SUSPENDED PARTICULATE MATTER (SPM) CONCENTRATIONS INVERSION FROM REMOTE SENSING DATA BASED ON ANALYTIC MODEL

LI YuXia[1,2] TONG Ling[1] Zhang YuanZhi[2] Pang Bo[1]

（1 Institute of Geo-Spatial Information Technology, University of Electronic Science and Technology of China, Chengdu 610054,China.2 Institute of Space and Earth Information Science (ISEIS),Chinese University of Hong Kong (CUHK), Hong Kong,China）

(liyuxia1979@yahoo.cn & liyuxia@uestc.edu.cn)

ABSTRACT

Suspended particle matter (SPM) includes phytoplankton and non-coloring Suspended particle matter. Its concentrations, size, distribution is very complex, and so it has not strict theory to describe the matter character. The method of using remote sensing technology to monitor water quality by obtaining the suspended particulate matter (SPM) concentration was studied in this paper, and the inversion of SPM from remote sensing image was respectively introduced based on an analytic model and empirical model.

The analytic model mainly focus on the problems above, making use of equivalent sphere Mie scattering theory, and the paper analyzes the scattering characteristics of water suspended particles. At first, we promote a formula to calculate scattering coefficient of suspended particles using scattering efficiency factor. This will solve the inaccuracy problems to calculate the scattering efficiency of phytoplankton and non-algal particles, and it can analyze the characteristics of scattering coefficient effectively. Then, the formulas of back scattering efficiency of phytoplankton and non-algal particles will be deduced using scattering phase function. These can accurately calculate the back scattering efficiency of suspended particles, and analyze the characteristics of back scattering coefficient effectively.

The empirical two-band ocean color remote sensing reflectance algorithm

($R_{rs}\lambda_1/R_{rs}\lambda_2$) will beused in practice for retrieving SPM concentrations, whereλ_1 is usually around red band and λ_1 is around green band. Recent literature suggested that the reflectance ratios $R_{rs}670/R_{rs}555$ of SeaWiFS data were highly correlated to SPM concentrations by using the coincident field data in Mississippi River estuary (D'Sa et al., 2007). This relationship can also be expressed as

$$SPM = A^* (R_{rs} 670/R_{rs} 555)^B \quad (1)$$

Similarly, MODIS and MERIS sensors have similar bands to receive water surface reflectance.Thus, Eq. (1) can be written as

$$SPM = A^* (R_{rs} Red/R_{rs} Blue)^B \quad (2)$$

where A and B are empirical coefficients and should be determined through in-situ data and satellite data combination analysis.

On the other hand, the backscattering coefficients have strong relationships with the SPM concentration, which can be given by (Stramski and Kiefer, 1991)

$$b_{bp}(\lambda) = b_{bp}(550)(\lambda/550)^n \times SPM \quad (3)$$

where b_{bp} is the backscattering coefficient, whereas the constant n should be determined. Based on the above mentioned algorithms, SPM concentration and its spatial distribution map can be produced with the determination of the empirical coefficients from local field datasets.

When the SPM estimated algorithms have been developed and established based on previous studies and our current research work, their accuracy assessment would be necessary.Part of the datasets collected from EPD of HKSAR and our field measured data of water samples will be used to evaluate the accuracy. The rest part of datasets will be used to verify the advanced algorithms via calculating standard errors and comparing with previous results. The deviation of the algorithm performance should also be analyzed in the study.

Keywords: Suspended Particulate Matter(SPM), scattering characteristics, Remote Sensing, analytic model