



## Applications of data assimilation methodologies in wind power forecasting

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Wind energy is one form of clean energy that is expected to play a significant role in power generation in many countries. Accurate wind forecasts are essential for balancing wind energy production and hence ensuring reliable grid operations, as well as for reducing the cost of wind power integration. One of the most effective ways to improve weather forecasts, including the wind forecasts, is through data assimilation. Data assimilation methods are routinely used in operational weather forecasting centers and in research at the universities. However, the use of data assimilation in wind power forecasting has been limited so far. The situation is changing now as the community is beginning to realize that, in this era of more abundant wind observations from met-towers, radars, lidars, sodars and satellites, data assimilation could play a significant role in the integration of wind energy onto the electric grid.

Precision Wind LLC and Colorado State University (CSU) joined together in exploring data assimilation methods for wind power forecasting. We use a data assimilation method called Maximum Likelihood Ensemble Filter (MLEF), developed at CSU, and a complex numerical weather prediction model, the Weather Research and Forecasting (WRF) model. We assimilate wind and power production site data to improve wind and power forecasts. We pay a special attention to reducing forecast errors of significant ramp events, which are recognized as the biggest challenge for the wind power forecast utility to the system operators. Results from a couple of pilot projects performed in real time for system operators over multiple months will be presented.