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BIOLOGICAL OXYGEN DEMAND FORECASTING FOR RESERVOIR WATER QUALITY MONITORING: A NEW APPROACH

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Abstract

In reservoir water quality monitoring, determining Biochemical Oxygen Demand (BOD) parameters is often time-consuming and costly. This study introduced a novel approach for predicting BOD_5 concentration through the Bayesian Model Averaging (BMA). Five best models were built using the BMA to predict BOD_5 in relationship with DO, TSS, COD, NO_3^-, NO_2^-, NH_4^+, Oil and Coliform. The final best selected model showed the relationship of BOD_5 with 4 variables: COD, NO_3^-, NO_2^-, and Coliform. BOD_5 received the highest relative importance to NO_2^- (0.361), followed by COD (0.214), NO_3^-(0.161) and Coliform (0.174) in the selected model. The developed model demonstrated robust performance, achieving an average accuracy of 93.26%. It was found that BMA was an effective method for building pollutant concentration prediction models. The BMA method was capable of using all observed parameters to build a model, thereby selecting the most important and optimal parameters to build a predicting model instead of the parameters selected by the modeler. Compared with methods such as Multiple Linear Regression (MLR), Artificial Neural Networks (ANN), or other artificial intelligence (AI) techniques, the MBA method demonstrated better forecasting result with $R^2 = 0.91$. The BMA method proposed the most optimal models with high R^2 but the least number of dependent variables, facilitating the running of the forecasting model.

Key words: BOD_5, Bayesian Model Averaging, reservoir water quality, water quality

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