Application of the measure-correlate-predict approach for wind resource assessment

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Measure-Correlate-Predict for Wind Resource Assessment

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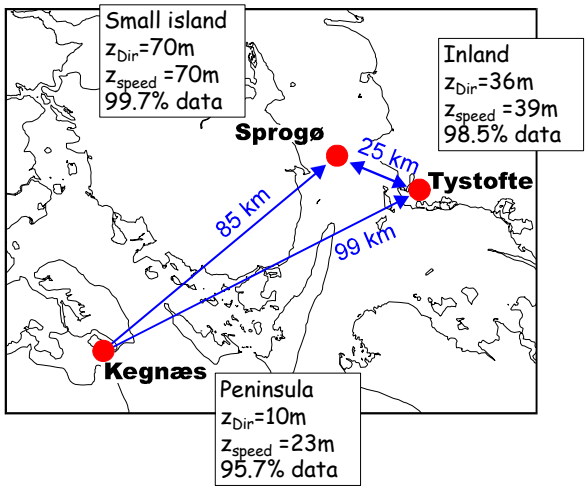
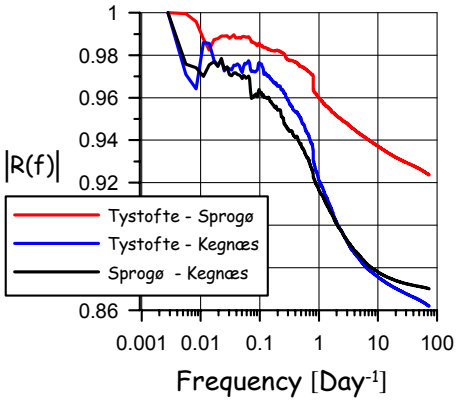
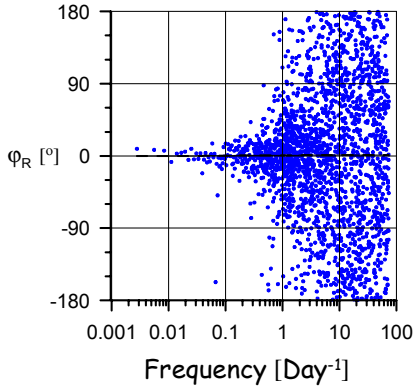
Measurements



The band-limited correlation coefficient depends on the cut-off frequency and spatial separation.



Phases of cross-correlation (Sprogø/Tystofte) are quite scattered at high frequencies!



Correlation

Linear regression models, for speed, direction or wind vector are constructed for each sector at the reference stations.

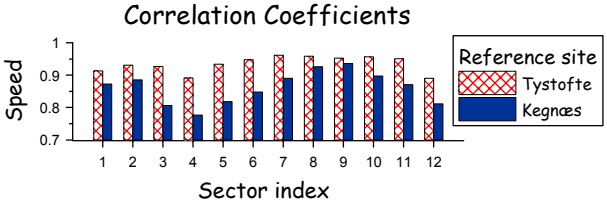
Speed: $s_p = a_s + b_s s_r$

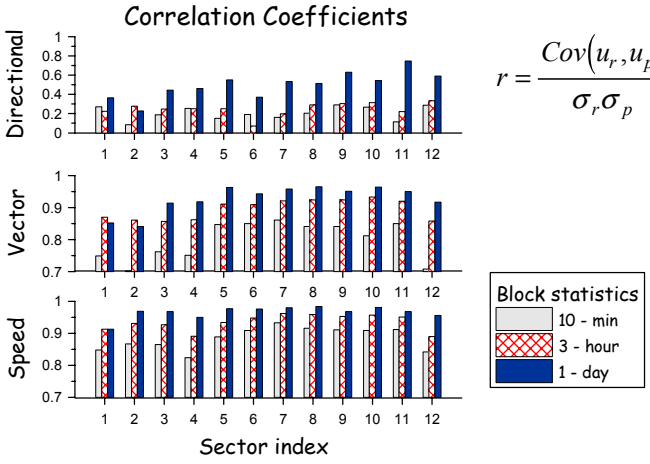
Direction: $\Delta\theta_p = a_\theta + b_\theta \Delta\theta_r$

Vector: $\begin{bmatrix} x_p \\ y_p \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} + \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} x_r \\ y_r \end{bmatrix}$

The Correlation between Tystofte and Sprogø based on 7-year time series by increasing block length of the input data. Speed is easier to predict than the wind vector and wind-direction predictions are very difficult.

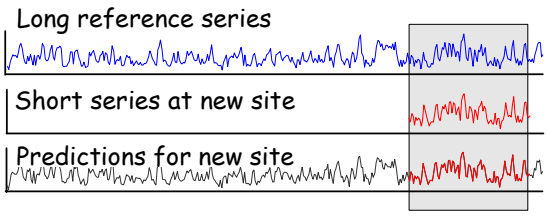
Correlations between Sprogø and two reference sites based on 3-hour data are best for the closest station.



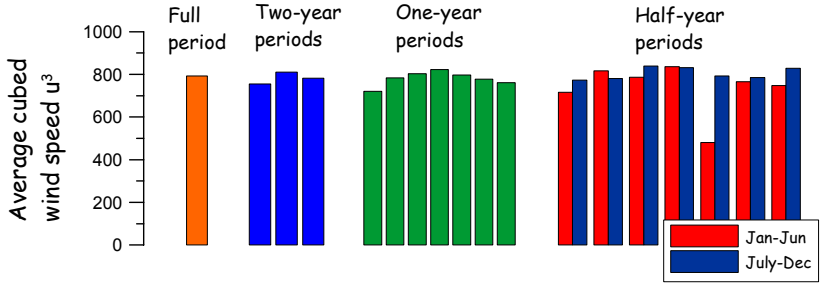


Predictions

The MCP principle is to construct a long time series for the new site by a correlation model and a long record from the reference site.



Predictions for Sprogø based on measurements from Tystofte repeated for various data overlap periods.



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