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Eulerian-Lagrangian Simulations of Three-Dimensional Turbulent Riser Flows JESSE CAPECELATRO, University of Colorado Boulder, PERRINE PEPIOT, National Renewable Energy Lab, OLIVIER DESJARDINS, University of Colorado Boulder, UNIVERSITY OF COLORADO BOULDER TEAM, NATIONAL RENEWABLE ENERGY LAB COLLABORATION — Particle suspended flows in vertical risers are used in many industries in the form of circulating fluidized beds. Applications include gasification/pyrolysis for biofuel conversion, coal combustion, and fluid catalytic cracking. Experimental studies have shown riser flows to be unsteady with large particle concentration fluctuations. Regions of densely packed particles, referred to as clusters form, which greatly affect the overall flow behavior and mixing properties. Because the solid phase is opaque, quantitative experimental results are limited, and therefore computational fluid dynamics (CFD) is used here to simulate 3D riser flows. The gas phase is solved with a high-order fully conservative finite difference code called NGA, tailored for turbulent flow computation. Lagrangian tracking is used to solve the particle phase. Statistics are computed for both the gas and particle phases, along with characteristic cluster sizes, shape, and velocities. Inter-particle collisions are considered and shown to affect the clustering behavior of the flow.

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