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Monitoring and modelling sediment transport in Versilia river (Tuscany-Italy)

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The shoreline of Tuscany region, located in the central part of Italy, is in these years experiencing a large erosion phenomenon, being of the order of several meters per year. In order to have a better understanding of this phenomenon, an estimation of both the volume and composition (gravel and sand) of sediments delivered by the rivers to the coastal zone over time scales of the order of one year is needed.

The aim of this research is to provide reliable sediment rating curves, i.e. relationships between the flow discharge and the sediment discharge, in a monitoring station located in the Versilia river. Sediment rating curves in gravel-bed rivers are developed from formulae or from sampling campaigns. The former are notoriously inaccurate; the latter require a large effort and may still not achieve an acceptable accuracy.

In this work, the sediment rating curve has been developed thorough an integrated approach combining field measurements and mathematical modelling. In the field phase, bed load and suspended load have been collected during various flood events together with measurements of local flow velocities, water depths and cross section geometry. In the analysis of suspended load, particular attention has been devoted to determine the wash load component. In the modelling phase, we have implemented a 1D hydro-morphodynamic model able to simulate the propagation of a flood wave in the reach under investigation considering the mobile character of the bed.