



Improving QPF by blending techniques at the Meteorological Service of Catalonia

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The current operational very short-term and short-term quantitative precipitation forecast (QPF) at the Meteorological Service of Catalonia (SMC) is made by three different methodologies: 1) advection of the radar reflectivity field, 2) identification, tracking and forecasting of convective structures and 3) numerical weather prediction models using observational data assimilation (radar, satellite, etc.). These precipitation forecasts have different characteristics, lead time and spatial resolutions. The objective of this study is to combine these methods in order to obtain a single and optimized QPF at each lead time. This combination (blending) of the radar forecast (1 and 2) and precipitation forecast from model (3) is carried out by means of different methodologies according to the prediction horizon. Firstly, in order to take advantage of the rainfall location and intensity from radar observations, a phase correction technique is applied to the NWP output to derive a corrected forecast (4). This procedure is based on estimating a shift-vector field to correct possible position and shape errors. To select the best precipitation estimation in the first hour ($t + 1h$), we evaluate the radar based rainfall (1 and 2) and corrected precipitation (4) forecasts.

In the second hour ($t + 2h$), the information from radar advection (1) and the corrected outputs from the model (4) are mixed by using different weights, which vary dynamically, according to indexes that quantify the quality of these predictions. This procedure has the ability to integrate the skill of rainfall location and patterns that are given by the advection of radar reflectivity field with the capacity of generating new precipitation areas from the NWP models.

From the third hour ($t + 3h$), as radar-based forecasting has generally low skills, only the quantitative precipitation forecast from model is used.

This method of blending different sources of prediction is verified for different types of episodes (convective, moderately convective and stratiform) to obtain a methodology for implementing it in an operational and dynamic way.