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Building and evaluating a set of hydrological signatures

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Hydrological signatures are indicators derived from observed or modelled hydrological data, that can be interpreted in terms of physical processes and linked to specific catchment response functions. They can be valuably used for the study of rainfall-runoff processes in a specific catchment, for catchment classification and comparison, or for hydrological model calibration and evaluation, in order to strengthen their ability to represent the dominant processes. Multiple signatures, using all kinds of hydrological variables (but mostly streamflow) are now available and reported in the litterature. However, the question of selecting and evaluating the signatures themselves has received less attention. How to build a set of signatures encompassing the various aspects of catchment response ? How to evaluate the information content and redundancy of these signatures ?

Our contribution presents a set of signatures based on commonly available hydrological variables (precipitation, streamflow and air temperature time series). It was built according the partitioning, storage and release catchment conceptual model of Wagener et al. (2007). It also includes the cryosphere compartment. Alongside already well-known signatures, new signatures were designed to fill gaps for the description of some catchment response functions. Two different methodologies were used to evaluate the signatures, based on the use additional variables provided by long-term hydrological observatories on the one side, and on a sensitivity analysis performed with a process-based hydrological model on the other side. The most relevant signatures could be identified and are available for further hydrological studies.