



Propagation of rating curve uncertainty in design flood estimation

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Statistical flood frequency analysis is commonly performed based on a set of annual maximum discharge values which are derived from stage measurements via a stage-discharge rating curve model. However, design flood estimation techniques often ignore the uncertainty in the underlying rating curve model. Using data from seven gauging stations in Norway, we investigate both the marginal and the joint effects of curve and sample uncertainty on design flood estimation. In addition, we consider the importance of assessing the added value of large streamflow measurements at the high end of the rating curve and in the annual maximum data series. The sample uncertainty is generally the main contributor to uncertainty in design flood estimates. However, accounting for curve uncertainty may strongly influence the results if an extrapolation of the rating curve is necessary. An additional high direct streamflow measurement will reduce the extrapolation degree and the rating curve uncertainty, and most likely reduce estimation biases in the return levels. A high annual maximum flood observation might, if combined with a large extrapolation degree, introduce estimation biases for return levels since the estimation is based on combining two highly skewed distributions.