

Consistency assessment of rating curve data in various locations using Bidirectional Reach (BReach)

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When estimating discharges through rating curves, temporal data consistency is a critical issue. In this research, consistency in stage-discharge data is investigated using a methodology called Bidirectional Reach (BReach). This methodology considers a period to be consistent if no consecutive and systematic deviations from a current situation occur that exceed observational uncertainty. Therefore, the capability of a rating curve model to describe a subset of the (chronologically sorted) data is assessed in each observation by indicating the outermost data points for which the model behaves satisfactory. These points are called the maximum left or right reach, depending on the direction of the investigation. This temporal reach should not be confused with a spatial reach (indicating a part of a river). Changes in these reaches throughout the data series indicate possible changes in data consistency and if not resolved could introduce additional errors and biases.

In this research, various measurement stations in the UK, New Zealand and Belgium are selected based on their significant historical ratings information and their specific characteristics related to data consistency. For each station, a BReach analysis is performed and subsequently, results are validated against available knowledge about the history and behavior of the site. For all investigated cases, the methodology provides results that appear consistent with this knowledge of historical changes and facilitates thus a reliable assessment of (in)consistent periods in stage-discharge measurements. This assessment is not only useful for the analysis and determination of discharge time series, but also to enhance applications based on these data (e.g., by informing hydrological and hydraulic model evaluation design about consistent time periods to analyze).