Discontinuous Galerkin Methods for Flow and Transport Problems in Porous Media

Béatrice Rivière and Mary F. Wheeler

The Center for Subsurface Modeling, TICAM, The University of Texas, Austin TX 78712, USA

Abstract

A class of Discontinuous Galerkin methods for solving fluid flow problems in porous media is presented and analyzed. These methods are locally conservative and they allow the use of a higher order approximation and unstructured grids. *A priori hp* error estimates are derived in the case of single phase flow problems. In the case of miscible displacement problems, which is modelized by coupled flow and transport equations, a new scheme based on discontinuous approximation spaces is introduced. Numerical comparisons are made between this scheme and the well known mixed finite element and higher order Godunov methods. The simulations clearly show the advantages of the Discontinuous Galerkin methods,