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**Discontinuous  $hp$ -finite element methods for advection-diffusion-reaction problems.** (English)

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SIAM J. Numer. Anal. 39, No. 6, 2133-2163 (2002).

The  $hp$ -version of the discontinuous Galerkin finite element method (DGFEM) for second-order partial differential equations with nonnegative characteristic form is studied. This class of equations includes elliptic and parabolic equations of 2nd order and problems of mixed hyperbolic-elliptic-parabolic type, but the emphasis in this paper is on advection-reaction equations without streamline-diffusion stabilization.

The error bounds are  $h$ -optimal and  $p$ -suboptimal since a factor of  $p^{1/2}$  enters. An extra factor of this kind is often encountered with  $hp$ -elements, and without a clever use of an  $L_2$ -projection a factor of  $p^{3/2}$  would deteriorate the estimate here. Moreover, the connection with mortar elements is mentioned. In particular the DGFEM is related to the case that the number of subdomains is not bounded for  $h \rightarrow 0$ .

Reviewer: [Dietrich Braess \(Bochum\)](#)

**MSC:**

- [65N30](#) Finite element, Rayleigh-Ritz and Galerkin methods for boundary value problems involving PDEs
- [65N12](#) Stability and convergence of numerical methods for boundary value problems involving PDEs
- [65N15](#) Error bounds for boundary value problems involving PDEs
- [35J25](#) Boundary value problems for second-order elliptic equations

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