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基于SWAT模型的三峡库区香溪河非点源氮磷负荷模拟

Study on non-point nitrogen and phosphorus load from Xiangxi River in the Three Gorges Reservoir area based on SWAT

关键词：氮磷 香溪河 三峡库区 SWAT 径流

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摘要：三峡水库蓄水后,水动力条件改变下营养盐的过量输入导致部分支流库湾水华现象及水体富营养化问题严重.本文以香溪河为研究示范区,基于GIS平台建立流域下垫面空间数据库,以氮磷为研究对象,应用SWAT模型对流域三大主要水系及涉及35个子流域进行2000—2009年径流、营养盐输出模拟研究,并对实测数据和模拟结果进行分析,结果表明:径流模拟结果校验阶段的效率系数0.65和0.86,确定系数是0.78和0.91,模拟效果较好,径流和营养盐负荷受降雨影响呈正相关关系,在丰水年和丰水季节较大,2000—2009年期间TN和TP年均负荷分别是2640.64和300.01 t,在2007年达到最大值,分别是3475.96和399.20 t,在2005年为最小值,分别是2036.72和226.44 t,TN和TP负荷的贡献率高岚水系>古夫水系>南阳水系,支流TN和TP输出强度空间差异较大,空间分布差异系数分别是0.34和0.58,TN最大值和最小值是29.39 kg·hm^{-2}·a^{-1}和3.86 kg·hm^{-2}·a^{-1},TP最大值和最小值分别是4.90 kg·hm^{-2}·a^{-1}和0.54 kg·hm^{-2}·a^{-1}.

Abstract: After impounding, water blooms occurred in some branch bays of the Three Gorges Reservoir owing to the changed hydrodynamic conditions and excessive nutrients. The spatial database of the underlying surface of the Xiangxi River basin was established based on GIS, and SWAT model was applied to simulate the runoff and nutrients loads derived from the three major distributaries watersheds and 35 sub-basins during 2000—2009. The results of observed and simulated load output were analyzed. It was showed that efficiency coefficients of runoff in validating and calibrating stages were 0.653 and 0.86, respectively, and the decided coefficients were 0.78 and 0.91, respectively. The runoff was positively correlated with the nutrient loads. The average TN and TP loads were 2640.64 and 300.01 t, the minimum occurred in 2005 were 2036.72 and 226.44 t, and the maximum occurred in 2007 were 3475.96 and 399.2 t, respectively. The order of TN and TP loads from the distributaries watersheds was Gaolan > Gufu > Nanyang. The spatial distribution of the TN and TP loads varied greatly, with the maximum and minimum values of TN being 29.39 and 3.86 kg·hm^{-2}·a^{-1} of TP being 4.90 and 0.54 kg·hm^{-2}·a^{-1}. The spatial variation coefficients of TN and TP were 0.34 and 0.58, respectively.

Key words: nitrogen and phosphorus Xiangxi River the Three Gorges Reservoir SWAT runoff

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