Abstract Submitted
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Modeling of Cluster-Induced Turbulence in Particle-Laden Channel Flow[1] MICHAEL BAKER, Iowa State Univ, JESSE CAPECELATRO, University of Michigan, BO KONG, RODNEY FOX, Iowa State Univ, OLIVIER DESJARDINS, Cornell University — A phenomenon often observed in gas-solid flows is the formation of mesoscale clusters of particles due to the relative motion between the solid and fluid phases that is sustained through the dampening of collisional particle motion from interphase momentum coupling inside these clusters. The formation of such sustained clusters, leading to cluster-induced turbulence (CIT), can have a significant impact in industrial processes, particularly in regards to mixing, reaction progress, and heat transfer. Both Euler-Lagrange (EL) and Euler-Euler anisotropic Gaussian (EE-AG) approaches are used in this work to perform mesoscale simulations of CIT in fully developed gas-particle channel flow. The results from these simulations are applied in the development of a two-phase Reynolds-Averaged Navier-Stokes (RANS) model to capture the wall-normal flow characteristics in a less computationally expensive manner. Parameters such as mass loading, particle size, and gas velocity are varied to examine their respective impact on cluster formation and turbulence statistics.

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Michael Baker
Iowa State Univ

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