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Estimation Of Chlorophyll-A Concentration Using Three-Band Algorithm On Worldview-2 Images

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The objective of the study is performing an estimation of chlorophyll-a (chl-a) concentration for an inland turbid salty lake. The study area is selected as Acigol (Turkey). To retrieve chl-a concentrations, a field study was conducted on July 09th, 2013 to collect water samples at 18 points. Concentrations over the area were between 0.87-8.72 mg/m^3. Due to the average chl-a content which was 6.27 mg/m^3, the lake is categorized as mezotrophic. As satellite data, a high resolution image acquired by WorldView-2 was used. The data consists of 8 bands that were defined as water bands according to the EM ranges sensitive to water. Radiometric and ATCOR atmospheric corrections were executed as preprocessing. Then, for each sampling point in the image, mean reflectance values in 1*1, 3*3, 5*5, 7*7, 9*9, 11*11, 13*13, 15*15, 17*17, 19*19, 21*21, 51*51 neighborhoods were calculated. As the method, three-band model was applied to the data in all neighborhoods, in order to determine the highest correlations between spectral values and chl-a content. Three-band reflectance model, which was first developed for estimating pigment contents in terrestrial vegetation, could also be evaluated as a method to assess chl-a in turbid productive waters as mentioned in the literature. Three-band model was tested with variable optical properties and it was shown that λ_1 should be around 670 nm, λ_2 around 710 nm, and λ_3 around 750 nm. Although correlations were investigated for all neighborhing windows, results were mainly evaluated for 51*51. Using three-band model for 51*51, λ_1= 546 nm (green), λ_2= 608 nm (red), λ_3= 659 nm (yellow) wavelengths found to give correlation as 0.9494. The results of this study show that a strong linear relationship is found between the chl-a concentration and remotely sensed spectral data, and three-band model is an effective way to detect the correlations between spectra and chlorophyll-a content.