Analyzing Water Contaminants Through Image Processing of Chlorophyll-a

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Remote sensing of water quality parameters and contaminants is a cheap and efficient alternative to traditional in-situ water sampling methods. Sensors on satellites detect the reflectance of these parameters at various wavelengths. The pigment chlorophyll-a is one of the most common parameters that can be remotely sensed. Since chlorophyll-a is prevalent in cyanobacterial blooms, it is often used to track and detect them. Many water contaminants cannot be directly tracked because they lack optical properties that satellites can detect. Satellite imagery of chlorophyll-a from the MODIS-Aqua satellite was analyzed using NASA's SeaDAS and the image processing software ImageJ to determine trends in chlorophyll-a concentration from 2008 to 2020. A generalized additive model (GAM) was used to examine the relationship between chlorophyll-a and six different water contaminants: cadmium, arsenic, lead, ammonia nitrate, nitrate, and phosphorus. Significant relationships ($p<0.05$) were found between chlorophyll-a and cadmium, arsenic, lead, and ammonia nitrate. When monitoring the water quality of a body of water, only sampling areas where remote sensing indicates a high chance of the presence of a certain water contaminant will conserve resources.

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