Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Clustering of small bubbles in homogeneous isotropic turbulence

CHANGHOON LEE, ITZHAK FOUXON, GIHUN SHIM, SEULGI LEE, Yonsei University — Transport of small bubbles in isotropic turbulence is numerically and theoretically investigated. The difference of the bubble's motion from the motion of heavy particles is determined completely by the lift force. The so-called flow of bubbles exists in the whole range of valid parameters of typically used equation of bubble motion. Therefore, the bubble velocity can be explicitly expressed in terms of the local fluid velocity and its derivatives. The spectrum of Lyapunov exponents and fractal dimension can be theoretically estimated. For very strong gravity, the bubble distribution shows a very strong multi fractal structure. Direct numerical simulation of bubble-laden isotropic turbulence has been performed. The Lyapunov exponents and fractal dimension are favorably compared between simulation and theory. Strong multi fractal structure takes the form of vertical columnar clustering.

Changhoon Lee
Yonsei University

Date submitted: 28 Jul 2017 Electronic form version 1.4