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Interactive comment on "Recent developments in predictive uncertainty assessment based on the model conditional processor approach" *by* G. Coccia and E. Todini

Anonymous Referee #3

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This paper makes a practical and significant contribution in the area of uncertainty assessment in flood forecasting. Its starting point is the acknowledgement that application of the NQTs to observed and forecast data does not necessarily produce a multivariate Gaussian distribution. One of the main contributions of the paper is the introduction of truncated normal distributions to better handle the heteroscedsasticity or non-Gaussian behavior found in the transformed multivariate variables. Of practical importance is the demonstration in Figure 14 that the TND method produces reasonably reliable forecasts - this is an absolutely essential requirement for any method reporting on forecast uncertainty.

I found the development of the methodology more than adequate except for the section dealing with TNDs for more than one forecasting model. For the multi-model TND, the authors basically assign a threshold for the best performing model thus restricting the TND to one model. It is unclear to me why this would properly take into account heteroscedasticity particularly in cases where the competing models have almost the same predictive skills. Does this methodology only work for the published case study or is it more robust?

As already noted, the reliability diagram in Figure 14 represents the most important test of the MCP performance. Because of the importance of this figure more detail about its construction should be provided. In addition, how many separate flood events were used, how many data points were used in estimating exceedance frequencies and what was the range of thresholds. Two points about the reliability diagram deserve further comment:

1) The reliability diagram must be constructed using events that are independent of the events used in calibration. It appears that Figure 14 was constructed from events in the validation period for MCP as shown in Figure 6. However, this period overlaps with the calibration period for Topkapi and the verification period for the ANN.

2) Figure 14 shows that most of the points fall below the 1:1 line suggesting MCP is consistently overestimating the probability of exceeding a threshold. A more critical discussion of this shortcoming would be appropriate.

The final discussion and conclusions need to be more forthcoming about the shortcomings/limitations of the methodology. While the use of multiple models has improved forecast skill, there appears to remain a bias in forecast uncertainty. Moreover, while the TND appears to address much of the non-Gaussian joint probability behavior in the transformed variables in the Baron Fork case study, its applicability to other catchments with different response times and data quality remains untested.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 9219, 2010.