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Non local heat transfer in dense suspensions with Stefan effect and thin surface layers FEDERICO MUNICCHI, MATTEO ICARDI, University of Nottingham — Suspension flows are pivotal in a large number of industrial processes due to their good heat and mass transfer properties. While a large amount of literature has been devoted to the study of heat transfer in such flows, the realm of pre-asymptotic conjugate transfer (where intra-particle transfer and non local effects are dominant) is still relatively unexplored. Particle-tracking techniques are often preferred to rigorous multiscale modelling to account for the thermal history of particles and particle clouds. In this work, a novel method to describe pre-asymptotic conjugate transfer between suspended particles and a suspending fluid is presented. This method is based on the Generalised Multi-Rate Transfer (GMRT), a formal multiscale method that describes temporal non locality (memory effects) using a set of local equations. The GMRT is extended to account for the effect of fluid displacement due to surface reactions (Stefan or "blowing" effect) and thin layers covering the particle surface. It is shown that the method, first developed for flows over immobile regions, can be extended to suspended solids, and numerical results are presented for the case of spherical particles.

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