Gregor Laaha

# Representation of spatial hydrologic variability.

Understanding the runoff generating processes in catchments is one of the key challenges of catchment hydrology. Catchments are complex systems, with a large number of strongly interdependent variables at many space and time scales. This makes it difficult to discover the processes in a particular catchment in greater detail. Instead of studying a particular catchment in much detail, we can explore spatial patterns of the runoff response to learn about the most important runoff generating processes in a study area. Further, to link the spatial variability of runoff with that of climate and catchment characteristics. The gained additional knowledge about catchment functioning can then be the departure for improving predictive models for ungauged basins, which enable more reliable estimates at ungauged basins than models which do not take process information into account. But this requires meaningful representations of spatial hydrologic variability.

This contribution discusses various methods to represent spatial hydrological variability. Guided by case studies of an Austrian and a German study area, we show how spatial patterns of the various runoff signatures, from droughts to floods, together with representations of climate and catchment characteristics can be jointly used to infer catchment functioning in terms of most important runoff generating processes. It is further shown how the information about similar and different functioning catchments can be used to improve regionalisation models. We conclude that the spatial patterns of runoff signatures, together with those of climate and catchment characteristics, contain a wealth of information, which can be profitably used for runoff predictions in ungauged basins.