Using AICc and KIC Model Discrimination Criteria in Combination to develop Optimal Weights for Model Prediction

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ABSTRACT

The Akaike information criterion (AICc) and Kashyap information criterion (KIC) are examined in combination to obtain a set of optimal model weights for multi-model analysis of prediction uncertainty. A series of one-dimensional candidate models were used to compare results using AICc and KIC for model-averaged predictions and prediction variances. KIC selected models produced more accurate and more precise predictions than AICc for sparse data sets with an estimated single parameter type (hydraulic conductivity). When the number of observations is increased, AICc and KIC selected models with higher parameter dimensions which resulted in similar model averaged predictions and prediction variances. AICc and KIC produced similar results for one prediction for models with two estimated parameter types (hydraulic conductivity and recharge) optimized using a small data set with 19 observations. A more accurate model-averaged second prediction was made by KIC-selected models using the same data set whereas AICc model averaged predictions were more precise. Additional observations used to optimize the two-parameter type models produced AICc model-averaged predictions that were more precise but which did not include the true prediction within the model-averaged prediction interval. KIC model averaged predictions for the same candidate models were more accurate with a broader prediction interval that included the true prediction. Results will likely vary with different model sets and observation data sets. Future work will focus on combining results of different model discrimination criteria with other statistical measures to obtain reasonable prediction intervals that are more likely to include the true prediction.