

滇池湖泊生态系统水动力学模拟

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Simulation of Hydrodynamics of Dianchi Lake Ecosystem

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摘要

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摘要 针对滇池富营养化状况,依据滇池生态环境建设规划,在以前研究工作的基础上,综合考虑湿地植物、底泥、水域条件变化,根据水动力学原理建立了垂向平均的二维生态系统水动力学模型,模拟了滇池现有水体、拆除防浪堤水域扩展后水体和滇池湿地建成后总水体3种情况的流场和浓度场,以及入滇河道达标排放后的水质浓度场,分析了湿地植物和水域扩展对滇池流场的影响,以及水域扩展、湿地植物、入湖河流达标排放对滇池水质的影响。结果表明,水域拓展对滇池流场的影响是局部的,湿地植物对滇池流场的影响主要发生在湿地区域。水域拓展对滇池水质具有一定影响, TN、TP平均质量浓度由2.08和0.19mg·L⁻¹ (现有水体)降至1.69和0.1619mg·L⁻¹;人工湿地建设对滇池水体TN、TP浓度影响较大,湿地建成后平均质量浓度降至0.76和0.0519mg·L⁻¹,基本达到GB 3838—2002《地表水环境质量标准》III类水质标准;人工湿地建设完成并且入滇河流达标排放后, TN、TP平均质量浓度分别降至0.17和0.01 mg·L⁻¹,水质明显改善。因此,人工湿地建设及入滇河流的达标排放对滇池生态环境的改善具有重要作用。

关键词: 滇池湖泊 生态湿地 生态系统水动力学模型 水质

Abstract: A vertical-average 2-D ecosystem hydrodynamic model was established based on the principles of hydrodynamics and in light of the status quo of eutrophication of Lake Dianchi, the program for reconstruction Lake Dianchi eco-environment, research works done in the past, and changes in vegetation, sediment and water of the wetland, to simulate and study flow fields and concentration fields of the existing waterbody, expanded waterbody by removing the breakwater and the whole waterbody after construction of wetland and concentration field of the water in inflowing rivers that have met the criteria of discharge. The effects of wetland plants and expansion of the waters on flow field of the lake and effects of expansion of the waters, wetland plants and up-to-standard discharge of inflowing rivers on water quality of the lake have been analysed. Results show that the effect on flow field of expansion of the waters was only to a part of the lake, while the effect of wetland plants was limited to the wetland area. Expansion of the waters may have some effect on water quality, lowering the mean concentrations of TN&TP from 2.08 and 0.19 mg·L⁻¹ to 1.69 and 0.16 mg·L⁻¹, separately, but construction of wetlands may have greater effect on TN&TP, lowering their mean concentrations down to 0.76 and 0.05 mg·L⁻¹, which basically meet with Grade III Criteria of Water Quality Standard. Once construction of artificial wetlands is accomplished and the water of inflowing rivers made up to the standard for discharge, the mean concentration of TN&TP may be lowered to 0.17 and 0.01 mg·L⁻¹, respectively, thus significantly improving the water quality of the lake. Therefore, the combination of the last two measures may play a critical role in improving the ecological environment of Lake Dianchi.

Keywords: Lake Dianchi ecological wetland ecosystem hydrodynamic model water quality

Received 2011-01-03;

Fund:

国家自然科学基金(50756001); 云南省自然科学基金(2008-ZC017M); 云南省中青年后备人才基金(2005PY01-34)

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引用本文:

程浩亮, 杨具瑞, 芦振爱, 凌桢, 李君宁. 滇池湖泊生态系统水动力学模拟[J] 生态与农村环境学报, 2011, V27(4): 74-80

CHENG Hao-Liang, YANG Ju-Rui, LU Zhen-Ai, LING Zhen, LI Jun-Ning. Simulation of Hydrodynamics of Dianchi Lake Ecosystem[J] Journal of Ecology and Rural Environment, 2011, V27(4): 74-80

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