



Morphodynamics modelling of bars in channels with graded sediment and sediment supply variation with the Telemac-Mascaret System

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Keywords: Graded sediment transport, fluvial morphodynamics, alluvial bars, numerical modelling, fluvial engineering.

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Abstract:

Numerical modelling of graded sediment transport in rivers remains a challenge [Siviglia and Crosato, 2016] and only few studies have considered the non-uniform distribution of sediment, although sediment grading is an inherent characteristic of natural rivers. The present work aims at revisiting the morphodynamics module of the Telemac-Mascaret modelling system and to integrate the latest developments to model the effects of non-uniform sediment on i) the sediment transport capacity estimated at the interface between the flow and the riverbed and on ii) the vertical sorting of sediment deposits in response to sediment supply changes. The implementation of these two processes has a key role on the modelling of bar dynamics in aggrading/degrading channels [Blom, 2008]. Numerical modelling of graded sediment transport remains a challenge due to the difficulty to reproduce the non-linear interactions between grains of different shape and size. Application of classical bedload equations usually fails in reproducing relevant transport rates [Recking, 2010 and references therein]. In this work, the graded sediment transport model of Wilcock and Crowe [2003] and the active layer concept of Hirano [1971] for the formulation of the exchange layer are implemented. The ability to reproduce the formation and evolution of graded-sediment bars is assessed on the basis of laboratory experiences from the literature.

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