



## **Uncertainty in streamflow records – a comparison of multiple estimation methods**

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Stage-discharge rating curves are used to relate streamflow discharge to continuously measured river stage readings in order to create a continuous record of streamflow discharge. The stage-discharge relationship is estimated and refined using discrete streamflow gaugings over time, during which both the discharge and stage are measured. The resulting rating curve has uncertainty due to multiple factors including the curve-fitting process, assumptions on the form of the model used, the changeable nature of natural channels, and the approaches used to extrapolate the rating equation beyond available observations. A number of different methods have been proposed for estimating rating curve uncertainty, differing in mathematical rigour, in the assumptions made about the component errors, and in the information required to implement the method at any given site. This study compares several methods that range from simple LOWESS fits to more complicated Bayesian methods that consider hydraulic principles directly. We evaluate these different methods when applied to a single gauging station using the same information (channel characteristics, hydrographs, and streamflow gaugings). We quantify the resultant spread of the stage-discharge curves and compare the level of uncertainty attributed to the streamflow record by the different methods..