6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11 – 15 June 2018, Glasgow, UK

PRECONDITIONERS FOR HYBRID DISCONTINUOUS GALERKIN METHODS OF THE STOKES PROBLEM

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Key Words: *hybridized, discontinuous Galerkin methods, preconditioning, Stokes*

Recently we introduced hybrid methods for the Stokes problem which were constructed such that the approximate velocity field is pointwise divergence free and H(div)-conforming [1]. A consequence of these properties is that our hybrid methods are pressure-robust, compatible with discontinuous Galerkin discretizations of transport equations and, in the case of the Navier–Stokes problem, our method is locally conservative and energy stable [2].

To achieve a pointwise divergence free and H(div)-conforming velocity field, we introduced a Lagrange multiplier to enforce normal continuity of the velocity field across facets and a Lagrange multiplier to penalize the fact that the approximate velocity field is not in H^1. As is typical of hybrid methods, it is then possible to eliminate element degrees of freedom from the linear system so that the Lagrange multipliers are the only globally coupled degrees of freedom. This static condensation significantly reduces the size of the discrete problem. In this talk we will discuss optimal preconditioners for these statically condensed linear systems.

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