A fully well-balanced scheme for the 1D rotating shallow water equations

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Various numerical schemes have been designed to approach the solutions of the well-known shallow water equations. The preservation of steady states, namely the well-balanced property, appears to be a of crucial interest to avoid nonphysical oscillations. By adding the Coriolis force to the system, we can model fluid flows at large scale since we take into account the Earth rotation. In consequence, the steady states are modified and their numerical preservation represents a real challenge. The first part of this presentation is devoted to the derivation of a numerical scheme that preserves all the steady states. Our strategy relies on a Godunov-type scheme with suitable source term and steady states discretisations. An other main issue detailed in the second part consists in improving the order of the scheme while preserving the fully well-balanced property. A suitable modification of classical methods is necessary. Finally, some numerical experiments will show the relevance and the accuracy of both first-order and second-order schemes.