AN EFFICIENT NUMERICAL SCHEME FOR SIMULATING FLOW AROUND OSCILLATING CIRCULAR CYLINDER IN NON-INERTIAL FRAME

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ABSTRACT

We develop an efficient numerical scheme for Navier-Stokes equations in non-inertial frame in order to investigate two-dimensional flow around an oscillating circular cylinder in arbitrary direction. Based on Crank-Nicolson scheme in time, the governing equations are discretized. Also, the second-order central difference scheme is applied in a staggered MAC mesh for spatial discretization. We recast the velocity-components decoupling projection method, which is based on block LU decomposition along with approximate factorization technique[1], in cylindrical coordinate so that the provisional velocity in momentum equations is solved without an iterative procedure. By introducing a mass-correction procedure, a convective boundary condition at a far-field is used in order to maintain kinetic energy in the computation domain. In addition, we employ the Fourier diagonalization technique [2] for solving the Poisson equation. Overall computational costs are significantly reduced because no iterative procedure is required in the entire computational procedure. Details of numerical results for flow over the oscillating cylinder will be presented at the meeting.

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REFERENCES