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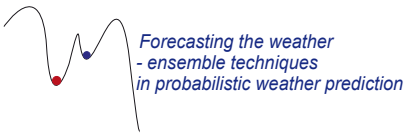

The new BOLAM version of the SIMM forecasting chain: A verification study over the MAP D-PHASE Operations Period

S. Mariani and M. Casaioli

Institute for Environmental Protection and Research (ISPRA), Department for Inland and Marine Waters Protection, Rome, Italy (stefano.mariani@isprambiente.it, 0039 06 50074228)

Forecast verification is a primary task for any meteorological, hydrological or environmental institution running a forecasting system which provides *a posteriori* assessment of the quality and value of forecasts. Furthermore, the verification outcomes help in determining the model's strengths and weakness and in identifying possible improvements for the forecasting system (e.g., implementation of advanced parameterization schemes, porting to a more efficient computer machine, extension of the domain) needed to overcome the deficiencies detected in the forecast performance.

This is the aim of the verification studies performed in the last decade as part of the activities related to the forecasting system called *Sistema Idro-Meteo-Mare* (SIMM) which is operational since 2000 at the Institute for Environmental Protection and Research (ISPRA, former APAT). SIMM is an integrated meteo-marine forecasting chain running on a SGI-Altix parallel machine, formed by a cascade of four numerical models, telescoping from the Mediterranean basin to the Venice Lagoon, and initialized by means of ECMWF analyses and forecasts. In addition, a hydrological model is integrated into the SIMM chain in cascade to the meteorological BOLAM model for research activities over two Italian river basins. Each numerical model of the SIMM forecasting system, and in particular BOLAM (which is at the base of the chain), has been regularly verified – through subjective and objective methodologies – by comparing the forecasts against the observations measured from in-situ networks and retrieved from satellite-borne instruments.

Following the implementation into the SIMM forecasting chain of a fully updated version of the BOLAM model, it has been decided to objectively evaluate in terms of quantitative precipitation forecast (QPF) the quality of such new version and the achieved improvements with respect to the previous one. To provide a statistical robust evaluation of the quality of QPFs modelled by BOLAM, it is then necessary to measure the relationship between forecasts and the corresponding observation analyses over a long time period and for different locations. Usually, for an improved model version, a long set of forecasts is only available after a long operating time period; however, the increase of computational power capabilities made possible nowadays to carry on massive programs of retrospective forecasting, generating a long sets of retrospective forecasts with a fixed numerical model. This has been indeed done with the new version of BOLAM: reforecasts have been then provided over the period June-November 2007, which corresponds to the MAP D-PHASE Operations Period (DOP). This choice for the verification period has the advantage of being associated with wide observation coverage over the Alpine area and Central Western Europe. In addition, the forecasts from the previous BOLAM version, which were operationally provided during DOP, have been used in the present work as control simulations to assess the impact of the fully updated, new BOLAM version.

The statistical assessment is performed by means of a multi-method approach based on the computation of traditional categorical scores, a visual investigation on how contingency table's hits, false alarms, and misses are spatially located, the calculation of the ROC diagram and a power spectrum analysis.