Abstract Submitted
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Onset of elasto-inertial turbulence in Taylor-Couette flow[1] TOM LACASSAGNE, Department of Mechanical Engineering, University College London (UCL), London, WC1E 7JE, UK, NEIL CAGNEY, School of Engineering and Materials Science, Queen Mary University of London, JURRIAAN GILLISSEN, Department of Mathematics, University College London (UCL), London, WC1E 6BT, UK, STAVROULA BALABANI, Department of Mechanical Engineering, University College London (UCL), London, WC1E 7JE, UK — We study the Taylor-Couette flow of a constant viscosity (Boger fluid) viscoelastic polymer solution using a flow visualisation method [1]. We report evidence of a new route to elasto-inertial turbulence (EIT) caused by merging and splitting of base Taylor vortices –named merge-split transition (MST) hereafter-when crossed by elastic axial waves (RSW). Vortex merging and splitting events are not due to transient behaviour, finite aspect ratio or shear thinning behaviour. They are random in nature and increase in frequency with Re. They cause abrupt changes in the axial spatial wavelength, leading to the transition from RSW to the EIT state. We identify MST as an inertial feature solely triggered by elasticity. The final EIT state resembles inertial turbulence in that it is highly disordered and has a broadband spectral signature, but occurs at much lower Re [2,3]. Its existence could be of great interest for mixing applications. [1] N. Cagney and S. Balabani, Phys. Fluids, vol. 31, no. 5, p. 053102, 2019. [2] N. Liu and B. Khomami, J. Fluid Mech., vol. 737, p. R4, 2013 [3] N. Latrache, N. Abcha, O. Crumeyrolle, and I. Mutabazi, Phys. Rev. E, vol. 93, no. 4, p. 043126, 2016

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Tom Lacassagne
Department of Mechanical Engineering, University College London (UCL), London, WC1E 7JE, UK

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