

ESTIMATING CHLOROPHYLL A CONCENTRATION IN LAKE WATER USING SPACE-BORNE HYPERSPECTRAL DATA

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ABSTRACTS

The optical property of lake water is very complex, and inversion of chlorophyll a concentration of lake water is hotspot and difficult problem in water quality remote sensing. The spectral reflectance and water qualities of 27 stations were acquired in the lake Taihu, a large shallow lake in eastern China, during the months from May to August, 2008 when blue algal bloomed(Fig.1). Basing on the characteristics spectral analysis, it was obvious that water body spectral character in lake Taihu in these months was dominated by the chlorophyll a. the position and height of fluorescence peak both have a positive correlation with chlorophyll a concentration. Besides empirical algorithm based on blue to green ratio, fluorescence remote sensing of chlorophylls is a more important and valid method for retrieving chlorophyll a concentration in lake water (Fig.2). The results show that chlorophyll fluorescence properties are effective in detecting chlorophyll a concentration in lake water, which provided new optional sensitive bands to retrieval chlorophyll a concentration in complex water.

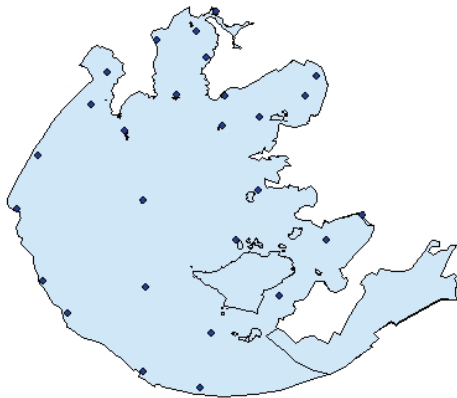


Fig.1. Distribution chart of sampling points in Lake Taihu

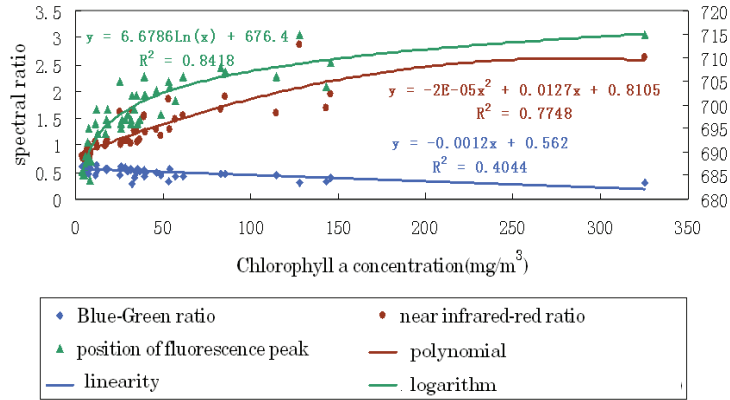


Fig.2. Comparison of fluorescence peak method and spectral ratio methods

The characteristic parameters of chlorophyll fluorescence peak (Fig.3), which consists of position of fluorescence peak, half width of fluorescence peak, the height of fluorescence peak above the reference baseline, the normalized height of fluorescence, mainly reflect the variation of chlorophyll a concentration. Thereby, we established the relationship between these properties of chlorophyll fluorescence peak and the concentration of chlorophyll a based on in-suit water spectral reflectance and water quality measurements. Relationships found between position of fluorescence peak, half width of fluorescence peak, the height of fluorescence peak above the reference baseline, the normalized height of fluorescence and the chlorophyll a concentration are presented. There were good response relationships between them. Their correlation coefficients are 0.8418, 0.8379, 0.7527 and 0.6847 respectively.

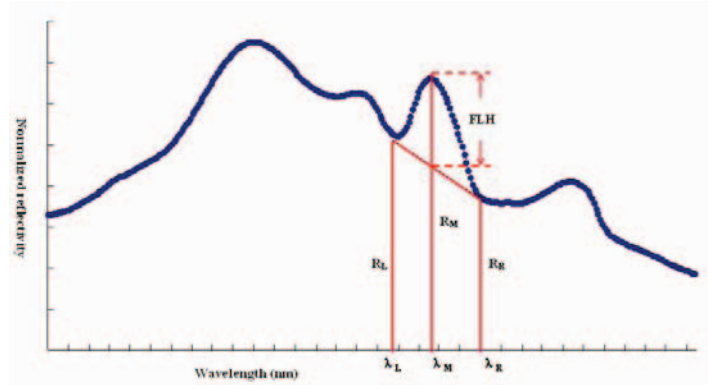


Fig.3. Schematic diagram of fluorescence peak

In mid-2008, Hyper Spectral Imager (HSI) on board its polar-orbiting HJ-1A satellite was launched, which is the first space-borne hyperspectral imager in China. This instrument measures the solar reflected radiation in 115 spectral bands in the visible and near-infrared parts of spectrum, with the spectral resolution 5nm and spatial resolution 100 m. Estimating of chlorophyll a concentration by fluorescence characters has been possible due to the great spectral resolution that sensor provide.

In this article, the feasibility of HJ-1A HSI observations for chlorophyll a concentration estimation is studied by applying the regression equation between fluorescence characters and chlorophyll a concentration established by the experimental water qualities and reflectance data in lake Taihu. And performances of HSI chlorophyll fluorescence algorithms under varying characteristic parameters of chlorophyll fluorescence peak will be compared with empirical MODIS algorithms also.

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