1079-65-154 **Yanlai Chen***, 285 Old Westport Rd, Department of Mathematics, North Dartmouth, MA 02747, and **Bernardo Cockburn**, 127 Vincent Hall, 206 Church St. SE, Minneapolis, MN 55455.
Convergence Analysis of Variable-degree HDG Methods for Convection-diffusion Equations on Nonconforming Meshes.

We present the error analysis of hybridizable discontinuous Galerkin (HDG) methods for convection-diffusion equations with variable-degree approximations on nonconforming meshes. In particular, for approximations of degree k on all elements and conforming meshes, we show that the order of convergence of the error in the diffusive flux is $k+1$ and that that of a projection of the error in the scalar unknown is 1 for $k=0$ and $k+2$ for $k>0$. We also show that, for the variable-degree case, the projection of the error in the scalar variable is h-times the projection of the error in the vector variable. When general nonconforming meshes are used, our estimates do not rule out a degradation of $1/2$ in the order of convergence in the diffusive flux and a loss of 1 in the order of convergence of the projection of the error in the scalar variable. They do guarantee the optimal convergence of order k+1 of the scalar variable. However, we show these losses of orders can be *recovered* if semimatching nonconforming meshes are used. These results hold for any (bounded) irregularity index of the nonconformity of the mesh. Finally, our analysis can be extended to hypercubes. (Received January 10, 2012)