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Solute transport in streams of varying morphology inferred from a high resolution network of potentiometric wireless chloride sensors

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There is ongoing interest in understanding and quantifying the travel times and dispersion of solutes moving through stream environments, including the hyporheic zone and/or in-channel dead zones where retention affects biogeochemical cycling processes that are critical to stream ecosystem functioning. Modelling these transport and retention processes requires acquisition of tracer data from injection experiments where the concentrations are recorded downstream. Such experiments are often time consuming and costly, which may be the reason many modelling studies of chemical transport have tended to rely on relatively few well documented field case studies. This leads to the need of fast and cheap distributed sensor arrays that respond instantly and record chemical transport at points of interest on timescales of seconds at various locations in the stream environment. To tackle this challenge we present data from several tracer experiments carried out in the Attert river catchment in Luxembourg employing low-cost (in the order of a euro per sensor) potentiometric chloride sensors in a distributed array. We injected NaCl under various baseflow conditions in streams of different morphologies and observed solute transport at various distances and locations. This data is used to benchmark the sensors to data obtained from more expensive electrical conductivity meters. Furthermore, the data allowed spatial resolution of hydrodynamic mixing processes and identification of chemical 'dead zones' in the study reaches.