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Arbitrary order finite volume schemes for SWE: complex flows in enclosed water bodies

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The aim of this work is to design and validate a 2D arbitrary order WENO-ADER scheme for the simulation of free surface flows using the Shallow Water Equations (SWE) with bed slope and friction terms. Experimental data obtained in a straight channel equipped with bank lateral embayments has been considered as a benchmark. The complexity of the flow patterns observed in the laboratory channel challenges the prediction capacity of the numerical scheme. Gravitational waves and resonant phenomena are successfully reproduced by the computational technique herein described. Thanks to the high order level of accuracy provided by the numerical scheme, the transient vortex shedding in the lateral cavities and their effect in the flow of the main channel are well captured. Contrary to high order schemes, the 1-st order version of this scheme is not able to reproduce the intrinsic particularities of such flow. We can thus affirm that such combination of the 2D depth-averaged mathematical model (SWE) with a high order numerical solver provides accurate results with an affordable computational time.