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How gravity and size affect the acceleration statistics of bubbles in turbulence VIVEK N. PRAKASH, YOSHIYUKI TAGAWA, Physics of Fluids Group, University of Twente, The Netherlands, ENRICO CALZAVARINI, Laboratoire de Mecanique de Lille CNRS/UMR, Universite Lille 1, France, JULIAN MARTINEZ MERCADO, Physics of Fluids Group, University of Twente, The Netherlands, FEDERICO TOSCHI, Department of Physics, and Department of Mathematics and Computer Science, Eindhoven University of Technology, The Netherlands, DETLEF LOHSE, CHAO SUN, Physics of Fluids Group, University of Twente, The Netherlands, INTERNATIONAL COLLABORATION FOR TURBULENCE RESEARCH COLLABORATION — We report results from a Lagrangian experimental investigation in the largely unexplored regime of very light (air bubbles in water) and large particles ($D/\eta >> 1$) in turbulence. Using a traversing camera setup and particle tracking, we study the acceleration statistics of $\sim 3\ mm$ diameter (D) bubbles in a water tunnel with nearly homogeneous and isotropic turbulence generated by an active-grid. The experiments reveal that gravity increases the acceleration variance and reduces the intermittency of the PDF in the vertical direction. Moreover, the experimental acceleration PDF shows a substantial reduction in intermittency at growing size ratios, in contrast to neutrally buoyant or heavy particles. All these results are closely matched by numerical simulations of finite-size bubbles with Faxén corrections.

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