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On bubble clustering and energy spectra in pseudo-turbulence[1]
JULIAN MARTINEZ MERCADO, DANIEL CHEHATA GOMEZ, DENNIS VAN GILS, CHAO SUN, DETLEF LOHSE, Physics of Fluids Group, Faculty of Science and Technology, University of Twente — We performed 3D-Particle Tracking (3D-PTV) and Phase Sensitive Constant Temperature Anemometry in pseudo-turbulence to investigate bubble clustering and to obtain the mean bubble rise velocity, distributions of bubble velocities, and energy spectra at dilute gas concentrations. To characterize the clustering the pair correlation function $G(r, \theta)$ is calculated. The deformable bubbles with equivalent bubble diameter $d_b = 4 - 5$ mm are found to cluster within a radial distance of a few bubble radii with a preferred vertical orientation. This vertical alignment is present at both small and large scales. The large number of data-points and the non intrusiveness of PTV allowed to obtain well-converged Probability Density Functions (PDFs) of the bubble velocity. The PDFs have a non-Gaussian form for all velocity components and intermittency effects can be observed. The energy spectrum of the liquid fluctuations decays with a power law of -3.2, different from the $\approx -5/3$ found for homogeneous isotropic turbulence.

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