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**Vortex methods with immersed lifting lines applied to LES of wind turbine wakes** PHILIPPE CHATELAIN, LAURENT BRICTEUX, GREGOIRE WINCKELMANS, Universite catholique de Louvain (UCL) - Institute of Mechanics, Materials and Civil Engineering (iMMC), PETROS KOUMOUTSAKOS, Chair of Computational Science - ETH Zurich — We present the coupling of a vortex particle-mesh method with immersed lifting lines. The method relies on the Lagrangian discretization of the Navier-Stokes equations in vorticity-velocity formulation. Advection is handled by the particles while the mesh allows the evaluation of the differential operators and the use of fast Poisson solvers. We use a Fourier-based fast Poisson solver which simultaneously allows 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 a three-dimensional field. We apply this approach to the simulation of a wind turbine wake at very high Reynolds number. The combined use of particles and multiscale subgrid models allows the capture of wake dynamics with minimal spurious diffusion and dispersion.

Philippe Chatelain
Universite catholique de Louvain (UCL) -
Institute of Mechanics, Materials and Civil Engineering (iMMC)

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