

## **Abstract**

In the last fifty years, new engineering problems, connected with gravel extraction, installation of dams and disposal of mine waste into rivers, have risen to the extent that sediment transport modeling is assuming a key role in realistic river hydraulic simulations. Floods, meandering, sediment load computation, river bed aggradation or degradation, channel design and navigation are some of the problems concerning the sediment transport in rivers. The description of the river dynamics and morphodynamics is then relevant and a clearer analysis of the existing models is necessary. Standard mathematical models for sediment transport in rivers employ simplified continuity equations. These equations are only valid for low sediment concentrations and Froude number. A rather complete model is presented and thanks to the coupling between morphodynamics and hydrodynamics the model can be applied also to higher concentration regimes and Froude number. Finally, numerical simulation of river dynamics has to consider the non-uniformity of sediments. In this work, a more traditional scheme, in which the grain size distribution curve is divided into a discrete number of classes and the transport is calculated for each class, is compared with a novel formulation. This method is based on the series expansion of sediment transport formulas. In conclusion, the algorithm can be integrated with a description of grain sorting and non-uniform sediment transport in order to better describe the river dynamics and morphology.