



Geomorphological control on groundwater flow, transit times and water quality

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In weathered zones, subsurface flows remain shallow and strongly depend on the geomorphological evolution of the landscape. Weathered profiles have limited depths. Subsurface circulations follow the structure of the hydrological catchment. Surface and subsurface flows are strongly coupled by rapid responses of saturations to recharge. Some of the circulations are indeed fast with surface/subsurface signatures and transit times of the order of some weeks to some months.

Most of the water is however much older as revealed by anthropogenic tracers. For example, in the western crystalline basement of France, characteristic transit times are more of the order of decades. Detailed groundwater flow and transport modelling in well-documented sites show that behaviour of weathered zones is intermediary between hydrology and hydrogeology. While organization of flows is strongly constrained by topography like for hydrology, transit times are however much longer like in hydrogeology.

Based on several catchments, we propose quantitative indicators to relate geomorphology with subsurface flow organization. We integrate geological constrains and saturation capacities to derive transit-time dynamics. We discuss the consequences on water quality linked to kinetically-controlled degradation of non-point source contaminants.