

Numerical Modeling of Wave Run-Up in Shallow Water Flows Using Moving Wet/Dry Interfaces

Authors : Alia Alghosoun, Michael Herty, Mohammed Seaid

Abstract : We present a new class of numerical techniques to solve shallow water flows over dry areas including run-up. Many recent investigations on wave run-up in coastal areas are based on the well-known shallow water equations. Numerical simulations have also performed to understand the effects of several factors on tsunami wave impact and run-up in the presence of coastal areas. In all these simulations the shallow water equations are solved in entire domain including dry areas and special treatments are used for numerical solution of singularities at these dry regions. In the present study we propose a new method to deal with these difficulties by reformulating the shallow water equations into a new system to be solved only in the wetted domain. The system is obtained by a change in the coordinates leading to a set of equations in a moving domain for which the wet/dry interface is the reconstructed using the wave speed. To solve the new system we present a finite volume method of Lax-Friedrich type along with a modified method of characteristics. The method is well-balanced and accurately resolves dam-break problems over dry areas.

Keywords : dam-break problems, finite volume method, run-up waves, shallow water flows, wet/dry interfaces

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