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Exploring the benefits of COSMO limited area model and the new ECMWF "ecPoint" precipitation post-processing

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Localized heavy rainfall is difficult to predict accurately, because the predicted location and the predicted intensity can both exhibit large errors. Ideally, weather forecasts should be provided for points and not for the large regions represented by global model grid boxes. This mismatch can be addressed using (i) high resolution limited-area models, or (ii) by applying some post-processing to global forecast models, as used in "ecPoint-rainfall", a new ECMWF probabilistic calibration technique being applied to create 12-h precipitation forecasts. The premise of ecPoint is that the forecast-versus-point-observation relationship depends not on location, but on physics, which we aim to encapsulate in more than 200 "grid-box weather-types". One can summarize this in mapping functions that project, for a given type, forecast amounts onto a corresponding, average, probabilistic distribution for gauge observations.

The MISTRAL (Meteo Italian SupercompuTing PoRtAL) project is funded under the Connecting Europe Facility (CEF) – Telecommunication Sector Programme of the European Union. The main project goal is to facilitate and foster the re-use of datasets by weather-dependant communities, to provide added value services using HPC resources. ECMWF participates in the project with the goal of improving probabilistic rainfall forecast products, to help with the prediction of flash floods in Italy and nearby Mediterranean regions. One of the objectives here is to exploit CINECA supercomputer facilities to bring together approaches (i) and (ii) highlighted above. For (i) we will use 2.2 km limited-area ensemble forecasts based on the COSMO model, apply new post-processing technique to selectively preserve the most reliable heavy rainfall signals, and then blend that output with ecPoint output (ii). In this way we will combine the most skilful aspects of the two systems. To do this, we are developing, testing, and verifying new 6-h ecPoint rainfall forecasts, prior to blending them with the post-processed COSMO ensemble output, using the CINECA supercomputer. The final product will comprise percentiles (1, 2,..99), for accumulated rainfall, for each COSMO gridbox up to lead times between 120 and 240 h. These can be used by customers as is, or simply converted into exceedance probabilities for user-defined thresholds. This innovative blending approach will exploit the strong points of two forecasting systems, helping to improve forecasts, and support decisions regarding weather alerts related to flash flood prediction. We will be providing forecast data for Italy and nearby regions with a higher level of quality and resolution, at the same time, a robust gateway for the European community.

In this presentation, we will point out the strengths and weaknesses of each system (COSMO ensemble, 12-h and 6-h ecPoint), and we will explain in detail the steps we are following to create a more robust forecast tool that could be used also for hydrological applications