# Homogeneous vs inhomogeneous turbulence at high Reynolds numbers in Newtonian, viscoelastic and hyper viscous fluids analysed through DNS

Carlos B. da Silva
IDMEC, Instituto Superior Técnico, Universidade de Lisboa, Lisboa 1049-001, Portugal

Recent direct numerical simulations (DNS) carried out at higher Reynolds numbers than previously available are used to finally settle several issues in homogeneous and strongly inhomogeneous turbulence. We start with the scaling of the so-called turbulent/non-turbulent interface that delimits the turbulent from the irrotational flow region in jets, wakes, mixing layers and boundary layers in Newtonian fluids, before showing how new hyper viscous simulations are able to finally settle down some long standing questions regarding the Lagrangian Kolmogorov similarity theory and Richardson's $t^3$ law. The talk ends with a discussion of the form of the energy spectrum in viscoelastic fluids at high Reynolds number which are used to build what is arguably the first large-eddy simulation model for viscoelastic fluids described by the FENE-p constitutive model.