WATER QUALITY REMOTE SENSING MONITORING RESEARCH IN CHINA BASED ON THE HJ-1 SATELLITE DATA

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1. INTRODUCTION

Water quality monitoring is the main basis for the water quality assessment and the water pollution management. Routine water quality monitoring needs through the water sampling and makes the chemical analysis based on the laboratory instrument. This method is time-consuming and laborious; furthermore, this method cannot satisfy the need of regional monitoring. On the other hand, there are unique superiority and the widespread prospects for remote sensing technique in the water quality monitoring, with the remote sensing technique's characteristics of fast, wide range, low cost and periodic dynamic monitor.

According to the water color remote sensing's object, it may be divided into three types, namely the ocean open water body remote sensing, the nearshore water body remote sensing and interior water body remote sensing [1]. The contents of the nearshore water body and interior water body are more than those of the ocean water body. The optical character of the interior water body is affected not only by the plant plankton but by the lifeless suspension and the decadent material influence. For the water shallow situation, we need to consider the material from under water for the water body optical quality. Generally speaking, the interior water body optical character is relatively complex, and the different interior water body's optical character is often different. It is also the difficult to establish strong, the high precision inversion model for the water quality parameter of interior water body [2].

Our study area is Lake Chaohu (E: 117°16 ' 54 " ~117°51 ' 46 ", N: 30°25 ' 28 " ~31°43 ' 28 "), located at the middle of Anhui Province, China. Lake Chaohu is the one of five big fresh water lakes in China. Since the 1980s, as a result of the upstream ecological environment's worsening, the big area the soil erosion is occurred. Furthermore, much pollutant, especially those from Hefei city, poured into the Lake Chaohu. The water quality of Lake Chaohu encountered heavy damage. The suspended solid content is always high, the transparency is low, the water body eutrophication degree is high, and the water body pollution is serious. The peripheral urban socio-

economic development is influenced seriously. So Lake Chaohu is one of the interior water bodies which government focuses on.

Many researches have been carried out for the water body water quality monitor using the TM data, and the relative ideal result is obtained for the parameters of chlorophyll *a*, the suspension, the transparency and the decadent material's estimation [3, 4]. Considering the temporal feature of the water pollution, HJ-1 CCD data (temporal resolution is about 2-3 days) is selected for the water quality inversion. The Chinese first environment satellite (HJ-1) is launched on September 6, 2008. The field of view for CCD amount to 720 kilometers, the nadir ground resolution is 30 meters. HJ-1 data is the main remote sensing data for operational environmental monitoring in China. We proposed the method of interior water body water quality parameter remote sensing monitoring based on the HJ-1 CCD data. The parameters of water quality conclude the chlorophyll a density, suspension density, as well as water body eutrophication index.

2. PRINCIPLES AND METHODS FOR WATER QUALITY PARAMETERS INVERSION

The water quality parameter remote sensing inversion is mainly based on the radiation energy which the sensor accepts. The leaving radiation and reflectance containing the water quality information will be obtained when elimination of surface solar flares and the white hat reflection for the water surface and through the atmosphere correction for the remote sensing data. There are three methods for the direct water quality parameter inversion, namely empirical method, semi-empirical method and method based on photobiology model analysis. Compared with the empirical method, semi-empirical method, the analysis method has the explicit physics significance, and versatile and the high inversion precision.

Based on the HJ-1 multi-spectrum data's characteristic, regarding the chlorophyll a density, the different empirical model is used for different regional water and different season. The suspension density is inverted based on the photobiology model in near-infrared single waveband. Lastly, the water body trophic level index is computed based on chlorophyll a and the suspension density.

3. RESULT AND CONCLUSTION

The HJ-1 CCD data was geometrically corrected, atmosphere corrected. And the water quality parameter can be inverted based on the method in section 2. We carried on the ground water quality sampling experiment in Lake Chaohu on June 13 and 15, 2009. We picked up the pixel value at the same location of the experiment measurement. There are 14 synchronized experiment points. The water quality for experiment and for image is compared and the result is shown in figure 1. Through the result we can see that HJ-1 CCD data can be used for water quality parameter inversion of the interior water body. However, the precision need to be improved.

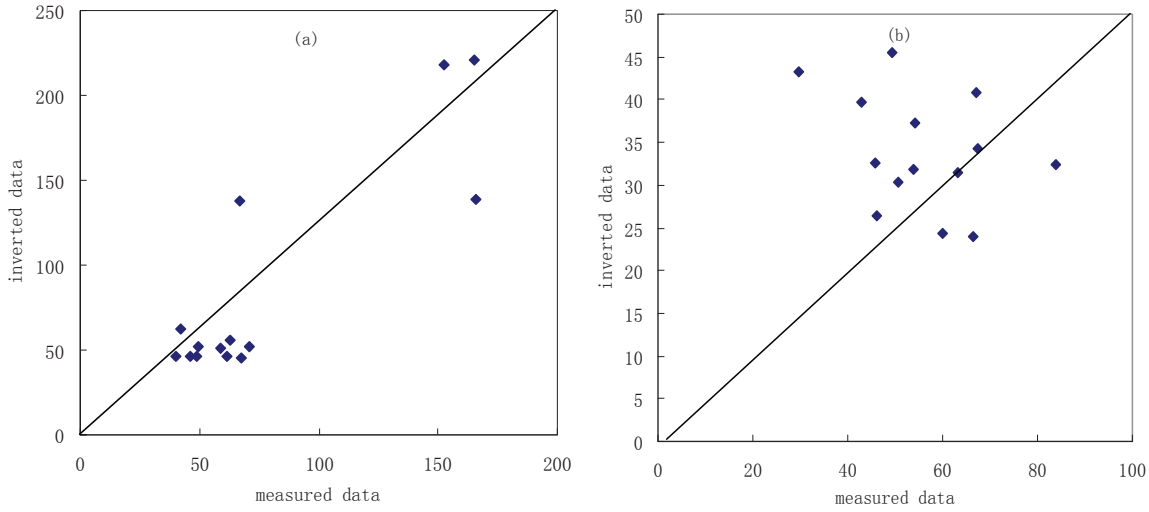

Figure 1 The scatter plot of measured data and inversion result
(a). chlorophyll a (b). suspension density

In order to enhance HJ-1 CCD data application in the interior water, we need to develop the following aspects in the near future work: Firstly, the spectral feature of some water quality parameters except chlorophyll *a*, suspension need to be researched, thus we can enlarge the types of quantitative monitor and establishes the different water quality parameter spectral database; Secondly, it is needed to develop the second water body atmospheric correction algorithm and to develop the special water color sensor. Thirdly, the interior water body optical character is needed to be further understood.

4. REFERENCES

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