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Added value of non-calibrated and BMA calibrated AEMET-SREPS probabilistic forecasts: the 24 January 2009 extreme wind event over Catalonia

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At 00 UTC 24 January 2009 an explosive ciclogenesis originated over the Atlantic Ocean reached its maximum intensity with observed surface pressures lower than 970 hPa on its center and placed at Gulf of Vizcaya. During its path through southern France this low caused strong westerly and north-westerly winds over the Iberian Peninsula higher than 150 km/h at some places. These extreme winds leaved 10 casualties in Spain, 8 of them in Catalonia.

The aim of this work is to show whether exists an added value in the short range prediction of the 24 January 2009 strong winds when using the Short Range Ensemble Prediction System (SREPS) of the Spanish Meteorological Agency (AEMET), with respect to the operational forecasting tools. This study emphasizes two aspects of probabilistic forecasting: the ability of a 3-day forecast of warn an extreme windy event and the ability of quantifying the predictability of the event so that giving value to deterministic forecast. Two type of probabilistic forecasts of wind are carried out, a non-calibrated and a calibrated one using Bayesian Model Averaging (BMA).

AEMET runs daily experimentally SREPS twice a day (00 and 12 UTC). This system consists of 20 members that are constructed by integrating 5 local area models, COSMO (COSMO), HIRLAM (HIRLAM Consortium), HRM (DWD), MM5 (NOAA) and UM (UKMO), at 25 km of horizontal resolution. Each model uses 4 different initial and boundary conditions, the global models GFS (NCEP), GME (DWD), IFS (ECMWF) and UM. By this way it is obtained a probabilistic forecast that takes into account the initial, the contour and the model errors.

BMA is a statistical tool for combining predictive probability functions from different sources. The BMA predictive probability density function (PDF) is a weighted average of PDFs centered on the individual bias-corrected forecasts. The weights are equal to posterior probabilities of the models generating the forecasts and reflect the skill of the ensemble members. Here BMA is applied to provide probabilistic forecasts of wind speed.

In this work several forecasts for different time ranges (H+72, H+48 and H+24) of 10 meters wind speed over Catalonia are verified subjectively at one of the instants of maximum intensity, 12 UTC 24 January 2009. On one hand, three probabilistic forecasts are compared, ECMWF EPS, non-calibrated SREPS and calibrated SREPS. On the other hand, the relationship between predictability and skill of deterministic forecast is studied by looking at HIRLAM 0.16 deterministic forecasts of the event. Verification is focused on location and intensity of 10 meters wind speed and 10-minutal measures from AEMET automatic ground stations are used as observations.

The results indicate that SREPS is able to forecast three days ahead mean winds higher than 36 km/h and that correctly localizes them with a significant probability of ocurrence in the affected area. The probability is higher after BMA calibration of the ensemble. The fact that probability of strong winds is high allows us to state that the predictability of the event is also high and, as a consequence, deterministic forecasts are more reliable. This is confirmed when verifying HIRLAM deterministic forecasts against observed values.