Prediction of dioxin concentrations in the Tokyo Bay estuary using a 3-D chemical fate prediction model

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Abstract

A 3-D chemical fate prediction model (FATE3D) was applied to predict the dioxin concentrations in the seawater of the Tokyo Bay estuary, Japan.

The simulation covered 1 year (from September 2002 to August 2003). Input data such as meteorological data, flow field conditions, concentrations and sinking rates of organic particulate matter, initial and boundary conditions, loading fluxes and physico-chemical properties of dioxins were used for the parameters of the model.

The simulation results could be favorably compared with the field measurements of dioxin concentrations in the estuary for both the particulate and dissolved phases, indicating the validity and predictive capability of the model. Furthermore, the differences in the seasonal cycles and distributions between the particulate- and dissolved-phase dioxins in the estuary were estimated from the simulation results.

However, the concentrations of the particulate-phase dioxins in the bottom layers (+1 m from the bottom) were underestimated because the resuspension process was not taken into account in the model. For improving the model's predictive capability, including the resuspension process to the formulae of the model shall be the focus of our next study.