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Understanding the link between deformability and drag reduction in sheared turbulent flows VAMSI SPANDAN, Physics of Fluids, University of Twente, ROBERTO VERZICCO, University of Rome "Tor Vergata", DETLEF LOHSE, Physics of Fluids, University of Twente — Injection of a small concentration of gas bubbles into a carrier fluid can result in significant drag reduction in wall bounded turbulent flows. While experimental studies have shown that deformability of the dispersed phase is crucial for strong drag reduction, measurement of local flow conditions to understand the governing mechanism is extremely challenging. In this work we attempt to understand the underlying physics between deformability and drag reduction across a regime of scales in a turbulent Taylor-Couette flow using Direct Numerical Simulations of the carrier flow while a mixture of approaches are used to simulate the dispersed phase (i) Euler-Lagrangian tracking of sub-Kolmogorov ellipsoidal bubbles with a sub-grid deformation model (ii) Fully resolved finite size bubbles with an interaction potential approach to capture the deformation dynamics. We will study and compare the boundary layer profiles, dispersion of the bubbles and shape oscillations of the bubbles as they are transported between the boundary layers and bulk back and forth to get a detailed understanding of the link between deformability and drag reduction.

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