

DETECTION AND MONITORING OF ALGAL BLOOMS IN PERSIAN GULF USING MODIS IMAGES

Tayebi E., Saradjian M.R.

Remote Sensing Division, Surveying and Geomatics Engineering Dept., University of Tehran, Tehran, Iran
Email: tayebi_elham@yahoo.com, sarajian@ut.ac.ir

Abstract

The Persian Gulf is susceptible to occurrence of algal bloom phenomenon. As a matter of fact a red tide phenomenon occurred in autumn 2008 and remained until spring 2009. The aim of this research is to detect red tide phenomenon in the Persian Gulf and to monitor it during its period of continuation using remote sensing data. Detection of red tide phenomenon in waters of the region has been accomplished by a chlorophyll anomaly monitoring method using water leaving reflectance in visible and near infrared data collected by MODIS sensor. By the regression method using remote sensing data and field measurements, an experimental bio-optical model has been created to estimate chlorophyll-a density of water. This model reveals %93 of the chlorophyll-a variation for chlorophyll-a ranging from 5 to 30 mg m⁻³. It may be used to estimate chlorophyll-a density with a normalized root mean square error (RMSEN) of %9.8 and mean normalized bias (MNB) of %0.4. In order to determine areas where red tide phenomenon has been occurred, a change detection algorithm has been used. Values of chlorophyll-a density have been estimated in specific dates using the proposed chlorophyll estimation model and then compared with chlorophyll map of the same area in a normal year (i.e. the previous year in this study). Through this comparison, areas with intensive change in chlorophyll-a density which would be apt to bloom occurrence are determined. As the proposed chlorophyll model has not been designed to provide the desirable accuracy in case 1 waters, a mask is used to omit the case 1 waters from the final red tide map. The obtained results show that the proposed regional chlorophyll model is effectively capable of detecting bloom occurrence areas compared to OC3M model of MODIS sensor.

Keywords: Algal bloom; chlorophyll density; Persian Gulf; change detection; MODIS Data