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Numerical simulation of water age and its potential effects on the water quality in Xiangxi Bay of Three Gorges Reservoir

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Abstract: After the impoundment of Three Gorges Reservoir, algal blooms frequently occurred in the tributaries of the reservoir, which has posed a great challenge for the local aquatic environment and ecology. To investigate the main causes and key factors of the algal blooms, the Environmental Fluid Dynamics Code (EFDC) model is applied to the simulation of the three-dimensional hydrodynamics and water quality in the Yangtze River and Xiangxi Bay, and the concept of water age is adopted to quantitatively analyze the effects of hydrodynamics on the water quality by linking water age and phytoplankton levels, which has seldom been explored in previous studies. The model results show good agreement with the field data, and the simulation reproduces the thermal stratification and density current in Xiangxi Bay. The results show that Xiangxi Bay exhibits quite complicated hydrodynamic characteristics, and could be divided into different zones according to the transport process. In the upper reach, the water quality is mainly affected by the upstream inflows, while it is mainly affected by the intrusion flow from the mainstream near the river mouth. Water age and

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