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Evaluation of the Impact of Uniform and Non-Uniform Resolution Implementations in Numerical Weather Prediction Models over the Accuracy of Short-Term Wind Prediction

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The increasing integration of renewable energy resources to the national grids necessitates accurate prediction of power generation from those sources in terms of secure operation of electricity grid system and energy trading. Electricity generation of renewable energy power plants such as wind and solar are inherently affected by weather conditions. The wind condition particularly is affected by surface characteristics such as orography and vegetation, therefore it is the one of the near surface atmospheric variables having the strongest local variability. The high-resolution Numerical Weather Prediction (NWP) models are utilized to take the local conditions into account. WRF model is the one of the most common NWP models having been widely investigated by various researchers. On the other hand, The Model for Prediction Across Scales (MPAS) is a relatively new NWP model utilizing non-uniform mesh structures, developed by the National Center for Environmental Predictions (NCEP). However, there are limited studies in the literature which compare the prediction performance of WRF and MPAS model in terms of surface wind speed. This study evaluates the prediction accuracy of near surface wind of two downscaled NWP models namely, WRF-ARW and MPAS. Both models are configured with almost identical physics suites and initialized with 3 hourly 00-UTC initialization of Global Forecast System (GFS) data. The model outputs are obtained at 10 minutes interval for 48 hours horizon. Hourly averaged model results are compared with observations from 104 on-site meteorological stations located in Turkiye having different complexity in terms of correlation coefficient and RMSE.