

Well-balanced flux-splitting finite volume methods using two matrices. Application to Shallow Water Equations with topography

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In this work, we present a technique to obtain well-balanced finite volume flux-splitting methods that uses two matrices. We consider a general formulation where we can write for example the Steger-Warming method and the Marquina's flux formula (see [R. Donat and A. Marquina. *J. Comput. Phys.*, (1996)] and [R. P. Fedkiw, B. Merriman, R. Donat, and S. Osher. In *Innovative methods for numerical solutions of partial differential equations.* (2002)]). For the case of Shallow Water Equations with topography the numerical scheme preserves exactly the stationary solution of water at rest (see [A. Bermúdez and M. E. Vázquez. *Computers & Fluids* (1994)]). The proposed scheme is validated with several numerical tests.

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