NC STATE UNIVERSITY
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Monitoring algal blooms using high-spatial resolution satellite imagery

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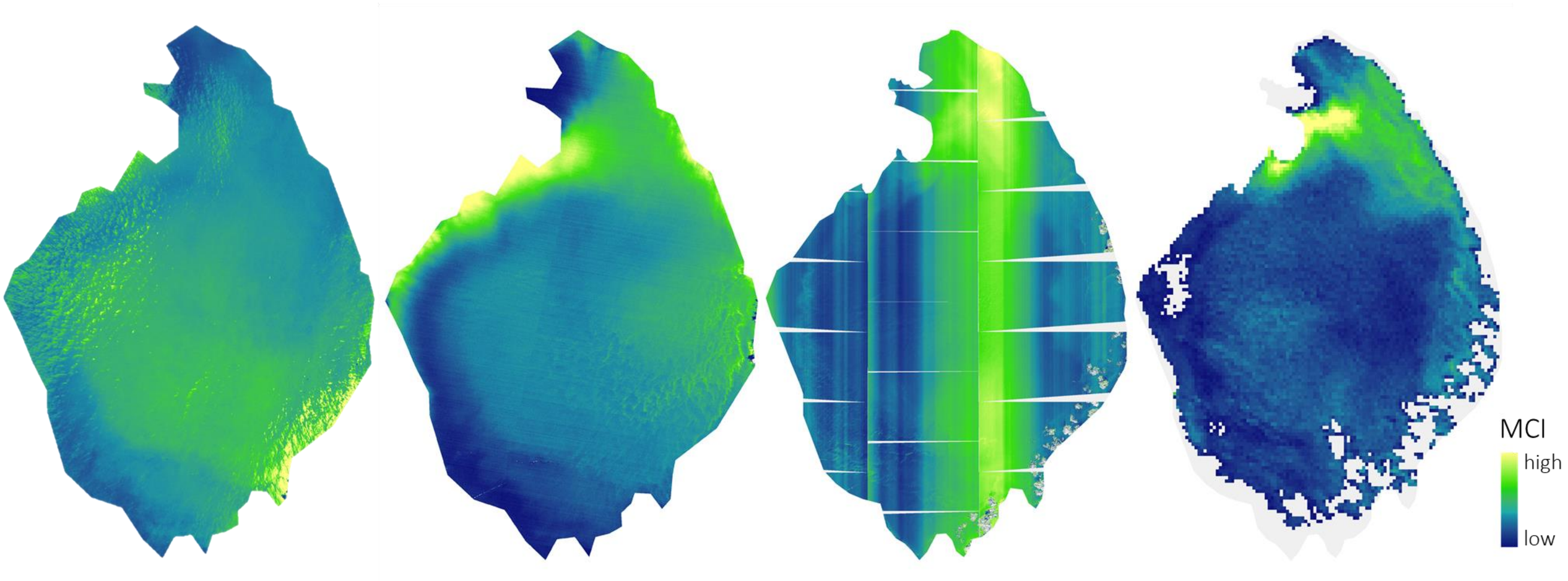
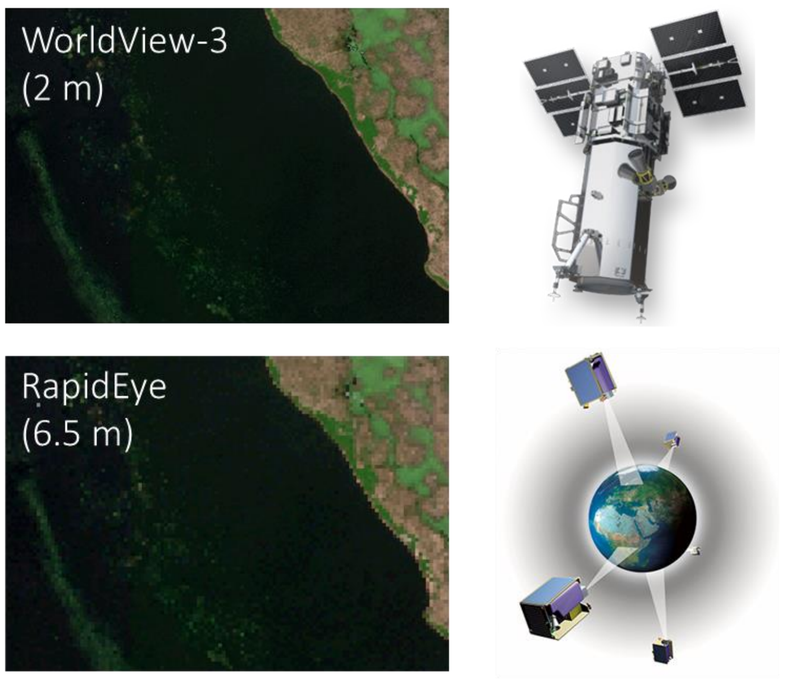
Maximum Chlorophyll Index (MCI) at four spatial resolutions



Lake Okeechobee MCI from 4 sensors: Planet[1] RapidEye (RE), European Space Agency (ESA) Sentinel-2 MultiSpectral Instrument (MSI), DigitalGlobe[2] WorldView-3 (WV-3) & ESA Sentinel-3 Ocean and Land Colour Imager (OLCI). MCI is an index of red, red edge, & near infrared (NIR) spectral bands. Images collected over 2-week span. Gray are clouds.



Pixel resolution comparison between sensors.

Study objective

Explore the usability of commercial satellite platforms for detecting chl-a at Lake Okeechobee in FL. Commercial platforms offer high spatial resolution; however, WV-3 revisits are infrequent and inconsistent, while RE has only a few, broad spectral bands. OLCI and MSI are non-commercial platforms that have been widely used for chl-a detection.

$$MCI = R_{rs}(\lambda_{Red\ edge}) - R_{rs}(\lambda_{Red}) \times \left[\frac{\lambda_{Red\ edge} - \lambda_{Red}}{\lambda_{NIR} - \lambda_{Red}} \times R_{rs}(\lambda_{NIR}) - R_{rs}(\lambda_{Red})\right]$$

Obtain imagery and subset to Lake Okeechobee → RE & WV-3: Apply radiometric calibration → RE & WV-3: Orthorectify, mosaic → Compute MCI. RE & WV-3: Band Math; MSI & OLCI: SNAP

Main Findings

- MSI and OLCI MCI produce reasonable results potentially suitable for operational use
- RE seems suitable for chl-a, but costs associated with imagery may limit operational use
- WV-3 has numerous potential limitations for operational implementation, including severe striping, georeferencing issues, and inconsistent revisits

Acknowledgements

[1]Planet Team (2017). Planet Application Program Interface: In Space for Life on Earth. San Francisco, CA. https://api.planet.com; [2]Imagery © [2017] DigitalGlobe, Inc. This work was supported by the NASA Ocean Biology and Biogeochemistry Program/Applied Sciences Program (proposal 14-SMDUNSOL14-0001) and the NASA 2016 Research Opportunities in Earth and Space Science (ROSES-16) Award NNX17AH01G.