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Balancing source terms and flux gradients in high-resolution Godunov methods: The quasi-steady wave-propagation algorithm. (English) Zbl 0931.76059

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We develop a variant of the wave-propagation algorithm which addresses the title problem by introducing a Riemann problem at the center of each grid cell whose flux difference exactly cancels the source term. This leads to modified Riemann problems at the cell edges in which the jump now corresponds to perturbations from the steady state. Computing waves and limiters based on the solution to these Riemann problems give high-resolution results. The one- and two-dimensional shallow water equations for flow over arbitrary bottom topography are used as an example, through the ideas apply to many other systems. The method is easily implemented in the software package CLAWPACK. © Academic Press.

MSC:

- 76M20 Finite difference methods applied to problems in fluid mechanics
- 76B15 Water waves, gravity waves; dispersion and scattering, nonlinear interaction
- 76L05 Shock waves and blast waves in fluid mechanics
- 35L65 Hyperbolic conservation laws

Cited in **255** Documents

Keywords:

shock capturing; Riemann problem; shallow water equations; arbitrary bottom topography; software package CLAWPACK

Software:

HE-E1GODF; CLAWPACK

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