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Abstract

When dealing with shallow water simulations, the velocity profile is often assumed to be constant along the vertical axis. However, since in many applications this is not the case, modelling errors can be significant. Hence, in this work, we deal with the Shallow Water Linearized Moment Equations (SWLME), in which the velocity is no longer constant in the vertical direction, where a polynomial expansion around the mean value is considered. The linearized version implies neglecting the non-linear terms of the basis coefficients in the higher order equations. As a result, the model is always hyperbolic and the stationary solutions can be more easily computed. Then, our objective is to propose an efficient, accurate and robust numerical scheme for the SWLME model, specially adapted for low Froude number situations. Hence, we describe a semi-implicit second order exactly fully well-balanced method. More specifically, a splitting is performed to separate acoustic and material phenomena. The acoustic waves are treated in an implicit manner to gain in efficiency when dealing with subsonic flow regimes, whereas the second order of accuracy is achieved thanks to a polynomial reconstruction and Strang-splitting method. We also exploit a reconstruction operator to achieve the fully well-balanced character of the method.