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Large Eddy Simulation of Vertical Axis Wind Turbine wakes; Part II: effects of inflow turbulence MATTHIEU DUPONCHEEL, PHILIPPE CHATELAIN, DENIS-GABRIEL CAPRACE, GREGOIRE WINCKELMANS, Universite catholique de Louvain — The aerodynamics of Vertical Axis Wind Turbines (VAWTs) is inherently unsteady, which leads to vorticity shedding mechanisms due to both the lift distribution along the blade and its time evolution. Large-scale, fine-resolution Large Eddy Simulations of the flow past Vertical Axis Wind Turbines have been performed using a state-of-the-art Vortex Particle-Mesh (VPM) method combined with immersed lifting lines. Inflow turbulence with a prescribed turbulence intensity (TI) is injected at the inlet of the simulation from a precomputed synthetic turbulence field obtained using the Mann algorithm. The wake of a standard, medium-solidity, H-shaped machine is simulated for several TI levels. The complex wake development is captured in details and over long distances: from the blades to the near wake coherent vortices, then through the transitional ones to the fully developed turbulent far wake. Mean flow and turbulence statistics are computed over more than 10 diameters downstream of the machine. The sensitivity of the wake topology and decay to the TI level is assessed.

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