



## **Multi-model or single-model post-processing: Pros and Cons**

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Post-processing of hydrologic model output can be viewed as an extension of the hydrologic model itself, such as in the case of under-dispersive hydrologic ensemble forecasts, where post-processing of the ensemble dispersion can implicitly account for missing scales of hydrologic variability or mis-representation of physical processes. In this study we compare and contrast two approaches for accounting for and minimizing sources of hydrologic modeling error: hydrologic multi-modeling or conditional post-processing of a single “best” hydrologic model. Our approach includes the following steps. First, we utilize FUSE (Framework for Understanding Structural Errors) to construct the multi-model ensemble for two watersheds with differing hydrologic characteristics. Second, we post-process a best single-model and multi-model simulations using quantile regression, an under-utilized but powerful statistical tool that optimally fits different quantiles of a probability distribution function. Third, we introduce a post-processing methodology for performing model selection that generates ensemble forecasts with an informative ensemble skill and spread relationship. To do this we conditionally select different historic scenarios for model development, and explore what states of the hydrologic system inform this selection process. Finally, we make direct comparisons between the multi-model and best single-model post-processing approaches, gauging the performance of each at providing credible probabilistic simulations during different hydrologic conditions.