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## CHALLENGES FOR 2D WATER QUALITY MODELLING OF LAKE TAIHU IN CHINA

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### Abstract

Lake Taihu is a shallow, wind-driven lake where eutrophication is always a serious problem. The study presented herein investigates the effect of wind on the eutrophication of the lake, by using a two-dimensional (2D) hydrodynamic model coupled with a 2D water quality model. The 2D water quality model looks in particular at the water quality situation of Lake Taihu in the year 2008 and predicts future changes in the algae bloom situation. The Delft3D modelling tool was used to build the hydrodynamic model based on the measured geomorphologic and meteorological data of Lake Taihu. Three different sets of wind conditions (no wind, constant wind and measured wind) were considered as wind effects on the water level and velocity, in both the wet and dry seasons. Based on the calibrated hydrodynamic model a 2D water quality model was built which was calibrated based on estimated data for nutrient loads. A one-year hydrodynamic simulation was performed, in order to determine the water quality situation of Lake Taihu. The estimated nutrient loads included total nitrogen (TN) and total phosphorus (TP) concentrations. The estimates are based on the population of cities around Lake Taihu, and the wastewater treatment plant capacity of the provinces of Jiangsu and Zhejiang, where the main sources of pollutants come from. Two time periods (spring and autumn) of algae blooms development for the year 2008 are presented. The results of the study indicate that: 1) the hydrodynamic model with constant wind conditions (southeast, 5m/s) showed better results than the one where measured wind conditions were used, simply because the measured wind data is insufficient at the moment; 2) the model clearly represents the water quality to an acceptable degree; 3) an increase in population in the area would lead to an increase in the maximum value of algae concentration from 35% to 76%; 4) if there is an improvement in technology at the wastewater treatment plant, then the maximum value of algae concentration will be between 17% and 42%.

*Key words:* 2D hydrodynamic modelling, algae bloom, Lake Taihu in China, water quality

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