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NWP Forecast Errors of Boundary Layer Flow in Complex Terrain Observed During the Second Wind Forecast Improvement Project (WFIP2) Field Campaign.

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The Second Wind Forecast Improvement Project (WFIP2) is a U.S. Department of Energy and NOAA-led program whose goal is to improve the accuracy of NWP forecasts of wind speed in complex terrain for wind energy applications. WFIP2 includes a field campaign held in the vicinity of the Columbia River Basin in the Pacific Northwest of the U.S., which began in October 2015, and will continue through March, 2017. As part of WFIP2 a large suite of in-situ and remote sensing instrumentation has been deployed, including a network of three 449 MHz radar wind profilers (RWP's) with RASS, eight 915 MHz RWP's with RASS, 18 sodars, 4 profiling microwave radiometers, 5 scanning lidars, 5 profiling lidars, a network of 10 microbarographs, and many surface meteorological stations. Key NWP forecast models utilized for WFIP2 are the 13 km resolution Rapid Refresh (RAP), 3km High Resolution Rapid Refresh (HRRR), 0.75km HRRR-Nest, and the 12 km North American Mesoscale (NAM) forecast system. Preliminary results from WFIP2 will be presented, including seasonal variations of model forecast errors of wind speed, direction, temperature and humidity profiles and boundary layer depths; meteorological phenomena producing large forecast errors; and the relative skill of the various NWP forecasting systems. Diurnal time height cross-sections of the model's mean bias and RMSE are evaluated for each of the models, providing a holistic view of model accuracy at simulating boundary layer structure. Model errors are analyzed as a function of season (3 month averages) and location, and show the impact of increasing model resolution on forecast skill. Seasonal averages of model biases and RMSE provide more robust results than do shorter case study episodes, and can be used to verify that model errors found in shorter case study episodes are in fact representative. The results are used to identify specific model weaknesses and the corresponding parameterization schemes that are in greatest need of improvement.