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On the simulation of turbulent particle-laden flow subject to radiation: Comparison between Eulerian and Lagrangian approaches
AYMERIC VIE, HADI POURANSARI, REMI ZAMANSKY, ALI MANI, CTR Stanford — The objective of this work is to assess the range of applicability of Eulerian particle transport solvers for radiatively driven particle-laden flows with applications in particle solar receivers and cloud dynamics. In particular we consider a triply periodic flow laden with particles subject to homogeneous radiation [studied by Zamansky et. al. 2013]. Heat transfer from particle clusters to the carrier gas generates buoyancy effects, which leads to vorticity generation in the carrier phase. The vortical structures induce preferential concentration and cluster modification. This feedback dynamics leads to a self-sustained state of turbulence. We present numerical investigation of this configuration using both Lagrangian particle models and Eulerian moment methods (EMM). For the Eulerian moment method, the particle density and momentum are solved using different numerical schemes under the monokinetic assumption. We compare the results obtained by both approaches varying the Stokes number, the particle loading as well as the mesh refinement.

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