

Well-posedness and optimal control for stochastic second grade fluids

Fernanda Cipriano

*Centro de Matemática e Aplicações (CMA), FCT, UNL and Department of
Mathematics, New University of Lisbon, Portugal.*

cipriano@fct.unl.pt

Abstract

This work deals with stochastic second grade fluids, which are incompressible non-Newtonian type fluids. It is well known that small random perturbations of turbulent fluids can substantially modify its behavior; here the deterministic equations are perturbed by a multiplicative white noise. We study the existence and uniqueness of stochastic solutions on a two-dimensional bounded domain endowed with slip boundary conditions. We also address a control problem, where the control is effected through a distributed random force. The well-posedness of the corresponding linearized equations is the main issue to analyze the Gâteaux derivative of the control-to-state map. The analysis of the adjoint equations allows to establish the first order necessary optimality conditions.

This is a joint work with N.V. Chemetov.

Keywords: Stochastic second grade fluids, Stochastic optimal control, Necessary optimality conditions.