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Multiphase three-dimensional direct numerical simulation of a rotating impeller with code Blue[1] LYES KAHOUADJI, Imperial College London, SEUNGWON SHIN, Hongik University, Korea, JALEL CHERGUI, DAMIR JURIC, LIMSI, CNRS, RICHARD V. CRASTER, OMAR K. MATAR, Imperial College London — The flow driven by a rotating impeller inside an open fixed cylindrical cavity is simulated using code *Blue*, a solver for massively-parallel simulations of fully three-dimensional multiphase flows. The impeller is composed of four blades at a 45° inclination all attached to a central hub and tube stem. In *Blue*, solid forms are constructed through the definition of immersed objects via a distance function that accounts for the objects interaction with the flow for both single and two-phase flows. We use a moving frame technique for imposing translation and/or rotation. The variation of the Reynolds number, the clearance, and the tank aspect ratio are considered, and we highlight the importance of the confinement ratio (blade radius versus the tank radius) in the mixing process. *Blue* uses a domain decomposition strategy for parallelization with MPI. The fluid interface solver is based on a parallel implementation of a hybrid front-tracking/level-set method designed complex interfacial topological changes. Parallel GMRES and multigrid iterative solvers are applied to the linear systems arising from the implicit solution for the fluid velocities and pressure in the presence of strong density and viscosity discontinuities across fluid phases.

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