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Gauging the ungauged basin: how many discharge measurements are needed?

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Abstract. Runoff estimation in ungauged catchments is probably one of the most basic and oldest tasks of hydrologists. This long-standing issue has received increased attention recently due to the PUB (Prediction in Ungauged Basins) initiative. Given the challenges of predicting runoff for ungauged catchments one might argue that the best course of action is to take a few runoff measurements. In this study we explored how implementing such a procedure might support predictions in an ungauged basin. We used a number of monitored Swedish catchments as hypothetical ungauged basins where we pretended to start with no runoff data and then added different sub-sets of the available data to constrain a simple catchment model. These sub-sets consisted of a limited number of single runoff measurements; in other words these data represent what could be measured with limited efforts in an ungauged basin. We used a Monte Carlo approach and predicted runoff as a weighted ensemble mean of simulations using acceptable parameter sets. We found that the ensemble prediction clearly outperformed the predictions using single parameter sets and that surprisingly little runoff data was necessary to identify model parameterizations that provided good results for the "ungauged" test periods. These results indicated that a few runoff measurements can contain much of the information content of continuous runoff time series. However, the study also indicated that results may differ significantly between catchments and also depend on the days chosen for taking the measurements.

[Final Revised Paper](#) (PDF, 440 KB) [Discussion Paper](#) (HESSD)

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