„The Influence of the Fluid Acceleration Term on the Simulation of a Particle-laden Compressible Jet with Shock waves“

Abstract:

A particle-laden compressible round jet is studied using direct numerical simulation and an Eulerian-Lagrangian point-particle approach is used to model fluid and particle phase. For this purpose, the particle motion is calculated by Newton's law and a two-way coupling mechanism describes the interaction between the two-phases. Our specific objective is to investigate the importance of the fluid acceleration term on the particle equations when strong gradients are present. Expectedly, the results indicate the importance of this term in regions where the shock waves occur. In these regions, the force due to the fluid acceleration shows to be at least three times bigger than the drag force due to steady fluid motion. We performed two simulations: one with the fluid acceleration presented in the particle equation and another where this term is omitted. The results show that the particles computed without this term substantially lag the changes of the properties of the fluid, than the simulation where this term is present.