



SEMINÁRIO DE EQUAÇÕES DIFERENCIAIS

**Well-posedness and optimal control for stochastic second grade
fluids**

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Resumo: The theory of turbulent Newtonian fluids turns out that the choice of the boundary condition is a relevant issue, since it can modify the behavior of the fluid by creating or avoiding a strong boundary layer.

- (1) We study stochastic second grade fluids filling a two-dimensional bounded domain, with the Navier-slip boundary condition with friction. We prove the well-posedness of this problem and establish a stability result. Our stochastic model involves a multiplicative white noise and a convective term with third order derivatives, which significantly complicate the analysis.
- (2) Also we study a stochastic control problem for the two-dimensional stochastic second grade fluids. The control acts through an external

stochastic force and we search for a control that minimizes a cost functional. We show that the Gâteaux derivative of the control to state map is a stochastic process being the unique solution of the stochastic linearized state equation. The well-posedness of the corresponding stochastic backward adjoint equation is also established, allowing to derive the first order optimality condition.

Joint work with Fernanda Cipriano, New University of Lisbon, Portugal.