



Improved week-ahead predictions of wind speed using simple linear models with wavelet decomposition

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Received 6 May 2015, Revised 4 February 2016, Accepted 18 February 2016, Available online 27 February 2016

Abstract

Simple linear methods are widely used for time series modelling and prediction and in particular for the forecast of wind speed variations. Linear prediction models are popular for their simplicity and computational efficiency, but their prediction accuracy generally deteriorates beyond a few time steps. In this paper we demonstrate that the prediction accuracy of simple auto-regressive (AR) models can be significantly improved, by as much as 60.15% for day-ahead predictions and up to 18.25% for week-ahead predictions, when combined with suitable time series decomposition. The comparison with new reference forecast model (NRFM) also shows similar accuracy gain of week ahead predictions. The combined model is capable of forecasting wind speed up to 7 days ahead with an average root mean square error less than 3 m/s. We also compare the performance of AR and f-ARIMA models in wind speed prediction and observe that the f-ARIMA model is no better than the AR model when used in combination with time series decomposition.

Keywords

Wind speed forecasting; Time series decomposition; Auto-regressive models; Fractional-ARIMA models