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General hydrogeological problems

6.2
Hydrogeology of karst

Characteristic of ammonia nitrogen adsorption on karst underground river sediments

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Karst aquifers are the most important aquifers in Southwest China. One of the characteristics of karst aquifers is that their enhanced permeability permits high flow velocities capable of transporting suspended and bedload sediments. The transport is episodic and occurs primarily during storm flow in the conduit system. As storm flow recedes, clastic sediments are deposited in the conduit system and at the spring mouths. Mobile sediment in karst may act as a vector for the transport of contaminates. A better understanding of sediment transport in karst is needed to protect these vulnerable systems. 14 sediment samples were collected from two underground rivers in typical peak-cluster and peak-forest karst areas in Liuzhou city, Guangxi Autonomous Region, China. According to simulated experiment methods, characteristic of adsorption of ammonia nitrogen on sediment was studied. The results of ammonia nitrogen adsorption dynamics on sediments showed that the maximum adsorption velocity was within 120 min. It reached balance after 120 min. The maximum adsorption quantity of ammonia nitrogen was 385.5 mg/kg, which was sediment from a cave in the middle areas of Guancun underground river system. The study of isotherm adsorption indicated adsorption quantity of NH_4^+ increase following by incremental balance concentration of NH_4^+ in the aquatic phase. Adsorption quantity of ammonia nitrogen in sediments has a relative linear relationship with adsorption balance concentrations. In the condition of low and high concentrations of ammonia nitrogen in overlying water, Langmuir and Tempkin couldn't simulate or simulate results couldn't reach remarkable level, while Linear and Freundlich models could do that, which has a little difference from rivers or lakes sediments. The maximum adsorption quantity in inlet of Longzhai cave was 0.0874 mg/l, while 0.0365 mg/l in the outlet, indicating the risk of ammonia nitrogen release was higher in the inlet than the outlet of the cave. Sediments from Zhonghudong cave and Nandong cave in Guancun underground river system showed adsorption and desorption balance concentrations were higher in summer than in spring, indicating adsorption and desorption balance concentrations were affected by seasonal variation. Risk of ammonia nitrogen release to aquatic phase was highest in summer.

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