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A look inside the Panola trenched hillslope - initial results of a tracer test

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Trenched hillslope studies are logistically challenging but have provided valuable information on hillslope hydrological processes. For example, they have shown that subsurface stormflow can respond very quickly to rainfall and that subsurface storm flow often varies in a non-linear and threshold-like way with total rainfall or antecedent conditions. They have also highlighted the high spatial variability in subsurface stormflow due to surface or bedrock topography or spatial variability in soil and bedrock characteristics. However, still less is known about mixing and flow velocities along hillslopes.

Here we present the initial results of a tracer test at the Panola trenched hillslope in Georgia, USA. We applied chloride to the surface of the lower half of the hillslope and bromide as a line source. We measured the concentrations in subsurface flow at 2-m sections of the trench face and for two macropores during a five-month period that included two large rainfall events that caused subsurface flow, and several sprinkling experiments on parts of the hillslope. We used 20 lysimeter pairs and more than 50 wells and piezometers across the hillslope to track the transport of the tracer through the soil to the trench. The results highlight the variability in flow pathways, the considerable difference between celerity and velocity, as well as the fast tracer transport through the weathered bedrock