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Wind Ramp and Large Forecast Error Analysis from the Second Wind Forecast Improvement Project (WFIP2)

James Wilczak, Irina Djalalova, Katherine McCaffrey, Laura Bianco, Joseph Olson, Jaymes Kenyon, Mark Stoelinga, Justin Sharp, Mikhail Pekour, David Cook, George Scott, Richard Eckman, and Sebastian F. Otarola-Bustos

NOAA

The second Wind Forecast Improvement Project (WFIP2) took place in the Columbia River Basin of Oregon and Washington states from Fall 2015 until Spring 2017. The project had an extensive field campaign with over 100 instruments and a model development component, aimed at improving short-term wind energy forecasts. Included in the instrumentation were 18 sodars located throughout the region, measuring vertical profiles of wind speed from 10 to 200 m for the duration of the project. Using all 18 sodars and the NOAA operational Rapid Refresh (RAP) and High-Resolution Rapid Refresh (HRRR) models, the 80-m (wind turbine hub height) winds were converted to power using a standard turbine power curve.

One of the biggest challenges for wind power production is the accurate forecast of wind ramp events, i. e. large changes of generated power over short periods of time. Using the sodar and model-derived power data, a wind ramp analysis was then performed using the Wind Ramp Tool and Metric of Bianco et al., (2015), and the impacts of model resolution (the 13km RAP model versus the 3 km HRRR) were investigated.

Also using the sodar data, 40 events with the largest aggregate forecast power errors at forecast hour 12 were identified, showing the seasonal distribution of these large error events. The highest frequency of occurrence was in the winter months, with the large error events frequently associated with the erosion of cold pool events. In contrast, less frequent summer events were most often associated with gap flow events through the Columbia River Gorge.