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Dynamics of air bubbles in Rayleigh-Be nard Convection: pair dispersion and effect of initial separation LEONARDO P CHAMORRO, JIN-TAE KIM, University of Illinois at Urbana-Champaign, JAEWOOK NAM, Yonsei University, SHIKUN SHEN, University of Illinois at Urbana-Champaign, CHANGHOON LEE, Yonsei University — Laboratory experiments were performed to uncover the dynamics of bubbles in Rayleigh-Benard (RB) convection at Ra=1.1x10^{10}, where streams of 1-mm bubbles were released at various locations from the bottom of the RB tank along the path of the roll structure. 3D particle tracking velocimetry was used to track simultaneously a relatively large number of bubbles, and to quantify the pair dispersion for various initial separations in the range of $25 \leq \eta \leq 225$, where η is the local Kolmogorov length scale. Numerical simulation was carried out to further study the role of the bubble's path instability. Results show that the pair dispersion underwent a transition phase similar to the ballistic-to-diffusive (t^2-to-t^1) regime in the vicinity of the cell center; however, it approached to a bulk behavior $t^{1.5}$ in the diffusive regime as the distance away from the cell center increased. At small initial separation, the pair dispersion exhibited t^1 in the diffusive regime, indicating that the convective turbulence reduced the amplitude of the bubble's path instability. At large initial separations, the pair dispersion exhibited t^2, showing the effect of the roll structure.

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