

A second-order semi-Lagrangian particle FEM method for the incompressible Navier-Stokes equations

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ABSTRACT

In this work, a second-order semi-Lagrangian particle finite element method (SL-PFEM) is presented. The method is based on the second order time integration algorithm, using an explicit scheme to integrate the particles' trajectories, and an implicit scheme to integrate the particle's velocities. The projection of the particle's intrinsic variables onto the finite element (FE) mesh is based on a second-order global least-square. The elliptic part of the Navier-Stokes equations is discretized with an implicit scheme and solved using an iterative process. The method is verified against available analytical solutions, and applied to the classic flow problems.