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A correction procedure for thermally two-way coupled point-particles[1] JEREMY HORWITZ, SWETAVA GANGULI, ALI MANI, SANJIVA LELE, Stanford University — Development of a robust procedure for the simulation of two-way coupled particle-laden flows remains a challenge. Such systems are characterized by O(1) or greater mass of particles relative to the fluid. The coupling of fluid and particle motion via a drag model means the undisturbed fluid velocity evaluated at the particle location (which is needed in the drag model) is no longer equal to the interpolated fluid velocity at the particle location. The same issue arises in problems of dispersed flows in the presence of heat transfer. The heat transfer rate to each particle depends on the difference between the particle's temperature and the undisturbed fluid temperature. We borrow ideas from the correction scheme we have developed for particle-fluid momentum coupling [1] by developing a procedure to estimate the undisturbed fluid temperature given the disturbed temperature field created by a point-particle. The procedure is verified for the case of a particle settling under gravity and subject to radiation. The procedure is developed in the low Peclet, low Boussinesq number limit, but we will discuss the applicability of the same correction procedure outside of this regime when augmented by appropriate drag and heat exchange correlations.

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Jeremy Horwitz
Stanford University

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