Two Discretisations of the Time-Dependent Bingham Problem

Mira Schedensack (Universitaet Leipzig, Mathematisches Institut),
Carsten Carstensen

This talk introduces a non-conforming Crouzeix-Raviart approximation of the stationary three-dimensional Bingham problem and the two-dimensional Mosolov problem for the flow in a pipe. The non-conformity allows for quasi optimal error estimates in contrast to the standard conforming $P1$ finite element scheme. Moreover, this space discretisation is combined with two time-discretisations for the corresponding time-dependent problems. The first time discretisation is a generalised midpoint rule and the second time discretisation is a discontinuous Galerkin scheme. The a priori error analyses for both schemes yield certain convergence rates in time and optimal convergence rates in space. It guarantees convergence of the fully-discrete scheme with a discontinuous Galerkin time-discretisation for consistent initial conditions and a source term $f \in H^1(0,T;L^2(\Omega))$.

[link to pdf] [back to Numdiff-17]