Rob Stevenson[*]

joint work with

Wolfgang Dahmen[†]

[*]Korteweg-de Vries Institute for Mathematics, University of Amsterdam, Netherlands

[†]Institut für Geometrie und Praktische Mathematik, RWTH Aachen, Germany

A stable DPG formulation of transport equations

We formulate and analyse a Discontinuous Petrov Galerkin formulation of linear transport equations with variable convection fields. We show that a corresponding *infinite dimensional* mesh-dependent variational formulation, in which besides the principal field also its trace on the mesh skeleton is an unknown, is uniformly stable with respect to the mesh, where the test space is a certain product space over the underlying domain partition.

Our main result states then the following. For piecewise polynomial trial spaces of degree m, we show under mild assumptions on the convection field that piecewise polynomial test spaces of degree $m+1$ over a refinement of the primal partition with uniformly bounded refinement depth give rise to uniformly (with respect to the mesh size) stable Petrov-Galerkin discretizations.

Finally we show how rigorously computable a posteriori error bounds can drive a convergent adaptive algorithm.