



Robust Numerical Methods for Shallow Water Flows and Advective Transport Simulation on Unstructured Grids

By Jingming Hou

Shaker Verlag Mai 2013, 2013. Buch. Condition: Neu. Neuware - The two-dimensional (2D) shallow water equations (SWEs) are extensively used for hydrodynamic simulations in hydraulic and environmental engineering. The transport process inside shallow water, such as the transport of contaminant and sediment, can be modeled by solving the transport equation numerically. When solving the advective transport equation and SWEs, second order numerical schemes are widely used to reduce numerical diffusion caused by first order schemes. However, numerical oscillations may be induced by second order schemes without proper limiters. Second order total variation diminishing based flux limiting schemes (TVD schemes) are able to get rid of such numerical oscillations. In this cumulative dissertation, second order TVD schemes derived on 1D grids are extended to 2D unstructured grids, within the framework of the cell-centered finite volume method, to comfort to complex geometry. Moreover, an efficient treatment for slope source terms of SWEs and a robust approach handling wetting and drying are devised. This dissertation is on the basis of four papers in peer reviewed international journals and four conference contributions. To extend second order TVD schemes to 2D unstructured grids, three methods are developed step by step. The first method adopts the...



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