Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Coupling of a 3-D vortex particle-mesh method with a finite volume near-wall solver Y. MARICHAL[1], Universite catholique de Louvain (UCL) - iMMC, T. LONFILS, Cenaero, M. DUPONCHEEL, P. CHATELAIN, G. WINCKELMANS, UCL - iMMC — This coupling aims at improving the computational efficiency of high Reynolds number bluff body flow simulations by using two complementary methods and exploiting their respective advantages in distinct parts of the domain. Vortex particle methods are particularly well suited for free vortical flows such as wakes or jets (the computational domain -with non zero vorticity- is then compact and dispersion errors are negligible). Finite volume methods, however, can handle boundary layers much more easily due to anisotropic mesh refinement. In the present approach, the vortex method is used in the whole domain (overlapping domain technique) but its solution is highly underresolved in the vicinity of the wall. It thus has to be corrected by the near-wall finite volume solution at each time step. Conversely, the vortex method provides the outer boundary conditions for the near-wall solver. A parallel multi-resolution vortex particle-mesh approach is used here along with an Immersed Boundary method in order to take the walls into account. The near-wall flow is solved by OpenFOAM® using the PISO algorithm. We validate the methodology on the flow past a sphere at a moderate Reynolds number.

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Date submitted: 29 Jul 2011 Electronic form version 1.4