Wind Speed Forecasts for a Wind Farm in British Columbia

Application of Model Output Statistics to Wind Speed Forecasts

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THE UNIVERSITY OF BRITISH COLUMBIA
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BC hydro
FOR GENERATIONS

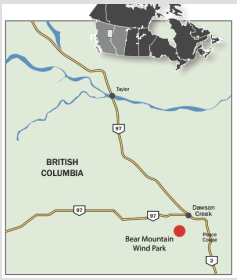
Abstract

This paper examines the performance of wind speed forecasts for the Bear Mountain Wind Farm (BMW) in British Columbia over a period of 6 months using an 11-member ensemble run by the University of British Columbia Geophysical Disaster Computational Fluid Dynamics Center. Three different hub-height interpolation methods, along with four different model output statistics (MOS) techniques, including linear regression, a 2-week running average bias, and two Kalman filters, are tested. The resulting ensembles are verified using bias, root mean squared error and mean absolute error plots.

Specific events, which were poorly forecasted, are studied to determine if ensemble members are underperforming and to determine if the spread of the ensemble is better suited as a forecast tool.

Verification of Forecasts

All of the MOS techniques successfully minimized the bias. The running average MOS with a linear interpolation resulted in the smallest total bias over the 60 hour forecast. Although the two-week running average bias was able to effectively minimise the average bias, it was unable to improve on the RMSE over the raw forecasts. The linear regression improved the variance errors over the raw forecast most successfully, whereas the Simple Kalman Filter increased the variance errors.



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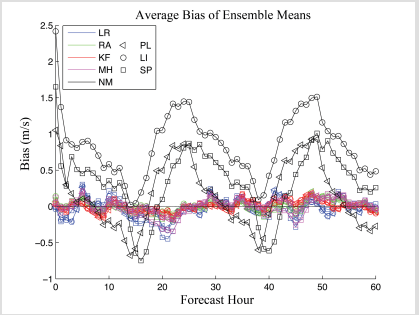


Figure 1. Average bias of ensemble means over the 60 hour forecast time (for legend definitions, see lower right table)

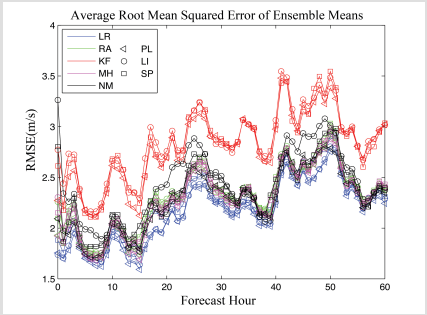


Figure 2. Average root mean squared error of ensemble means over the 60 hour forecast time.

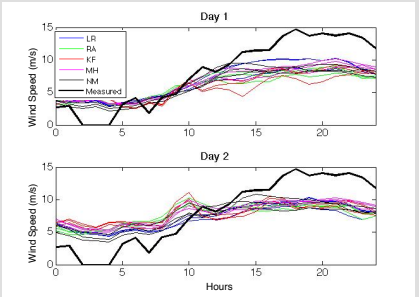


Figure 3. Day 1 and Day 2 mean ensemble forecasts for June 2nd, 2010.

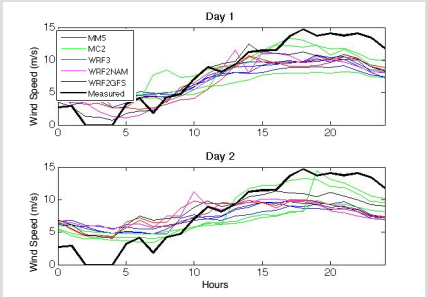


Figure 4. Day 1 and Day 2 ensemble member forecasts adjusted using linear regression MOS and power law interpolation for June 2nd, 2010.

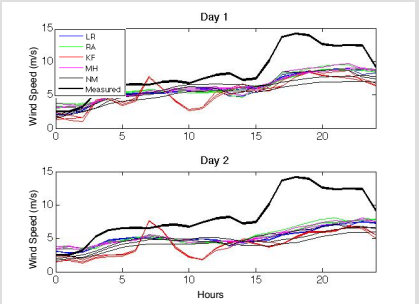


Figure 5. Day 1 and Day 2 mean ensemble forecasts for July 10th, 2010.

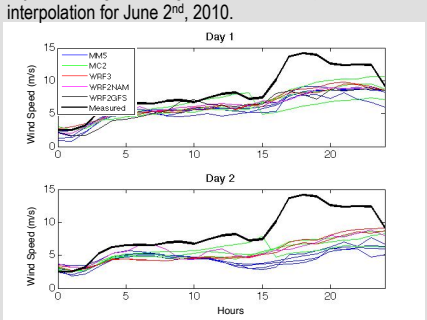
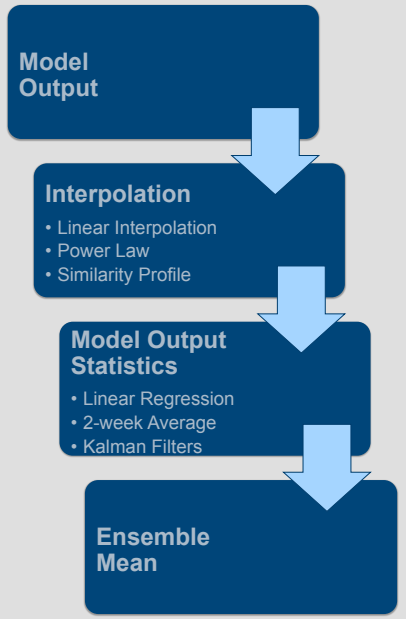


Figure 6. Day 1 and Day 2 ensemble member forecasts adjusted using linear regression MOS and power law interpolation for July 10th, 2010.

Ensemble Forecasting

Model/Res	108km	36km	12km	4km	Vertical
MM5	x	x	x	x	20mb
MC2	x	x	x		50mb
WRF2GFS			x		25mb
WRF2NAM			x		25mb
WRF3NAM		x	x		25mb



Hub Height Interpolation	
Linear Interpolation	LI
Power Law	PL
Similarity Profile	SP
Mode Output Statistics	
Linear Regression	LR
2-week Running Average	RA
Simple Kalman Filter	KF
Miranda Holmes KF	MH
No MOS Applied	NM