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Vortex rings in non-Newtonian viscoelastic fluids play yo-yo

Julie ALBAGNAC^{1,2}, David LAUPTSIEN^{1,2}, Dominique ANNE-ARCHARD^{1,2}

1. Université de Toulouse ; INPT, UPS ; IMFT (Institut de Mécanique des Fluides de Toulouse) ;
Allée Camille Soula, F-31400 Toulouse, France
2. CNRS ; IMFT ; F-31400 Toulouse, France

-abstract-

Vortex rings are coherent vortical structures widely presents in geophysical flows and engineering applications. Numerous applications imply industrial processes including food processing, or petrol industry. Those applications are very often confronted with non-Newtonian fluids. Nevertheless, to the best of our knowledge, only few studies dealing with vortex dynamics in non-Newtonian shear-thinning fluids exist, and none with viscoelastic ones.

The aim for the present study is to characterize experimentally the dynamics of vortex rings generated thanks to a piston-cylinder apparatus in various viscoelastic fluids as a function of the generalized Reynolds number, the piston stroke and the final piston position relative to the cylinder exit. In particular, the elastic property of the fluid will be highlighted by the furling-unfurling of vortex rings.

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