydraulic connectivity of hyporheic zone

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Groundwater-surface water exchanges have received growing interest in the last years, such as the study of hyporheic zone, where provides degrees of hydraulic connection for the stream with riparian zones. This exchange process is crucial because it influences the composition of nutrients or pollutions both in the stream and riparian zones.

Generally the advective pumping effect induced by the streambed characteristics is considered as the main cause influencing the transport of fluid through the groundwater-surface water interface. The conception "Transient Storage Model" is thus commonly adopted in many stream-subsurface exchange studies, which compares the difference in concentration between the stream and the adjacent storage zone by the mass transfer coefficient. However, the impact of lateral groundwater inflow is not fully taken into account in many cases. Besides, to accurately identify the extent or the boundary of stream-subsurface exchange zone is still under debate, and the difficulty of accessing these areas in situ may hence lead to prediction error.

Our study designs an indoor J-shaped column experiment for the investigation of hydraulic connectivity among vadose zone, hyporheic zone and stream. Without taking advective pumping as the cause of stream-subsurface flux exchange, our experiment adopts groundwater flux condition as the control variable and to observe the solute transport pattern in different scenarios. By this innovative experiment, we expected to more accurately describe the dynamic interaction between the rivers and the subsurface water in adjacent aquifers.