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Estimation of a long-term mean sediment load

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The suspended sediment load carried by rivers is highly variable in space and time. The statistical relationship between the daily suspended sediment load and the stream discharge is called the rating curve and commonly takes the power law form. Rating curves are widely used to estimate drainage basin sediment yields. In this study, we explore how the short-term discharge events with variable magnitude and frequency behaviour, controls the long-term mean sediment load. The long-term mean sediment load is obtained by integrating the action of all transport events weighted by their probability of occurrence. The probability density function of daily discharges is given by a two-parameter frequency-magnitude distribution of daily discharge events. This function starts with an inverse exponential tail that represents the lowest probabilities of very small discharges compared to the most probable daily discharge and ends with an asymptotic power law tail for floods. The long-term mean sediment load was calculated from (i) consecutive 9-year daily mean data acquired in the Vilaine river drainage basin (in Brittany, a French North-West region). With an area of 1 400 km^2 and a maximum altitude of 300 m, the catchment is mainly made up of schist, sandstone and granite. Annual precipitations are around 800 mm and discharges up to 180 m3.s-1. The daily mean sediment load is estimated from a 15-minute time step sub-sampling; (ii) consecutive 3-year data acquired every 10 minutes on three small catchments (in Normandy and Brittany, north-western regions of France). With areas lower than 5 km^2 and 150 m maximum altitudes, these three catchments are made up of schist. Annual precipitations are around 900 mm and discharges up to 0.6 m3 s-1.