Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

A novel family of DG methods for diffusion problems PHILIP JOHNSON, ERIC JOHNSEN, Univ of Michigan - Ann Arbor — We describe and demonstrate a novel family of numerical schemes for handling elliptic/parabolic PDE behavior within the discontinuous Galerkin (DG) framework. Starting from the mixed-form approach commonly applied for handling diffusion (examples include Local DG and BR2), the new schemes apply the Recovery concept of Van Leer to handle cell interface terms. By applying recovery within the mixed-form approach, we have designed multiple schemes that show better accuracy than other mixed-form approaches while being more flexible and easier to implement than the Recovery DG schemes of Van Leer. While typical mixed-form approaches converge at rate 2p in the cell-average or functional error norms (where p is the order of the solution polynomial), many of our approaches achieve order 2p+2 convergence. In this talk, we will describe multiple schemes, including both compact and non-compact implementations; the compact approaches use only interface-connected neighbors to form the residual for each element, while the non-compact approaches add one extra layer to the stencil. In addition to testing the schemes on purely parabolic PDE problems, we apply them to handle the diffusive flux terms in advection-diffusion systems, such as the compressible Navier-Stokes equations.

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Date submitted: 31 Jul 2017 Electronic form version 1.4