Oberseminar Nichtlineare Differentialgleichungen

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A variational approach to the (non-newtonian) Navier-Stokes equations

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Abstract: In this talk, we discuss an alternative approach to obtain solutions to the Navier-Stokes equations via variational methods. In particular, we deal with the regime of non-newtonian fluids, i.e. where the fluid's viscosity is not constant, but dependent on the rate-of-strain. Inspired by the treatment in the newtonian framework, we define a sequence of functionals with a positive parameter. We show that minimisers of these functionals converge weakly to Leray-Hopf solutions of the Navier-Stokes equations as the parameter tends to zero. This variational approach might offer a new mathematical viewpoint on turbulent behaviour of fluids, as effects of weak convergence are directly visible in the problem setup.

The talk is based on joint work with Christina Lienstromberg (Stuttgart), M. Ortiz (California Institute of Technology) and R. Schubert (Bonn)

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