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Partitioning of particle temperature in gas-solid turbulent flows
ENRICA MASI, OLIVIER SIMONIN, PASCAL FEDE, IMFT — In this work we characterize the particle temperature distribution of inertial particles interacting with a turbulent non-isothermal flow. In the general frame of the mesoscopic Eulerian approach developed by Fevrier et al. [*J. Fluid Mech.*, 533, 1-46] for the particle velocity distribution, we show that the instantaneous particle temperature can be partitioned in two different contributions. The first contribution is a continuous temperature field shared by all the particles and taking into account two-point correlations. The second is a random spatially uncorrelated contribution, characterized in terms of Eulerian fields of particle moments. This conclusion is pointed out through statistical one-point and two-point correlation analysis. Statistics are measured from numerical simulations of particles suspended into a homogenous, isotropic, stationary non- isothermal turbulence where discrete particle paths are computed by Lagrangian tracking. The goal of this work is to improve the comprehension of mechanisms of heat transfer and transport for the development of unsteady Eulerian modelling approaches for reactive two-phase flows. The local instantaneous Eulerian equations for the mesoscopic temperature and the random uncorrelated heat flux are derived. We also point out that temperature distribution is related to the both dynamical and thermal particle response times.

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