On bubble clustering in pseudoturbulence

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Dispersed two-phase flows are found in nature as well as in industry. When bubbles are rising in a quiescent fluid, they induce velocity fluctuations. These fluctuations are referred to as pseudoturbulence. In pseudoturbulence the rising bubbles are the only source of energy. A rapid increase of velocity variance with gas volume fraction at very dilute regimes has been reported in ref.[1]. The origin of this rapid increase has not yet been fully understood. The dependance of the fluctuations on bubble concentration has also been investigated for Reynolds number $Re \approx 800$, Risso *et al.*[4] found that the normalized liquid velocity fluctuations scale with the void fraction α as $\alpha^{-0.4}$, whereas for moderate Reynolds number $Re = O(10)$, Cartellier *et al.*[3] found a scaling with $\alpha^{2/3}$.

Bubble clustering has been predicted numerically[2] and confirmed experimentally[1,3] in pseudoturbulence, but the mechanism that provoke clustering is controversial. For cluster measurements, hitherto only 2D image based techniques have been used.

In this talk we will present recent (summer 2008) experimental results on bubble/liquid velocity fluctuations and the corresponding spectra in the dilute regime at high Reynolds and moderate Weber numbers and on the bubble clustering. The experiments are performed in the Twente water channel, using a 3D particle tracking velocimetry technique and constant temperature anemometry.

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[4] F. Risso, K. Ellingsen, J. Fluid Mech. **453**, 395-410 (2002).