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Spatial analytic reasons of eutrophication in Baiyangdian Basin, China

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Baiyangdian is the closed lake located in North China Plain, about 150 km to the south of Beijing. The lake provides domestic and industrial water to surrounding area. The lake has functions of flood mitigation, water purification, conservation of biodiversity, that is ecosystem services. However, water shortage and pollution becomes serious problem, and ecosystem services are deteriorated.

Recent economical development in China leads increase in local industries, and population is increasing in the surrounding area. Water demand is also increasing, that lead to decreased storage and dry up of Baiyangdian lake.

Baiyangdian collects nine streams from Taihangshan mountains and effluent stream flows into Bohai Bay. Swamp area include about 3,700 of creeks connecting 146 water areas through channels. Total area is about 366 km² including 36 villages in the swamp area. The climate is temperate monsoon climate, which has dry and cold winter, and hot and moist summer. Average annual precipitation is 563.9 mm, and annual average pan evaporation reaches 1369 mm. About 80% of precipitation is concentrated from June to September.

Baiyangdian as natural wetland has many functions, namely ecosystem services. Proper conservation is required to maintain local agriculture and industries. The final goal of the study is conservation of ecosystem services of natural wetland. In this paper, we report the interannual and seasonal changes in water area and wetland vegetation in Baiyangdian by using satellite remote sensing. Field survey of water quality had conducted in 2010. The relationship between the condition of surface water and vegetation and water quality is investigated.

China 1km Mesh Grid Land Cover data in 1980 and 2000 shows the residential land and industrial land increased in Baiyangdian, and the arable land in the middle and mountain areas tend to increase, but decrease in plain area. Reduction of arable land area corresponds to the residential and industrial land increased area.

In addition, Water area and vegetated area in the lake has a decreasing tendency between 1989 and 2001. This is caused by housing and agricultural developments in the reclaimed land. Especially the upper part of Baiyangdian suffers development activities. On the other hand, it is proved that large water areas of Baiyangdian had been separated.

Field survey was carried out on April, June and September in 2010. Total nitrogen, total phosphorus, nitrate-nitrogen were measured at plural sampling points. The concentrations of the items are high at the inlet channel of Baiyangdian lake. It seems wetland vegetation (mainly reed grass) absorb the nutrients. The concentration in September is the lowest in the season. This is considered to be the absorption of the nutrients by vegetation in the growing season. It remains as the next point to discussion. Moreover, the observation months results are compared. The absorption rate of the nutrients in September is more high than it in April and June. One the reasons is that reed grass absorb the nutrients in the growing season from April to July. In addition, the transparency at inlet is much lower than center and outlet . The concentration distribution and the seasons change of water projects , are based on the pollutants from the upper steam, wetland vegetation purification function and the seasonal distribution of precipitation to illustrate.

Baiyangdian is a enclosed water which is near to the city , and solve the problems about enclosed water is the world common project . For example , in Japan , they are using Water Pollution Prevention Law and Lake Water Quality Prevention Measure to improve the water quality . In the future, the research of comparative hydrology based on around the world about enclosed water subject , to master the lake water environment problems as the earth in environment problems.

Keywords: Ecosystem services, Water pollution, Water area, Wetland vegetation