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LBM-DSMC Hybrid Method for Complex Out-of-Equilibrium Flows GIANLUCA DI STASO, HERMAN J.H. CLERCX, Eindhoven Univ of Tech, SAURO SUCCI, IAC-CNR, Rome, FEDERICO TOSCHI, Eindhoven Univ of Tech — Many complex flows are characterized by the simultaneous presence of a range of non-equilibrium and rarefaction effects in different regions of the flow field. We recently developed a Direct Simulation Monte Carlo (DSMC)-Lattice Boltzmann Method (LBM) hybrid scheme, based on domain decomposition technique and on Grads moments method, able to accurately and efficiently simulate such flows. While DSMC is employed to compute the flow field only where large non-equilibrium effects are present, the more computationally efficient LBM is employed wherever the non-equilibrium effects can be dealt with perturbatively, i.e. according to Navier-Stokes hydrodynamics. Here we present the results on the application of the hybrid method to complex three-dimensional flows, in particular to the flow around a microsphere and through a disk-shaped expansion channel. The solutions provided by the hybrid method are compared against full DSMC simulations and the computational gain guaranteed by the application of the hybrid method over the full DSMC is also demonstrated.

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