AEMET-γSREPS: Forecasting uncertainty in AEMET operational forecasts

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Thinking in terms of uncertainty in the operational forecast is the current goal for high resolution operational predictions. Fields like precipitation with convection, surface winds or fog, are very sensitive to model uncertainties and errors, resulting in a rapid loss of predictability in such meso-scales. The best tool that can try to quantify this uncertainty is a Short Range Ensemble Prediction System (SREPS). In this poster we briefly summarize how has been the first year since the implementation of the multi-boundaries multi-model convection-permitting AEMET-γSREPS at 2.5km in the operational AEMET forecasts, from the forecasters point of view. Some words about new products released and future developments of the system are also presented.

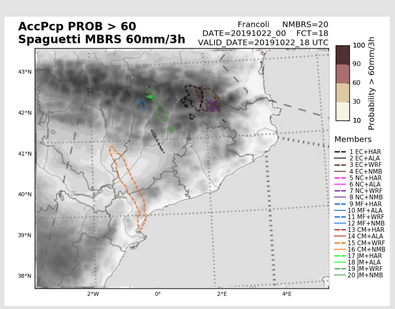
1. What do the forecasters say?

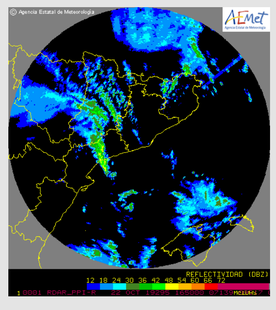
AEMET-γSREPS has been increasingly used in AEMET operational forecasts since it was officially released in Autumn 2018. Almost all regional forecast offices are using it. Although the system has not reached its full potential, we can say it is in a mature state. This is the opinion of Iberian-East and Mediterranean warning forecasters about the system:

"From forecasters' experience, the main contribution of the system is to predict strong convective precipitation and its spatial variabilty. Besides it is useful to see the range of change of temperature from day to day or the localization of wind gusts in orographic areas and its associated spatial variabilty."

2. Three nice recent cases where AEMET-γSREPS did a good job

a) Stationary convective train

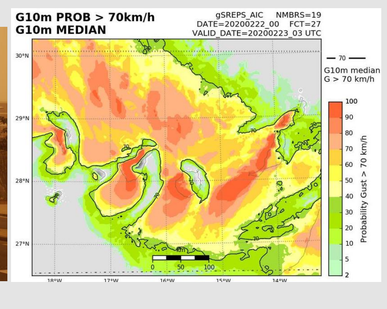




October is usually a month with large amounts of convective precipitation inland from the Mediterranean cost. The case presented here was a major flood event occurred in Catalonia which produced enormous damages.

One member of the AEMET-γSREPS, WRF model using Canadian GEM global model as BCs, was able to predict the catastrophic rainfall 18 hours before it happened. The fact that only 1 member of 20 indicates the extreme event made it difficult to take any decision based on probability reasoning. However, what made the system a valuable tool was that this forecast allowed the forecaster to monitor more carefully the zone defined by the extreme event or outlier of our PDF.

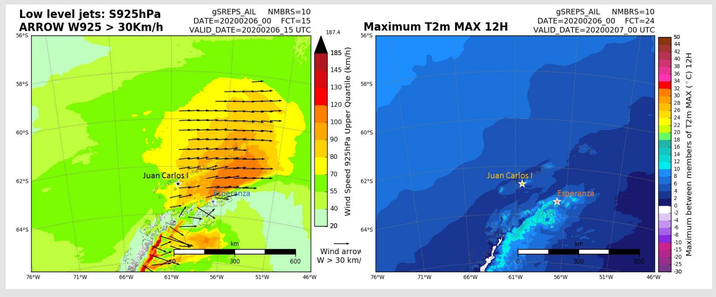
b) "*Calima*" in Canary Islands



Last February all Canary Islands were hit by a phenomenon called *Calima*. Calima is the suspended dust that is advected from the Sahara Desert to the Islands. During several days the atmosphere became completely dusty making difficult to breath.

On the right, the probability of having more than 70 km/h of 10m wind gust, and the median of the field (black line), for a 27 hours forecast. In this case the system predicted correctly the zones with strong gusts and the ones with low values of wind (like the hole in the centre of the imatge, where the capital, Las Palmas, is located).

c) Record of Temperature in Antartica



On the 6th of February it was reported 18.4 ºC in the Esperanza research station at the Antarctic Peninsula. It was produced by a combination of warm temperatures and a Föhn Wind event leeside of the Antarctic Peninsula mountains. If positive evaluated it could become the highest temperature registered ever in the continent.

AEMET-γSREPS reproduced a Föhn Wind and the rise of temperatures downhill the Antarctic Peninsula. Eventually, the observed temperature was even higher than the one forecasted, showing the importance of the local factors in the forecast.

3. Specific products for specific types of prediction (present and future)

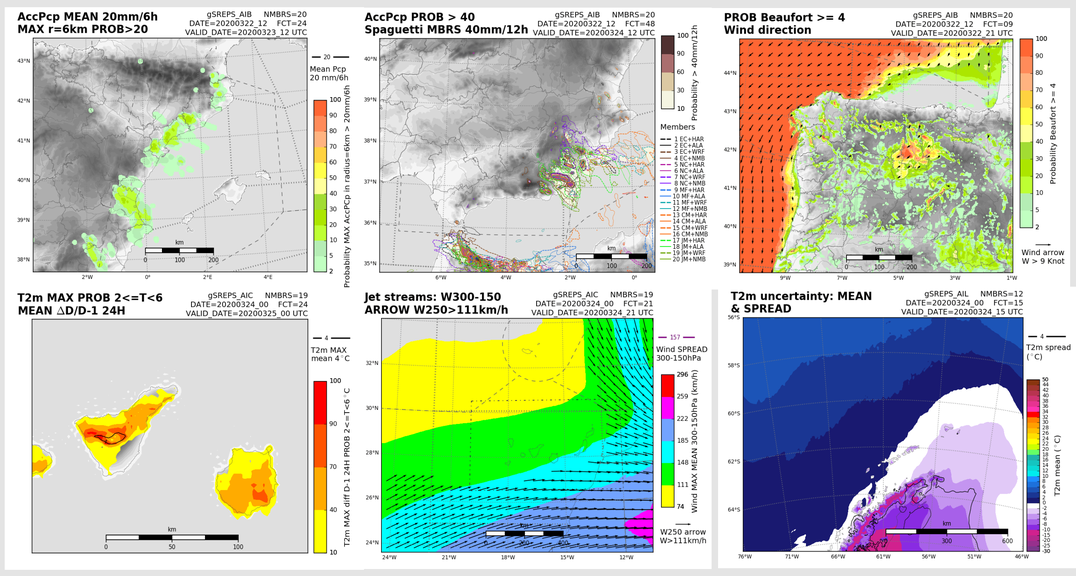
Current products:

- More than 5000 plots (500 for each area) per forecast run
- 3 domains: Iberia, Canary Island and South Shetland Islands (Antarctica) and the corresponding subareas according to the National Prediction System
- Products for specific types of prediction: daily forecasts, extreme events (warnings with their thresholds), aeronautic forecasts (flight levels), maritime forecasts (Beaufort scale), ...
- Special emphasis in different products for estimating the spatial variability of convective precipitation and wind gust: *spaghetti* of members, probability maps with and without localization radius, mean, median, percentiles…

Future products:

- Calibrated EPSgrams for airports: AEROgrams
- Local predictions around airports to support approximation way for landing and taking off
- Specific products for probability of thunderstorms, fog and Snow level
- Extreme Forecasting Index (EFI)
- Non-calibrated EPSgrams for any location
- Dynamic zooming web-site with few products as precipitation and wind

Examples of products for forecasters:



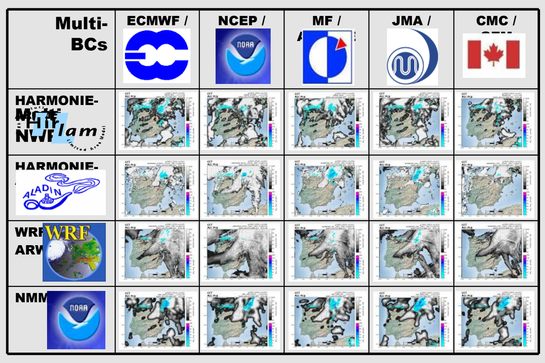
4. AEMET-γSREPS: current system description, TCA and future

Current system

- AEMET-γSREPS is the Spanish-Portuguese convection-permitting Short-Range EPS composed by 4 NWP-LAMs combined with 5 GCM (see Figure below)
- It runs on 3 domains: IBERIA, CANARY and LIVINSGTON (4 months during austral summer Antarctic Spanish annual campaign).
- It runs up to H+48 at 00UTC and at 12UTC too for the IBERIA domain
- Horizontal resolution of each member is 2.5 km and vertical between 65 and 71 levels
- Portugal and Madeira Islands forecaster plots delivered to IPMA due to IPMA-AEMET EPS collaboration

Future System:

- Hard work is being done to make the system Time Critical Application Level 2 (TCA) at ECMWF
- In 2020 Data Assimilation will be introduced for each member
- Monthly autoverification with *harp*
- Increasing Iberian domain
- Moving to 25 member LAM-EPS including GEM-LAM (Canadian NWP model)



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