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Influence of Coriolis forces on the structure and evolution of wind-turbine wakes MAHDI ABKAR, FERNANDO PORT-AGEL, EPFL ENAC IIE WIRE — In this study, large-eddy simulation (LES) is combined with a turbine model to investigate the effect of Coriolis forces on the structure and evolution of wind-turbine wakes. In order to isolate the Coriolis effect on the turbulent wake flow, two set of simulations are performed. In the first set of simulations, atmospheric boundary layer (ABL) flow is driven by the geostrophic forces including the effect of Earth's rotation, while in the second case, the ABL flow is driven by a unidirectional pressure gradient forcing. Both cases have the same mean horizontal velocity and turbulence intensity at the hub height. The simulation results show that the Coriolis forces significantly affect the spatial distribution of the mean velocity deficit and turbulence statistics in the wake region. In particular, it is found that the Coriolis effect, responsible for vertical wind veer, has important lateral wake stretching effects, which in turn significantly impacts the wake recovery and wake meandering characteristics downwind of the turbines. We also apply the proper orthogonal decomposition (POD) to LES data of the wake. The results indicate a very high correlation between the most energetic modes and both maximum velocity deficit and wake meandering characteristics.

Mahdi Abkar
EPFL ENAC IIE WIRE

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