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A Comparison of Uncertainty Processors (HUP, BMA and MCP) in the Normal Space

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Three uncertainty processors, namely HUP (Krzysztofowicz, 1999), BMA (Raftery, 1993) and MCP (Todini, 2008) are currently used for predictive uncertainty assessment in flood forecasting.
This presentation deals with the analysis of the three approaches and of their performances when applied in the Normal space, after converting the original observations and forecasts through a Normal Quantile Transform. This is commonly done in the case of HUP and MCP and advocated by Todini (2008) in the case of BMA, in order to meet the multi Normal Likelihood hypothesis, which underlines thIS approach.
It will be shown that the three processors are strongly related and, while BMA and MCP are quite similar only differing in terms of the methodology used to estimate the conditional distributions, HUP produces different and less accurate results, due to the lag-1 Markov assumption made in order to define a prior density function.
Interesting results of the comparison will be illustrated both analytically and through a numerical example using observations and forecasts in the River Po in Italy.