Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Weather Research and Forecasting model simulation of an onshore wind farm: assessment against LiDAR and SCADA data[1] CHRISTIAN SANTONI, EDGARDO J. GARCIA-CARTAGENA, LU ZHAN, GIACOMO VALERIO IUNGO, STEFANO LEONARDI, The University of Texas at Dallas — The integration of wind farm parameterizations into numerical weather prediction models is essential to study power production under realistic conditions. Nevertheless, recent models are unable to capture turbine wake interactions and, consequently, the mean kinetic energy entrainment, which are essential for the development of power optimization models. To address the study of wind turbine wake interaction, one-way nested mesoscale to large-eddy simulation (LES) were performed using the Weather Research and Forecasting model (WRF). The simulation contains five nested domains modeling the mesoscale wind on the entire North Texas Panhandle region to the microscale wind fluctuations and turbine wakes of a wind farm located at Panhandle, Texas. The wind speed, direction and boundary layer profile obtained from WRF were compared against measurements obtained with a sonic anemometer and light detection and ranging system located within the wind farm. Additionally, the power production were assessed against measurements obtained from the supervisory control and data acquisition system located in each turbine. Furthermore, to incorporate the turbines into very coarse LES, a modification to the implementation of the wind farm parameterization by Fitch et al. (2012) is proposed.

[1]This work was supported by the NSF, grants no.1243482 (WINDINSPIRE) and IIP 1362033 (WindSTAR), and TACC.

Christian Santoni
The University of Texas at Dallas

Date submitted: 31 Jul 2017 Electronic form version 1.4