Rough Precipitation Forecasts based on Analogue Method: an Operational System

Mario Raffa (1), Paola Mercogliano (1,2), Gwendoline Lacressonnière (3), Bruno Guillaume (3), Céline Deandreis (3), and Pierre Castanier (3)

(1) CMCC Foundation, Euro-Mediterranean Center on Climate Change, Capua, ITALY, (2) CIRA - Centro Italiano Ricerche Aerospaziali, Meteo System & Instrumentation Laboratory, Capua, Italy (p.mercogliano@cira.it), (3) ARIA Technologies, Boulogne Billancourt, FRANCE

In the framework of the Climate KIC partnership, has been funded the project Wat-Ener-Cast (WEC), coordinated by ARIA Technologies, having the goal to adapt, through tailored weather-related forecast, the water and energy operations to the increased weather fluctuation and to climate change.

The WEC products allow providing high quality forecast suited in risk and opportunities assessment dashboard for water and energy operational decisions and addressing the needs of sewage/water distribution operators, energy transport & distribution system operators, energy manager and wind energy producers. A common "energy water" web platform, able to interface with newest smart water-energy IT network have been developed. The main benefit by sharing resources through the "WEC platform" is the possibility to optimize the cost and the procedures of safety and maintenance team, in case of alerts and, finally to reduce overflows.

Among the different services implemented on the WEC platform, ARIA have developed a product having the goal to support sewage/water distribution operators, based on a gradual forecast information system (at 48hrs/24hrs/12hrs horizons) of heavy precipitation. For each fixed deadline different type of operation are implemented: 1) 48hour horizon, organisation of "on call team", 2) 24 hour horizon, update and confirm the "on call team", 3) 12 hour horizon, secure human resources and equipment (emptying storage basins, pipes manipulations . . .).

More specifically CMCC have provided a statistical downscaling method in order to provide a "rough" daily local precipitation at 24 hours, especially when high precipitation values are expected.

This statistical technique consists of an adaptation of analogue method based on ECMWF data (analysis and forecast at 24 hours). One of the most advantages of this technique concerns a lower computational burden and budget compared to running a Numerical Weather Prediction (NWP) model, also if, of course it provides only this specific atmospheric variable without a complete description of the weather situation.

In the first phase, the method considers a selection of analogous situations in terms of mean sea level pressure, specific humidity and total precipitation. In the second one, a subset of observations data is extracted according to the analogues found. The research of analogues consists of cascading filters designed to find the most similar weather situation in a historical archive of ECMWF analysis.

The method has been calibrated in the period between 2008 and 2011, over different France weather stations (Paris, Meaux, La Londe Les Maures etc) in order to forecast extreme rainfall events. The results of the operational demonstrator, which has been running since September 2016 over the same France weather stations, show good performances in terms of prediction of extreme events at 24hrs horizon, meant as daily quantitative precipitation greater than 93th percentile of distribution, with a relative low false alarm rate.