EGU2018-6915: Estimating predictive hydrological uncertainty by dressing a probabilistic post-processing approach; a comparison with application to a tropical catchment

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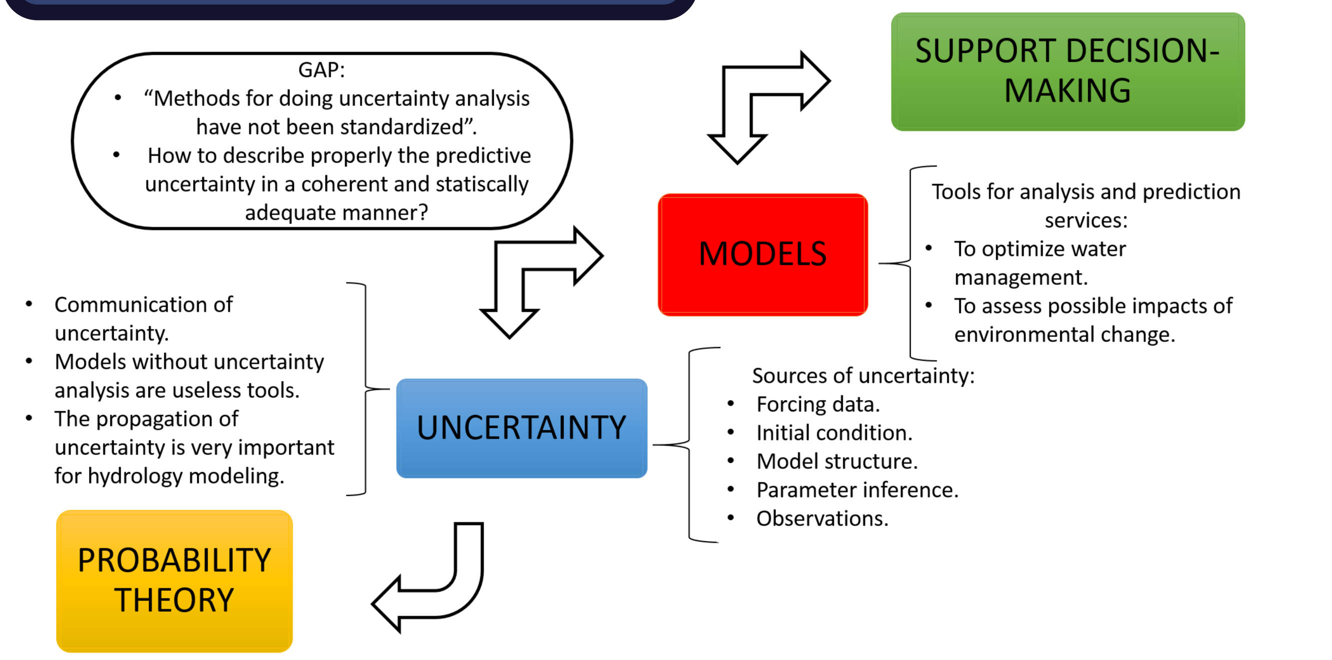
1. INTRODUCTION



2. METHODS

We tested four conditional predictive uncertainty post-processors (Fig. 1) in terms of deterministic and probabilistic verification.

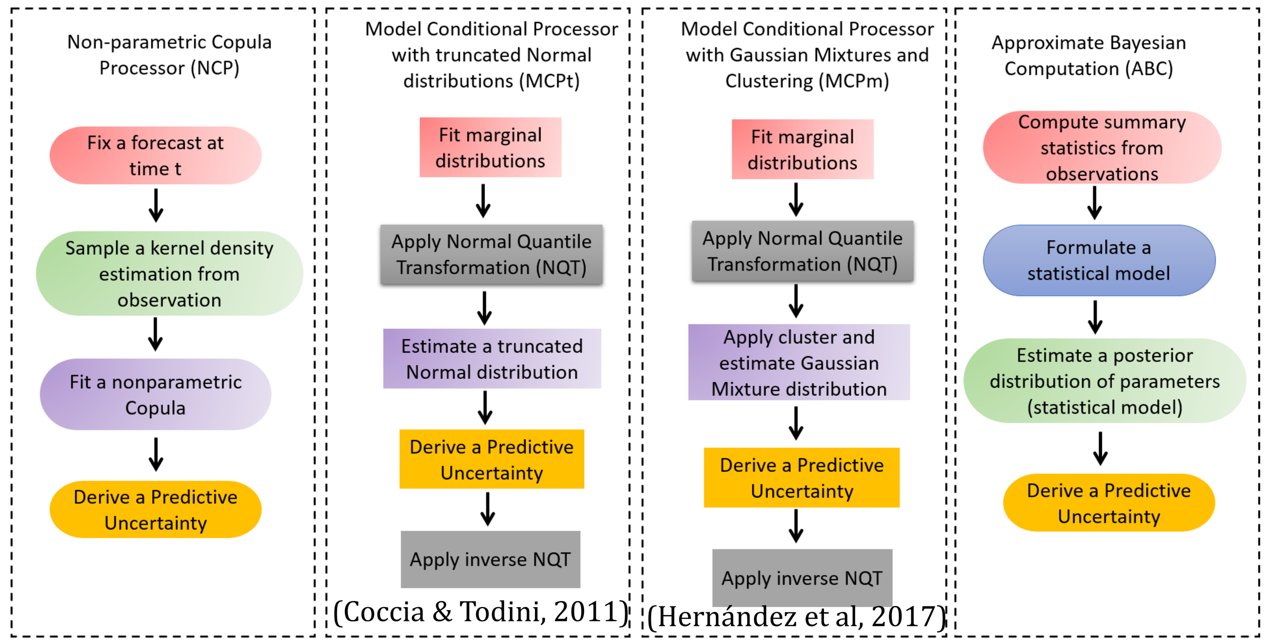


Fig. 1 Flowchart of different post-processors were tested.

The approaches were tested using monthly data from Citarum Hulu tropical catchment (Fig. 2) located in Indonesia. We used a conceptual and distributed hydrological model, TETIS (Francés et al. 2007).

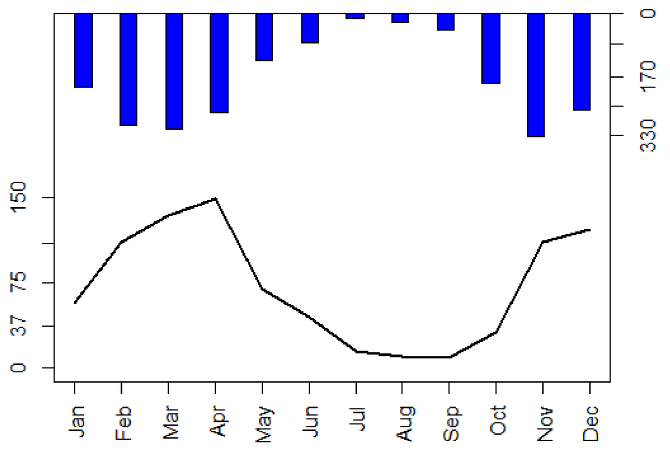


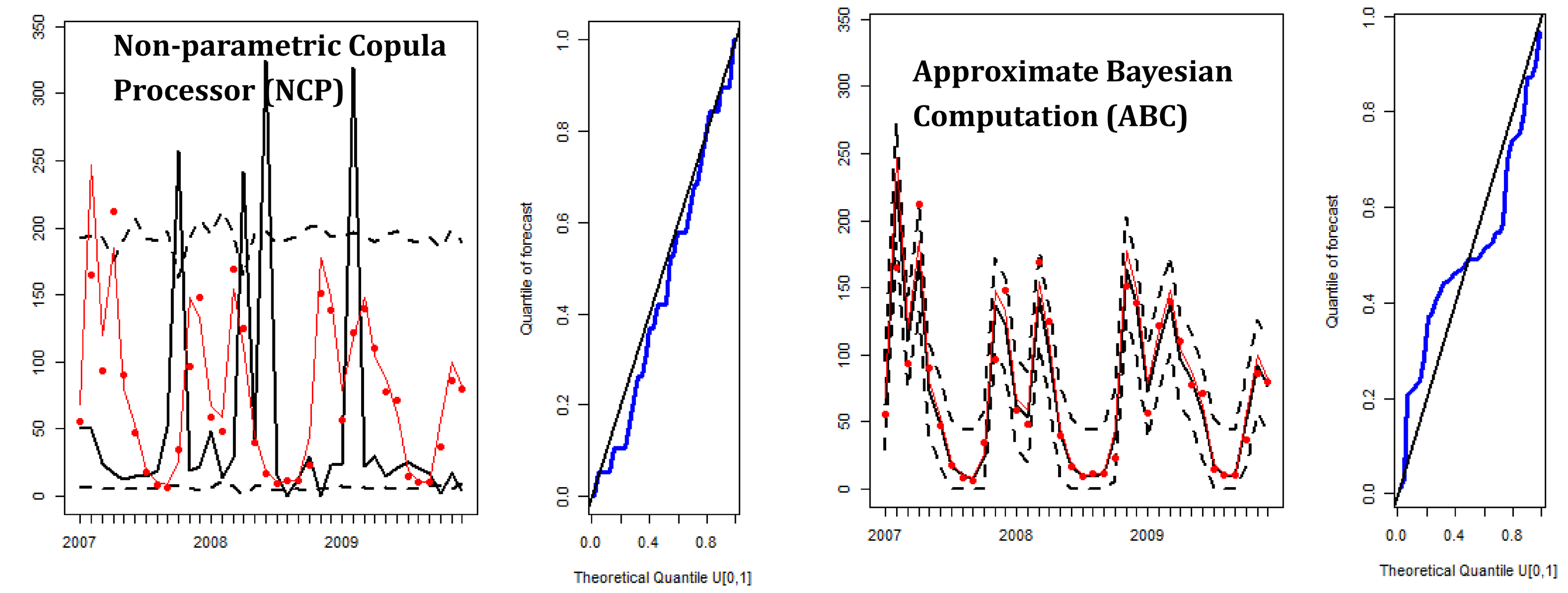
Fig. 2 Water balance in the Citarum Hulu river catchment. Blue bars correspond to rainfall (mm) and black line to the discharge in ($m^3 s^{-1}$).

3. RESULTS

Table 1. Deterministic and probabilistic Goodness-of-Fit of the (i) Non-parametric Copula Processor (NCP), (ii) model conditional processor using a truncated Normal distribution (MCPt), (iii) model conditional processor using a Gaussian mixture and Clustering (MCPm), and (iv) Approximate Bayesian Computation (ABC) for the Citarum Hulu catchment.

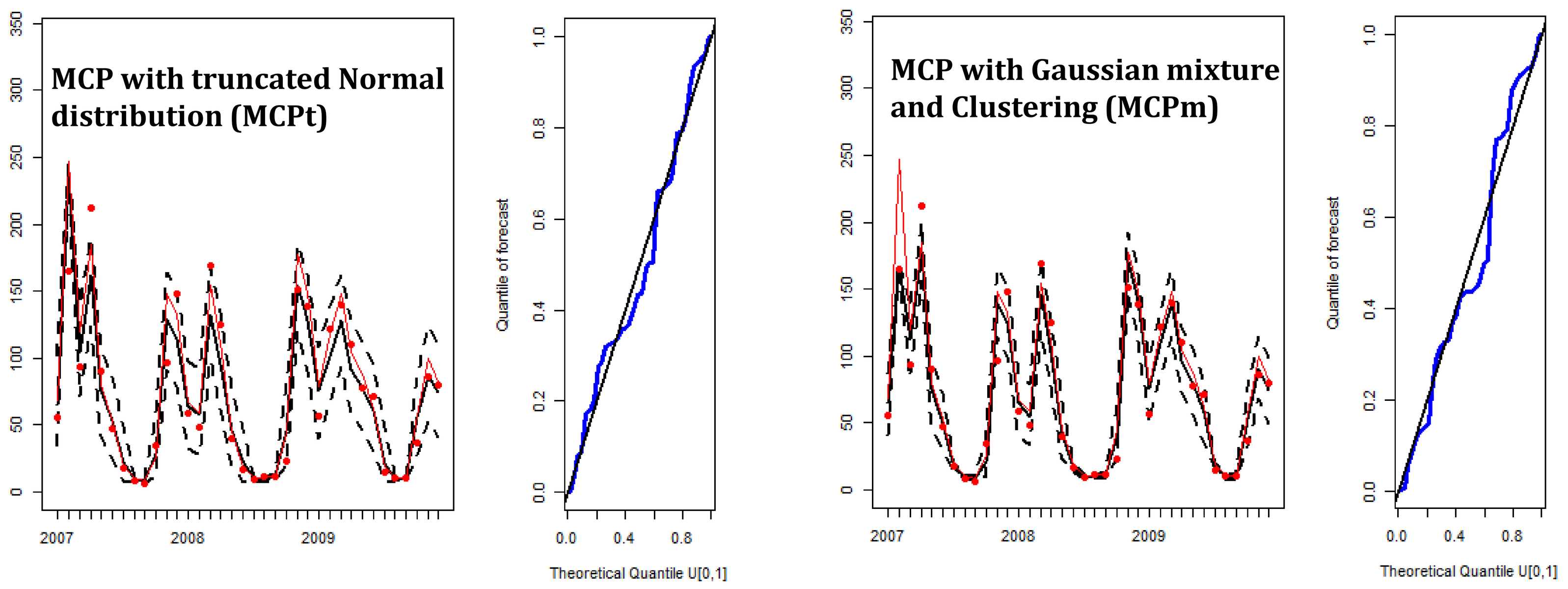
Performance Measure	Post-processor			
	NCP	MCPt	MCPm	ABC
Nash–Sutcliffe efficiency (NSE)	-2.055	0.861	0.935	0.896
Kling–Gupta efficiency (KGE)	-0.149	0.911	0.937	0.947
Pearson Correlation	-0.075	0.928	0.967	0.948
Coefficient of variation ratio	1.330	0.947	0.946	0.995
Bias ratio	0.757	0.994	0.998	1.010
Reliability (R)	0.980	0.984	0.982	0.985
Precision	1.390	6.032	8.770	3.300
Kolmogorov-Smirnov test (p-value)	0.234	0.764	0.578	0.216
95% exceedance ratio (ER95)	5.56	13.8889	11.112	8.334

The NCP low precision value of 1.39, reported in Table 1, indicated a poor sharpness of the predictive distribution. The sharpness refers to the spread of the predictive distribution.



The ABC QQ-plot showed over-estimated predictive uncertainty.

Figure 3. Conditional predictive uncertainty for TETIS model on the Citarum Hulu catchment. Time series of observations (red dots), predicted discharge (red line), the best prediction (mode) (black continuous line), and 95% prediction limits (black dashed line) (left). QQ-Plot of the conditional predictive distribution (right).



The QQ-plots showed a correct uncertainty estimation.

Figure 4. Conditional predictive uncertainty for TETIS model on the Citarum Hulu catchment. Time series of observations (red dots), predicted discharge (red line), the best prediction (mode) (black continuous line), and 95% prediction limits (black dashed line) (left). QQ-Plot of the conditional predictive distribution (right).

4. DISCUSSION

In the present study, we tested four conditional predictive uncertainty post-processors in terms of deterministic and probabilistic verification. The major findings of this study can be summarized as below:

- All post-processors passed the uniformity test (Kolmogorov-Smirnov). It means that the probability forecast is correct.
- The NCP was the worst in terms of accuracy (NSE and KGE), but it was the best in terms of 95% exceedance ratio.
- Although the ABC worked just with summaries statistics and simulations, it performed well.

The next research step will involve a validation process, as well as a wider range of climatic forcings.

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