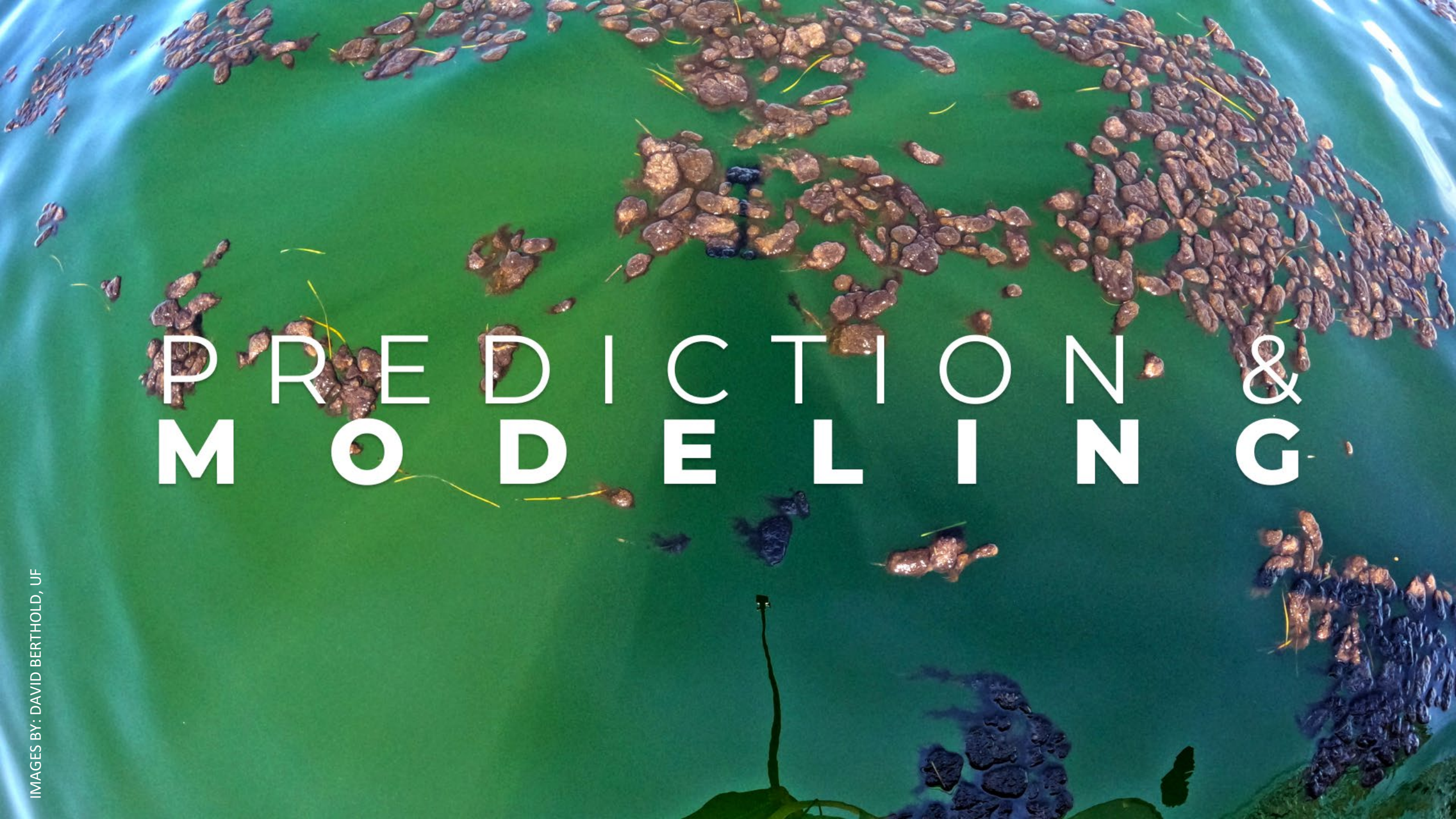

IMAGES BY: DAVID BERTHOLD, UF

Lake Okeechobee Near-Term HAB Forecasting using Machine Learning

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South Florida Water Management District

PROJECT SUMMARY

Accurate **prediction** capability via ML built on data assemblage and enhanced **detection**

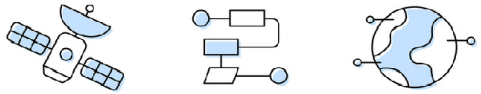
Increasing computing power using Google's distributed servers

Obtaining next-generation, high spatial resolution satellite imagery

esri®

planet.

Google Earth Engine



MAJOR TAKEAWAYS

SFWMD has worked with next-generation technologies and data resources to assess the accuracy of predictive BGA models in Lake Okeechobee.

To date, models developed for BGA prediction have a balanced accuracy of less than 80% at 2-3 days.

Our scientists are focused on leveraging the high-computing power of cloud platforms to improve model accuracy and predictive power by improving machine learning model inputs and assumptions.

ADDITIONAL RELEVANT INFO

Monitoring BGA using NOAA's CI-cyano algorithm (HAB index) from Sentinel-3 satellite:

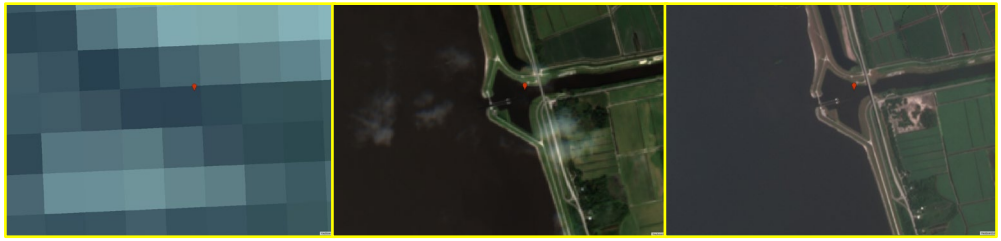
Benefits

- OLCI sensor captures spectral characteristics of phycocyanin, distinguishes BGA from non-toxic green algae
- Near-daily revisit time

Challenges

- 300x300 meter resolution
- Sentinel-2 has better spatial resolution, not able to distinguish cyanobacteria

Using imagery in machine learning workflows will require using distributed server network available on Google Earth Engine / Google Cloud platforms



RESEARCH PRIORITIES

“Lessons learned” at SFWMD - previous work illustrates that developing accurate BGA prediction models will require development of cross-platform integrated, multidisciplinary models

- **Improve blue-green algal bloom *prediction***

  Step 1. Improve BGA ***detection***

  * Remote sensing
    - *Evaluate the accuracy of satellite imagery compared to discrete and in situ sampling* using cloud platforms and high-spatial resolution multispectral imagery (Planet Labs, 4 meter)

  Step 2. Improve BGA ***modeling***

  * Incorporate multidisciplinary models to develop ML including:
    - *Develop good physical models of water column structure and circulation,* incorporate wind and precipitation predicative models with ecological process modeling (nutrient availability, growth rates, grazing, etc.)

NEW DATA GAPS

The ability to predict harmful BGA bloom dynamics depends on the ability to **accurately monitor features** known to impact the **growth, distribution** and **toxicity of cyanobacteria**

- Detection of algal groups using multispectral imagery is improving, but it is still a developing science.
- Chemical toxins are not detectable remotely. Monitoring potentially toxic species is key.
- Algal bloom prediction models will require outputs of several other prediction models as input features and model accuracy is tightly linked.

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