Some advances in the upwind hybridized discontinuous Galerkin method for dynamical cores

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We will present new developments on the emerging Hybridized Discontinuous Galerkin (HDG) method targeting at large-scale and parallel simulation of the dynamical core. In particular, we will present an iterative HDG (iHDG) method that exploits current and future multi-threaded computing system with massive concurrencies. We provide both theoretical justification and numerical results to support the iHDG idea. Furthermore, we also present fast and scalable preconditioning strategies for HDG method that potentially make the HDG approach competitive with the existing methods. Several test cases and models for the dynamical core will be presented to demonstrate the potential of the HDG approach.

Keywords: hybridizable Discontinuous Galerkin method, Discontinuous Galerkin method, non-hydrostatic model, dynamical core, parallelization