Abstract

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Title

The utility of remote sensing for detecting harmful algal blooms in small waterbodies

Description

Harmful algal blooms (HABs) are an important issue in water management around the world, which is being addressed by the Nuisance and Harmful Algae Partnership (NHASP) in Australia. There is a pressing need for effective strategies for monitoring the spatio-temporal variability of HABs in waterbodies with sparse sampling records. Remote sensing techniques have become increasingly popular for detecting and monitoring HABs in large inland lakes and coastal waters. However, it is still challenging to accurately detect HABs in small inland waterbodies via satellite data. Barriers include the size of these waterbodies and the limited number of freely-available high resolution satellites, as well as the lack of regular field sampling for many of these waterbodies.

To investigate the utility of satellite products for HAB detection in small waterbodies, three satellite products with a range of high spectral resolutions (Landsat 8, Sentinel 2 and Planetscope) were used to understand how satellite resolution, availability of spectral bands and lake size impacts HAB detection. This was tested using different existing algorithms and a machine learning method, Self-Organizing Map (SOM). We found that the most important feature of HAB detection was the satellite bands available and algorithm skill was largely unrelated to lake size. However, there are several challenges in adopting remote sensing data to detect HABs. These include the effects of weather, algae dynamics, macrophyte cover and the correction models for remote sensing data. In addition, the match between satellite overpass and sampling time for calibration is an important consideration. Given these challenges, a combined program of regular sampling and remote sensing is recommended for monitoring for small waterbodies.