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An evaluation of dimensionless shear stress in braided streams

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The evaluation of sediment transport rate in braided networks is a challenging issue. It is well known that the over reaction of the sediment discharge to the planimetric and altimetric variations is one of the peculiar characteristic of braiding (Paola, 2001) and causes the typical unsteadiness of the system (Ashmore, 1988; Hoey & Sutherland, 1991). But it has not been completely understood how the main morphodynamical parameters (water discharge, valley slope, channel width, Ĕ) affect the quantification of bed load transport rate in a braided river. A series of experimental runs has been performed on a laboratory model at the University of Trento (Italy), in a wide flume, with uniform sand and different values of the longitudinal slope and of the water discharge. We monitored the bed configuration with a laser sensor device and collected the sediment rate in a submerged tank at the downstream end of the flume. The objective of the data analysis is to obtain an evaluation of the dimensionless shear stress (Shields parameter) of the whole network and consequently to predict the mean sediment transport rate. Mean parameters of each cross section are computed with a simple model, that however takes into consideration the transversal variability of both geometry and flow. This procedure allows for a better estimate of the sediment transport, that, on the contrary, is invariably underestimated in the one dimensional standard models (Ferguson, 2003). The data are then averaged on a great number of cross sections, in order to filter out the characteristic fluctuations of braiding. Data analysis shows that the mean value of the Shields parameter on the whole network seems not to depend on the water discharge. Therefore, the solid discharge is mainly function of the active width (i.e. the portion of the total width where sediment transport occurs) of the network.