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Comparison between numerical and parametrical uncertainty in the application of simplified water quality models

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Simplified models based on the complete stirring tank reactor (CSTR) theory can be helpful in preliminary water quality assessments. The uncertainties of these tools should be considered for better decision-making. The research aimed to answer the following question: Is the uncertainty of the parameters or is the uncertainty of the numerical methods that generate the greatest range of possibilities for a simple water quality model? Two opposite hydrological conditions of lentic environments were investigated. Numerical uncertainty was estimated through an ensemble of six different numerical methods for solving the ordinary differential equation (ODE). Monte Carlo simulations were employed to quantify the parametric uncertainty. Uncertainty sources were compared based on the generated interquartile range for each case study. The numerical uncertainty was equivalent to the parametric uncertainty for low reservoir volumetric oscillation, whereas the numerical uncertainty prevailed over the parametric uncertainty for high volumetric ascension. The parametric uncertainty collaborated to consider the uncertainties in the definition of parameters that are not necessarily static. The results demonstrated that these considerations are relevant in situations of seasonal effects of water storage, which can be observed in drought scenarios, and even as an effect of climate change. Suggestion is in favor of the ensemble approach, as considering the variability of results through numerical and parametric uncertainties in simplified models could help build trust on the decision-making process concerning the preliminary assessment of water quality in lentic environments.