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Typology of hydrological metrics based on synthetic errors for single peak events

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The selection of the appropriate metrics in hydrology is an unsolved problem for single and multi objective approaches. A clear typology of hydrological measures is a first step for an objective selection methodology.

In this work we suggest such a typology based on the response of a metric to a number of synthetic errors for single peak events. These synthetic errors include for example peak over- or underestimation, baseflow over- or underestimation, recession too fast or too slow, and erroneously simulated peak or missing peaks. Based on the response of a metric for these peaks, we define so called error response groups (ERG). In an ERG, each measure is able to detect a certain number of errors while they are insensitive to the remaining errors.

Results show that a large number of mean squared error based measures (including the Nash-Sutcliffe coefficient of efficiency) belong to the same ERG, which shows sensitivity for all the tested synthetic errors. We present eight additional ERGs and the related measures and discuss the relevance for the selection of measures.