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Series Distance – A new metric to compare hydrographs in accordance with intuition

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Applying metrics for hydrograph comparison is a central task in hydrological modelling, used both in model calibration and the evaluation of simulations or forecasts. Motivated by the shortcomings of standard objective metrics such as the Root Mean Square Error or the Mean Peak Time Error and the advantages of visual inspection as a powerful tool for simultaneous, case-specific and multi-criteria (yet subjective) evaluation, a new objective metric termed Series Distance is presented, which is in close accordance with visual evaluation.

The Series Distance is an event-based method and consists of three parts, namely a Threat Score which evaluates overall agreement of event occurrence, and the overall distance of matching observed and simulated events with respect to amplitude and timing. The novelty of the latter two is the way in which matching point pairs on the observed and simulated hydrographs are identified, namely by the same relative position in matching segments (rise or recession) of matching events. Thus, amplitude and timing errors are calculated simultaneously but separately, from point pairs that also match visually, considering complete events rather than only individual points (which is for example the case with metrics related to Peak Time Errors).

After presenting the Series Distance method, its properties will be discussed and compared to those of standard metrics and visual inspection, both at the example of simple, artificial hydrographs and an ensemble of realistic forecasts. The results suggest that the Series Distance compares and evaluates hydrographs in a way comparable to visual inspection, but in an objective, reproducible way.