



## How long should we measure to obtain reliable average catchment sediment yields?

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It is widely reported in literature that catchment sediment yields (SY, t km<sup>-2</sup> y<sup>-1</sup>) can vary significantly from one year to another and measurements should be made over a sufficiently long period to obtain a reliable average SY-value. Little information exists, however, on how long such a measuring period should be or which factors control the annual variability in SY. A better understanding of this annual variability would be very useful for the implementation of future measuring campaigns and for assessing the reliability of previously measured SY-data. This study aimed at addressing this research need.

For this purpose, a database was set up with time series of measured annual sediment yields of rivers for various regions in Europe and the Middle East. Data from over 430 rivers were collected, representing more than 11 400 individual years of measurements. Measuring periods ranged from 7 to 58 years, as only rivers with at least 7 years of SY-observations were considered. Catchment areas (A) ranged from 1 km<sup>2</sup> to 60 000 km<sup>2</sup>.

A first important observation was that for most rivers the annual variation in SY was not normally distributed but positively skewed. As a result, mean annual SY collected during a very short measuring period (e.g. < 5 years) have a larger probability to underestimate the long-term average SY. Inter-annual variation in SY was found to be large: for circa 50% of the rivers the ratio between the maximum and minimum observed SY was larger than 20. For a few rivers, this ratio was even larger than 10 000.

The relation between the variation in SY and various catchment characteristics was investigated. Inter-annual variation in SY was found to be positively correlated with average SY, indicating that rivers with high sediment loads are generally characterized by a higher variability. Furthermore, variability tends to decrease with increasing A. However, for catchments smaller than 10 000 km<sup>2</sup>, no clear relationship between A and SY-variability was found. Also between different geographical regions, important differences were found: whereas inter-annual variability was found to be very low in the boreal regions of Europe, mountainous regions and (semi-)arid regions were generally characterized by a higher variability. Based on these trends and observations, preliminary guidelines can be developed to assess the reliability of SY-data, based on their measuring period and catchment characteristics.