Performance analysis of the WRF Model coupled to WindSim and WAsP Models for the Short Term Wind Energy Prediction System of Keltepe Wind Farm of Turkey

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In this study, we assessed the results of the short-term wind energy prediction system (SWEPS) that our research group has recently developed for Turkey. SWEPS uses the numerical weather prediction model (WRF), a CFD model WindSim, a physical model WAsP, and a model output statistics method to improve the results of the models. Here, we present the comparisons of WRF/WindSim with WRF/WAsP coupled model results with Artifical Neural Network improvement. The study area is the wind farm Keltepe located in the town of Balikesir where is the northwestern part of Turkey. We evaluated the coupled model performance by using the hourly data for the year of 2010. Wind power of the farm has been estimated up to 3-day coupling with WRF, WindSim, and WAsP Models. The resulting estimates of 2010 are compared with observational wind power data in terms of error analyses namely root mean square error (RMSE) and normalized root mean square errors (nRMSE). Performance comparisons of the coupled model WRF, WindSim and WAsP include the horizontal resolutions of the WRF model 9km, 3km, and 1km. Wind power model results for each turbine were evaluated for 24, 48, and 72 hours and seasonally. Consequently, both resolutions of the models show variability at different seasons for depending on the turbine locations including the complexity of the terrain of the interest. Moreover, our results also show that WRF/WindSim coupling system may be better than WRF/WAsP system for Keltepe.