

The effect of cascade hydropower group's leading reservoir regulation control on nitrogen migration

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Abstract

Cascade hydropower group of Wujiang River in Guizhou Province, China, is an essential part of the west-east power transmission project. Hongjiadu Hydropower Station is the first reservoir in the cascade hydropower group, with a hydraulic retention time of 1.008 years, DAM height of 179.5 m, a controlled watershed area of 9,900 km², a total storage capacity of 4.95 billion m³, an adjusted storage capacity of 3.36 billion m³, an annual average runoff of 4.89 billion m³, a total installed capacity of 0.6 million kilowatts[1]. Since 2004, Hongjiadu Hydropower Station has generated power. Water storage in the flood period and water power generation in the dry period led to a huge difference in water level and affected fish habitat. Firstly, the water and nitrogen mass balance model was applied. CVL Grid and Google Earth Pro were applied to build 292 orthogonal grids. Environmental fluid dynamics code was exploited to simulate the hydrodynamic, temperature, water quality, and sediment modules of Hongjiadu Reservoir in 2007, 2008 and 2017. The fieldwork and the interpolation method were used to inputted particulate refractory organic nitrogen, easily degradable organic nitrogen, dissolved organic nitrogen, Kjeldahl nitrogen, ammonia nitrogen[2,3], nitrate-nitrogen[2,3], and total nitrogen of inflow rivers. Cage farming brought large amounts of particulate nitrogen (fish feed), which were input the corresponding grids of Hongjiadu Reservoir. Fortunately, cage farming has now turned into ecological fish farming. This model was an exploration of fish habitat protection in the first stage of a cascade hydropower station. [1]Liang, X.; et. al. 2019. Control of the hydraulic load on nitrous oxide emissions from cascade reservoirs. *Environ. Sci. & Technol.* 53(20): 11745-11754. [2]Liu, X. 2010. The effects of cascade reservoirs on biogeochemical cycling of nitrogen in River-Reservoir system -take Wujiang River and its branch Maotiao River in SW China for example, Guiyang, Institute of Geochemistry, Chinese Academy of Sciences, Doctoral degree (In Chinese).

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Cascade hydropower group of Wujiang River in Guizhou Province, China, is an essential part of the west-east power transmission project. Hongjiadu Hydropower Station is the first reservoir in the cascade hydropower group, with a hydraulic retention time of 1.008 years, DAM height of 179.5 m, a controlled watershed area of 9,900 km², a total storage capacity of 4.95 billion m³, an adjusted storage capacity of 3.36 billion m³, an annual average runoff of 4.89 billion m³, a total installed capacity of 0.6 million kilowatts . Since 2004, Hongjiangdu Hydropower Station has generated power. Water storage in the flood period and water power generation in the dry period led to a huge difference in water level and affected fish habitat. Firstly, the water and nitrogen mass balance model was applied. CVL Grid and Google Earth Pro were applied to build 292 orthogonal grids. Environmental fluid dynamics code was exploited to simulate the hydrodynamic, temperature, water quality, and sediment modules of Hongjiadu Reservoir in 2007, 2008 and 2017. The fieldwork and the interpolation method were used the inputted particulate refractory organic nitrogen, easily degradable organic nitrogen, dissolved organic nitrogen, Kjeldahl nitrogen, ammonia nitrogen, nitrate-nitrogen, and total nitrogen of inflow rivers. Cage farming brought large amounts of particulate nitrogen (fish feed), which were input the corresponding grids of Hongjiadu Reservoir. Fortunately, cage farming has now turned into ecological fish farming. This model was an exploration of fish habitat protection in the first stage of a cascade hydropower station.