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ACHIEVING EFFICIENT SOLUTIONS TO THE SHALLOW WATER EQUATIONS WITH HIGH-ORDER DISCONTINUOUS GALERKIN METHODS

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In this presentation, we investigate the performance of high-order discontinuous Galerkin finite element discretizations of the shallow water equations through application to a suite of rigorous test cases. The test cases considered incorporate a number of factors that need to be considered in order to properly assess the capability of high-order methods to model realistic coastal flow problems, including time-dependent boundary conditions in the form of tidal forcing, spatially varying bathymetry, curved boundaries, and source terms in the form of friction. We highlight several issues that need to be taken into account in the solution of such problems in order to fully gain the benefits of using a high-order approximation. We also present new high-order explicit time steppers and numerical integration rules designed specifically for discontinuous Galerkin discretizations of hyperbolic problems and examine the reduction in computational cost that they afford over well-established methods.