

HYBRID HIGH-ORDER METHODS FOR INCOMPRESSIBLE FLOWS OF NON-NEWTONIAN FLUIDS

MICHELE BOTTI, DANIEL CASTAÑÓN QUIROZ, DANIELE A. DI PIETRO, AND ANDRÉ HARNIST

ABSTRACT. In this presentation we first give a quick introduction to the Hybrid High-Order (HHO) method for the Poisson equation, and mention its connection with the Hybrid Discontinuous Galerkin (HDG) method. We then present a HHO method for the steady motion of non-Newtonian incompressible fluids of small velocities, and then continue with a HHO method for generalized Navier–Stokes equations adapted, not only to non-Newtonian fluids, but also to fluids with non-classical convective behaviour. Both methods have several appealing features such as the support of general meshes and high-order approximation. We present a convergence analysis of both methods under some general assumptions. The final part of the presentation will be dedicated to illustrating the methods with a well-known problem in fluid mechanics, the lid-driven cavity flow.

Keywords: hybrid high-order methods; non-Newtonian fluids; Navier–Stokes; general meshes;

Mathematics Subject Classifications (2010): 65N08, 65N30, 65N12, 35Q30, 76D05

MOX, DEPARTMENT OF MATHEMATICS, POLITECNICO DI MILANO, MILANO, ITALY.

Email address: `michele.botti@polimi.it`

INSTITUTO DE INVESTIGACIONES EN MATEMÁTICAS APLICADAS Y EN SISTEMAS, UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO, MÉXICO.

Email address: `daniel.castanon@iimas.unam.mx`

IMAG, UNIV MONTPELLIER, CNRS, MONTPELLIER, FRANCE.

Email address: `daniele.di-pietro@umontpellier.fr`

LMAC, UNIVERSITÉ DE TECHNOLOGIE DE COMPIÈGNE, COMPIÈGNE, FRANCE.

Email address: `andre.harnist@utc.fr`