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中文题名	长江三峡工程下游荆江洞庭湖水沙数学模型研究
英文题名	Numerical Simulation of Flow and Sediment Transport for Jingjiang River and Dongting Lake Downstream the Three Gorges Project
中文关键词	荆江-洞庭湖;河网水沙数学模型;河道演变分析;江豚栖息地;洞庭湖水资源
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中文文摘	三峡水库蓄水运行后，因上游来沙的大幅减少，水库淤积较预期淤积量小，但中下游的河道演变形势却较以前的认识发生了一些新的变化。一方面下游河道的冲刷量由于测量方法的不同存在差异；另一方面清水下泄后，在长江上出现了一些控制节点，如松滋口附近的芦家河浅滩和洞庭湖出口处的城陵矶-螺山河段，这些关键节点仅少量冲刷甚至出现了一些淤积。未来长江中下游河道将如何演变，江湖关系会怎样发展，这些科学问题值得进一步深入研究。为了解决这些问题，本文收集整理了三峡水库蓄水前后的实测水沙资料和地形数据，比较了输沙率法和断面法冲淤量计算结果的差别，对长江干流近年来的河道演变规律做出了定性的判断，并还原了宜昌-沙市河段采砂等人工干扰对断面改变的影响。在现状河道冲淤分析基础上，为了进一步预测长江干流河道冲淤形势和江湖关系演变规律，分别建立了一维河网水动力学模型和河网泥沙输移模型来对长江干流宜昌-大通河段、洞庭湖水系进行数值模拟，模型中包括断流模块、糙率自动调整模块、一二维耦合模块、不平衡输沙模块、河床变形调整模块等几个主要部分，通过率定和验证，可以较好的反映江湖中复杂的水沙运动规律。建立的河网水沙数学模型被应用于长江中下游荆江洞庭湖水沙计算中，模型采用 2003-2008 实测水沙系列作为边界条件。按上述边界条件计算可知：长江中下游河段在未来 40 年内还将持续冲刷，但因近年来城螺节点持续淤积的影响，城陵矶水位在一段时间内还将持续居高不下，给长江中下游的防汛工作带来一定的压力。为了评估未来的防洪形势，文中又分别计算了 1998 年洪水和 1954 年洪水在冲刷后地形条件下，三峡水库的运行调度方案及城陵矶附近蓄滞洪区容积需求。三峡水库的蓄水运行对长江中下游生态环境也产生了较大影响，文中以江豚栖息地发展趋势及取水安全问题为例，分析了三峡建成后河道地形改变对长江中下游珍贵水生生物栖息地可能造成的影响。结合洞庭湖的水资源需求形势，本文又分析了松滋、藕池、太平三口的分流变化趋势和地形改变后的洞庭湖区水资源问题，结果表明：三口进入洞庭湖分流量，以及洞庭湖出口处城螺河段河床的变化都将影响洞庭湖内的总水量和水资源形势。
外文文摘	After the Three Gorges Dam (TGD) closed the Yangtze River, due to reduction upstream sediment input, the risk of excessive siltation has been reduced, however, the erosion situation of middle and lower reaches of the Yangtze River, has undergone some new changes, which is different from the original viewpoints. In some local areas of the Yangtze River, key positions or reaches for flood management raised, such as the Lujiahe shoal and the reach from the Chenglingji to Luoshan. They are located in or near the Songzi inlet and the outlet of Dongting Lake to Yangtze River. Few amount of erosion, but even deposition, appears at these key positions. Under the control of nodes, problem about the fluvial process of the middle and lower reaches of Yangtze River and exchange of water and sediment between Jingjiang River and Dongting Lake should be investigated further.In the paper, measured data of flow, sediment transport and river bed deformation before and after the the Three Gorges Project (TGP) operation are collected. The results from the cross section topography method are compared to the results by amount of sediment discharge rate method. The qualitative conclusions of cluvial process are presented and the impact of sand mining on river bed deformation is estimated in the reach from Yichang to Shashi. In order to predict the evolution trend of the middle and lower reaches of the Yangtze River and relationship between the Jingjiang River and Dongting Lake, one dimensional mathematical model of river network for flow and sediment transport model are presented. The calculation domain is from Yichang, downstream of the dam, to Datong, involving Dongting Lake. The model includes a mended zero discharge module, a self-adjusting roughness coefficients module, a coupled 1d and 2d channel flow module, a non-equilibrium sediment transport

	module and a bed deformation module. The models are calibrated by the field hydrological and sediment transport data, results of water level and flow discharge agree well with the measured data. The model can be used to calculate the movement of water and sediment transport.The measured data from October, 2003 to October, 2008 are adopted as input boundary data, the model is used to calculate the evolution of the middle and lower reaches of the Yangtze River. The results show that the general erosion occurs in from Yichang to Hankou, but deposition occurs in from the Chenglingji to Luoshan, the results increase the flood risk at Chenglingji station. The series measured data of 1954 and 1998 Yangtze River floods are used to assess the flood control situation after the topographic variation. Some scheduling schemes to prevent flood are designed and the volume of flood diversion area is calculated.The impoundment of the TGP will effect on the ecological environment of the Yangtze River. In this paper, taking the water safety development trend of Dolphins habitat as an example, possible impact of terrain changes on the Yangtze River rare aquatic habitat are analyzed. Aim at water resource proble of Dongting Lake, the discharge trend of three inlets (Songzi, Ouchi and Taiping) and water resource problem in Dongting Lake have been discussed, the result shows that both of variation of distributary for three inlets and river bed deformation at Chenglingji to Luoshan intensely influence water resource of Dongting Lake.
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