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Drag Modification by Micro-bubbles in Taylor-Couette Turbulence: A Numerical Approach VAMSI SPANDAN, RODOLFO OSTILLA-MONICO, ROBERTO VERZICCO, DETLEF LOHSE, Physics of Fluids, University of Twente — We simulate two phase Taylor-Couette (flow between two co-axial independently rotating cylinders) using the Euler-Lagrange approach in which bubbles are treated as point particles with effective forces such as drag, lift and added mass acting on them. The outer cylinder is stationary, while the inner cylinder is rotated to reach a Reynolds number $Re \sim 10^4$ with almost 10^5 bubbles dispersed into the carrier phase.Two-way coupling is implemented between the dispersed phase and the carrier phase allowing us to study the effect of these point like bubbles on the overall structure of the flow. The two-way coupling is implemented through a unique forcing scheme where the back reaction from a single bubble is spread out over a finite computational volume rather than a finite number of nodes as previously done in literature, which ensures grid independent results. We observe that the bubbles are responsible for disrupting the coherent vortical structures in the carrier flow ultimately resulting in drag modification. In addition we also study the spatial distribution and effect of neutrally buoyant particles dispersed into the flow.

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