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Effects of microbubbles on the Taylor-Green vortex flow A. FERRANTE, S. ELGHOBASHI, University of California, Irvine — Numerical simulations of the Taylor-Green vortex (TGV) flow laden with microbubbles were performed to study the effects of microbubbles on a simple vortical flow using the two-fluid approach. The study was motivated by our DNS results of a spatially developing turbulent boundary layer laden with microbubbles [J. Fluid Mech. 503 (2004)] which showed that the presence of bubbles results in a *local positive divergence of the fluid velocity*, $\nabla \cdot \mathbf{U}$. This velocity divergence displaces the near-wall quasi-streamwise vortical structures away from the wall, thus reducing the skin friction. In the present study, the continuity and momentum equations of both phases (fluid and bubbles) were numerically solved in a cubical domain. The results for Stokes number equal to 0.25 and bubbles volume fraction of 1% show that the magnitude of the vorticity at the center of the vortex decays faster than that of the single-phase flow. After 20 turnover times of the initial vortex, the magnitude of the vorticity at the center of the vortex becomes 30% smaller than that of the single-phase flow. Analysis of the vorticity equation shows that the *local positive velocity divergence of the fluid velocity*, $\nabla \cdot \mathbf{U}$, created in the vortex core by the clustering of the bubbles, is responsible for the vorticity decay. Results for different Stokes numbers and bubbles volume fractions will be presented.

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