Thresholds in karst catchments: the example of the Lurbach karst system

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Threshold behavior in hydrological systems generally involves a qualitative change of either a single process (process threshold), the response of the system (response threshold), or the functioning of the system (functional threshold) (ZEHE & SIVAPALAN, 2009). The transition from laminar to turbulent flow provides an example of threshold behavior at the process level, which occurs when the ratio of inertial forces to viscous forces (represented by the Reynolds number) exceeds an empirical threshold value. This transition, for instance, occurs in karst aquifers where water flows rapidly through solution conduits, and it is known that it may strongly influence the hydrological response of the springs draining these aquifers. Assessing if and under which conditions this leads to threshold behavior at the response level, however, is not straightforward, as the spring response is governed by the interaction of several processes and flow components. One example of a response threshold is provided by the Lurbach System (Austria) where the sinking stream Lurbach, which under low-flow conditions only resurges at the Hammerbach spring, additionally supplies a second spring, the Schmelzbach outlet, once a given threshold discharge is exceeded. Interestingly, this threshold appears to have changed after a flood event in 2005, presumably because of the plugging of flow paths with sediments or collapse material. Flow duration curves, master recession curves, and the thermal response of the Hammerbach spring have markedly changed since then, suggesting that a sudden qualitative change in the hydrological functioning was triggered by this flood event (functional threshold). This example demonstrates that thresholds in karst catchments are closely connected to geomorphologic processes, such as sediment transport, and climatic factors, such as the occurrence of extreme events.

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ZEHE, E. & SIVAPALAN, M. (2009): Threshold Behaviour in Hydrological Systems as (Human) Geo-Ecosystems: Manifestations, Controls, Implications. Hydrology and Earth System Sciences 13 (7): 1273–1297.

Serpentinite slices within a tectonic zone at the base of the Juvavic nappe systems (Eastern Alps, Austria): petrography and geochemistry

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Near to Unterhöflein (Lower Austria/Austria) at the eastern margin of the Eastern Alps several tectonic slices of serpentinites occur within a highly tectonised zone composed of schist of the Werfen Formation and different Triassic limestones and dolomites. The tectonic zone is situated at the base of the Juvavic nappe system of the Austroalpine unit. In a similar position basic magmatic rocks are known from several other localities, mostly occuring within evaporitic sediments of the Permian Haselgebirge (GRUBER et al., 1992; SCHORN et al., 2013). Further between the Juvavic nappe system and the underlying Tirolic nappe system tectonic slices of the Meliata unit occur, which represents remnants of the Neotethys oceanic domain (MANDL & ONDREJIKOVA, 1993).