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IMPROVING WATER QUALITY MEASUREMENT: AN ALGORITHM TO ESTIMATE CHLOROPHYLL-A IN CASE-II SHALLOW WATER

Abstract

Water is an essential resource for survival of the mankind. The availability of usable water and water bodies like lakes and ponds are under increasing threat due to growing population and industrialization. Water resource management is a recognized important activity by United Nations and the Water quality measurement is a basic step in water body management.

It is well proven fact by many studies that the chlorophyll (Chl-a) determines the quality of the water and high chlorophyll concentration is harmful. Traditional method of Chl-a concentration measurement involves water collection at different locations in the water body, filter the Chl-a and test them at laboratories. This method consumes more time resources and suitable for less number of samples. Also, this method is not suitable for large water bodies where more samples are essential to establish the Chl-a distribution.

The optical reflectance spectrum of the water is utilized for Chl-a estimation and it provides the Chl-a concentration in near real time. The reflectance spectrum can be obtained using in-situ spectral radiometer, or high spectral resolution instruments from satellites, airplane and UAVs. In addition to the data from one of the appropriate sources, suitable algorithms are very important in extracting Chl-a concentration from reflectance method. Though many algorithms are developed and established for water quality measurement in Case-I waters (Oceans), algorithms for Case-II water bodies (Inland and coastal water) are still under development.

It can be noted that most of the Case-II water bodies in India are shallow in nature. This study presents about the development, testing and results of an algorithm for Case-II water bodies (Inland and coastal water). An algorithm to estimate chlorophyll concentration based on derivative data suitable to shallow water bodies is discussed. This algorithm is developed and tested using high spectral resolution spectro-radiometer data involving usage of Hyperspectral data and its derivatives.

The paper establishes the need for such an algorithm and continues to discuss the development approach and methodology followed and the overall measurement model. It presents the initial results and comparison with other models such as two band ratio model. The limitations and challenges are also discussed which shall be useful for improving the model leading to enhanced measurements and diverse applications.

Though this algorithm is developed for shallow water bodies, it will be tested for deep water bodies also for Chl-a estimation and results will be presented drawing the directions for future research work.