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On the mechanism for the clustering of inertial particles in the inertial range of isotropic turbulence LANCE COLLINS, ANDREW BRAGG, PETER IRELAND, Cornell University — In this talk, we consider the physical mechanism for the clustering of inertial particles in the inertial range of turbulence. By comparisons with DNS data we demonstrate that the mechanism in the theory of Zaichik *et.al.* (Phys. Fluids. 19:113308, 2007) quantitatively describes the clustering of particles in the inertial range. We then analyze the theory for isotropic turbulence in the limit $Re_\lambda \to \infty$. For arbitrary St (Stokes number), there exists a separation in the inertial range beyond which $St_r \ll 1$, where St_r is the Stokes number based on the eddy turnover timescale at separation r. The inertial-range clustering in this limit can be understood to be due to the preferential sampling of the coarse-grained velocity gradient tensor at that scale. At smaller separations, there may be transitions to $St_r \sim 1$, where a path history symmetry breaking effect dominates the clustering mechanism, and in some cases $St_r \gg 1$, which implies ballistic behavior and a flat RDF. The scaling for each of these regimes is derived and compared to DNS, where applicable. Finally, we compare the results with the "sweep-stick" mechanism by Coleman and Vassilicos (Phys. Fluids 21:113301, 2009) and discuss the similarities and differences between the two theories.

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