MODELING, APPROXIMATION, AND ANALYSIS OF PARTIAL DIFFERENTIAL EQUATIONS INVOLVING SINGULAR SOURCE TERMS (MS - ID 39)

Analysis and approximation of fluids under singular forcing

Abner Salgado

University of Tennessee

asalgad1@utk.edu

Motivated by applications, like modeling of thin structures immersed in a fluid, we develop a well posedness theory for Newtonian and some non-Newtonian fluids under singular forcing in Lipschitz domains, and in convex polytopes. The main idea, that allows us to deal with such forces, is that we study the problem in suitably weighted Sobolev spaces. We develop an a priori approximation theory, which requires to develop the stability of the Stokes projector over weighted spaces. In the case that the forcing is a linear combination of Dirac deltas, we develop a posteriori error estimators for the stationary Stokes and Navier Stokes problems. We show that our estimators are reliable and locally efficient, and illustrate their performance within an adaptive method. We briefly comment on ongoing work regarding the Bousinessq system. Numerical experiments illustrate and complement our theory.