

Abstract Submitted
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Numerical investigation of finite-time singularity of particle-laden flow SEULGI LEE, CHANGHOON LEE, Yonsei University — This study aims at investigation of finite-time singularity of particle velocity gradient by collision using a new approach. The motion of particle is derived in Eulerian frame under the assumption that velocity of particles is a smooth function in space, and is uniquely determined by the position of a particle. The derived equation of particle motion looks simple, but the solution is determined by a very complex process. In particular, the particle velocity gradient can easily go to infinity within a finite time due to the quadratic nonlinearity when the motion of particle is driven by turbulence. The discontinuity of the particle velocity gradient physically means a collision between two particles. Thus, a detailed investigation of the process of particle velocity gradients going to infinity allows a rigorous mathematical description of particle collisions in turbulence. Using this concept, the singularity of particle velocity gradient for various Stokes numbers and gravity factors is investigated firstly in a simple and intuitional Taylor-Green vortex flow and then in two-dimension turbulent flow. Detailed results will be presented in the meeting.

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