Confinement Effect on the Dynamics of Concentration Non-Equilibrium Fluctuations

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It is well-known that a macroscopic gradient affects fluctuations in a fluid by making them long-ranged and enhancing their amplitude. The study of fluctuation dynamics reveals that small fluctuations exhibit diffusive lifetimes, while fluctuations larger than a characteristic size live shorter because of gravity, as theoretically and experimentally demonstrated. In this presentation we will report a combination of experimental, theoretical and numerical evidence of a dramatic slowing-down for fluctuations larger than a size dictated by the extent of the system parallel to the gradient. Results from dynamic shadowgraph experiments are complemented by theoretical calculations based on Fluctuating Hydrodynamics and previously developed to investigate the intensity of fluctuations, as well as by numerical simulations. The experimental data is found to be in excellent agreement with theory and simulations including realistic boundary conditions, demonstrating that the origin of the slowing-down is confinement.