杜彦良,周怀东,彭文启,刘晓波,王世岩,殷淑华.近10年流域江湖关系变化作用下鄱阳湖水动力及水质特征模拟[J].环境科学学报,2015,35(5):1274-1284

近10年流域江湖关系变化作用下鄱阳湖水动力及水质特征模拟

Modeling the impacts of the change of river-lake relationship on the hydrodynamic and water quality revolution in Poyang Lake

关键词：鄱阳湖 流域江湖关系变化 二维水动力水质模型 水动力水质影响模拟 TN和TP

基金项目：国家重点基础研究发展计划项目(No.2012CB417004); 国家自然科学基金(No.50879093, 41173118)

作 者 单位

杜彦良 中国水利水电科学研究院, 北京 100038

周怀东 中国水利水电科学研究院, 北京 100038

彭文启 中国水利水电科学研究院, 北京 100038

刘晓波 中国水利水电科学研究院, 北京 100038

王世岩 中国水利水电科学研究院, 北京 100038

殷淑华 中国水利水电科学研究院, 北京 100038

摘要：鄱阳湖水文情势受流域来水及长江共同影响,近10年流域、长江和鄱阳湖间关系发生了较大变化,导致了新的水文节律调整,进一步使得湖区水质环境发生变化.对近10年序列(2003—2012年)和1956—2002年序列的多年平均的日水文过程进行对比,分析了鄱阳湖的流域入流、湖口出流及湖区水位的年内变化过程;近10年鄱阳湖最高水位降低,湖相时间变短,河相时间增长;通过构建鄱阳湖的二维水动力水质模型,并采用实测2010年湖区水动力及水质数据对模型进行率定验证,在此基础上着重研究流域、江湖水文情势变化条件下,湖区的水动力和水质发生的变化.模拟结果显示,由于4—6月间湖区丰水期滞后13 d,8—10月间枯水期提前21 d,导致TN浓度在两个时间段内分别上升10.6%和12.4%,TP浓度在两期间内分别升高11.7%和13.6%.在8—10月期间,湖区水位下降速率增加,南部与西部的碟型湖提前与主湖区分离,形成相对静水的水塘,加剧了碟型湖的富营养化风险.

Abstract：The hydrological regime condition of Poyang Lake was mainly influenced by watershed runoff and the Yangtze River. In recent 10 years, the relationship of basin, Yangtze river and Poyang lake had been changed greatly. This change not only caused an altered hydrological rhythm, but also affected the water environment in the Lake. The average daily hydrological processes in the period of 2003—2012 had been compared with those in 1956—2002. Results show that seasonal allocations of basin inflow and lake outflow were altered, the highest water level were decreased, and the time of limnetic facies of Poyang Lake were shortened. Furthermore, a 2 dimensional numerical model of hydrodynamic and water quality was applied to study the impacts of the changing river-lake relationship, and the model was validated by the measured data in 2010. The results reveal that water quality became worse due to the drought season coming earlier 21 days during Aug to Nov, and 13 days lagging of flood season during Apr to Jun. The concentration of TN in Poyang lake increased by 10.6% and 12.4% during the periods of Apr to Jun, and Aug to Oct, respectively. TP concentration increased by 11.7% and 13.6% during the above two respective periods. In the recent 10 years, the separation of dish-shaped lakes at south and west of Poyang Lake from the main lake occurred earlier in the period of Aug to Oct than that in 1956—2002. which increased the risk of eutrophication.

Key words：Poyang Lake the change of river-lake relationship depth-averaged 2D numerical model the simulation of the impacts on hydrodynamics and water quality TN and TP