How much can we learn about the turbulence of fluids from the motions of tiny particles?

When investigating fluids, researchers introduce "fluid tracers" into the fluid and track their movement to visualize the fluid's motion; particles with very low inertia such as air bubbles have been assumed to make good tracers. This assumption, however, is now called into question by a study that demonstrated that using lightweight particles as tracers is not always a good idea, and that gravity has a significant effect on how tracers behave. The researchers of this study also devised a mathematical model to explain how the acceleration of particles in a turbulent fluid is affected by factors such as gravity.

What this study found calls for a change in methodology when using tracers. It questions the assumption that particles, bubbles, and droplets can all make good tracers as long as their inertia is small enough. The selection and accuracy of tracers in future work can be improved by taking the study's findings into account. Their findings and the mathematical model are applicable not only to small particles, but also to heavier and denser particles. Additionally, their model can be used not only in the flows of liquids, such as the ocean, but also for clouds in the atmosphere.