EGU22-10976
https://doi.org/10.5194/egusphere-egu22-10976
EGU General Assembly 2022

Hybrid wind power forecasting model (WRFv4.1.3 and Artificial Neural Network) considering roughness sublayer characteristics

Jeongwon Kim, Kyeongmin Gim, and Jinkyu Hong
Yonsei University, Atmospheric Science, Seoul, Korea, Republic of

Wind power is attracting more attention as an alternative energy in accordance with efforts to reduce carbon emissions, but its stable operation is difficult due to the intermittency of wind. Since the 1990s, many previous studies have suggested forecasting models focusing on accuracy and speed using numerical weather prediction models, statistical approaches, and hybrid techniques. However, although their verification methods and periods are different, most showed high errors of about 15% or more. In this study, we developed and validated a hybrid forecasting model using the mesoscale model Weather Research and Forecasting (WRF) and artificial neural network (ANN) for a wind farm located in Yeongyang-gun, Gyeongsangbuk-do, South Korea, a complex mountainous terrain (36°36′49″N, 129°13′21″E). In order to simulate more accurate wind at hub-height of wind turbine (i.e., 80 m), roughness sublayer parameterization (Yonsei surface layer scheme; YSL) is used and daily spatio-temporal high resolution wind forecasts are performed for one year in 2020. The simulated wind speed and actual wind power generation at that time are used as training data set for ANN to construct a hybrid forecast model, and it is validated for January and February 2021. Our analysis shows that improved parameterization in the roughness sublayer can significantly contribute to wind power forecasting through more accurate wind speed forecasting.