Abstract Submitted
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The Generalized Fractal Dimensions of a 2-D Compressible Turbulence[1] JASON LARKIN, WALTER GOLDBURG, University of Pittsburgh, MAHESH BANDI, Los Alamos National Laboratory — Steady-state turbulence is generated in a tank of water 1m x 1 m x 0.3 m and the trajectories of particles floating on the surface are tracked in time. Initially the floaters are uniformly distributed. As time goes on they coagulate and form a fractal structure. The surface pattern reaches a steady state in approximately $t^* = 1$ s. In the time interval $0 \lesssim t \lesssim 2t^*$, measurements are made of the generalized fractal dimensions $D_q(t)$ of the floating particles starting with the uniform distribution $D_q(0)$ =2. In the steady state, the pattern formed by the floaters continues to fluctuate at a time scale dictated by the underlying turbulent flow. This time scale is also of the order of 1 s. To understand the origin of the coagulation phenomenon, one must remember that the floaters form a compressible system, unlike the water molecules that drive them. The time evolution of the $D_q(t)$ are measured for a range of q less than 10. The coagulated particles form into string-like structures having values of D_q ranging down to approximately 1.5.

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