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Random Walk Particle Tracking For Multiphase Heat Transfer AARON LATTANZI, Univ of Colorado - Boulder, XIAOLONG YIN, Colorado School of Mines, CHRISTINE HRENYA, Univ of Colorado - Boulder — As computing capabilities have advanced, direct numerical simulation (DNS) has become a highly effective tool for quantitatively predicting the heat transfer within multiphase flows. Here we utilize a hybrid DNS framework that couples the lattice Boltzmann method (LBM) to the random walk particle tracking (RWPT) algorithm. The main challenge of such a hybrid is that discontinuous fields pose a significant challenge to the RWPT framework and special attention must be given to the handling of interfaces. We derive a method for addressing discontinuities in the diffusivity field, arising at the interface between two phases. Analytical means are utilized to develop an interfacial tracer balance and modify the RWPT algorithm. By expanding the modulus of the stochastic (diffusive) step and only allowing a subset of the tracers within the high diffusivity medium to undergo a diffusive step, the correct equilibrium state can be restored (globally homogeneous tracer distribution). The new RWPT algorithm is implemented within the SUSP3D code and verified against a variety of systems: effective diffusivity of a static gas-solids mixture, hot sphere in unbounded diffusion, cooling sphere in unbounded diffusion, and uniform flow past a hot sphere.

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