

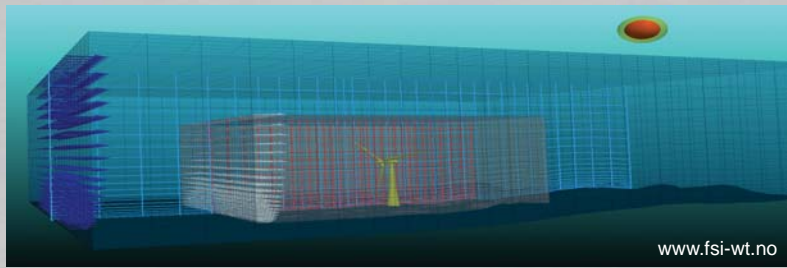
Statistical Analysis of wind mast data from the Bessaker Wind Farm

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INTRODUCTION

Usability of observation data from a wind mast located close to the Bessaker Wind Farm is investigated using an autocorrelation analysis in this work.



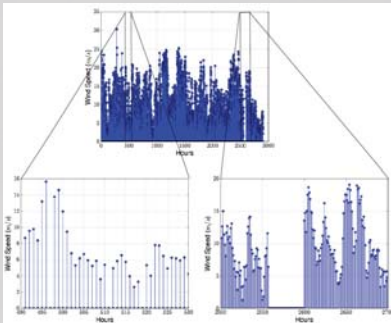
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DATA DESCRIPTION



- Onshore Bessaker wind farm is selected which has 25 turbines and located in a complex terrain.
- Data is recorded after every 10 minutes interval from wind-mast located 35 m above the ground.

FACTS ABOUT THE DATA



- Missing data (NaN) ☹
- Zero values (mean average is zero) ☹
- Spikes ☹

PREPROCESSING OPTIONS

Global average value
Neighboring value
Linear Interpolation

CONCLUSION

- Minimum sample size of the time series is required for a faithful representation of the autocorrelation.
- Wind in the location under consideration has a memory of 6-7 hours
- For long term forecasting observation data is not sufficient but can be used in combination with numerical forecast

AUTOCORRELATION ANALYSIS TO RECONSTRUCT THE DATASET

Autocorrelation is a very important tool for displaying the manner in which the past continues to affect the future. The autocorrelation function:

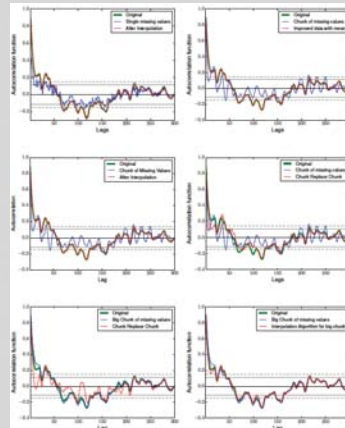
$$\rho(k) = \frac{(1/n) \sum_{t=1}^{n-k} (X_t - \mu)(X_{t+k} - \mu)}{(X_t - \mu)^2} = \frac{\sigma(k)}{\sigma(0)}$$

$\sigma(k)$ = autocovariance coefficient,
 k = number of lags,
 μ = mean of the data,
 $\sigma(0)$ = variance of the data.

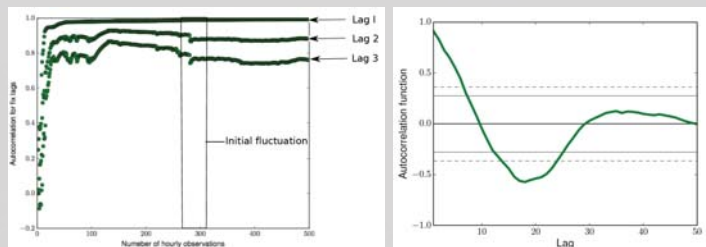
Artificially created 10% inaccuracy.

Considered the following cases:

- scattered single missing values,
- chunk of missing values in short intervals,
- one big chunk of missing values.



AUTOCORRELATION CURVE (MEMORY IN WIND)



- Autocorrelation curve varies depending upon the length of timeseries upto a certain length after which they collapse on a single curve (right).
- Autocorrelation drops to zero in 10 hours

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