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**Effects of Reynolds Number and Stokes Number on Particle-pair Relative Velocity in Isotropic Turbulence: An Experimental Study**[1]
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— Effects of Reynolds number ($R_\lambda$) and Stokes number ($St$) on particle-pair relative velocity (RV) were studied using four-frame particle tracking in an enclosed turbulence chamber. Two tests were performed: varying $R_\lambda$ between 246 and 357 at six $St$ values, and varying $St$ between 0.02 and 4.63 at five $R_\lambda$ values. By comparing experimental and DNS results of mean inward particle-pair RV, $\langle w_r^- \rangle$, we observed excellent agreement for all test conditions across a large range of particle separation distance ($r$); however at $r \leq 10\eta$ ($\eta$: Kolmogorov length scale), experimental $\langle w_r^- \rangle$values were higher than simulation. At fixed $St$,$\langle w_r^- \rangle$ was found to be independent of $R_\lambda$ in the observable $St$, $r$, and $R_\lambda$ ranges. At fixed $R_\lambda$, $\langle w_r^- \rangle$ increased with $St$at small $r$ and decreased with $St$ at large $r$. We further compared $\langle w_r^- \rangle$ and variance of RV, $\langle w_r^2 \rangle$, between experiments, DNS and theoretical predictions by Pan and Padoan (2010). At $0 < St \leq 1$, theory-predicted $\langle w_r^- \rangle$ and $\langle w_r^2 \rangle$ matched with DNS and experiment in the range of $r = 1 - 60\eta$. As $St$ increased, theoretical predictions were lower than experiment and DNS results. The potential causes of these trends are explored. Additionally, we discuss the observed electrostatic charge effect on particle relative motion in isotropic turbulence and our plans of studying this effect using an integrated experimental, numerical and theoretical approach.

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