Microbial Water Quality Modelling of the Detroit River to assess the source water quality in drinking water treatment plants of Windsor and Amherstburg

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Abstract:

Detroit River is an important part of the Great Lakes system that connects Lake St. Clair with Lake Erie. Studying microbial water quality of the Detroit will certainly contribute to the improvement of Great Lakes water quality. So this study fits in the grand challenge "Safeguarding Healthy Great Lakes". In this study, a coupled hydrodynamic and microbial water quality model of the Detroit River has been developed. The three dimensional hydrodynamic simulation was performed with TUFLOW-FV tool by using bathymetry, flow, water level and forcing data. The simulated model output was compared with the field observed data and the performance parameters were also calculated. The coefficient of determination, R^2 values for the water level, flow and temperature were calculated 0.91, 0.6 and 0.7 respectively which shows satisfactory functionality of the model. The microbial module named Aquatic-Eco-dynamics was then coupled with the verified hydrodynamic model for microbial simulation. The hydrodynamic model provides velocity distribution of the entire system that being used in microbial module to simulate the fate and transport of *E. coli* with the consideration of decay rates and other ecological factors. Results show that the loadings from Little River and bypass from Little River wastewater treatment plant affect the microbial water quality of the Windsor Water Treatment Plant (WWTP). This model also simulated the impact of Canard River loadings in the Amherstburg Water Treatment Plant (AWTP) microbial water quality. This functional model can be used for supporting drinking water treatment and implementing water resources management decisions