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DEVELOPMENT OF HARMFUL ALGAL BLOOM DETECTION MODEL FOR MANILA BAY, PHILIPPINES USING COPERNICUS SENTINEL DATA PRODUCTS

Abstract

Algal blooms are phenomena characterized by rapid increase and accumulation of plankton biomass in an aquatic ecosystem which could lead to some beneficial events (e.g., increased ocean productivity) or deleterious impacts on the well-being and socioeconomic status of coastal communities. The persistence and increasing frequency of harmful algal blooms (HABs) have negatively affected the Philippines since the first reported case in 1983. Over the years, the country has experienced (1) massive economic losses due to shellfish contamination and fish kill events and (2) public health-related issues attributed to the consumption of mariculture contaminated with biotoxins produced by HABs. However, the current HAB monitoring efforts are still heavily reliant on logistically challenging sampling activities and in situ measurements. Hence, delays in the release of advisories and warnings are inevitable, highlighting the need for the development of an early HAB detection system that is easily accessible, cost- and energy-efficient, and logistically feasible, even for remote areas. In this work, we explored the potential applications of Copernicus Sentinel data products in the development of HAB detection algorithms suitable for the waters of Manila Bay, an economically important bay in the Philippines. Information about the frequency of HAB events, causative species, water physicochemical characteristics, and other parameters from a combination of in-situ and satellite datasets were reviewed to understand bloom dynamics in the bay. The algorithms were implemented in a time-series of Sentinel-2 and Sentinel-3 data using the Google Earth Engine (GEE) Platform, to identify potential blooms. The green line height (GLH) and fluorescence line height (FLH) in remote sensing reflectance (Rrs) spectra were used at 20 m (S2) and 300 m (S3) spatial resolutions. Initial results show that bloom detection using Sentinel-2 data can be utilized to aid bloom monitoring efforts in Manila Bay waters. Dark blooms (low GLH and high FLH) and green blooms (high GLH) detected within the bay coincided with shellfish advisories. The insights gathered in this study will serve as a baseline for the system design of future EO missions that will focus on Philippine waters and its surroundings. Lastly, the potential applications of data generated will contribute to the development and improvement of HAB advisory systems in the Philippines to mitigate its impacts in coastal communities.