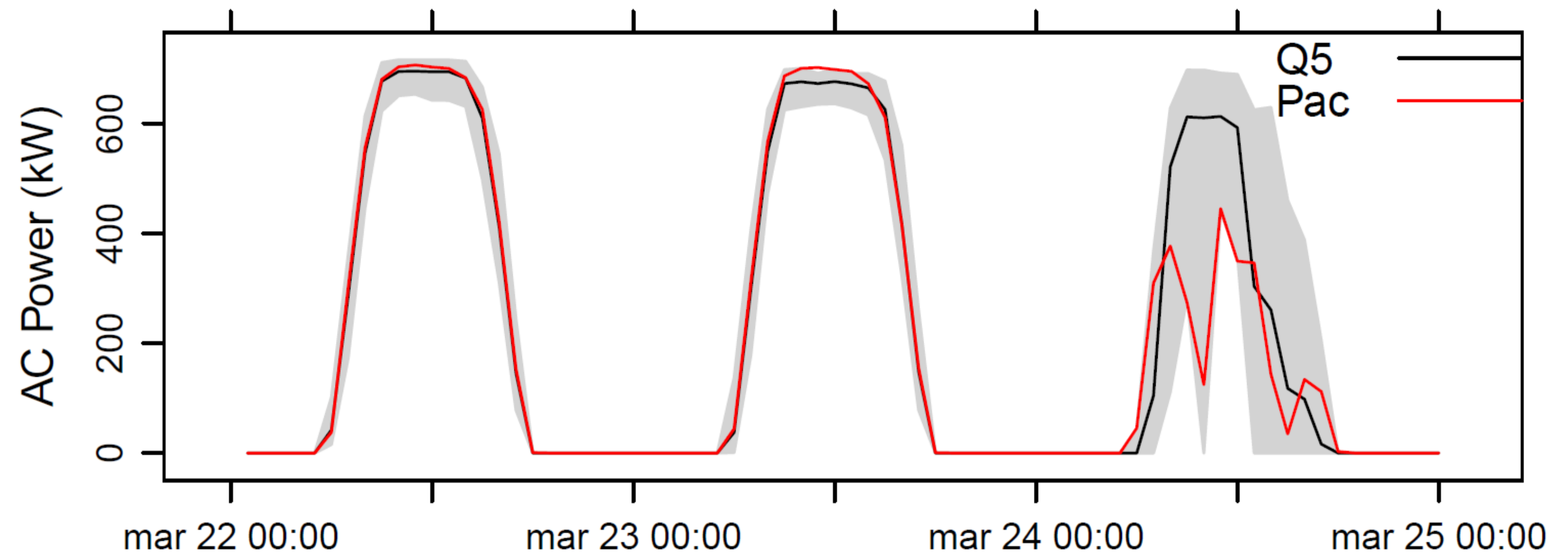


# USING A NONPARAMETRIC PV MODEL TO FORECAST AC POWER OUTPUT OF PV PLANTS

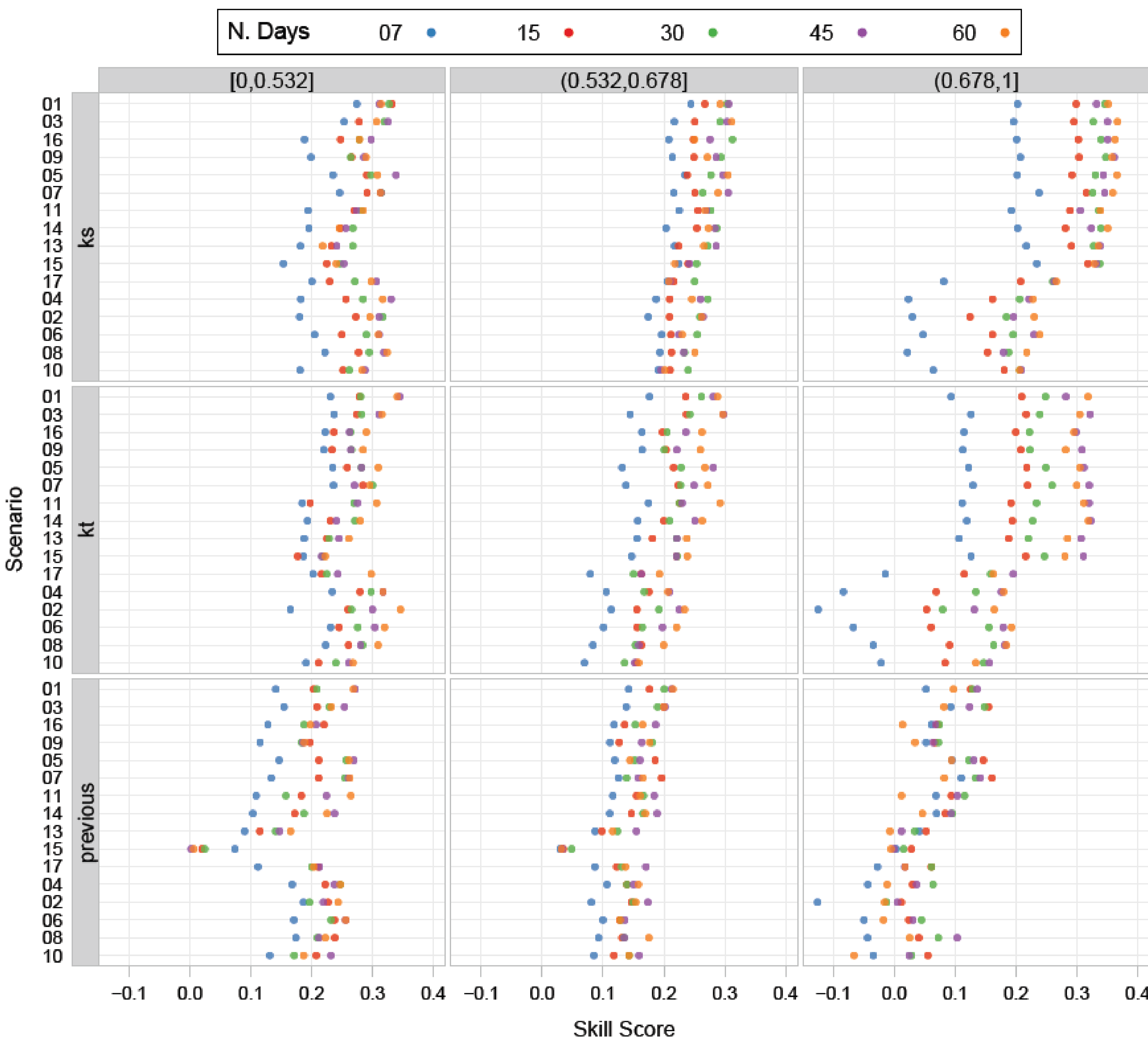
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## INTRODUCTION

A methodology to derive AC power forecasts one day ahead with hourly resolution using a nonparametric PV model based on Quantile Regression Forests is proposed. A probabilistic forecast is produced, providing statistical information about its uncertainty (median and 80% confidence interval). A systematic and exhaustive weather variable importance analysis was carried out with different scenarios. The influence of several variability indexes derived from the original variables was assessed. Both the length and the selecting method (*Previous*, *KT* and *KS*) of the train time series were analyzed in terms of model performance.



Example of simulation with  $N = 30$  days and selecting method *KS*. Q5 is the median forecast and the grey area corresponds to the 80% confidence interval.



## CONCLUSION

- The presence of irradiance data, predicted and/or calculated, leads to better results
- Increasing the number of weather variables do not necessarily increase the accuracy of the forecast
- Selecting methods based on similarity measures behave better than choosing recent days (method *KS* achieved the best results)
- The training set length has no significant impact on the model performance with time series longer than 15 days ( $N = 30$  days presented good results)
- The confidence interval amplitude is enough to contain almost all observations within, even during clouded days

## METHODOLOGY

The methodology is as follows:

- Collect previous AC power measurements of PV plants
- Collect forecasts of weather variables from a NWP model
- Process the weather variables
- Prepare train and test time series
- Train the Quantile Regression Forest tool
- Predict AC output power

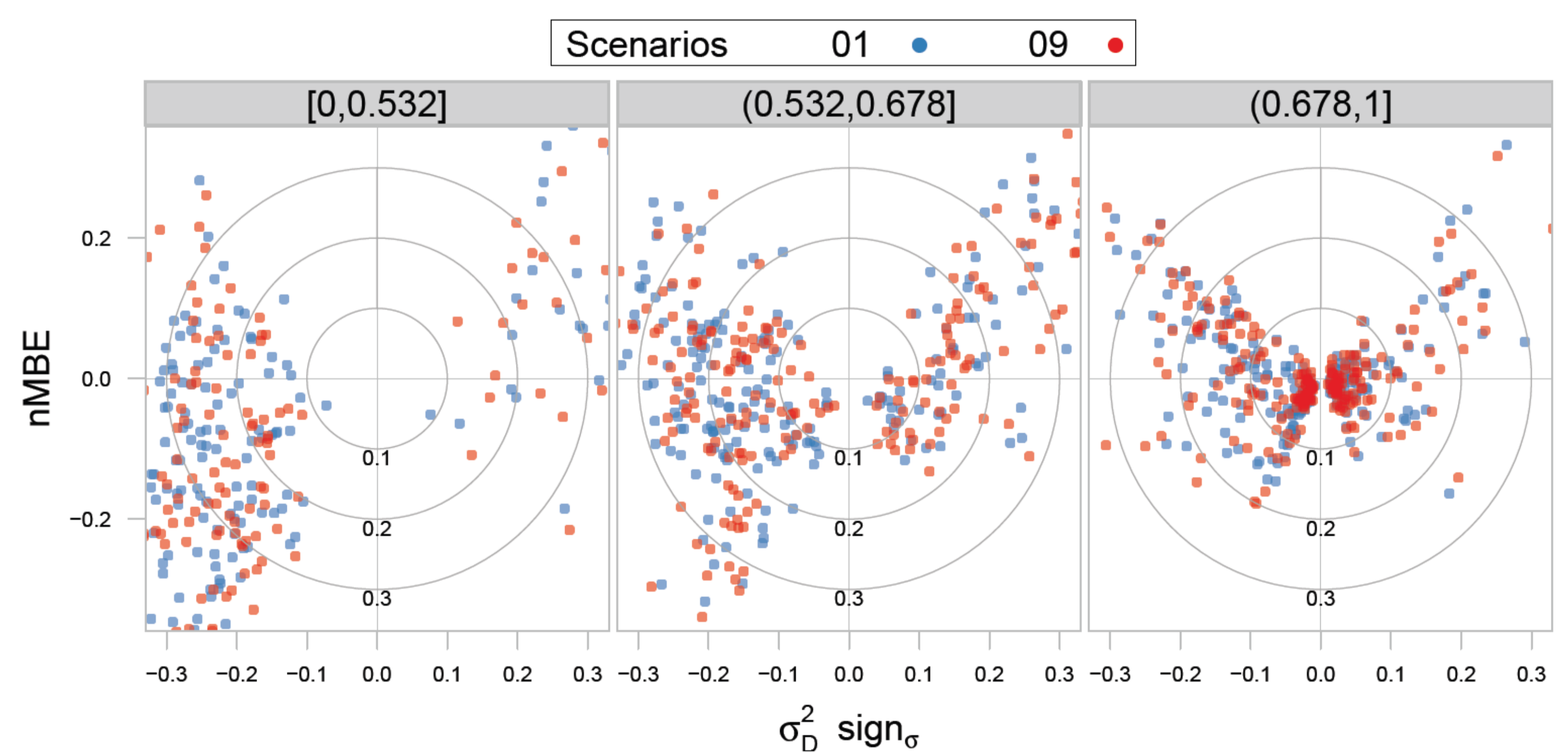
## TOOLBOX

An online toolbox to implement the methodology was built upon the R environment. Two packages were developed during the study:

- meteoForecast to import weather forecasts
- PVF for AC power prediction

The toolbox is freely available at:

<http://vps156.cesvima.upm.es:3838/predictPac/>



Target Diagrams with  $N = 30$  days and selecting method *KS*. Each diagram comprises the daily results for a different clearness index class.

