Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Transport of temperature-velocity covariance in gas-solid flow and its relation to the axial dispersion coefficient[1] SHANKAR SUBRAMANIAM, BO SUN, Iowa State University — The presence of solid particles in a steady laminar flow generates velocity fluctuations with respect to the mean fluid velocity that are termed pseudo-turbulence. The level of these pseudo-turbulent velocity fluctuations has been characterized in statistically homogeneous fixed particle assemblies and freely evolving suspensions using particle-resolved direct numerical simulation (PR-DNS) by Mehrabadi *et al.*(JFM, 2015), and it is found to be a significant contribution to the total kinetic energy associated with the flow. The correlation of these velocity fluctuations with temperature (or a passive scalar) generates a flux term that appears in the transport equation for the average fluid temperature (or average scalar concentration). The magnitude of this transport of temperature-velocity covariance is quantified using PR-DNS of thermally fully developed flow past a statistically homogeneous fixed assembly of particles, and the budget of the average fluid temperature equation is presented. The relation of this transport term to the axial dispersion coefficient (Brenner, *Phil. Trans. Roy. Soc. A*, 1980) is established. The simulation results are then interpreted in the context of our understanding of axial dispersion in gas-solid flow.

[1]NSF CBET 1336941

Shankar Subramaniam
Iowa State University

Date submitted: 01 Aug 2015 Electronic form version 1.4