# On the Stochastic Optimal Distributed Control of 3rd Grade Fluids

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Most studies on fluid dynamics have been devoted to Newtonian fluids, which are characterized by the classical Newton's law of viscosity. However, there exists many real fluids with nonlinear viscoelastic behavior that does not obey Newton's law of viscosity. My aim is to present some results on the derivation of "the optimality system" related to a class of non-Newtonian fluids of differential type. Namely, the stochastic optimal control of incompressible $3^{rd}$-grade fluids in 2D,driven by a multiplicative noise via *formal Lagrange multipliers in infinite-dimensional systems*. This talk is based on a recent work with Fernanda Cipriano (CMA, Univ. NOVA de Lisboa).