Towards catchment classification by means of environmental tracers and landscape analysis: The Attert catchment in Luxembourg

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Until recently hydrological research has been mainly focusing on detailed investigations at small spatial scales, resulting in a set of more and more complex physically-based and spatially distributed hydrologic models. While much of the research effort today is targeted to advance these hydrological model predictions at the catchment scale, shortcomings remain to adequately capture the dominating hydrological processes across a range of scales that translate into the rainfall-runoff response of a catchment. Thus, studies addressing the fundamental relations between catchment structure and function are urgently needed, as they help catchment classification by advancing our knowledge about suitable catchment signatures and controls at different spatial and temporal scales.

In our study in the nested Attert catchment in the Grand-Duchy of Luxembourg (Europe) we investigate how environmental tracer dynamics, hydrological response behavior and landscape analysis can help to identify such dominating controls on runoff generation across multiple scales. Techniques to characterize landscape structure and hydrological processes are complementary applied to identify scales in which shifts of the dominant hydrological processes occur. These dominating controls in turn provide a more integrated perspective of catchment structure and functioning that can be used for catchment classification based on functional response.