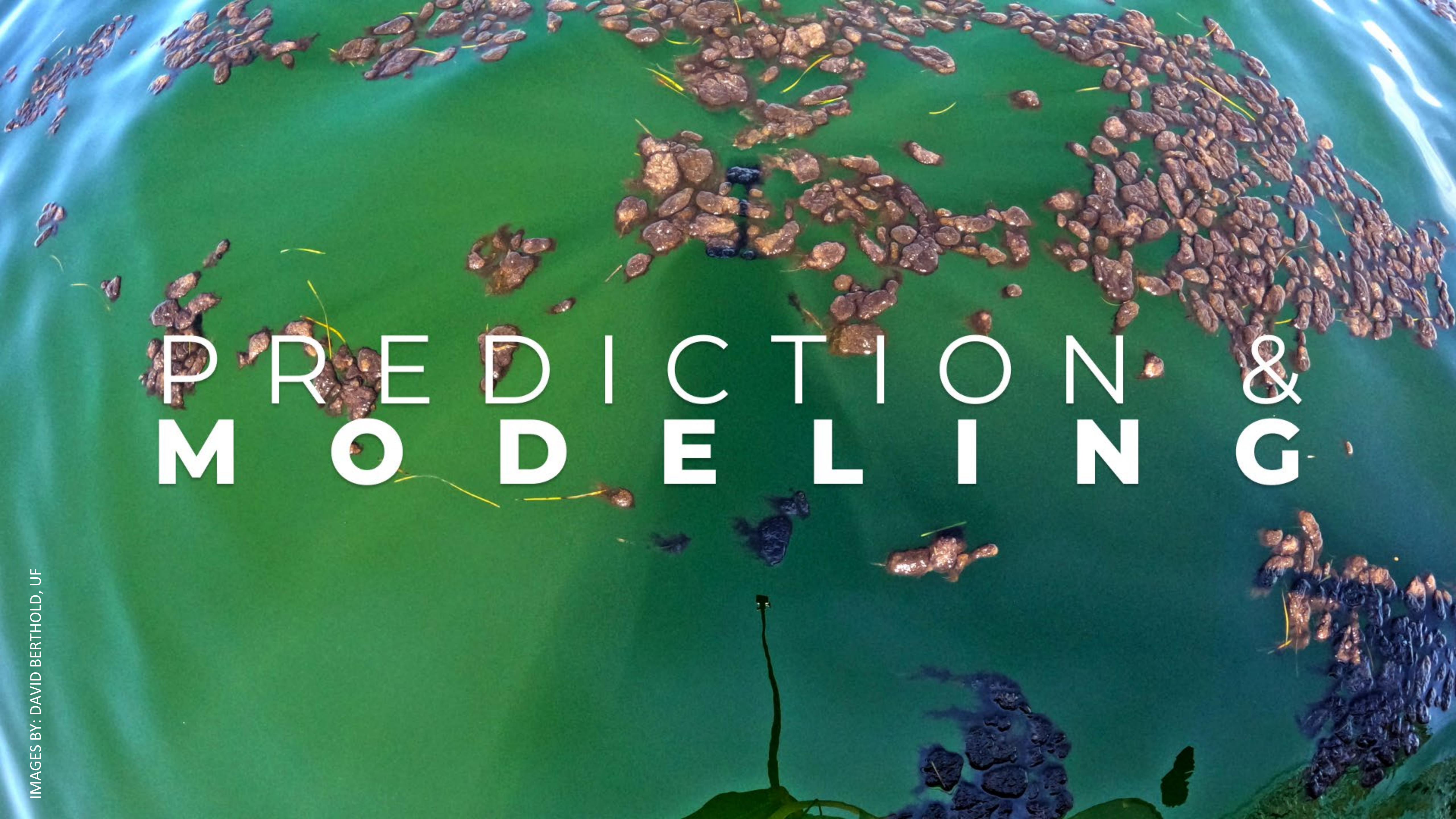
PREDICTION &
MODELING
IMAGES BY: DAVID BERTHOLD, UF

Mechanistic Modeling and Prediction of Water Quality and Bluegreen Algae Blooms in Lake Okeechobee, Caloosahatchee River, and St. Lucie Estuary

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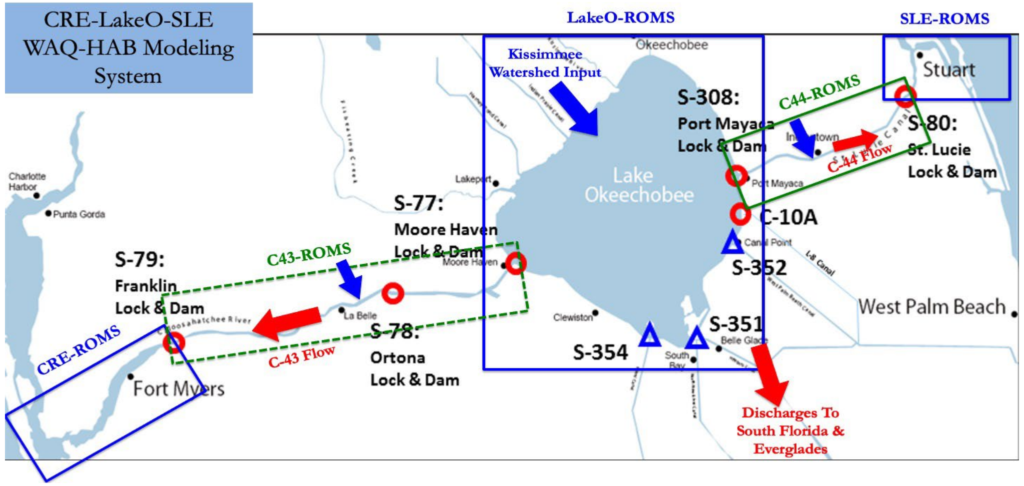
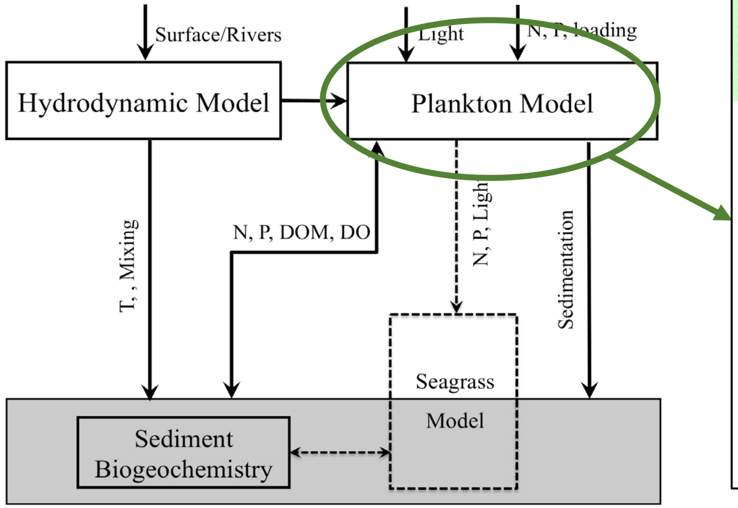
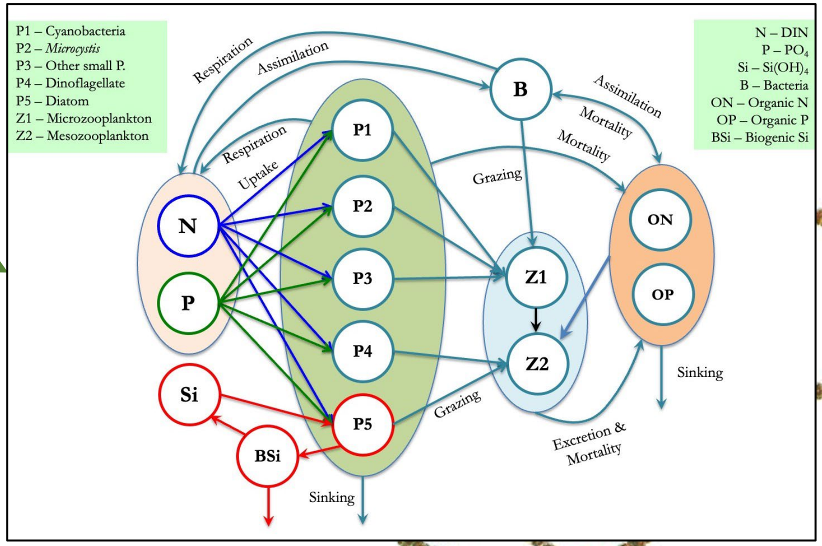
PROJECT SUMMARY

Research Objectives

- Development of an integrative mechanistic WAQ-HABs model system
- Simulate and investigate the dynamics of water quality and BGA & other phytoplankton blooms
- Operational forecast for management applications



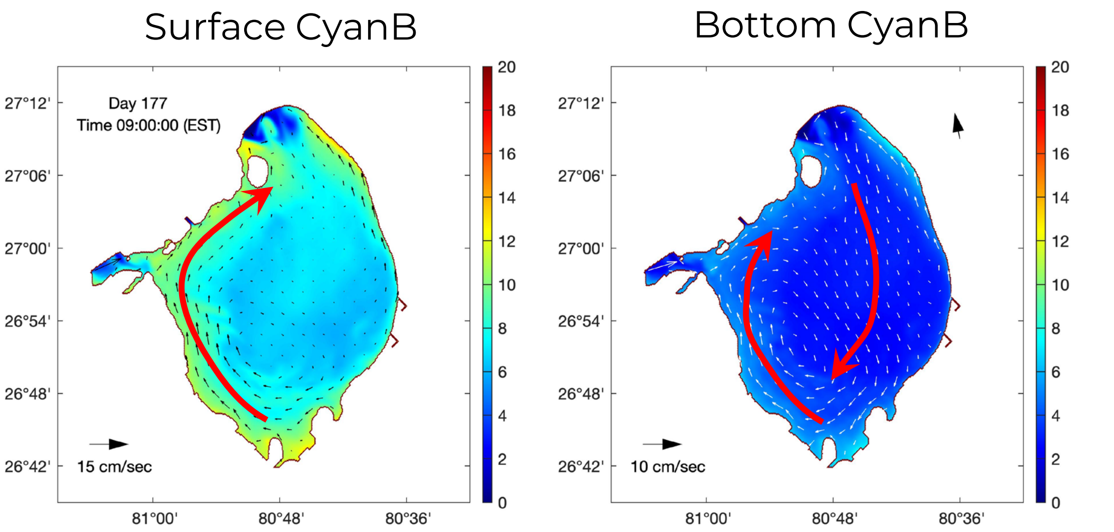


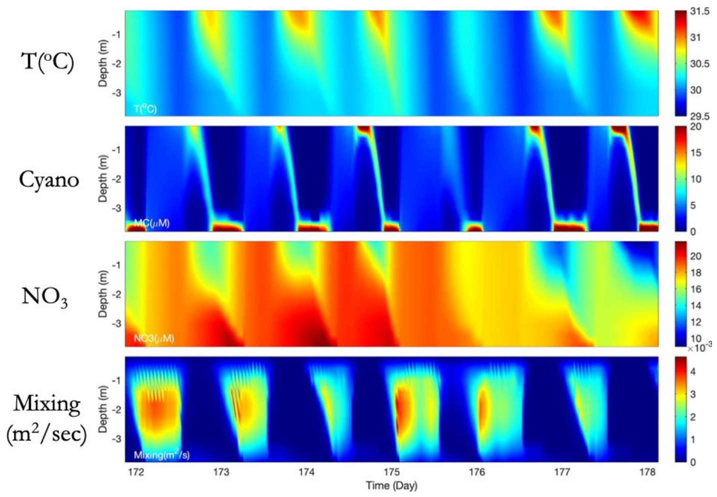


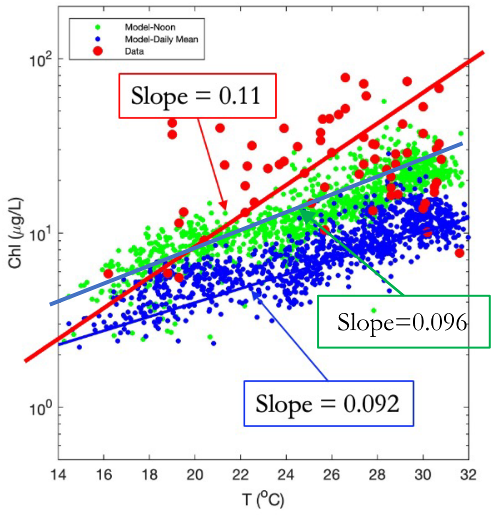
MAJOR TAKEAWAYS

Lake Okeechobee

- **Physics is important: 2-layer circulation, strong diurnal cycle, and daytime stratification in summer**
- **Coupling between diurnal physics (mixing, winds) and DVM (light) control diurnal bloom dynamics & spatial patterns**
- **Temperature (Q10, optimal growth) & winds (mixing) define seasonality (MC has higher Q10 relative to others; loses buoyancy when T decreases)**

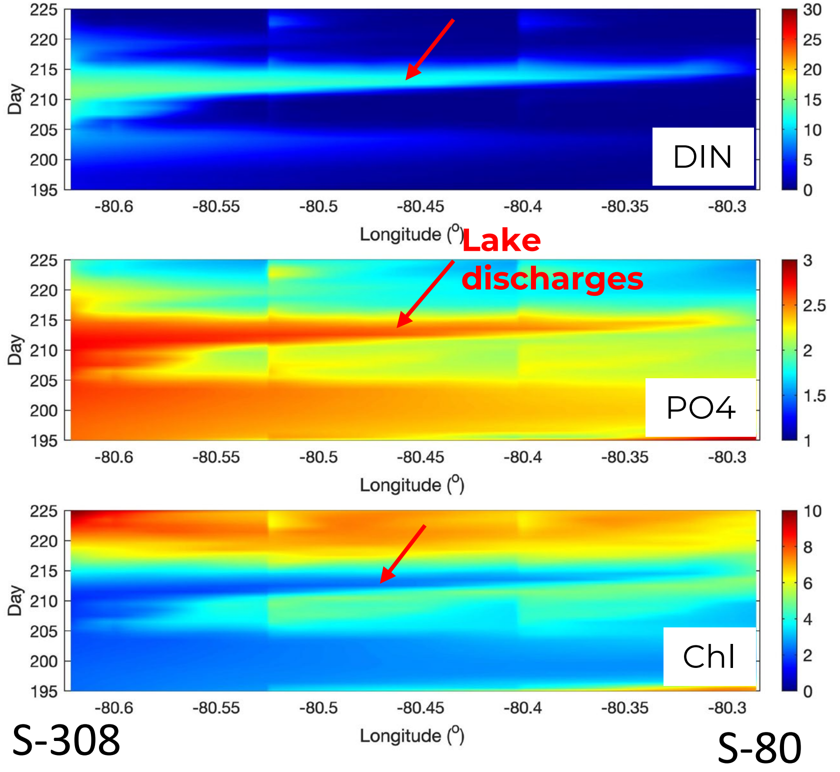




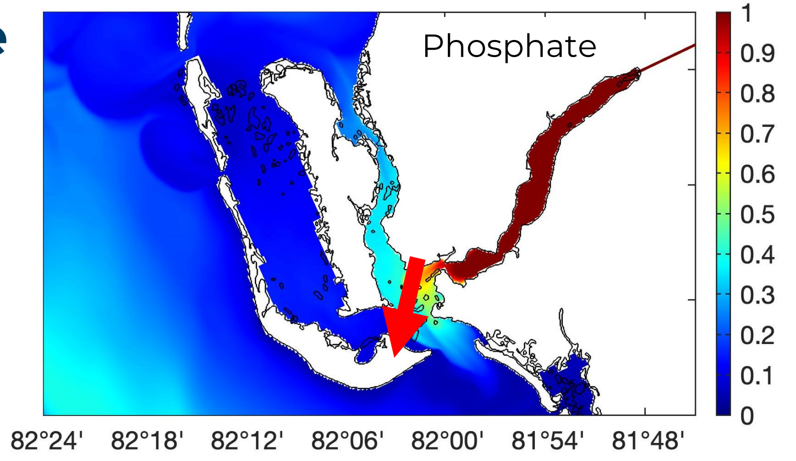


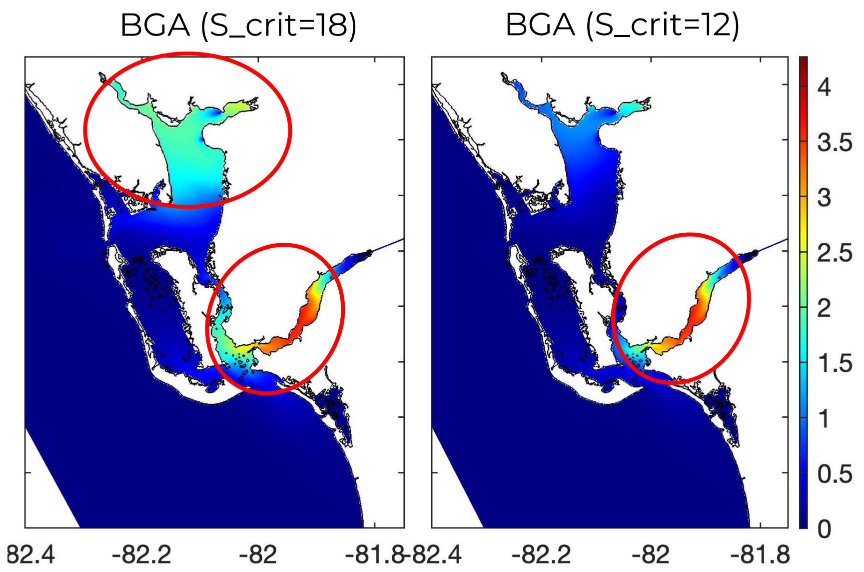
ADDITIONAL RELEVANT INFO

C-43 & C-44 Canals – Conduits or incubators?



CRE – Excessive P from rivers/Lake may feed into coastal BGA blooms



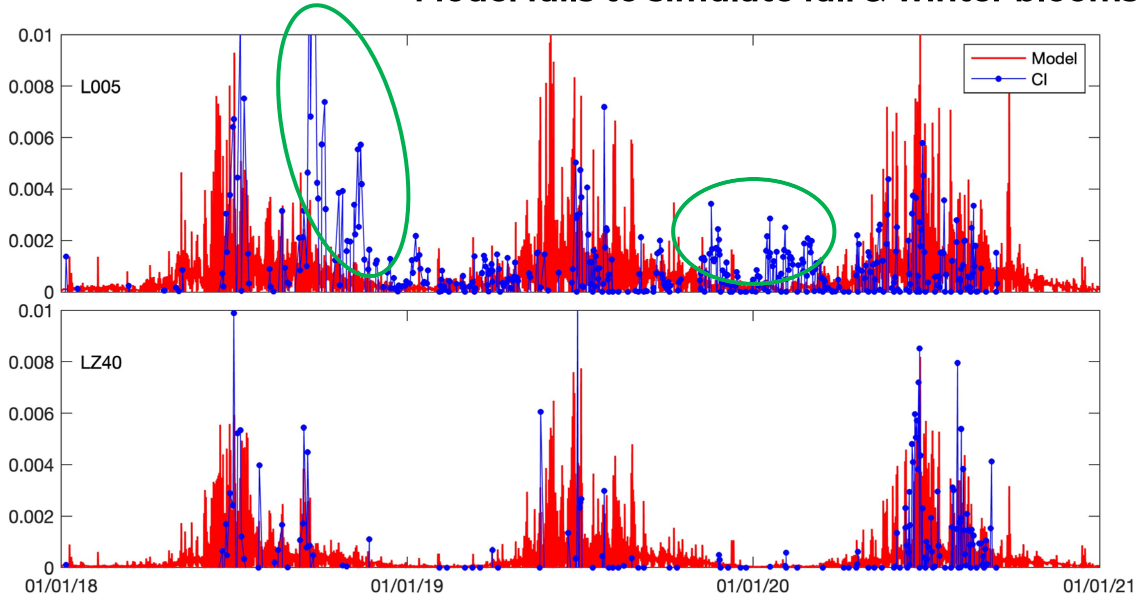


S tolerance affects spatial ranges in estuaries (SLE + CRE)

RESEARCH PRIORITIES

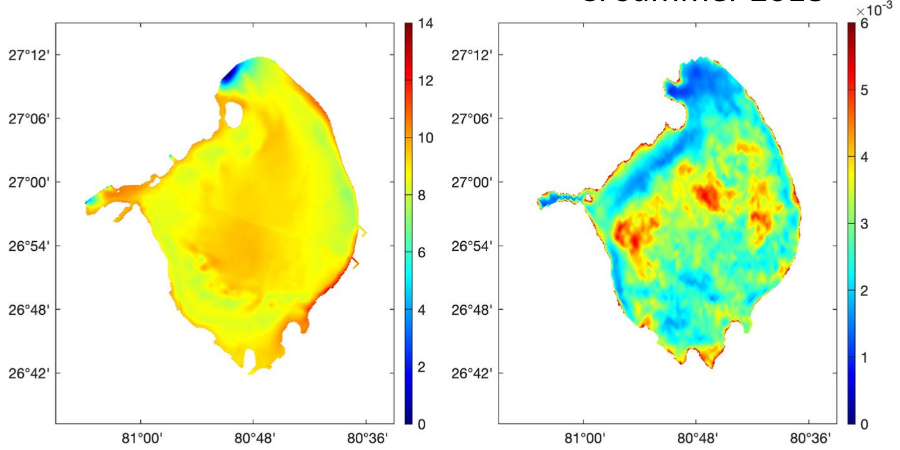
- ~~Collect regular nutrient (external and internal) load data into Lake Okeechobee~~
- Improve blue-green algae prediction
- Develop good physical models of water column structure and circulation
- ~~Evaluate the accuracy of satellite imagery compared to discrete and *in situ* sampling~~
- ~~Create a better explanation of satellite imagery for the lay audience~~

Model fails to simulate fall & winter blooms



Model BGA summer 2018

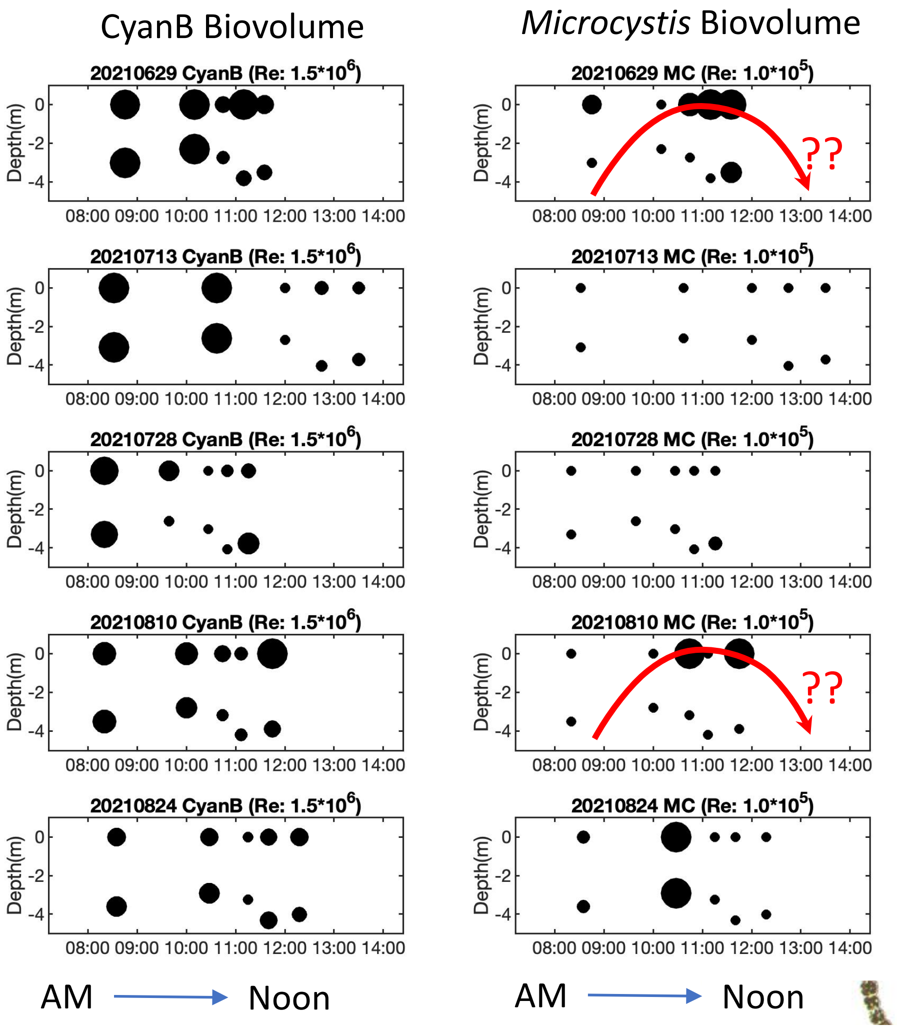
CI summer 2018



CI data: T. Moore

NEW DATA GAPS

1) **Phytoplankton biological rates/behaviors (DVM, colony formation, grazing rate)**
2) **Phytoplankton abundances & biomass (groups)**
3) **Sediment processes/rates**
4) **Upstream and watershed inputs (discharges, nutrients, phytoplankton) (C-43, C-44, KSR)**



Data Source: M. McFarland

ACKNOWLEDGEMENTS

- Funding sources
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- Collaborators
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  - USF: J. Cannizzaro and C. Hu
  - SFWMD: C. Armstrong, D. Sun, Z. Chen, and A. Wachnicka
- Water quality data are from DBHYDRO
- All computation is done at FAU cluster Koko