

Study on apparent settling velocity of nutrients for Banchengzi reservoir, China

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ABSTRACT

Beijing is one of the largest cities in the world and also a city with severe water shortage. Since the 1990s, the Miyun reservoir has become the most important source of drinking water for Beijing. In the past 20 years, with the economic growth and development, the nutrient load of the Miyun reservoir increased gradually, which increased the risk for the bloom of harmful algae. In the past 10 years, there were many researches about the nutrients in the water body of the Miyun reservoir or the upper-rivers of the Miyun reservoir. However, there was a lack of a connection between the researches about nutrients in the rivers and the Miyun reservoir, which made it difficult to simulate the process of the delivery of nutrients from rivers to reservoir.

Settling losses in the water body can be expressed as a flux of mass across the surface area of the sediment-water interface, and the apparent settling velocity(v) was an important parameter that describes the process of the delivery of nutrients from rivers to reservoir in many nonpoint-source pollution models.

To estimate the apparent settling velocity of nutrients, in 2009-2010, 230 water samples were collected from Banchengzi reservoir and the upper-river basin of it, analyzed for total nitrogen (TN), nitrate (NO_3^- -N), ammonium (NH_4^+ -N), total phosphorus (TP) and index of potassium permanganate (COD_{Mn}) to estimate flux of nutrients.

The results showed that the apparent settling velocity for nitrogen and phosphorus of the Banchengzi reservoir were 20.3m/year and 9.5 m/year. After the river runoff entered the reservoir, the apparent settling velocity for nitrogen increased rapidly, which was 3 times faster than that before the river runoff entered the reservoir. The apparent settling velocity for nitrogen increased with the temperature of the surface layer of water body. After the river runoff entered the reservoir, the spatial distribution of

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nutrients changed. Before the river runoff entered the reservoir, the concentration of TP of water body decreased from the inlet to the outlet of the reservoir; after the runoff entered the reservoir, the concentration of TP increased from the inlet to the outlet of the reservoir, for the phosphorus which was from sediment re-suspension travelled from the inlet to the outlet of the reservoir. Before the runoff entered the reservoir, the concentration of $\text{NH}_4^+\text{-N}$ of water body increased from the inlet to the outlet of the reservoir; after the runoff entered the reservoir, the spatial difference of concentration of $\text{NH}_4^+\text{-N}$ was not obvious as before.

Keywords: nutrients, apparent settling velocity, spatial distribution, Banchengzi reservoir