



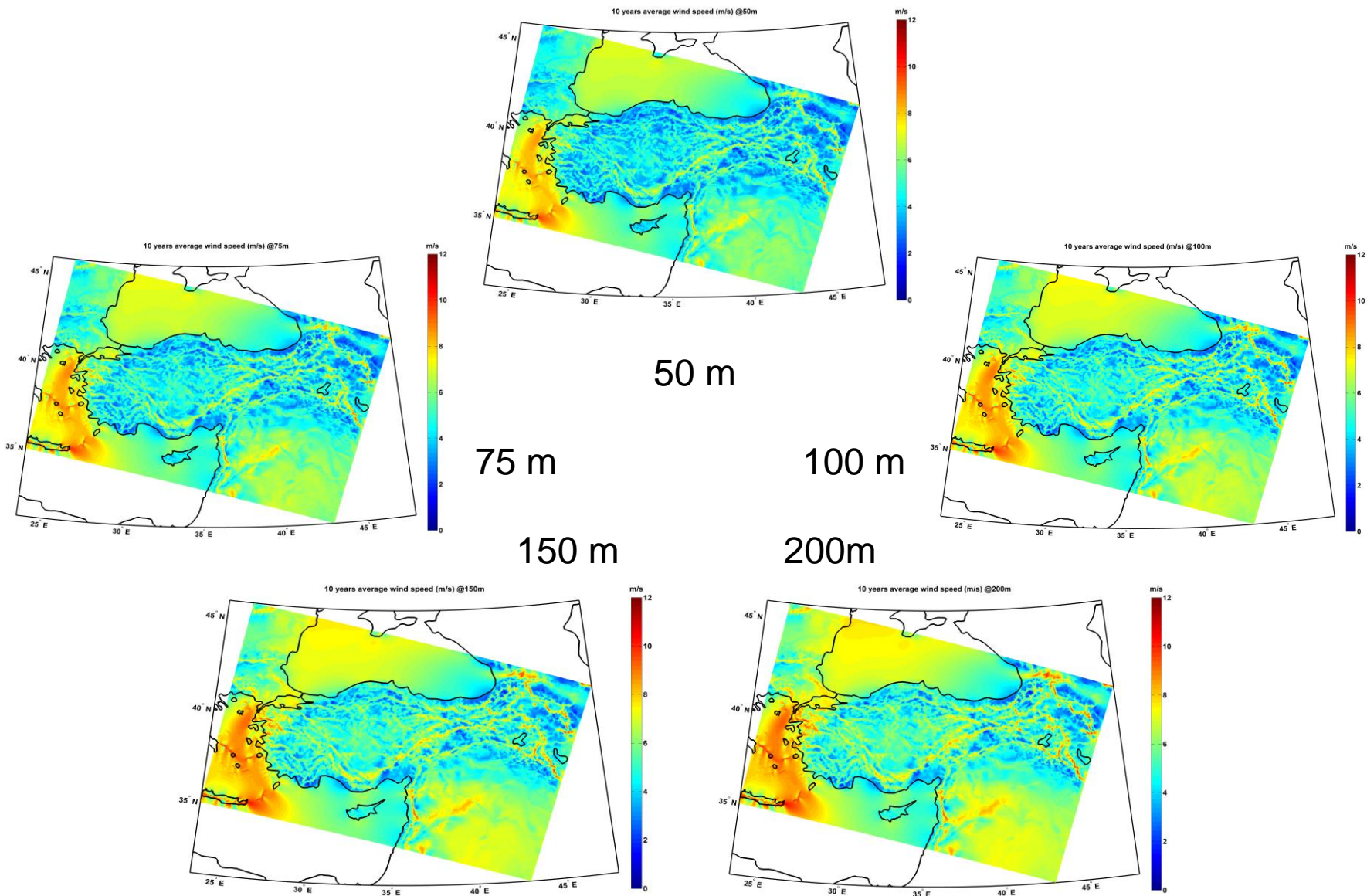
Assessment of surface wind from the long-term production run over Turkey.

Sibel Menteş, Tarık Kaytancı, Yasemin Ezber, Yurdanur Ünal
Istanbul Technical University

Objectives

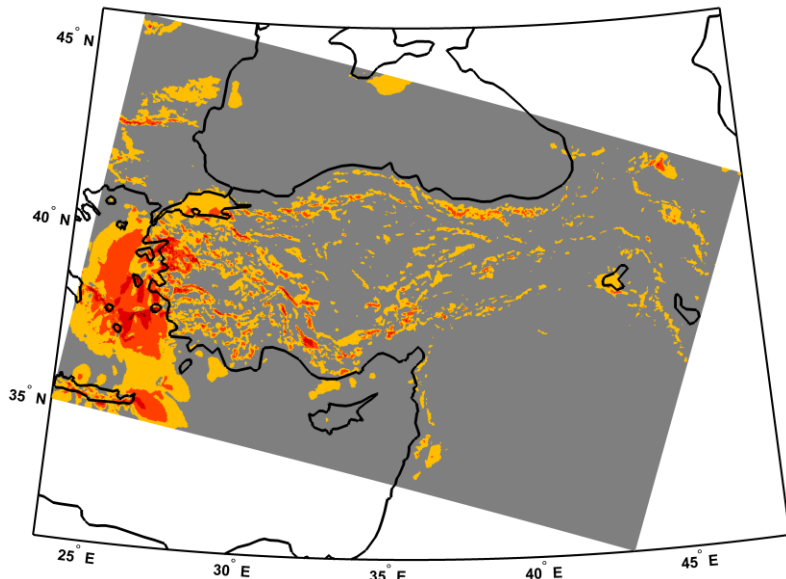
- Comparison of production runs over Turkey with surface observations for 10 years period
mast data for 2015
- Composite Analysis for extreme years.
- Classification of model performance over Turkey
 - Topography
 - Elevation
 - Terrain complexity
 - Climate zones
 - Land use

Average Wind Speed for 2007-2017 period

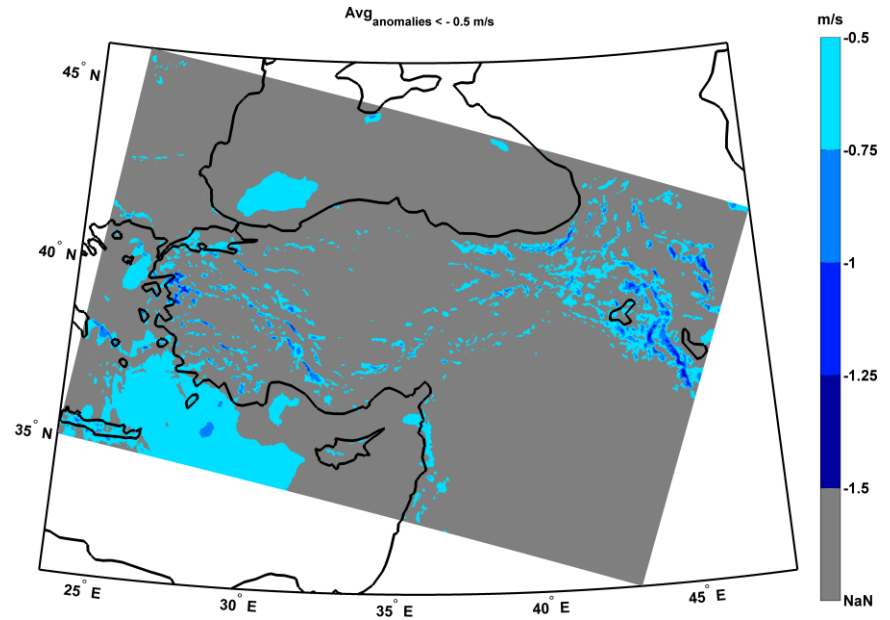


Composite Analysis

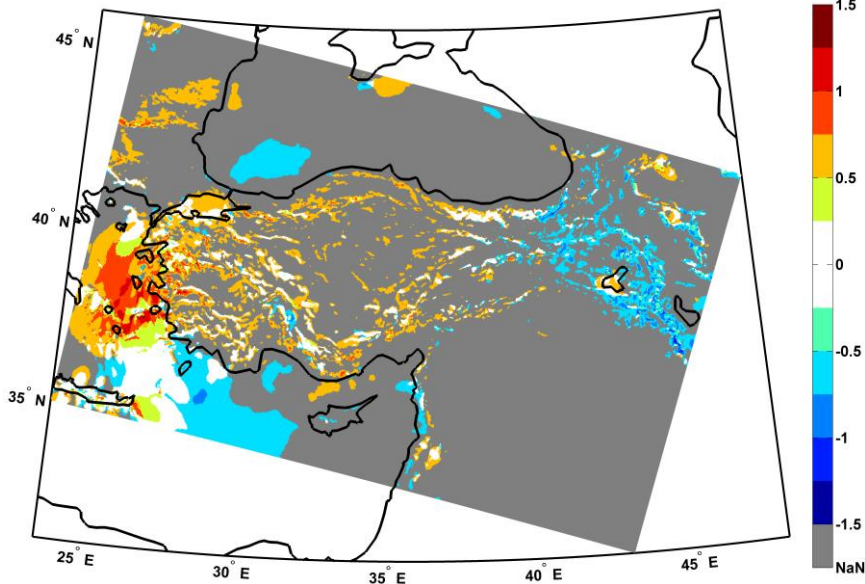
Avg_{anomalies > 0.5 m/s}



Avg_{anomalies < -0.5 m/s}



(Avg_{anomalies > 0.5 m/s}) + (Avg_{anomalies < -0.5 m/s})

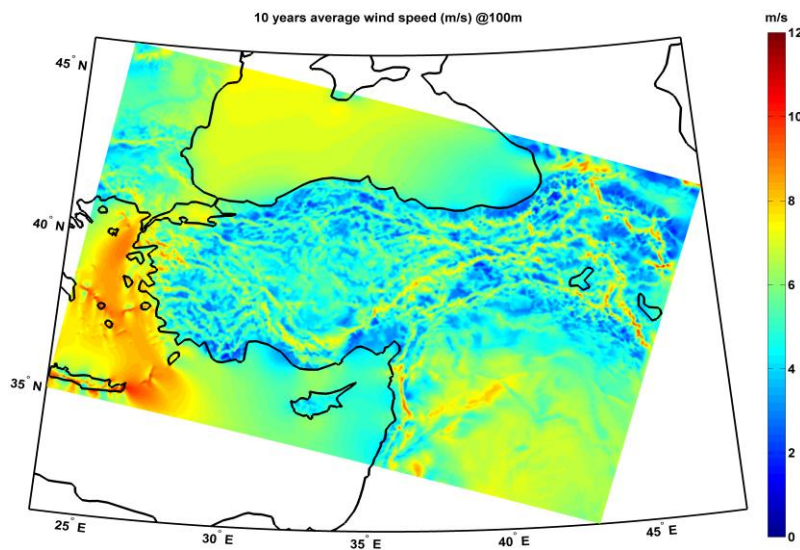
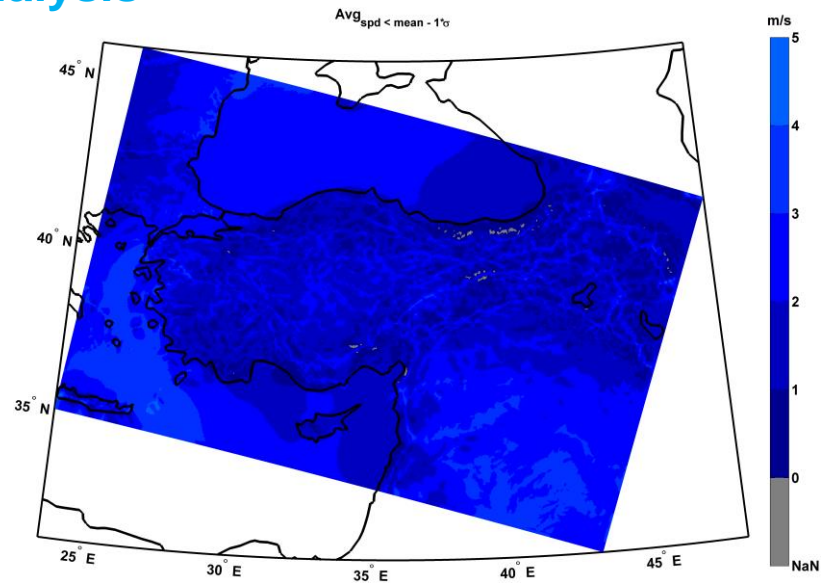
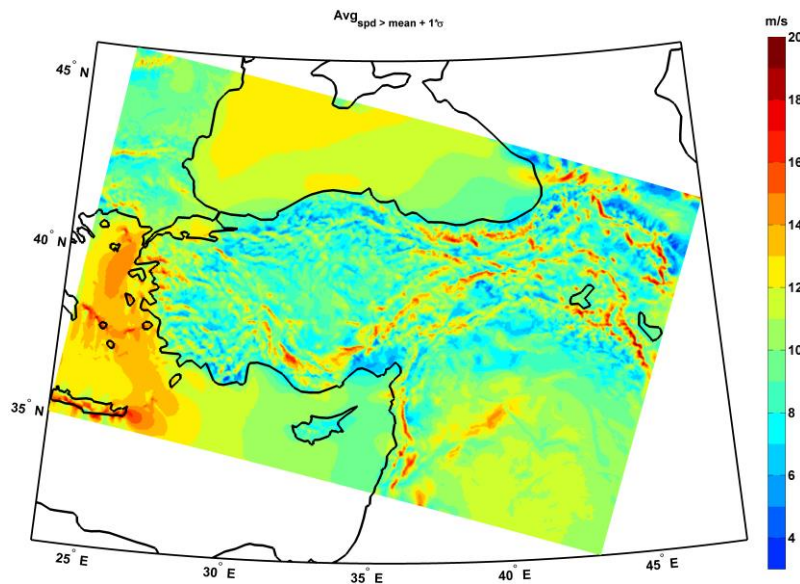


$$V_c < V_{\text{mean}} - 0.5 \text{ m/s}$$

$$V_w > V_{\text{mean}} + 0.5 \text{ m/s}$$

$$V_{\text{dif}} = V_w - V_c$$

Composite Analysis

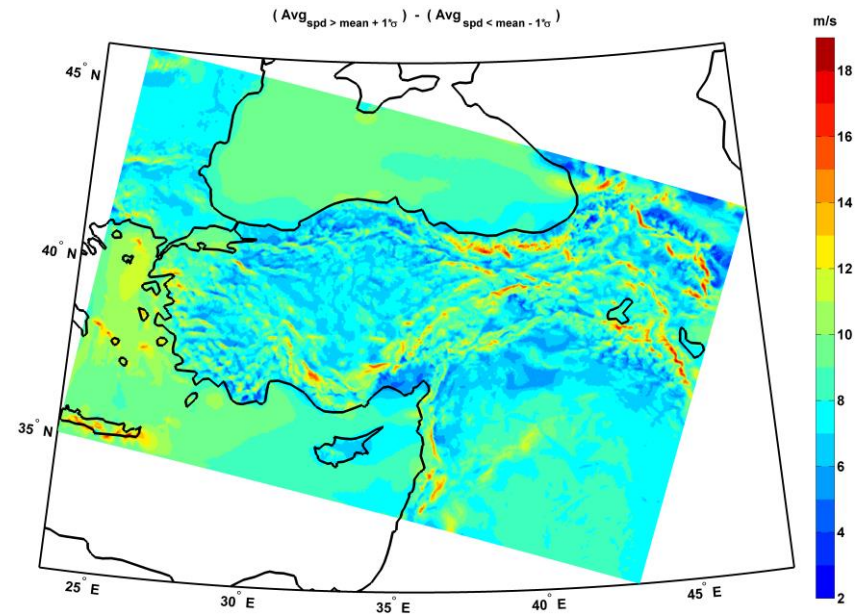
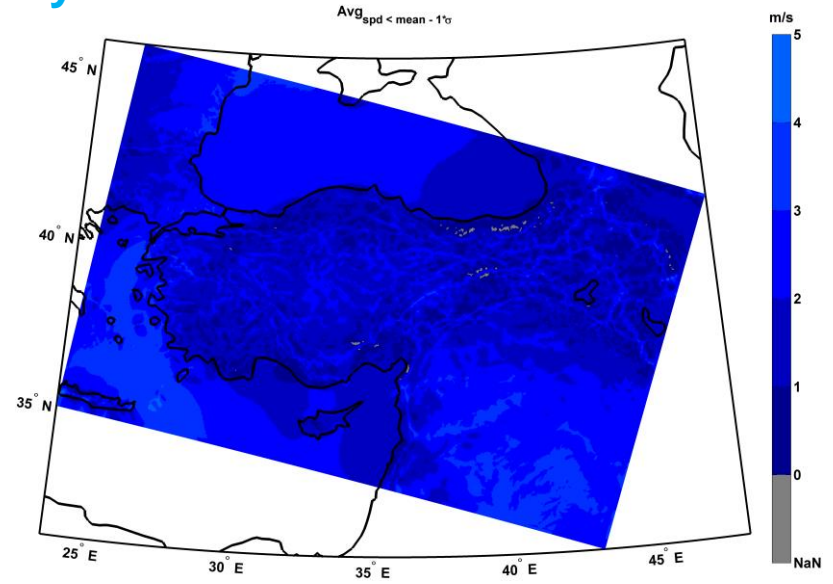
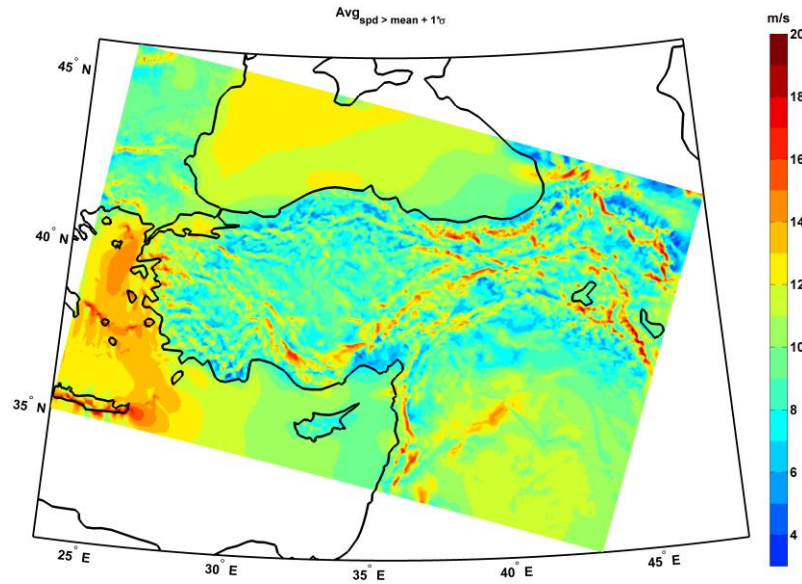


$$V_{\text{mean}_l} < V - \sigma$$

$$V_{\text{mean}_h} > V + \sigma$$

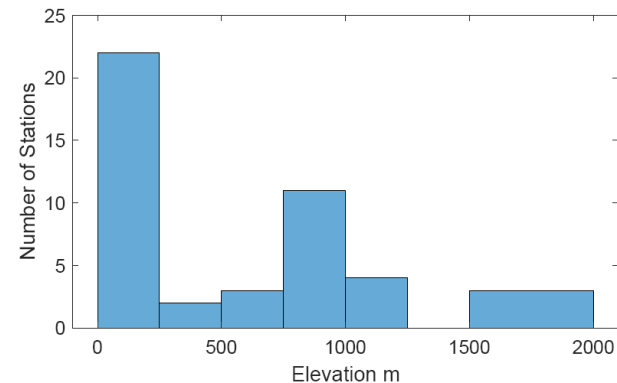
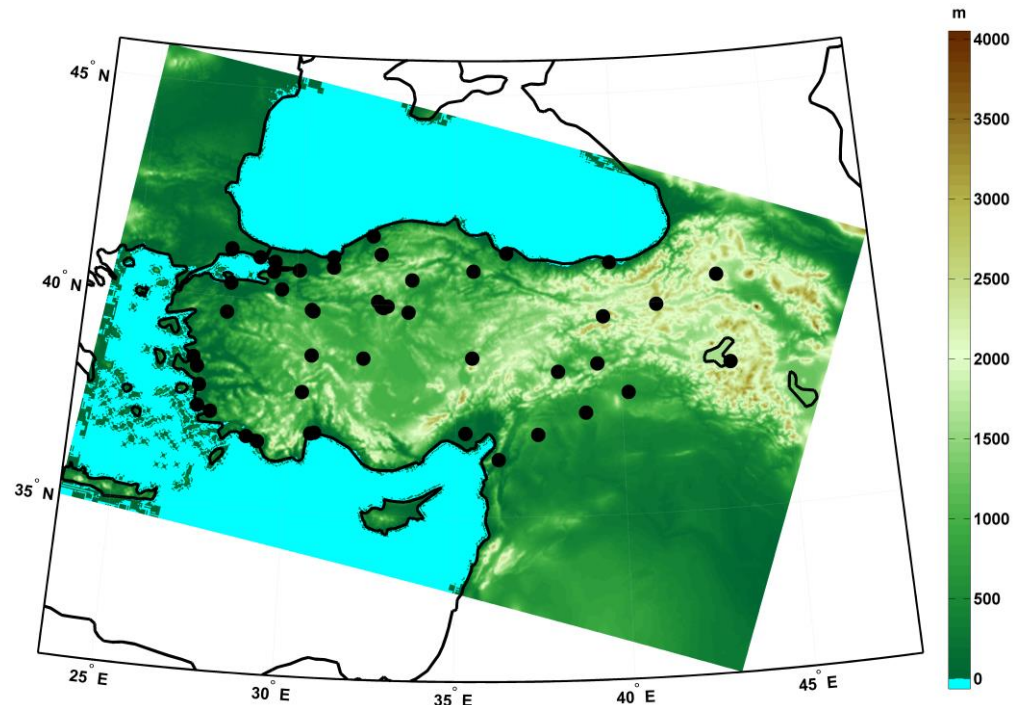
$$V_{\text{dif}} = V_{\text{mean}_h} - V_{\text{mean}_l}$$

Composite Analysis



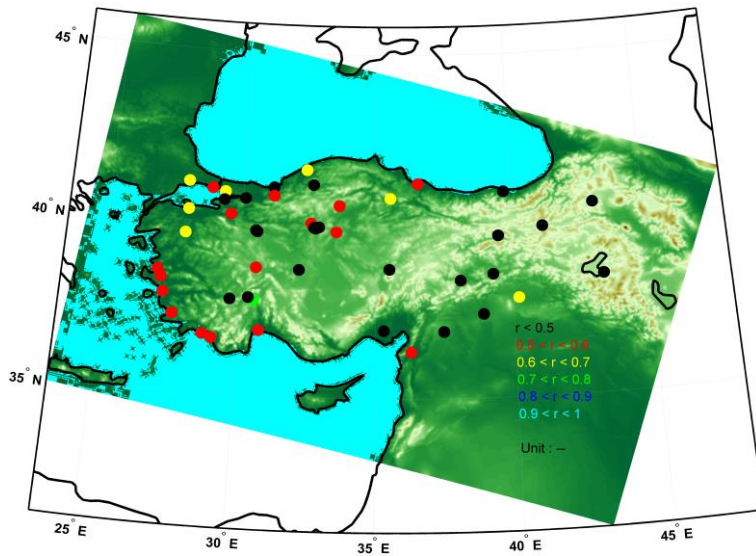
Spatial Distribution of Selected Stations

- 47 station
- 10 years hourly wind speed observations at 10 m
- They are distributed over different climate zones of Turkey
- Station' elevations range 3-1795m

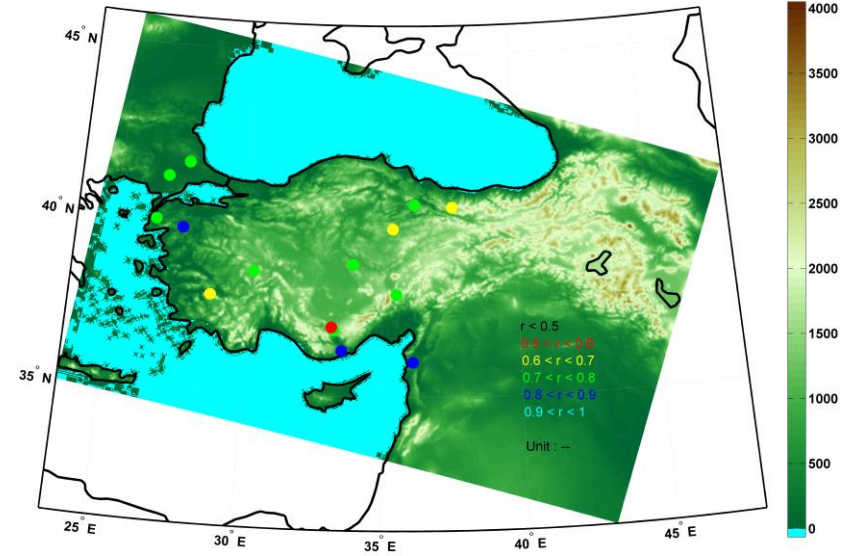


Comparison of model performance statistics (pearson & rmse) at surface stations and mast measurements at 80m & 60m

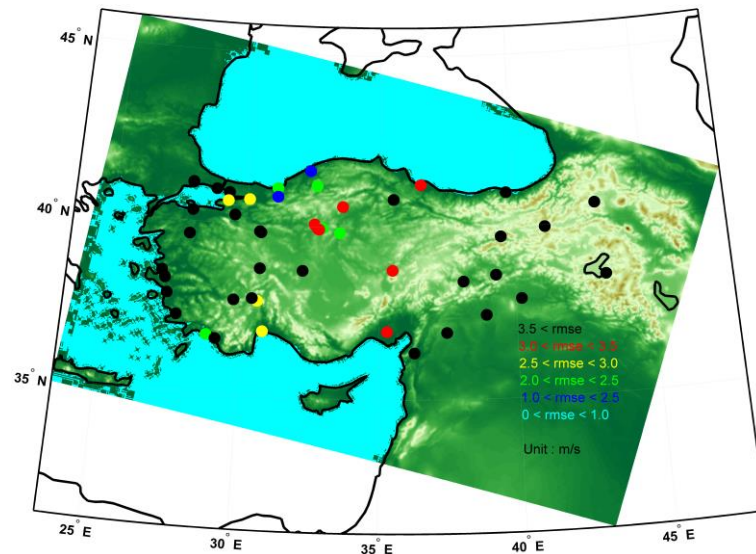
Pearson Corr. Coeff. in surface stations for 2007-2017



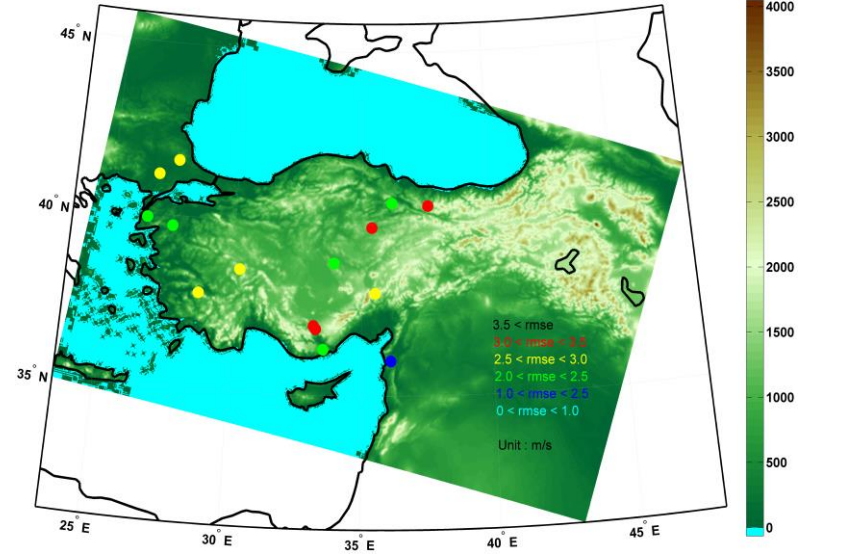
Pearson Corr. Coeff. at 80m (Mut=60m) for 2015



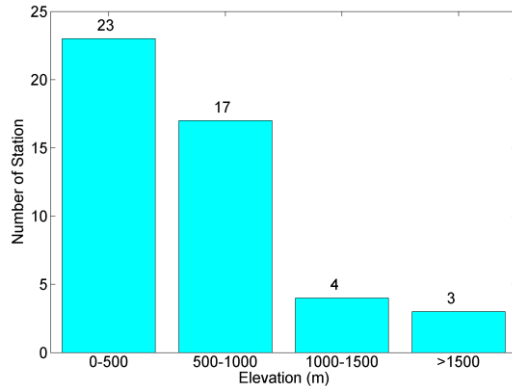
RMSE (m/s) in surface stations for 2007-2017



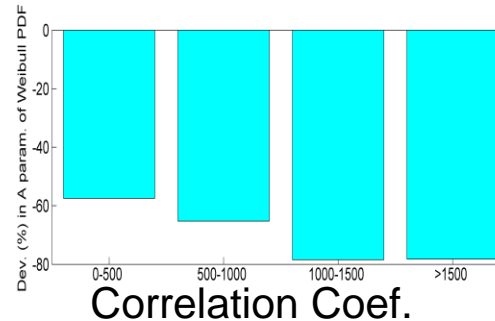
RMSE (m/s) at 80m (Mut=60m) for 2015



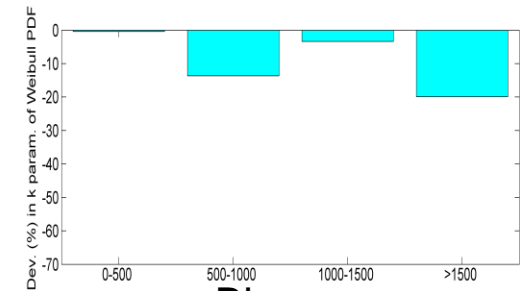
Average Model Performance Statistics Based on “Elevation”



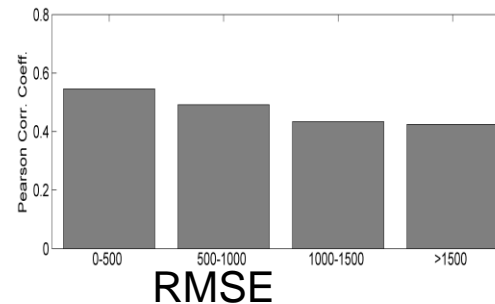
Scale Parameter



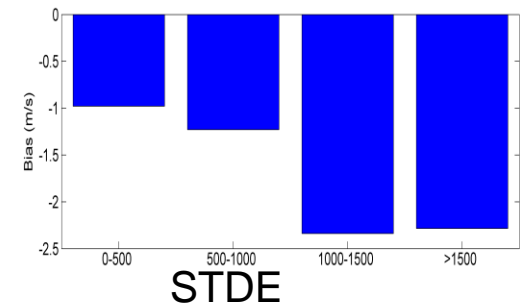
Shape Parameter



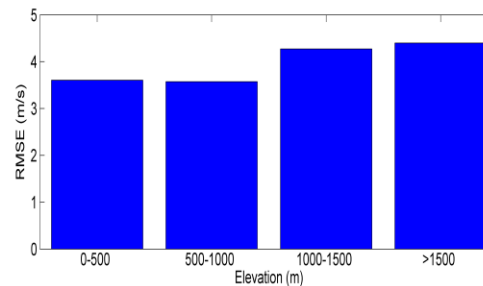
Correlation Coef.



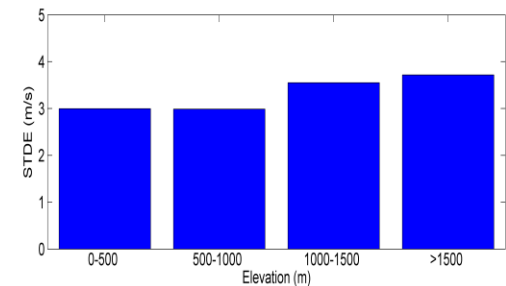
Bias



RMSE

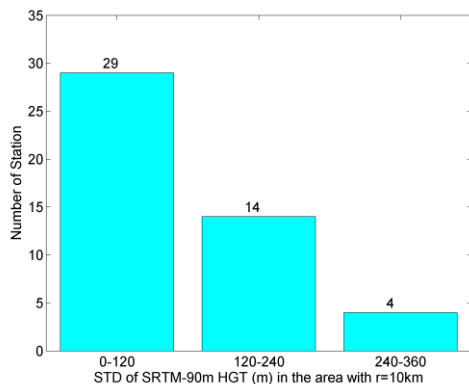


STDE



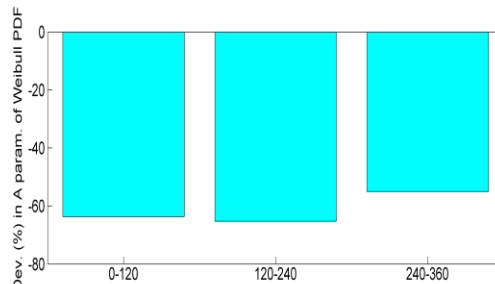
- Scale Parameter 57% → 78%
- Shape Parameter 0 → 19%
- r 0.54 → 0.42
- Bias 1 – 2.29 m/s
- RMSE 3.5 m/s → 4.5 m/s
- STDE 2.9 m/s → 3.7 m/s

Average Model Performance Statistics Based on “Terrain Complexity”

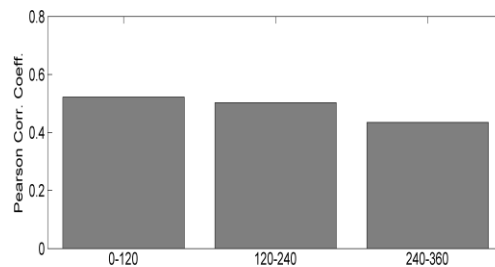


- Scale Parameter 63% → 59%
- Shape Parameter 4.8 → 8%
- r 0.52 → 0.43
- Bias 1.4 – 0.7 m/s
- RMSE 3.7 m/s → 3.2 m/s
- STDE 3.1 m/s → 2.6 m/s

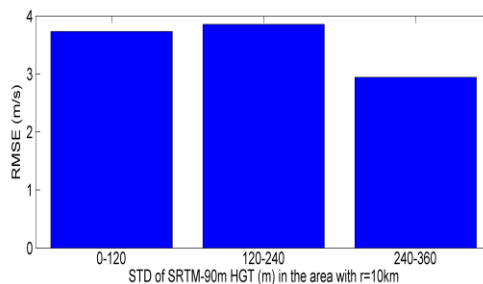
Scale Parameter



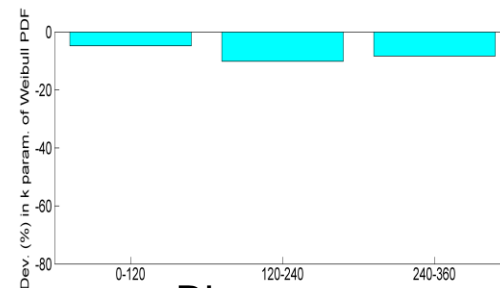
Correlation Coef.



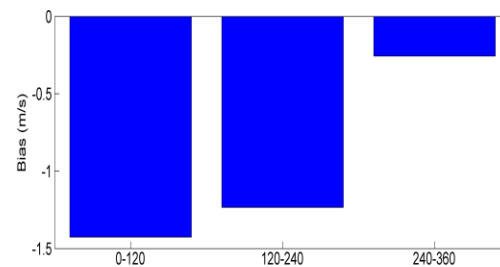
RMSE



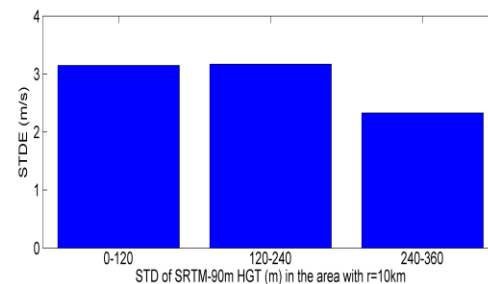
Shape Parameter



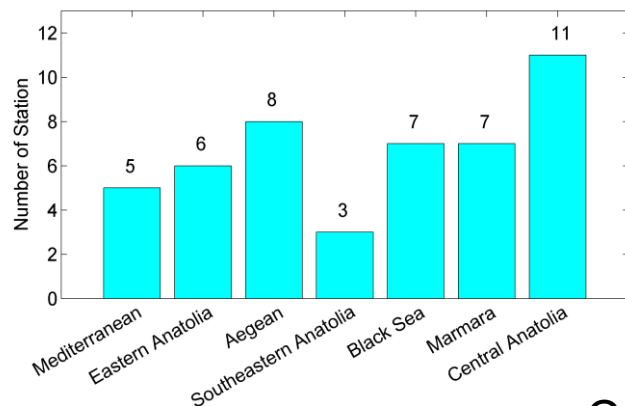
Bias



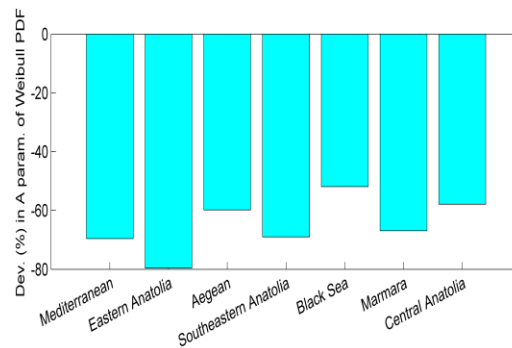
STDE



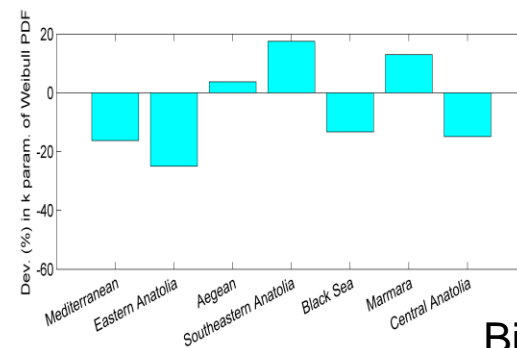
Average Model Performance Statistics Based on “Geographic Region”



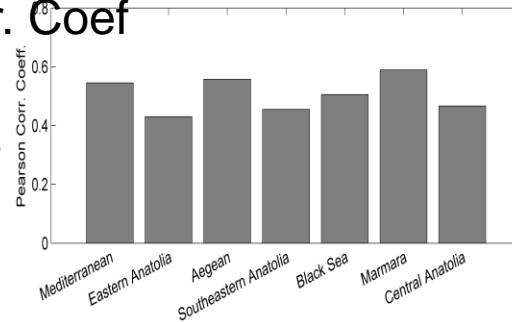
Scale Parameter



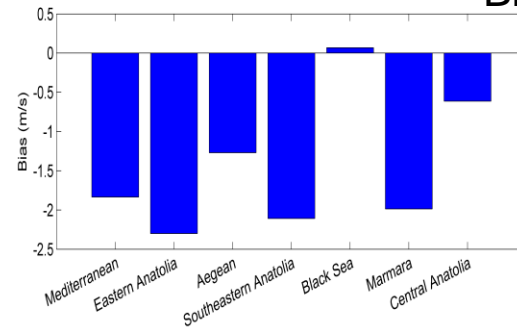
Shape Parameter



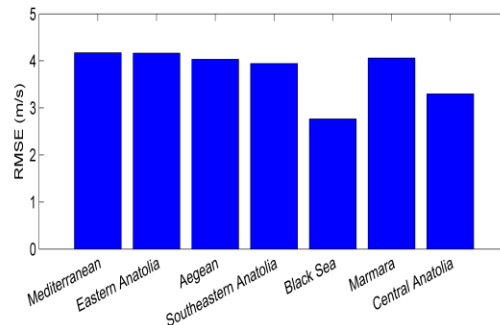
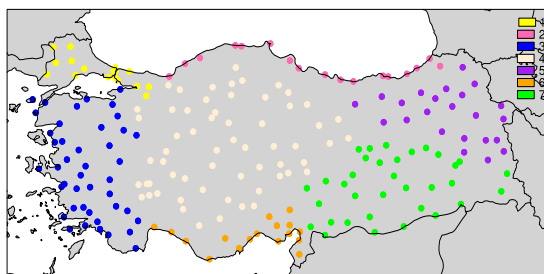
Cor. Coef



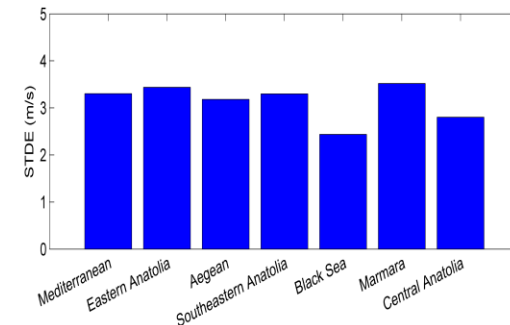
Bias



- The smallest biases (-0.07 m/s) and RMSE (2.7m/s) are seen in Black Sea Region.
- The largest ones (-2.4 m/s; 4.17 m/s) in Eastern Anatolia Region

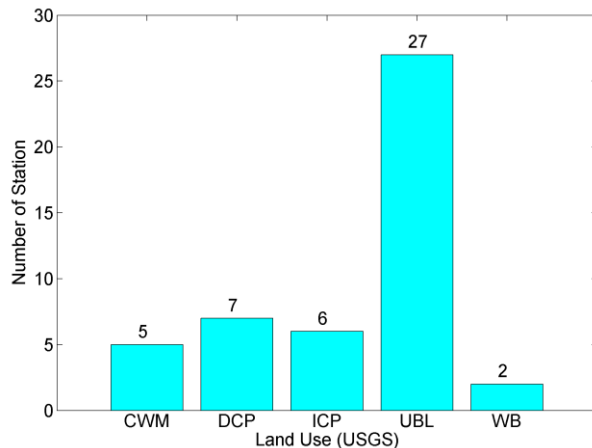


RMSE

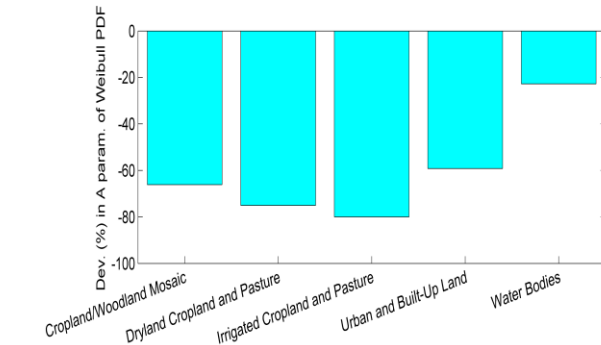


STDE

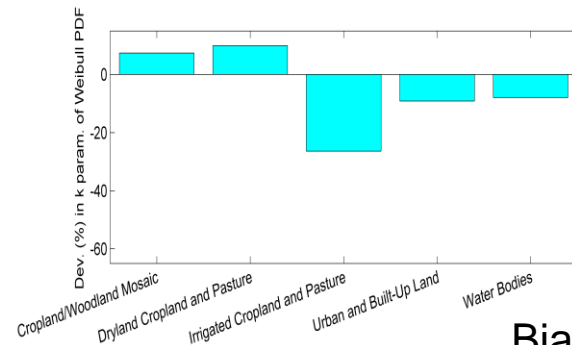
Average Model Performance Statistics Based on “Land Use”



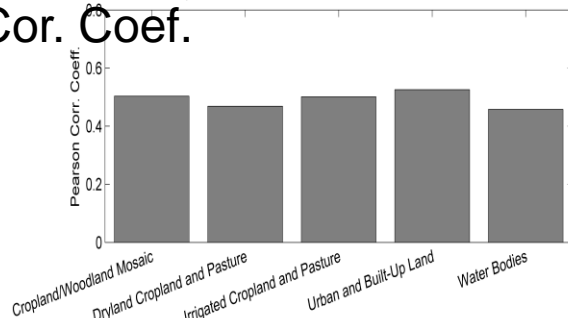
Scale Parameter



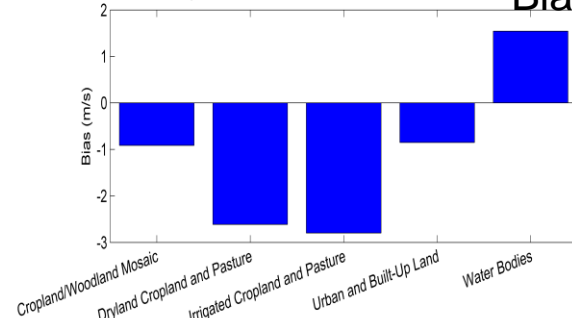
Shape Parameter



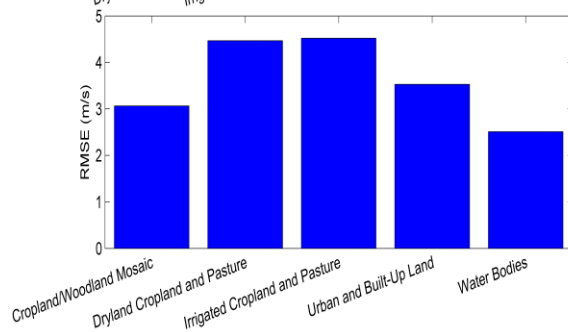
Cor. Coef.



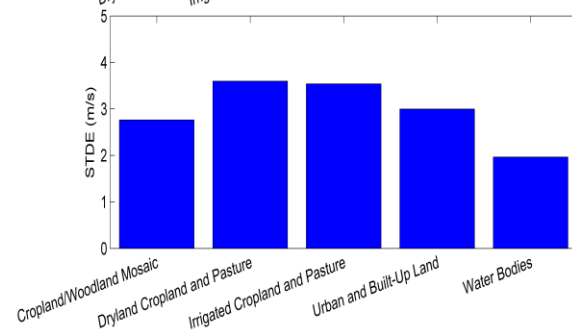
Bias



There are problems in the representation of land use around the stations compared.

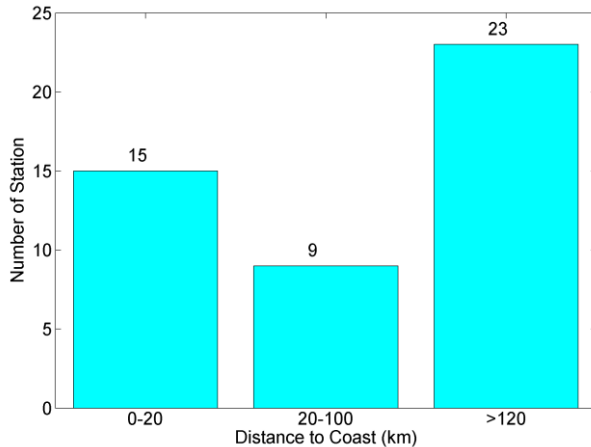


RMSE

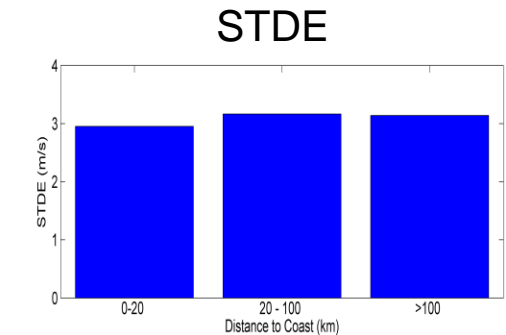
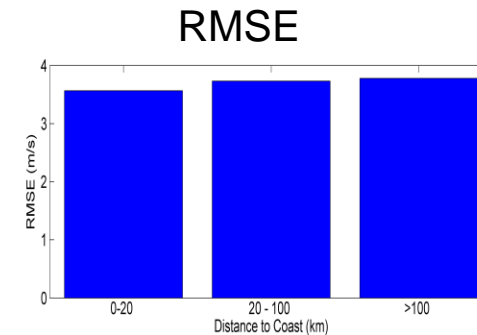
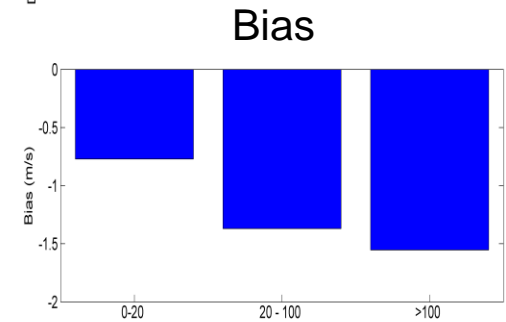
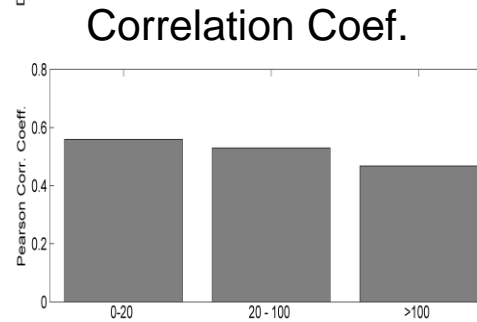
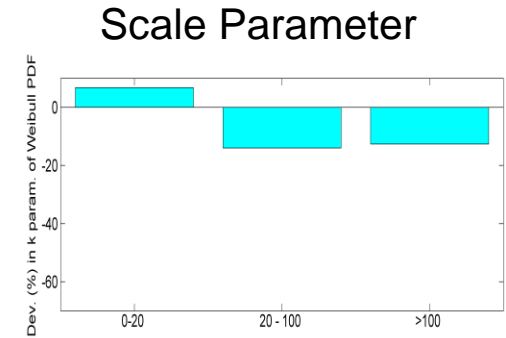
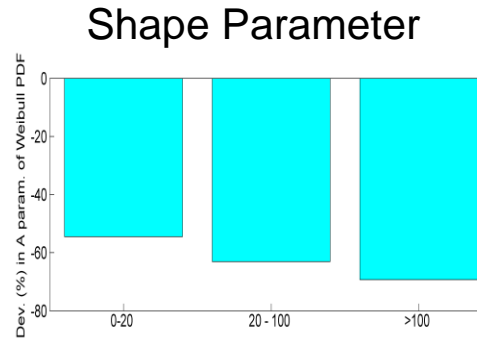


STDE

Average Model Performance Statistics Based on “Distance to Coast”



From coastal regions to the inland, model performance in simulating 10 m wind field decreases.

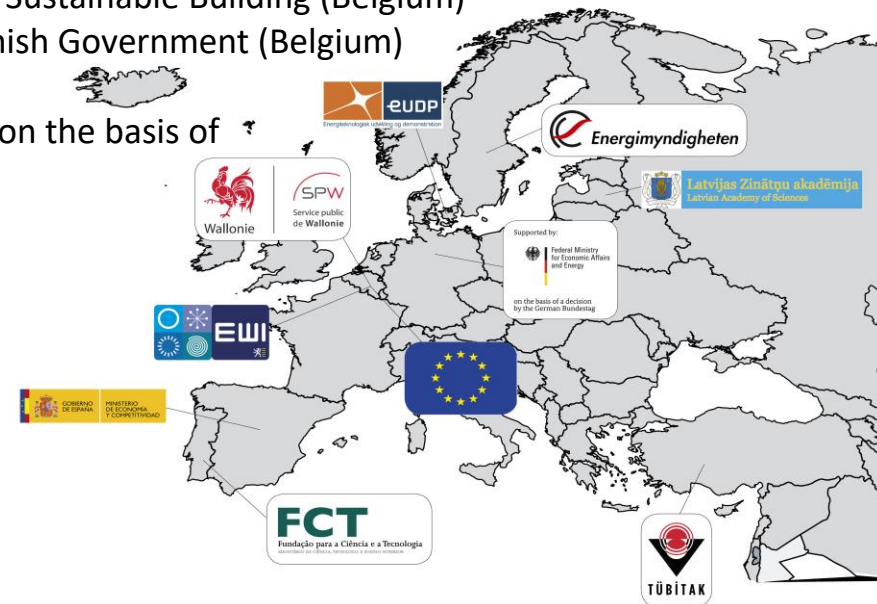


Acknowledgements



The NEWA project is supported by a European Commission's ERA-Net Plus project, number 618122, joining national projects from 9 funding agencies from 8 member states:

- Public Service of Wallonia, Department of Energy and Sustainable Building (Belgium)
- Department of Economy, Science and Innovation Flemish Government (Belgium)
- Danish Energy Authority (Denmark)
- Federal Ministry for the Economic Affairs and Energy, on the basis of the decision by the German Bundestag (Germany)
- Latvijas Zinatnu Akademija (Latvia)
- Fundação para a Ciência e a Tecnologia (Portugal)
- Ministerio de Economía y Competitividad (Spain)
- The Swedish Energy Agency (Sweden)
- The Scientific and Technological Research Council of Turkey (Turkey)



www.neweuropeanwindatlas.eu