An example of wind forecast improvement using NWP predictors on a buoy in the Basque Country

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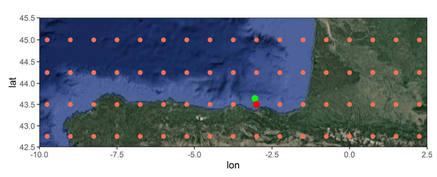
Introduction

The goal of the research is to get a wind forecast model for the next 24 hours, to perform reliable operational forecasting.

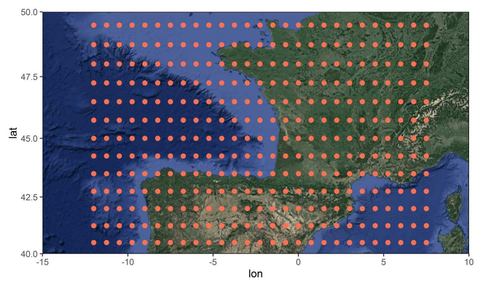
Data

Hourly wind data (U and V components) at 00 UTC and 12 UTC:
- Observational in Bilbao-Bizkaia buoy (Fig. 1)
- ERAI [1] NWF model:
  - Predictors from analyses (Msl, U10m, V10m and t2m) (Fig. 2)
  - Forecasts steps at 03h, 06h, …, 24h in the nearest grid point (Fig. 1)

The data cover the period from 2007 to 2014, (50% train, %50 test)



[Fig. 1 Bilbao Bizkaia buoy (green) and the nearest grid point from ERAI (red)]



[Fig. 2 ERAI domain used for reanalysis data]

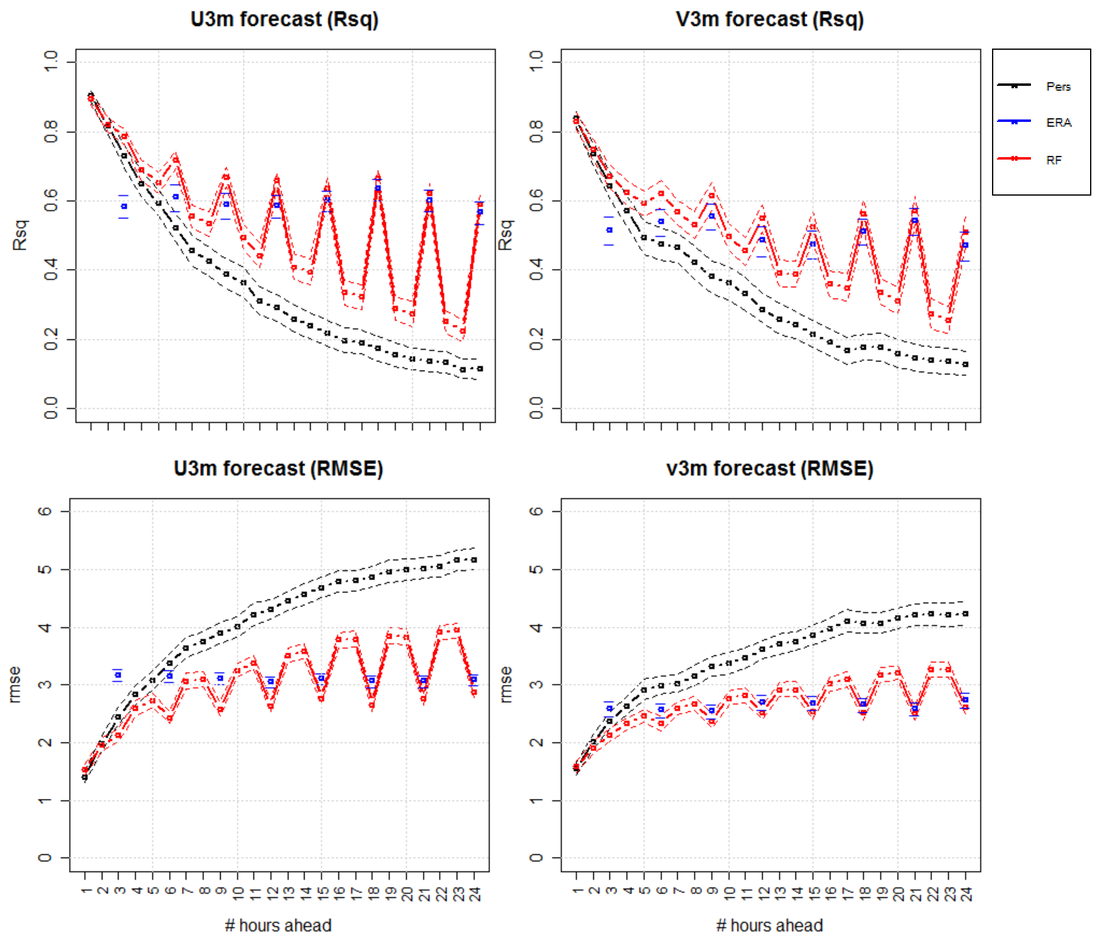
Methodology

Extended Principal Component Analysis (ExtEOFs) [2] are used and the forecast quality at each horizon is estimated by means of a bootstrap algorithm with 1000 samples.

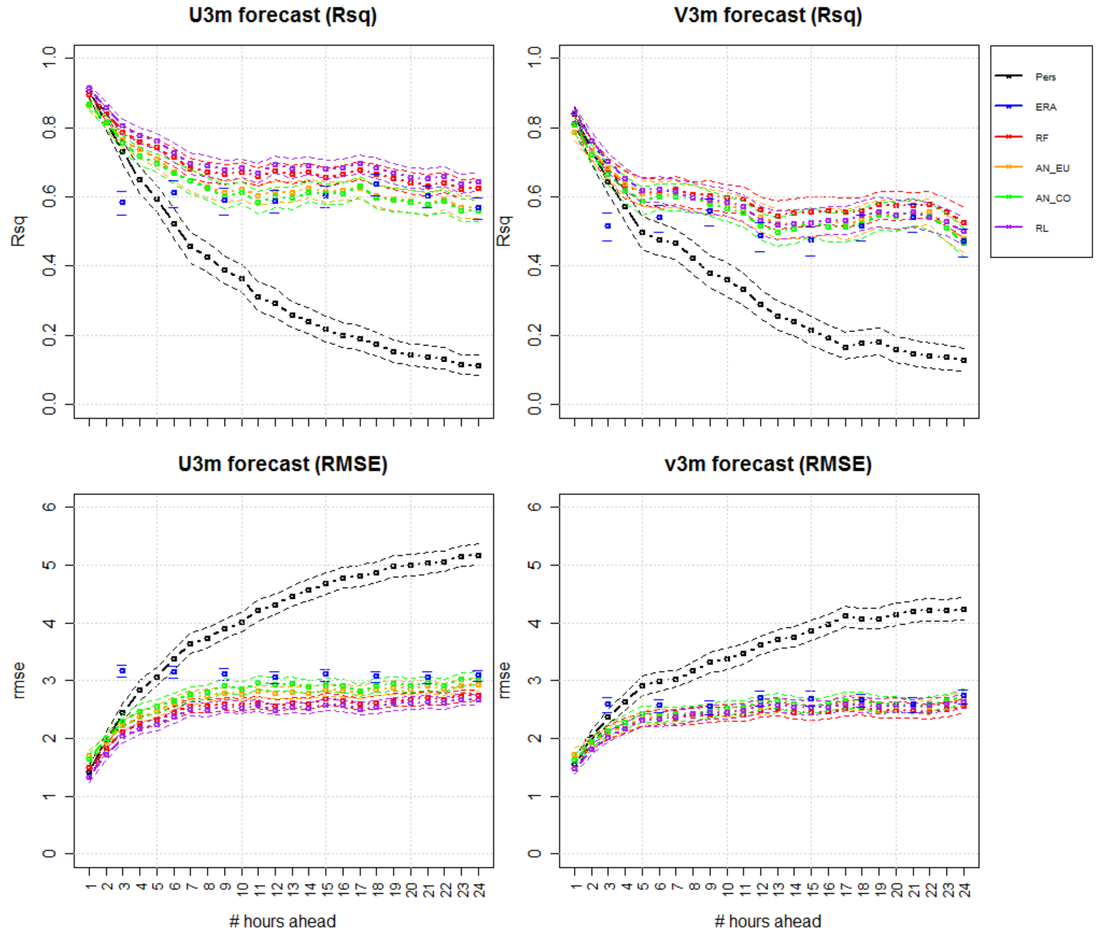
The methods used and compared are:

- Persistence
- Lineal regression (LR) [3]
- Random forests (RF) [4,5]
- Analogs with Eclidean norm (AN_EU) [6]
- Analogs with Maximun Cosine metric (AN_CO).

Results



[Fig. 3 Persistence, ERAI and RF (with ERAI predictors at 03h, 06h, …, 24h) forecast for the next 24 hours of wind U, V components at Bilbao Bizkaia buoy]



[Fig. 4 Persistence, ERAI, RF, RL, AN_EU, and AN_Co forecasts for the next 24 hours of wind U, V components at Bilbao Bizkaia buoy]

Summary and Discussion

- The best model for wind forecast during the first three hours is Persistence.
- In the interval [04h, 24h] the statistical models are the best option
- Carefully designed statistical methods allow to beat the persistence and numerical forecasts from ERAI
- The differences between statistical methods are due to the accuracy of the predictors and the location, instead of the complexity of the method.

Acknowledgements

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