

# SPATIO-TEMPORAL SHORT-TERM WIND FORECAST: THE PROACTIVE REGIME-SWITCHING METHOD

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Accurate short-term forecasts are indispensable for harnessing wind energy reliably. On a wind farm, local wind conditions exhibit sizeable fluctuations at a fine temporal resolution. For shortterm forecasting, capturing these fluctuations is of paramount importance, and is therefore the aim of the proactive regime-switching method presented herein. The essence of our approach is to calibrate the forecasts obtained from statistical models to better capture outof- sample changes in wind behavior and thus enhance the accuracy of prediction. We model this calibration by means of two elements: the wind regime observed at the time of the forecast, and the runlength, which is the time elapsed since the most recent regime change. Our approach further allows the incorporation of well-known features of wind fields: spatio-temporal correlations, flow-dependent asymmetries and non-stationarity, in addition to regime-switching dynamics. Using one year of turbine-specific wind data, we show that the proactive regime-switching method can offer a wide margin of improvement over existing forecasting methods in terms of both wind speed and power. This is joint work with Ahmed Aziz Ezzat and Yu Ding