Abstract Submitted
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Accurate and efficient coupling of a near-wall Eulerian solver with a Vortex Particle-Mesh method for aerodynamics and wakes[1] PHILIPPE BILLUART, PHILIPPE CHATELAIN, GREGOIRE WINCKELMANS, Universite catholique de Louvain — We present and illustrate a new hybrid Eulerian-Lagrangian approach for aerodynamics: the near-wall region is resolved using an Eulerian solver (here finite differences) while the vortex-particle-mesh (VPM) method, supplemented by an immersed interface method (IIM), is used for capturing the wake region. Indeed, the isotropic elements of the VPM-IMM do not permit to resolve accurately and efficiently the boundary layer but perform very well in the wake region thanks to their negligible dispersion and diffusion. The grid-based solver is well suited for resolving the boundary layers. With such coupling, the advantages of both solvers are kept whereas their respective drawbacks are eliminated, permitting to simulate efficiently high Reynolds number flows. The key feature of the approach also lies in the way both methods are coupled: accurately and without Schwarz iteration. The approach is tested and analysed/validated on the flow past a cylinder. It is then applied to the flow past a regularized Joukowski airfoil.

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