ETH zürich

Institute of Fluid Dynamics
Institute of Energy and Process Engineering

Colloquium Thermo- and Fluid Dynamics

Instabilities in rectlinear flows and their link to viscoelastic turbulence with and without inertia

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Many liquids in the modern world possess both elastic and viscous properties (e.g. paints, saliva and DNA suspensions, among many other polymers). Understanding their behaviour is paramount in many industrial processes where turbulence is commonplace but may be highly undesirable (e.g. pharmaceutical, chemical, and plastic). Little is known about how and why this viscoelastic turbulence occurs, mainly due to the complexity and variety of the mathematical models used to describe it. In particular, it has only recently been realised that there may be three distinct types: a polymer-adjusted Newtonian turbulence (NT), which predominantly exists due to inertial effects; elastic turbulence (ET), which exists in the absence of inertia and is entirely driven by the elasticity, and a third form called Elasto-inertial turbulence (EIT) which requires a balance of inertia and elasticity to exist. Many questions exist about these two forms of viscoelastic turbulence: in particular, whether they are dynamically connected, what triggers them and how EIT interacts with the presence of Newtonian turbulence at low levels of elasticity. In this talk, I will attempt to review recent work seeking some answers largely stimulated by a recently-discovered viscoelastic centre mode instability (Garg et al. Phys. Rev. Lett., 121, 024502, 2018) and a newly-discovered `polymer diffusive instability' (Beneitez et al. Phys. Rev. Fluids 8, L101901, 2023).

Since 2021, I have been a postdoc in the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge and a Junior Research Fellow at Christ's College, Cambridge. Before that, I did my PhD at KTH Royal Institute of Technology in Stockholm, working on the subcritical transition of shear flows.

Date: Wednesday, 3 April 2024
Time: 16:15 - 17:15h
Place: ETH Zurich, ML H 44
Host: Prof. George Haller

Further information: https://ifd.ethz.ch/events/ktf.html

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