# Estimation of extreme wind speed for wind power in Taiwan area by using numerical weather prediction model data: TWRF (Typhoon WRF)

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An operational numerical weather prediction model, Typhoon WRF (TWRF) based on the Advanced Research Weather Research and Forecasting model (ARW WRF), is used in this study to rerun 2009-2019 tropical cyclone cases that hit Taiwan to derive grid data of the annual maximum wind speed of each year near Taiwan. The performance of the model had also been examined for the track and intensity of tropical cyclones, as well as for the verification of wind speed compared with the data of certain ground meteorological stations. It shows that the simulations of the track and intensity of tropical cyclones are able to be analyzed for extreme wind speed, but the model data would generally give overestimated wind speed for some acceptable reasons. A horizontally-smoothed dataset is also applied to avoid model uncertainty and errors. In addition, in order to discuss whether the 2009-2019 typhoon-affected data is sufficient for making these estimations, long-term data were added to combine with the original dataset. Furthermore, the vertical wind profile derived from the model data is also analyzed and compared with the observation data. The results suggest that the model simulation may offer a better way to calculate extreme wind speed estimations than some conventional methods. Some topographical effects or mesoscale phenomena can be distinguished over the main offshore wind farm region, which were usually ignored in previous studies. The grid data might be useful when it comes to estimating extreme wind speed over 50-year periods. The analyses of vertical wind profiles also indicates that the Hellmann exponent should be adjusted under different wind speed conditions.

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