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The CAOS project: Interdisciplinary monitoring for the identification of hydrologic functional units

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Hydrologic functional units (also known as hydrologic response units or lead topologies) form the basis of many hydrological models and are usually delineated with a simple GIS analysis. Despite the fact that it is a common concept, there are few studies on the determination of hydrologic response units in the real world.

This study is part of ongoing research within the DFG research unit CAOS (Catchments As Organized Systems) and aims at identifying functional units in the field. This ambitious endeavor is based on an interdisciplinary monitoring design involving a large number of sensor clusters, but also includes tracer studies, remote sensing, geophysical exploration, and meteorological and ecological investigations. Each sensor cluster is designed to observe a variety of different fluxes and state variables above ground and below ground in the saturated and unsaturated zone. The number of sensors is chosen to capture the spatial variability as well as to characterize the average dynamics.

The sampling design produces an extensive data set over a large number of functional units controlled by different topologies, geological-, soil- and vegetation characteristics. It enables us to test our hypotheses on system functioning, investigate links between internal pattern dynamics and integral responses, and determine minimum data needs for system characterization. The resulting data sets and system understanding will be used to develop, parameterize and validate a hydrological model based on functional units. Research is focused on the Attert catchment in Luxemburg.