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Reliability of general purpose finite-volume solvers for wall-modeled large-eddy simulation of open channel flow at a moderate Reynolds number WEIYI LI, MARCO GIOMETTO, Columbia University — Wall-modeled large-eddy simulation is increasingly being used in both industry and academia for the characterization of wall-bounded high Reynolds number flows. Numerical simulations are often carried out using general-purpose finite volume solvers, whose solution is known to be particularly sensitive to the nature of the discretization scheme. Such a sensitivity introduces a degree of uncertainty in model results that is yet to be fully quantified. We here assess the quality and reliability of a general-purpose finite volume solver in wall-modeled large-eddy simulation of a pressure-driven, open-channel flow at friction Reynolds number 2000. Simulations are performed using an algebraic, equilibrium, wall-layer model. Results are contrasted against corresponding DNS data and predictions from a single-domain pseudo-spectral solver. Model predictions will be discussed with a lens on the impact of the grid aspect-ratio, grid resolution, discretization schemes for the velocity and pressure, time stepping procedure, and velocity-pressure coupling scheme.

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