About fully-well-balanced schemes for shallow-water equations.

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The present work concerns the numerical approximation of the weak solutions of the well-known shallow-water model. A particular attention is paid on the steady states. Indeed such specific solutions are essential to ensure the accuracy of the scheme when considering some important regimes. A large literature is devoted to numerical schemes able to exactly preserve the so-called lake at rest which coincides to the simpler (linear) stationary regime. More recently, the nonlinear steady solutions, governed by the Bernouilli's equations, have been considered. The situation turns out to be drastically distinct because of the strong nonlinearties. In the present talk, we present several approach, based on Godunov-type methods, to deal with this severe problem. In addition, we present applications coming from nonlinear friction source term models. A MUSCL second-order extension is also proposed. This talk is illustrated with several numerical experiments.