A robust uncertainty treatment with bias correction in model calibration for better predictability

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Non-normality is an important issue in model calibration. From prediction perspective, it is also seen that extremes are often missed and results are bias. In practice, one may not be able to or willing to modify the existing models, especially when the models are complicated and/or one need to retain the functionality in the current models due to physical interpretation. In this paper, we promote a framework to correct model bias by multivariate transformation and derive stable residuals by simultaneous transformation. By doing these, we construct a hieratical model structure so that our model components are build on the top of existing model. This approach is easy to be implement and programming as long as the existing models can conduct simulation. In this way, the programming burden is minimized. The framework is general to handle different models and importantly is statistically sound. Our modeling practice/framework includes the original model as a special case. Information based statistical model selection criteria can be used to determine if simple structure or even the original model is sufficient. The framework is demonstrated by using some typical hydrological models with data from Australia.

Key words: Bias correction, both-side Box-Cox transformation, Regression, Rating Curve.