

Internal Webinar

Relative motion of particles advected by a turbulent flow

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Turbulent flows carrying small particles are found in many natural settings. Some of the examples are small water droplets in the clouds, microorganisms in oceans, and astrophysical dust in proto-planetary disks and the interstellar medium. Due to turbulence, these small particles may collide and merge to form larger particles. This process of collision and coalescence plays an important role in the formation of rain in the clouds, and the formation of planets in protoplanetary disks. The frequency and outcome of collision depend on the relative velocities of nearby particles. We study the statistics of the relative velocity of particles at small separation by using direct numerical simulations. We find that these PDFs have a power-law tail indicating that two nearby particles can have very high relative velocity. The exponent of the power-law depends on the correlation dimension of the small scale clusters of the particles in phase space.

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