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# Computation of sediment transport in rivers: analysis of the sediment rating curves

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Some studies about analytical solutions of a 1-D morphodynamic model (Fasolato et al., 2010) have shown that any river reach maintains a stationary morphological situation (equilibrium condition) under the hypothesis that the boundaries of the river reach are in equilibrium as far as solid and liquid inputs are concerned. This hypothesis means that the bottom profile of the river reach and the grainsize composition of the bed should remain constant in time, provided that sediments and water entering the river reach are related by an equilibrium relation.
This condition is not always satisfied, especially in the mountain rivers, as the formation mechanisms of water and sediment inputs are quite different and seasonally delayed. These initial perturbations give place to important deviations from the "average" curve of sediment transport vs water flow curve (namely from the transport curve calculated in equilibrium conditions).
This work presents a general approach that can be used to explain and possibly predict these deviations. The approach is based on the deterministic analytical solution of the harmonic river (Fasolato et al., 2010), combined with a recursive model of ArMa type, which found the unknown parameters of the linear combination of the boundary conditions through minimizing a mean square error, in order to obtain the best ArMa model from two different points of view: its performances both in fitting the available data and providing a prediction algorithm for the future evolutions. The recursive model for a synthetic river reach will provide the instantaneous sediment discharge as a function of the instantaneous water flow (namely equilibrium conditions) and the water flow measured at one or more previous time (non-equilibrium conditions).
The model is applied of two Italian case studies: Adige River and Po River.