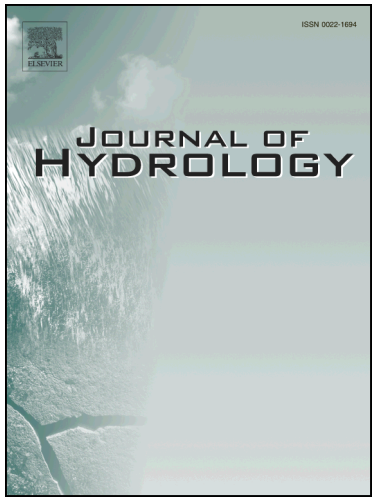

Research papers

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Modelling of hyperconcentrated flood and channel evolution in a braided reach using a dynamically coupled one-dimensional approach

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Abstract: Hyperconcentrated sediment-laden floods often occur in a braided reach of the Lower Yellow River, usually leading to significant channel evolution. A one-dimensional (1D) morphodynamic model using a dynamically coupled solution approach is developed to simulate hyperconcentrated flood and channel evolution in the braided reach with an extremely irregular cross-sectional geometry. In the model, the improved equations for hydrodynamics account for the effects of sediment concentration and bed evolution, which are coupled with the equations of non-equilibrium sediment transport and bed evolution. The model was validated using measurements from the 1977 and 2004 hyperconcentrated floods. Furthermore, the effects were investigated of different cross-sectional spacings and allocation modes of channel deformation area on the model results. It was found that a suitable cross-sectional distance of less than 3 km should be adopted when simulating hyperconcentrated floods, and the results using the uniform allocation mode can agree better with measurements than other two allocation modes.

Keywords: hyperconcentrated flood; morphodynamic model; coupled solution; cross-sectional spacing; allocation mode of bed deformation area; braided reach