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Predictive Uncertainty and Hydro-meteorological Ensemble Forecasting

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This work aims at discussing the use of "predictive uncertainty" in flood forecasting and water resources management , particularly when meteorological ensemble forecasts are available.
Using data from actual operational flood forecasting systems, this work shows the improved expected benefits that can be obtained by fully incorporating predictive uncertainty into the decision making process, instead of using deterministic forecasts (as presently done) or by simply delivering to the end user uncertain, and hardly understood, forecasts (as commonly planned to be done).
This work also introduces and discusses the presently available continuous (Hydrologic Uncertainty Processor, Bayesian Model Averaging, Model Conditional Processor, etc.) and binary (Logistic Regression, Binary Multivariate Bayesian Processor, etc.) uncertainty processors, showing their performances on the basis of actual data derived from operational flood forecasting systems.
Finally, the problem of incorporating meteorological ensembles into hydrological predictive uncertainty is discussed and a number of possible alternatives is presented setting into evidence the problems that currently limit their use. The main problems for proficiently use meteorological ensembles relate to (1) the lack of long forecasting meteorological runs for which precipitation forecasts have been saved as opposed to the presently available re-analyses; (2) the continuous improvements in the meteorological models that modify in time their performances combined to the lack of willingness of the meteorological centres of re-running the new versions on past data; and (3) the difficulty at tagging the different members of the ensembles .