

A Second Order Time Homogenized Model for Sediment Transport

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A multi-scale method for the hyperbolic systems governing sediment transport in subcritical case is developed. The scale separation of this problem is due to the fact that the sediment transport is much slower than flow velocity. We first derive a zeroth order homogenized model, and then propose a first order correction. It is revealed that the first order correction for hyperbolic systems has to be applied on the characteristic speed of slow variables in one dimensional case. In two dimensional case, besides the characteristic speed, the source term is also corrected. We develop a second order numerical scheme following the framework of heterogeneous multi-scale method. The numerical results in both one and two dimensional cases demonstrate the effectiveness and efficiency of our method.