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On the relation between preferential concentration and radial relative velocity of inertial particles in homogeneous isotropic turbulence BAIDURJA RAY, LANCE COLLINS, Cornell University — The radial distribution function (RDF, a statistical measure of preferential concentration) and the PDF of the radial relative velocity (w_r) are the two statistical inputs to the collision kernel for inertial particles, which determines their collision rate in a turbulent flow. Although the relative velocity between the particles drives their spatial distribution (and hence the RDF), the relation between the two is not yet well-established. In this paper, we investigate this relationship using direct numerical simulation (DNS) of particle-laden homogeneous isotropic turbulence, with and without filtering. We show that the spatio-temporal variation of the skewness of the PDF of w_r is qualitatively similar to that of the RDF. We then apply a low-pass sharp spectral filter to the DNS velocity field and use the filtered velocity field to calculate the RDF and the PDF of w_r. The first and second moments of w_r are found to decrease monotonically with filtering for all separation distances irrespective of the particle Stokes number (St), whereas the skewness decreases with filtering for low St and increases with filtering for high St. This non-monotonic response of the skewness to filtering is qualitatively similar to the response of the RDF to filtering, and points towards a connection between them.

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