Vortex Particle-Mesh methods for large scale LES of aircraft wakes PHILIPPE CHATELAIN, MATTHIEU DUPONCHEEL, Univ Catholique de Louvain, YVES MARICHAL, WaPT, Wake Prediction Technologies, GRGOIRE WINCKELMANS, Univ Catholique de Louvain — Vortex methods solve the NS equations in vorticity-velocity formulation. The present Particle-Mesh variant exploits the advantages of a hybrid approach: advection is handled by the particles while the mesh allows the evaluation of the differential operators and the use of fast Poisson solvers (here a Fourier-based solver which allows for unbounded directions and inlet/outlet boundaries).A lifting line approach models the vorticity sources in the flow; its immersed treatment efficiently captures the development of vorticity from thin sheets into 3-D field. Large scale simulations of aircraft wakes (including encounter cases where a following aircraft flies into the wake) are presented, which alsodemonstrate the performance of the methodology: the adequate treatment of particle distortion, the high-order discretization, and the multiscale subgrid models allow to capture wake dynamics with minimal spurious dispersion and diffusion.

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