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Turbulence Dissipation Equation for Particle Laden Flow CLAYTON CROWE, JOHN SCHWARZKOPF, PRASHANTA DUTTA, Washington State University — A governing equation for turbulent dissipation is derived from fundamental principles for the carrier phase in particle-laden flow. The governing equation is valid for incompressible flows with no mass transfer between the dispersed and continuous phases. The equation is obtained by volume averaging the same equation used for single phase flows which includes the effects of the particle surfaces. The governing equation shows an additional production of dissipation term that is related to the instantaneous relative velocity gradients at the particle surface. The terms in the governing dissipation transport equation were simplified to produce a model that is similar to the time averaged dissipation model currently used for single phase flows. The model was then applied to experimental data for particles falling in an initially quiescent flow. The ratio of the new production of dissipation coefficient (due to the presence of particles) to the dissipation of dissipation coefficient was found to be related to the particle diameter and the Taylor length scale. The ratio of the coefficients was appeared to have a remarkable relationship with the relative Reynolds number of the particle. Future studies should address the validity of the equation under various flow condition and also be compared with DNS studies.

Prashanta Dutta
Washington State University

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