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Numerical simulation of flow past an oscillating cylinder beneath a free surface SERPIL KOCABIYIK, OLEG GUBANOV, LARISA MIRONOVA, Memorial University of Newfoundland — A computational study of laminar flow of a viscous incompresible fluid past an oscillating cylinder close to a free surface is performed. The integral form of unsteady two dimensional Navier- Stokes equations is only discretized in the fluid flow region using fixed Eulerian staggered grid. Well-posed boundary conditions are used at the inflow and outflow boundaries. The no-slip boundary conditions are prescribed at the solid boundary. At the free surface boundary conditions are described by neglecting the motion of ambient air. The volume of fluid method is used to track a moving free surface interface. A piecewise-linear interface reconstruction algorithm is used at each time step for determining the position of both the free surface and fluid-body interfaces. The reconstructed free surface is then advected using computed local velocity field based on a geometrical area-preserving volume of fluid advection algorithm. The numerical simulations are conducted at a fixed Reynolds number, $R = 200$, and at displacement amplitude-to-cylinder diameter ratios of $A = 0.25$ and $A = 0.5$ when submergence depth-to-cylinder diameter ratio is 1.25. Previously computed and observed flow fields around submerged cylinders are compared to current numerical results and good agreement is found.

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