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**An immersed interface vortex particle-mesh solver** YVES MARICHAL[1], PHILIPPE CHATELAIN, GREGOIRE WINCKELMANS, Universite catholique de Louvain — An immersed interface-enabled vortex particle-mesh (VPM) solver is presented for the simulation of 2-D incompressible viscous flows, in the framework of external aerodynamics. Considering the simulation of free vortical flows, such as wakes and jets, vortex particle-mesh methods already provide a valuable alternative to standard CFD methods, thanks to the interesting numerical properties arising from its Lagrangian nature. Yet, accounting for solid bodies remains challenging, despite the extensive research efforts that have been made for several decades. The present immersed interface approach aims at improving the consistency and the accuracy of one very common technique (based on Lighthill's model) for the enforcement of the no-slip condition at the wall in vortex methods. Targeting a sharp treatment of the wall calls for substantial modifications at all computational levels of the VPM solver. More specifically, the solution of the underlying Poisson equation, the computation of the diffusion term and the particle-mesh interpolation are adapted accordingly and the spatial accuracy is assessed. The immersed interface VPM solver is subsequently validated on the simulation of some challenging impulsively started flows, such as the flow past a cylinder and that past an airfoil.

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