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A method to calculate sediment fluxes from infrequent data: application to 65 rivers of the French river quality database

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Improving knowledge of sediment exports represents one major challenge for environmental sciences considering their role in geochemical cycles and their link with Earth's surface processes. Because suspended sediment (SS) fluxes in rivers reflect the integration of combined erosion, transport and deposition processes that occur within the drained area, their calculation is thus essential in surface processes studies. Suspended sediment fluxes are estimated from discharge measurements and SS concentrations, either by averaging methods or by predicting sediment concentration values from continuous discharge data. In the latter case, a power function (or power law relation) is often defined between the observed SS concentrations and the corresponding discharge data. However it seems unrealistic to consider a single relation between SS concentrations and river discharges. The reason is that sediment production processes are not homogeneous in time, showing local and seasonal effects for example in agricultural areas where land cover varies inside a year or in mountainous regions where snow melting has a strong influence. Moreover, these processes are also spatially heterogeneous, due to spatial patterns in landscape characteristics, meteorological phenomena and geomorphology. In addition, important gaps persist when calculating SS fluxes, mainly due to SS measurements are not always carried out with high frequency. Based on 65 river basins in France, with various sizes, geomorphologies and land uses, this study aims at testing methods for an estimation of annual sediment loads, based on infrequent SPM concentration data spanning over several decades.