Effects of subgrid-scale modeling on wind turbines flows[1] UMBERTO CIRI, Univ of Texas, Dallas, MARIA VITTORIA SALVETTI, University of Pisa, STEFANO LEONARDI, Univ of Texas, Dallas — The increased demand for wind energy had led to a continuous increase in the size of wind turbines and, consequently, of wind farms. A potential drawback of such large clusters lies in the decrease in the efficiency due to the wake interference. Large-Eddy Simulations (LES) coupled with blade models have shown the capability of resolving the unsteady nature of wind turbine wakes. In LES, subgrid-scale (SGS) models are needed to introduce the effect of the turbulence small scales not resolved by the computational grid. Many LES of wind farms employ the classic Smagorinsky model, despite it suffers from some major drawbacks, e.g. (i) the presence of an input tuning parameter and (ii) the wrong behaviour near solid walls. In the present work an analysis of the effects of various SGS models is carried out for LES in which the turbine tower and nacelle are directly simulated with the Immersed Boundaries method. Particular attention is dedicated to the region of separated flow behind the tower where the impact of the SGS models is expected to be important. We focus herein on non-dynamic eddy-viscosity models, which have proven to have a correct behaviour near solid walls. A priori and a posteriori tests are performed for a configuration reproducing an experiment conducted at NTNU.

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