PO. 364

OFFSHORE WIND FIELD: Application of Statistical Models as a Spatial Validation Technique

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Abstract

Generally, atmospheric mesoscale models are used as tools to perform wind atlases. In recent decades, significant efforts have been applied to the development and improvement of this kind of models to reduce their systematic errors. These ones are assessed when model results are compared with observations. In practice, such errors could be statistically corrected if observational data was available for the same area.

A deviation matrix of the wind field between WRF model and wind data retrieved from the QuiKSCAT satellite was obtained by the application of two statistical techniques – kriging and composite method. The spatial validation performance was evaluated with observational wind data from an anemometric mast installed on Berlengas islet since November 2006 to the present.

The following are a preliminary assessment of the statistical methods as spatial validation techniques. These are a part of the spatial validation methodology to be used within the EU FP7 NORSEWInD project [4].

Objectives

- *Compare the spatial validation performance of the Kriging interpolator method against a developed composite method. The results are evaluated at the anemometric mast point with the wind atlas.*

Methods

- *Kriging interpolator method described in [1,2].*
- *Composite method is a spatial tool developed by LNEG defining the deviation matrix as a weighted linear combination of several data points where the linear coefficients associated to each grid point are calculated in accordance to the inverse distance of the nearest points [3].*

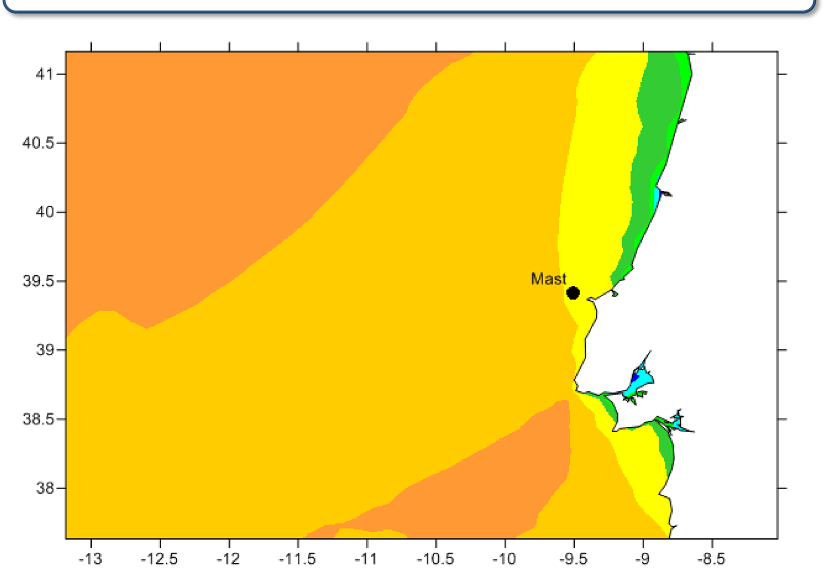
Two approaches for spatial interpolation comparison's evaluation:

- *1- Grid performed using all wind data retrieved from QuiKSCAT;*
- *2+3 – Different grids performed with distinct wind data points from QuiKSCAT*

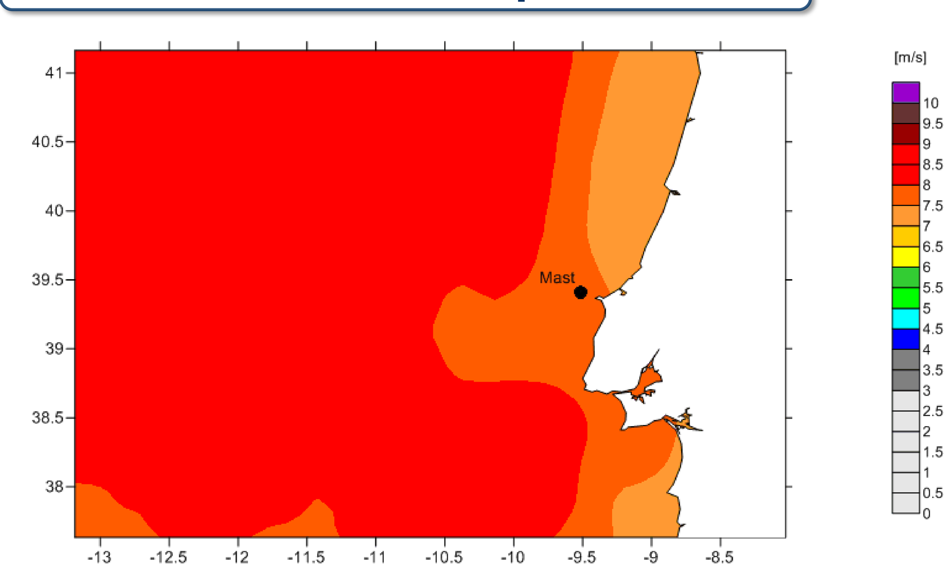
Results

WIND FIELD

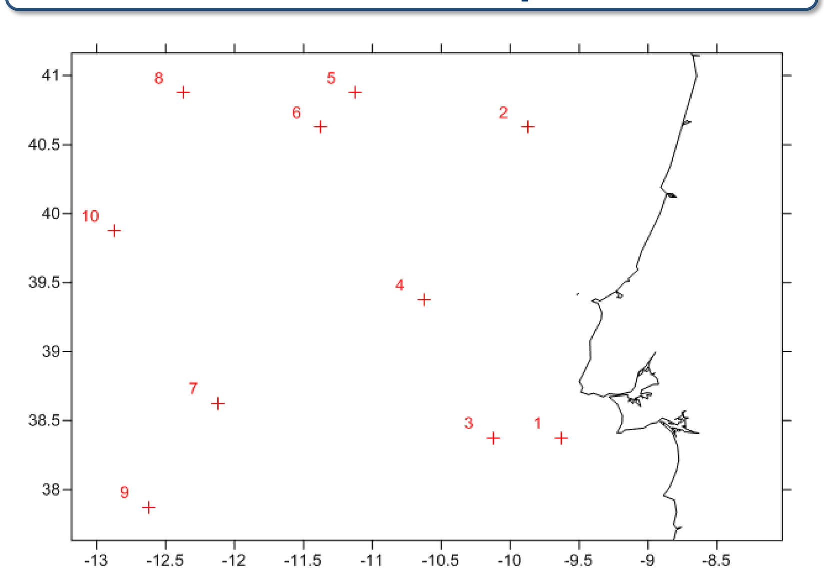
WRF



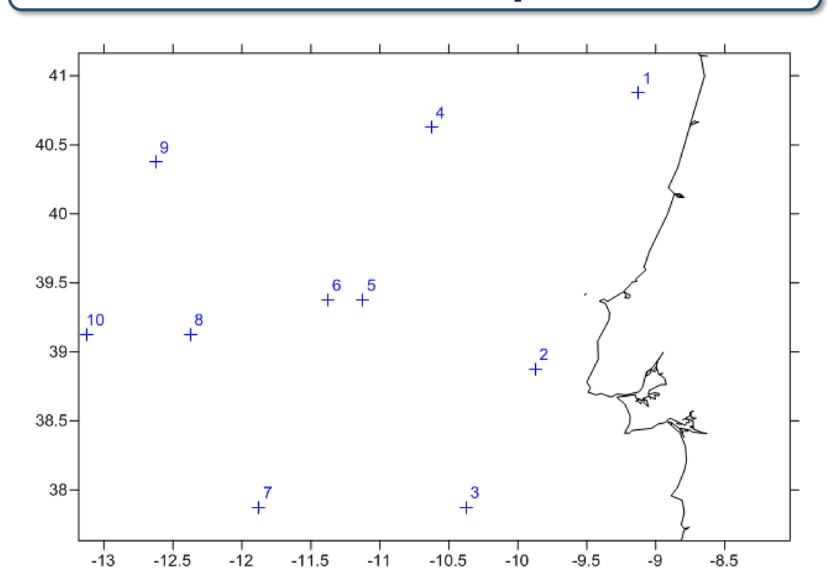
1. Satellite – 219 points



2 . Satellite – 10 points

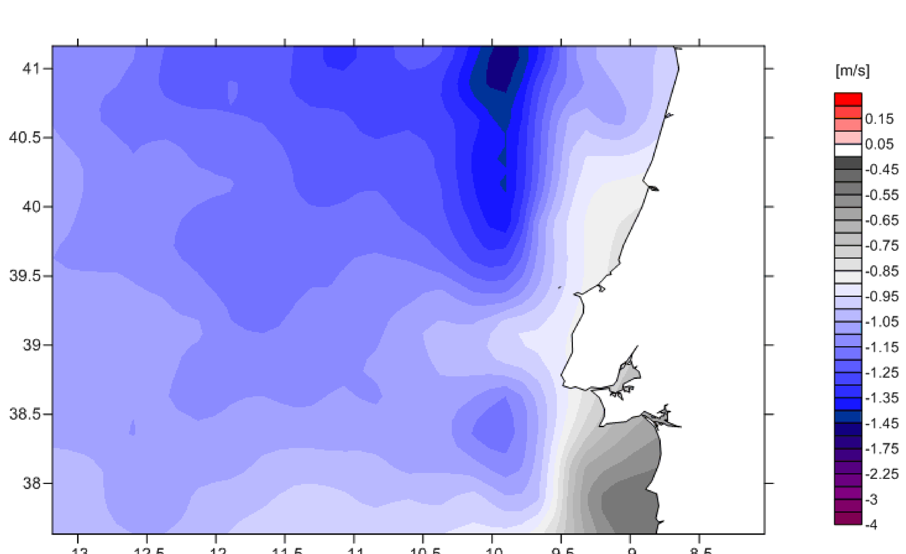


3. Satellite – 10 points

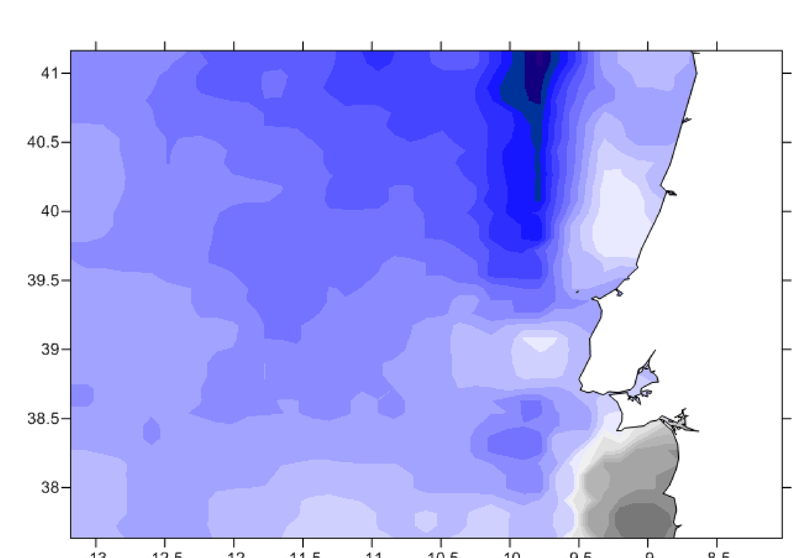


Deviation Matrix

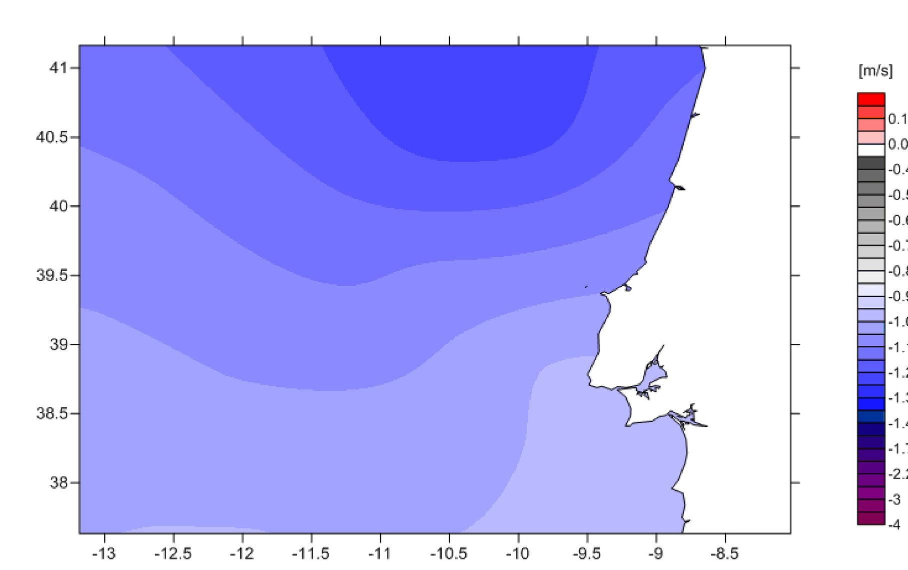
Kriging Interpolation (1)



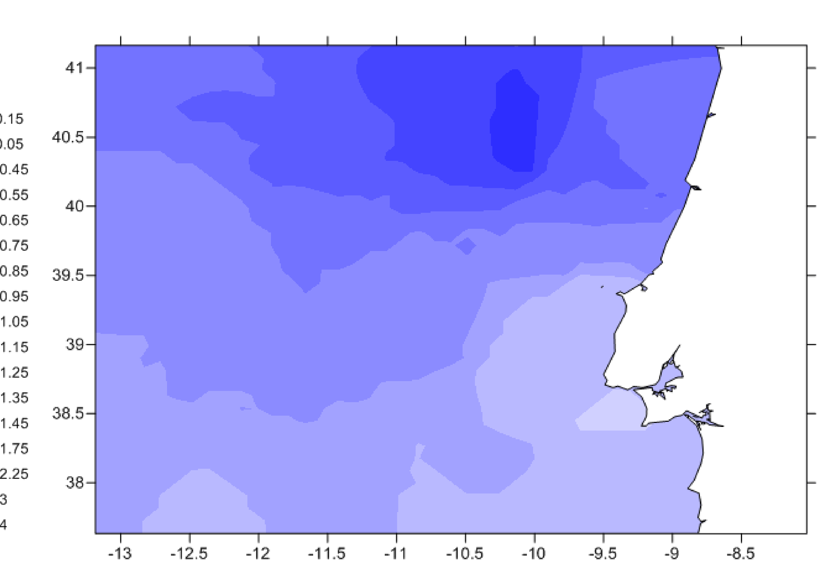
Composite Method (1)



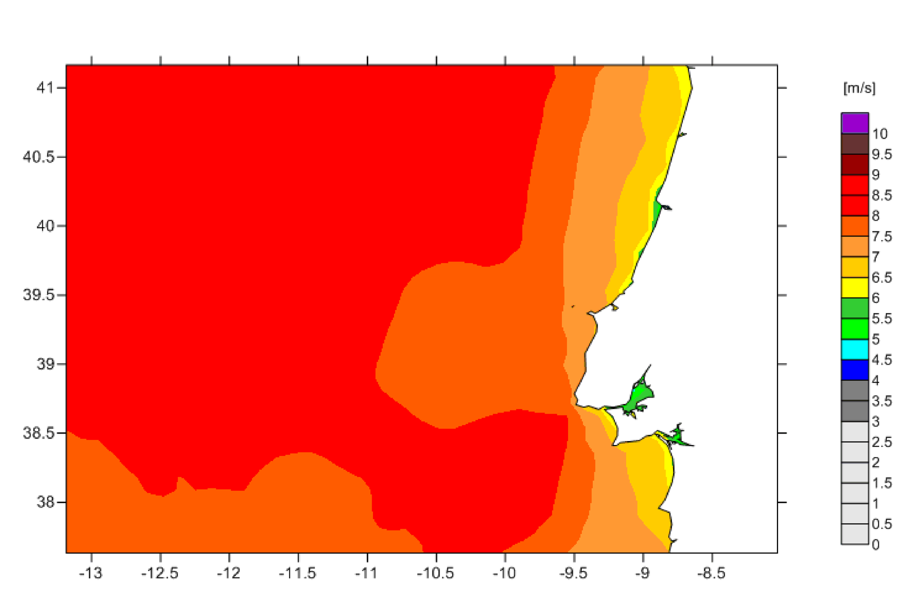
Kriging Interpolation (2+3)

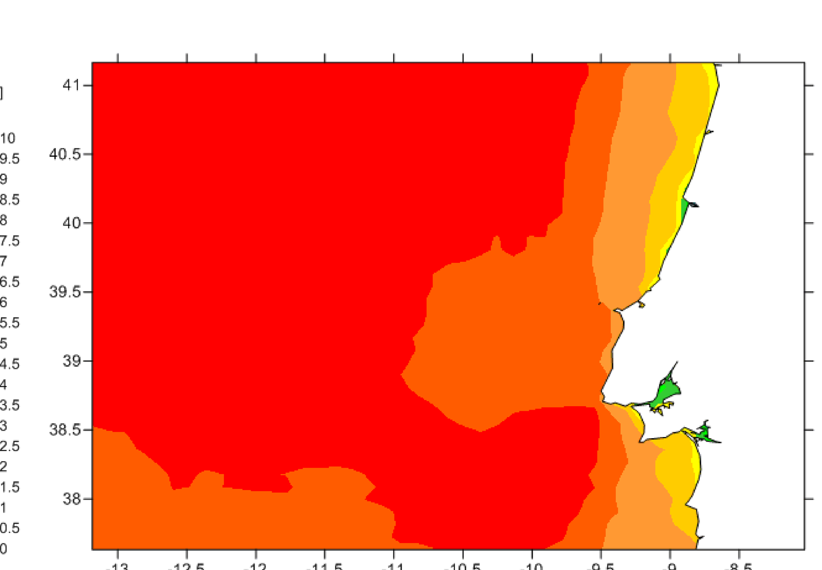


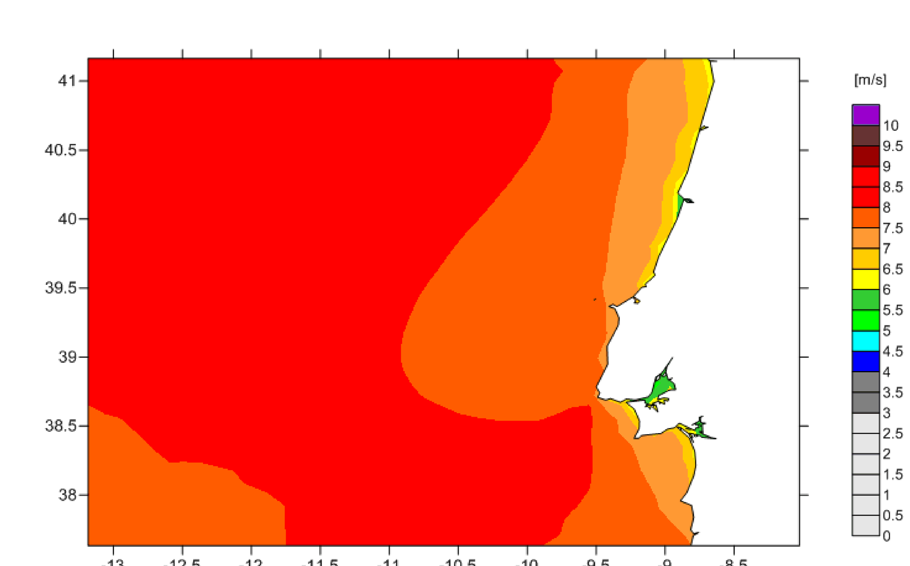
Composite Method (2+3)

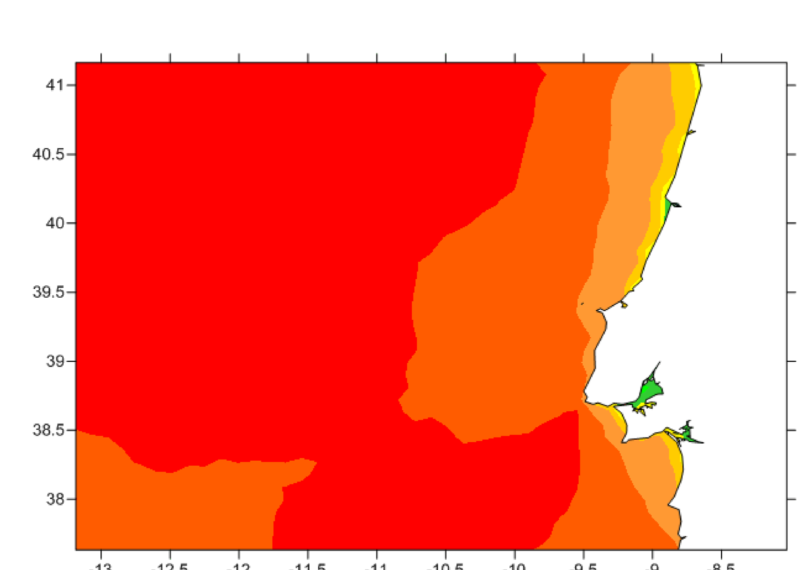


WRF - Deviation Matrix







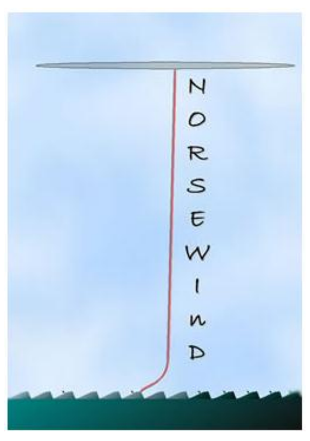


Conclusions

				(1) ALL Points		(2 + 3) 20 Points	
	WRF	Satellite	Mast	Kriging	Composite	Kriging	Composite
Mean (m/s)	6.58	7.56	7.27	7.33	7.28	7.44	7.31
Bias (m/s)	-0.69	0.29	-	0.06	0.01	0.17	0.04
SCORE (%)	-	-	-	99.24	99.97	93.93	99.66

- *Similar results (score 99% - 100%) on both spatial methods for the first case, i.e., when using all satellite wind data in one grid;*
- *Two or more grids (e.g. obtained from different wind sources of data) ingested into the composite method achieve better results, i.e., higher performance (~100%) against the Kriging interpolator (~94%);*
- *Spatial deviation variability is enhanced by the composite method compared to Kriging which smooths the results.*

References



[1] Abramowitz, M., and Stegun, I. (1972), *Handbook of Mathematical Functions,* Dover Publications, New York.

[2] Cressie, N. A. C. (1990), *The Origins of Kriging,* Mathematical Geology, v. 22, p. 239-252.

[3] P. Costa and A. Estanqueiro (2003), *A Methodology to Compute Wind Resource Grids in Complex Terrain Based on Multiple Anemometric Stations*, EWEC, Madrid.

[4] http://www.norsewind.eu