

Abstract Submitted  
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**Vortex Particle-Mesh method for flows past bodies: a comparison of the iterative penalization and immersed interface methods.** THOMAS GILLIS, GREGOIRE WINCKELMANS, PHILIPPE CHATELAIN, Université catholique de Louvain (UCL) - Institute of Mechanics, Materials and Civil Engineering (iMMC) — The Vortex Particle-Mesh (VPM) method is well suited for solving advection dominated incompressible flows. However, the efficient and accurate handling of solid boundaries in this method still constitutes an active domain of research. The boundary enforcement conditions the vorticity production at the wall and is thus paramount to the accuracy of the global method. We here focus on two iterative algorithms: the iterative penalization method and the immersed interface method. The iterative penalization uses a mask function over the grid and is therefore quite straightforward to use as it simply adds a penalization sub-step to the time step, already implemented in a body-free method. On the contrary, the immersed interface method uses an interface detection and modification of the numerical scheme for points near the interface. This preserves the order of accuracy up to the boundary, yet it increases the implementation efforts. We compare these two techniques on the benchmark of the flow past an impulsively started cylinder at  $Re=9500$ . We analyze the solutions of both methods, their accuracy up to the boundary and the related cost.

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