



Assessing the total uncertainty on average sediment export measurements

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Sediment export measurements from rivers are usually subjected to large uncertainties. Although many case studies have focussed on specific aspects influencing these uncertainties (e.g. the sampling procedure, laboratory analyses, sampling frequency, load calculation method, duration of the measuring method), very few studies provide an integrated assessment of the total uncertainty resulting from these different sources of errors. Moreover, the findings of these studies are commonly difficult to apply, as they require specific details on the applied measuring method that are often unreported. As a result, the overall uncertainty on reported average sediment export measurements remains difficult to assess.

This study aims to address this gap. Based on Monte Carlo simulations on a large dataset of daily sediment export measurements (> 100 catchments and > 2000 catchment-years of observations), the most dominant sources of uncertainties are explored. Results show that uncertainties on average sediment-export values (over multiple years) are mainly controlled by the sampling frequency and the duration of the measuring period. Measuring errors on individual sediment concentration or runoff discharge samples have an overall smaller influence. Depending on the sampling strategy used (e.g. uniform or flow-proportional), also the load calculation procedure can cause significant biases in the obtained results. A simple method is proposed that allows estimating the total uncertainty on sediment export values, based on commonly reported information (e.g. the catchment area, measuring period, number of samples taken, load calculation procedure used). An application of this method shows that total uncertainties on annual sediment export measurements can easily exceed 200%. It is shown that this has important consequences for the calibration and validation of sediment export models.