Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Particle-resolved DNS(PR-DNS) to study the bulk settling velocity of poly-dispersed particles[1] YINUO YAO, OLIVER FRINGER, CRAIG CRIDDLE, Stanford University — A PR-DNS is implemented to investigate poly-dispersed particle hydrodynamics in triply-periodic flow. The particle motion is computed with a direct forcing IBM approach along with the collision model proposed by Biegert et al.(2017). The direct forcing method accurately predicts particle motions with moderate particle Reynolds numbers up to 360. To avoid the small time-step size needed to simulate collisions with the soft-sphere approach, we use the adaptive collision time model proposed by Kempe et al.(2012). Poly-dispersed particles are initialized randomly in two- and three-dimensions and subjected to gravity to settle while interacting with one another. Simulations are then run until the mean settling velocity, reaches steady state. This relates the velocity to mean particle Reynolds number. Different poly-disperse particle scenarios are devised that allow for the study of the effect of the particle size distribution while keeping other bulk properties fixed. The results are discussed in the context improving energy efficiency of the fluidized bed reactors in the wastewater treatment, which are characterized by the pressure loss due to motion of poly-dispersed particles in turbulent flow. This work is supported by California Energy Commission (CEC).

[1]California Energy Commission (CEC)

Yinuo Yao
Stanford University

Date submitted: 01 Aug 2019 Electronic form version 1.4