Recent progress in discontinuous Galerkin methods for shallow water and overland flow

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ABSTRACT

In this talk, I will discuss recent progress in the development and application of discontinuous Galerkin (DG) finite element methods for one- (section-averaged), two- (depth-averaged), and three-dimensional shallow water flow, along with approaches for modeling the corresponding kinematic approximation to these equations for overland flow due to rainfall runoff. The DG methods are being developed in the context of a multidimensional, multi-physics modeling framework for coupled shallow water + overland flow that employs three-/two-dimensional (prismatic/triangular) elements for shallow water flow, one-dimensional line elements (element edges) for flow in small-scale channels/rivers that are too computationally expensive to resolve in a full multidimensional setting, and the concept of so-called kinematic or run-off cascades for overland flow. We will discuss the formulation and implementation of the new modeling approach and present results from example test cases.