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Two-Phase Measurements Of Small Inertial Particles In High-Re Turbulent Boundary Layers TIM BERK, FILIPPO COLETTI, University of Minnesota — The interaction of small inertial particles with a turbulent boundary layer is of importance in a wealth of physical phenomena, e.g., transport of particles in the atmospheric boundary layer as well as industrial and biological applications. Our in-depth understanding is thwarted by the lack of comprehensive experiments. Here we perform two-phase measurements of microscopic inertial particles in high-Re turbulent boundary layers. Particles are injected in the boundary layer in the one-way coupled regime. Flow field measurements (PIV) and tracking of inertial particles (PTV) are performed simultaneously. This enables conditioned evaluation of fluid velocity at and around the inertial particles. The conditionally averaged flow around particles indicates the preferential sampling of specific flow structures by the inertial particles. This preferential sampling can help explain deviation of streamwise particle velocity from the mean fluid velocity and deviation of vertical particle velocity from the Stokes settling velocity. The fluid velocity at the particle location is an important term in, e.g., the advection-diffusion equation. Moreover, using the simultaneous two-phase measurements, widespread assumptions for estimating the concentration profile can be critically evaluated.

Tim Berk
University of Minnesota

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