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Clustering of gas-solids flows in a vertical duct AARON M. LATTANZI, SARAH BEETHAM, University of Michigan, KEE ONN FONG, FILIPPO COLLETTI, University of Minnesota, JESSE CAPECELATRO, University of Michigan — In this work, numerical simulations of moderately dense gas-solids flows in the fully-developed region of a vertical duct are performed. The simulations are performed within a volume-filtered Eulerian-Lagrangian (EL) framework and compared to novel experimental measurements. The high mass loading considered here leads to significant two-way coupling and the spontaneous generation of densely-packed clusters that fall along the duct walls. Two-phase flow statistics are extracted from the simulations and compared against detailed experimental measurements obtained from high-speed imaging and particle-tracking velocimetry. Additionally, a model for the pseudo-turbulent Reynolds stress (PTRS) was implemented within the EL framework to account for sub-grid particle-induced velocity fluctuations. Simulations with the PTRS closure allow the effect of a pseudo-turbulence model on clustered flows to be rigorously assessed for the first time.

Aaron M. Lattanzi
University of Michigan

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