Abstract Submitted
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Bubble deformability is crucial for strong drag reduction in turbulent Taylor-Couette flow[1] CHAO SUN, DANIELA NAREZO GUZMAN, DENNIS P.M. VAN GILS, DETLEF LOHSE, Physics of Fluids Group, University of Twente — Bubbly Taylor-Couette flow in the turbulent regime is studied both globally and locally at Reynolds numbers of $5.1 \times 10^5 - 2.0 \times 10^6$ for pure inner cylinder rotation. We measure the drag reduction (DR) based on the global torque for global gas volume fractions (α_{global}) up to 4%, and observe a moderate DR for Re $= 5.1 \times 10^5$, and a strong DR for Re $= 1.0 \times 10^6$ and 2.0×10^6. Remarkably, more than 40% of DR is achieved for $\alpha_{global} = 4\%$ at Re $= 2.0 \times 10^6$. We investigate the statistics of the liquid flow velocity, and directly measure the local bubble concentration and Weber number for two Reynolds numbers in different drag reduction regimes, i.e. Re $= 1.0 \times 10^6$ (strong DR) and 5.1×10^5 (moderate DR). By combining global and local measurements we reveal that bubble deformability is crucial for strong drag reduction in bubbly turbulent Taylor-Couette flow.

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