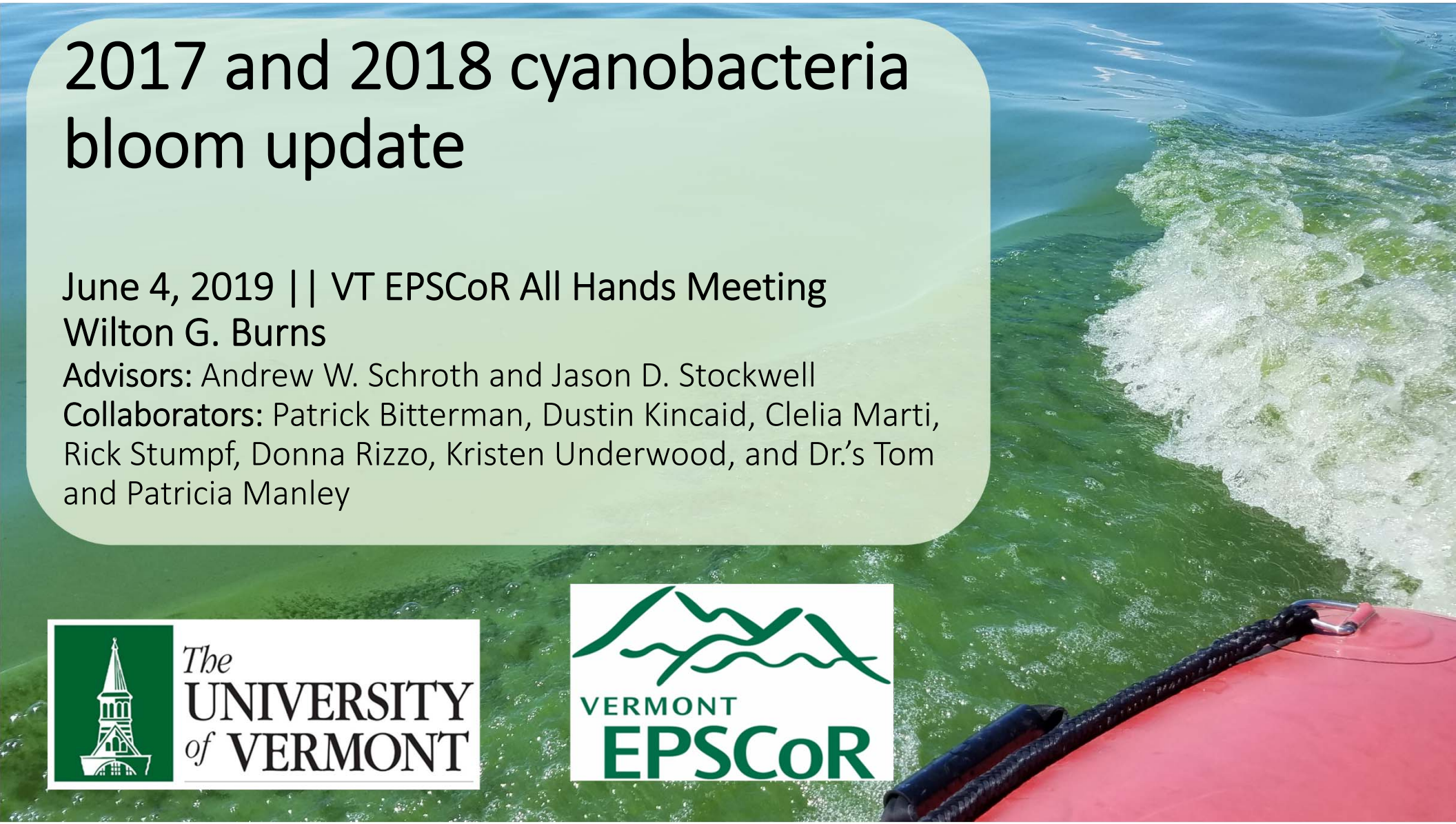
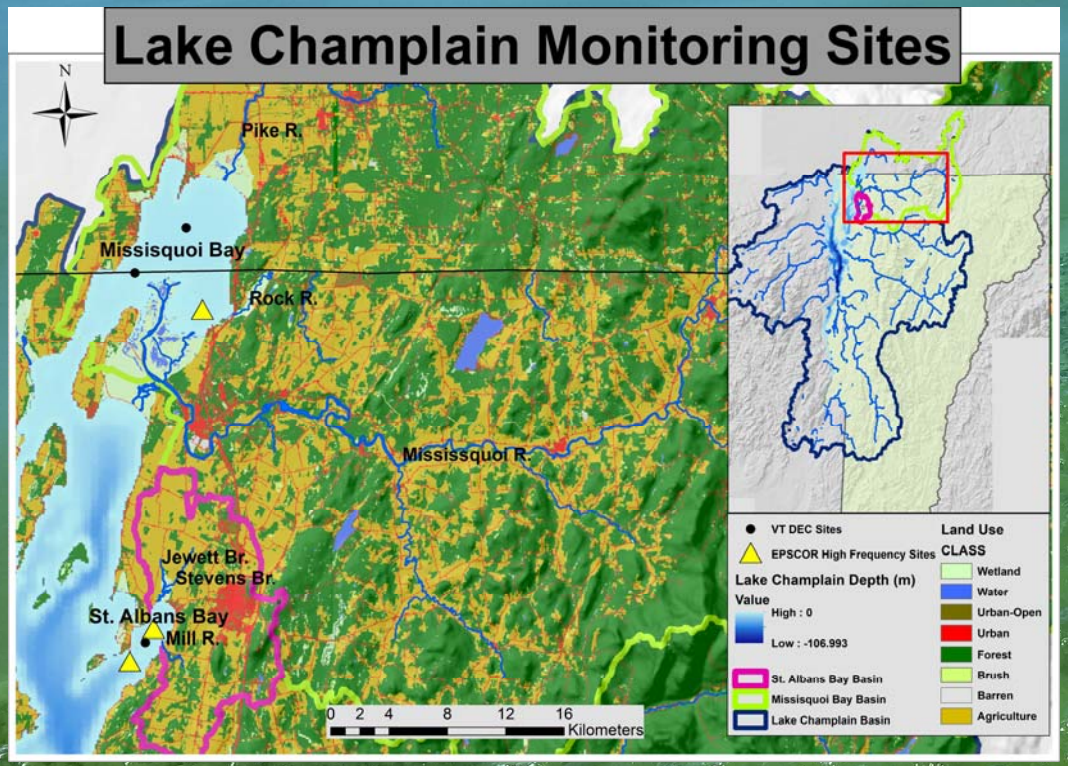
2017 and 2018 cyanobacteria bloom update

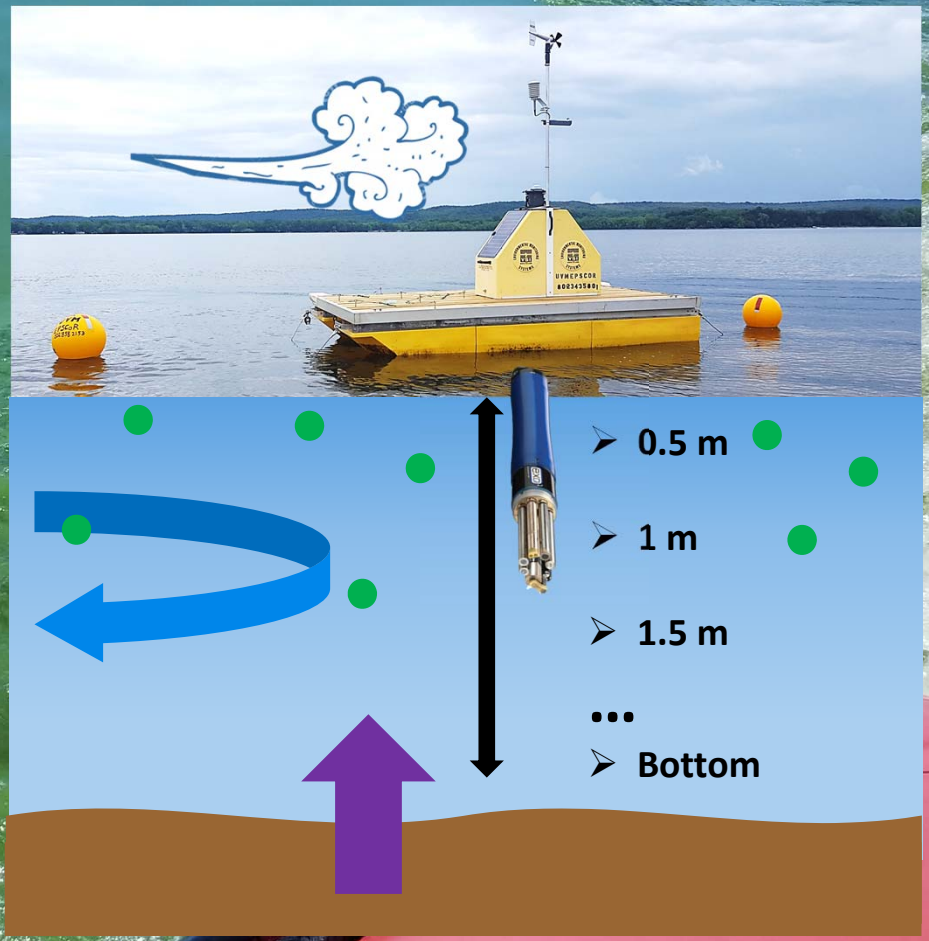
June 4, 2019 || VT EPSCoR All Hands Meeting

Wilton G. Burns
Advisors: Andrew W. Schroth and Jason D. Stockwell
Collaborators: Patrick Bitterman, Dustin Kincaid, Clelia Marti, Rick Stumpf, Donna Rizzo, Kristen Underwood, and Dr.'s Tom and Patricia Manley



High-frequency monitoring of Missisquoi and Saint Albans bays



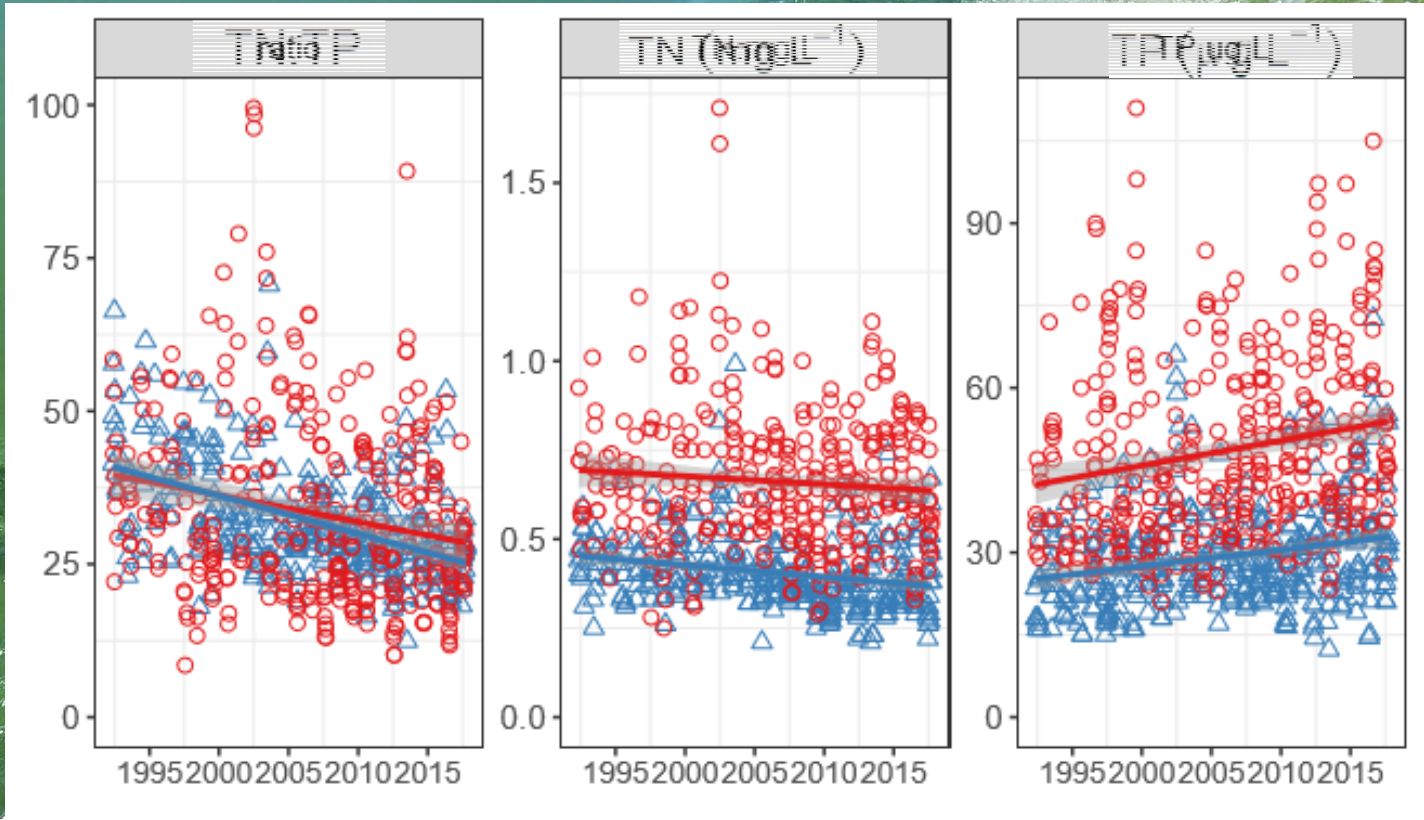


Long-term VT DEC dataset shows similar ratio in both bays and higher total nutrients in MB

- Data: VT DEC 1992 – 2017 bi-weekly dataset

Missisquoi Bay (MB)

St. Albans Bay (St. AB)

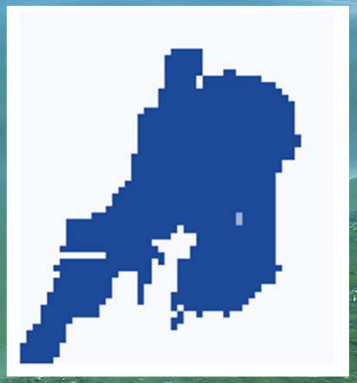


Today's objectives

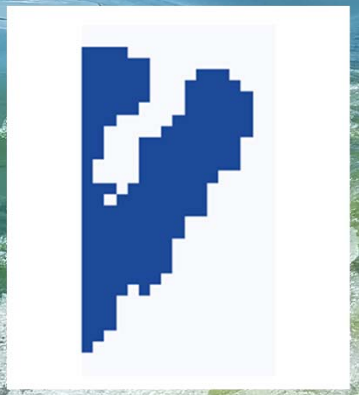
- What did we learn from 2017 field campaign?
- How do our buoy sensors pair with remote sensing technologies?

- How did our perspective on bloom dynamics evolve with another year of high-frequency buoy data?

1) Bay comparison



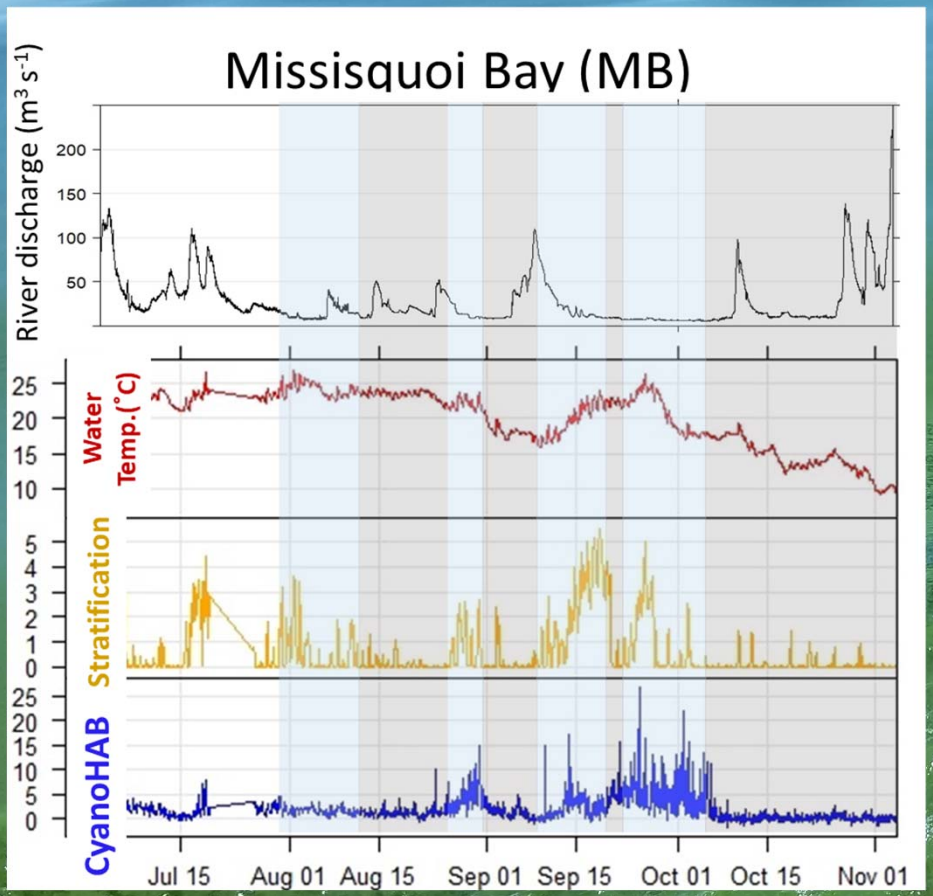
vs

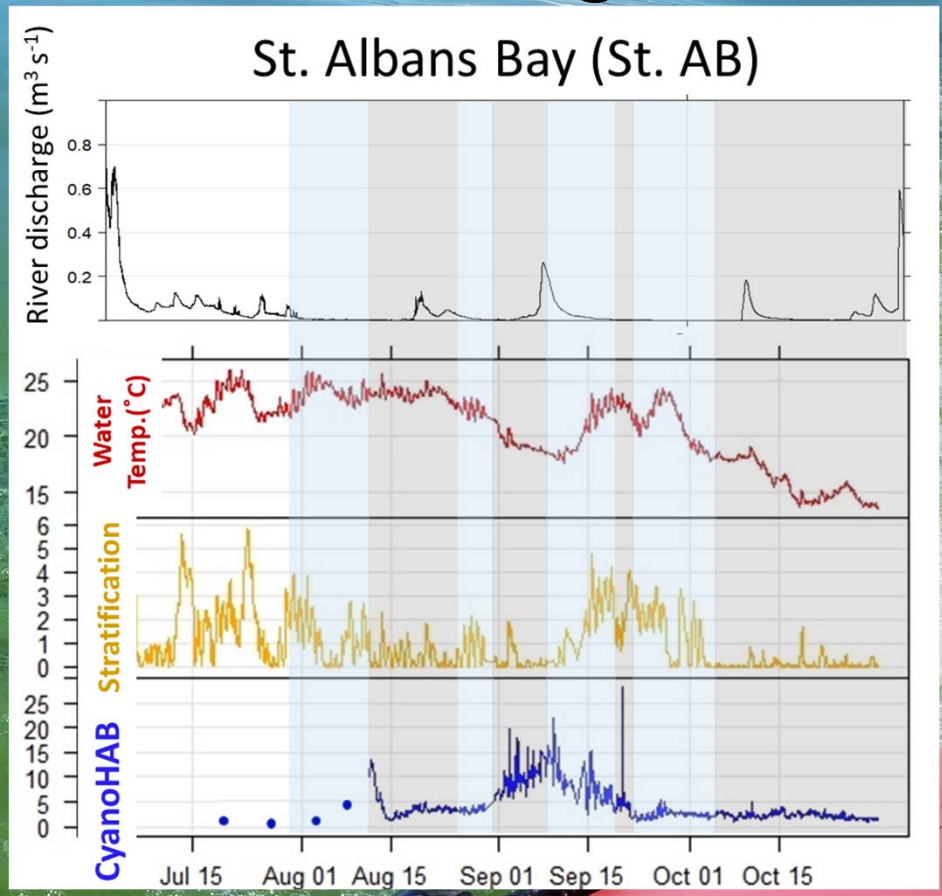


2) Year to year comparison

vs

2017 blooms were late and had different timing





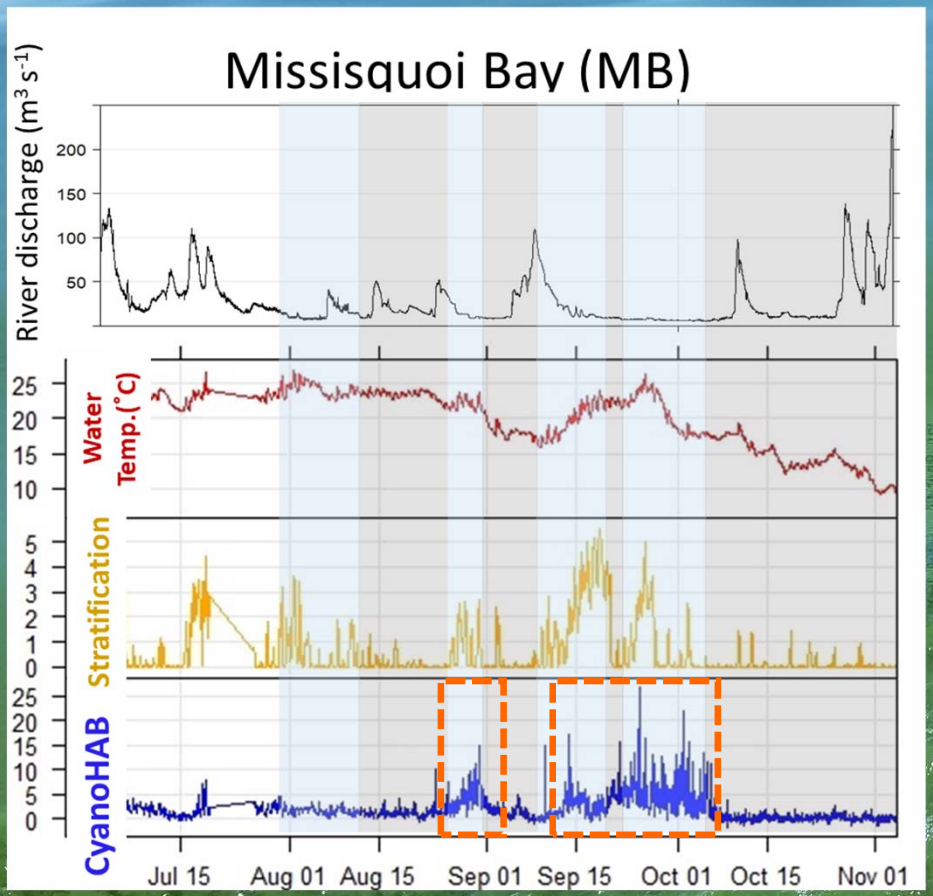
KEY

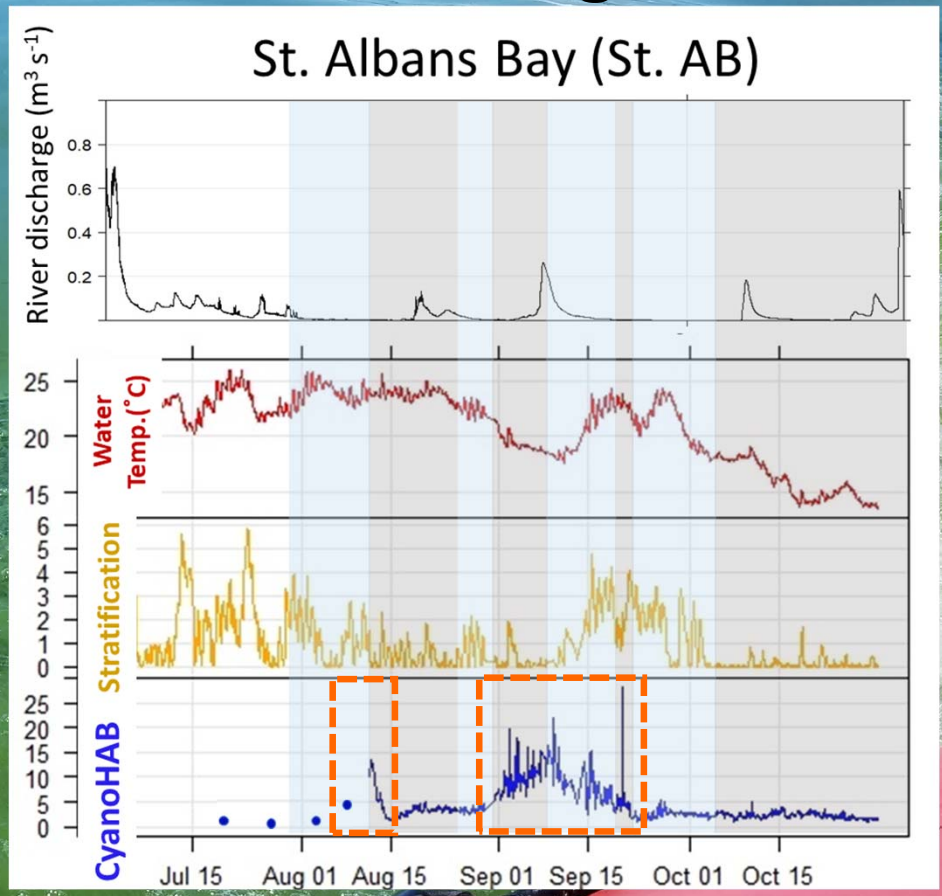
BLUE: Significant stratification in one or both bays

GRAY: Significantly well-mixed in one or both bays

Cyano bloom

2017 blooms were late and had different timing





KEY

BLUE: Significant stratification in one or both bays

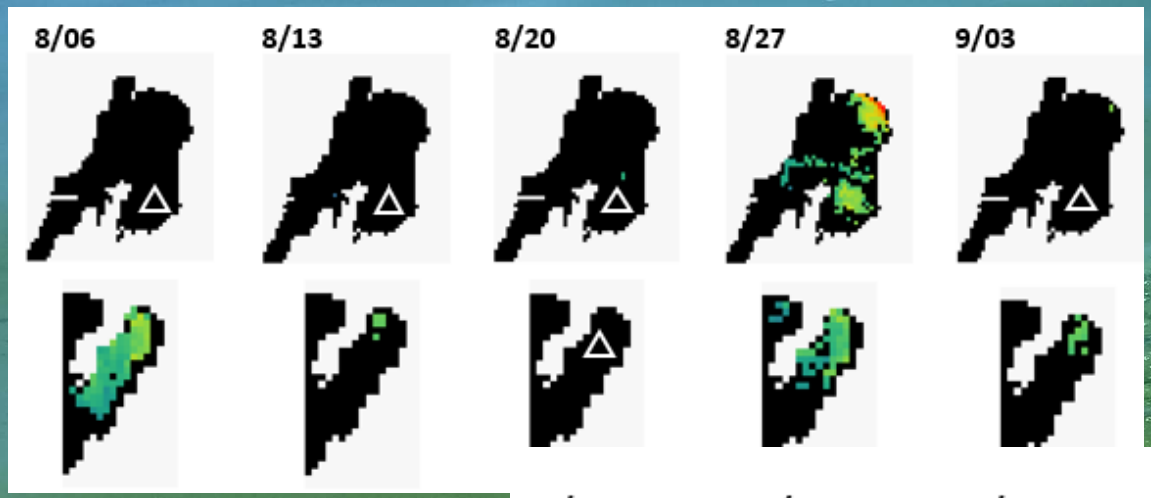
GRAY: Significantly well-mixed in one or both bays

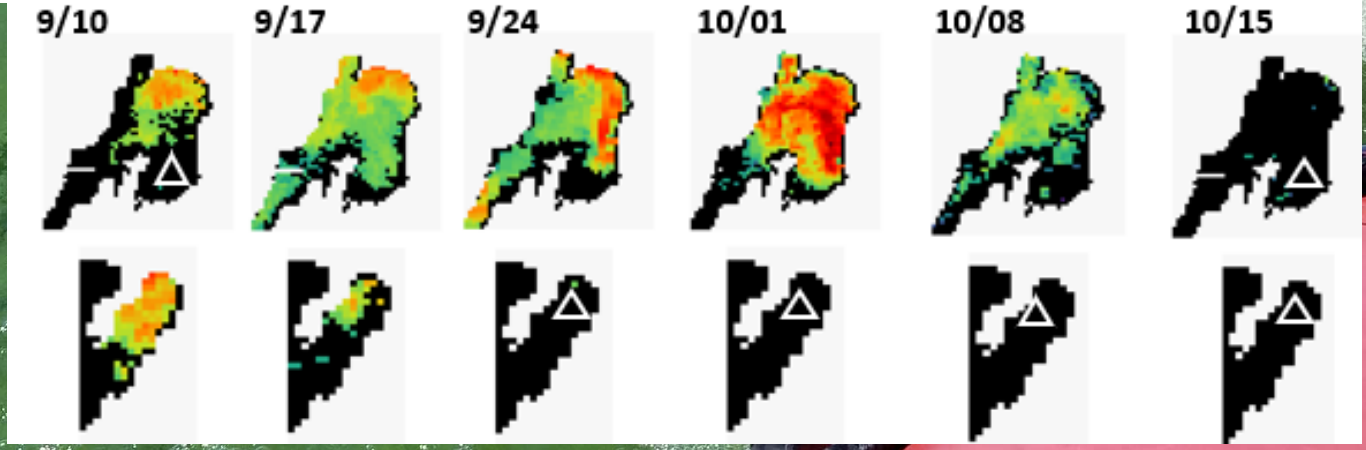
Cyano bloom

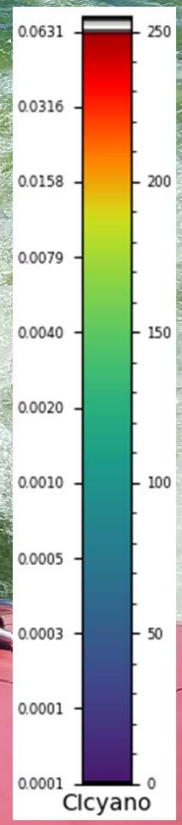
Today's objectives

- What did we learn from 2017 field campaign?
- How do our buoy sensors pair with remote sensing technologies?
- How did our perspective on bloom dynamics evolve with another year of high-frequency buoy data?

2017 bloom was late and persisted into October in MB but shut down late September in St. AB

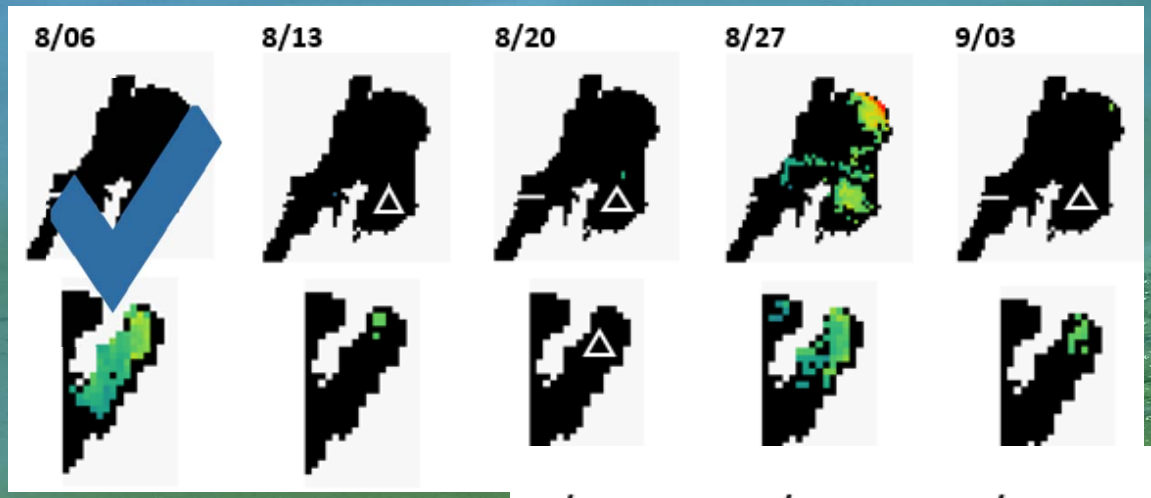


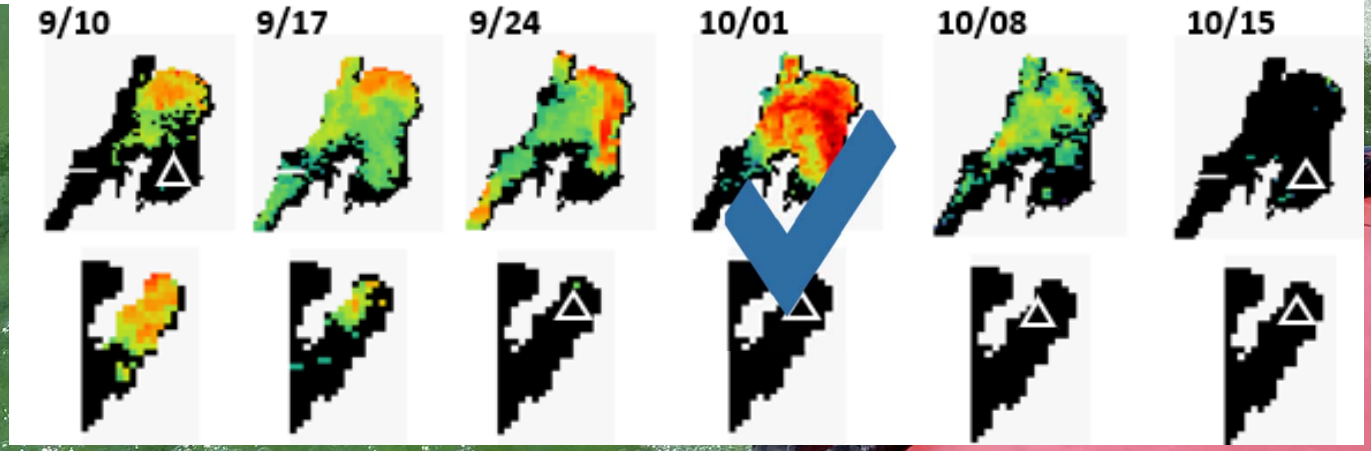


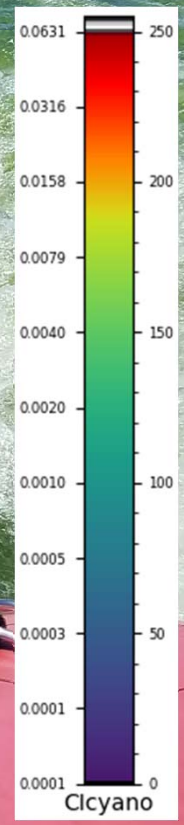


*Composite images of weekly maximum values for each pixel

2017 bloom was late and persisted into October in MB but shut down late September in St. AB

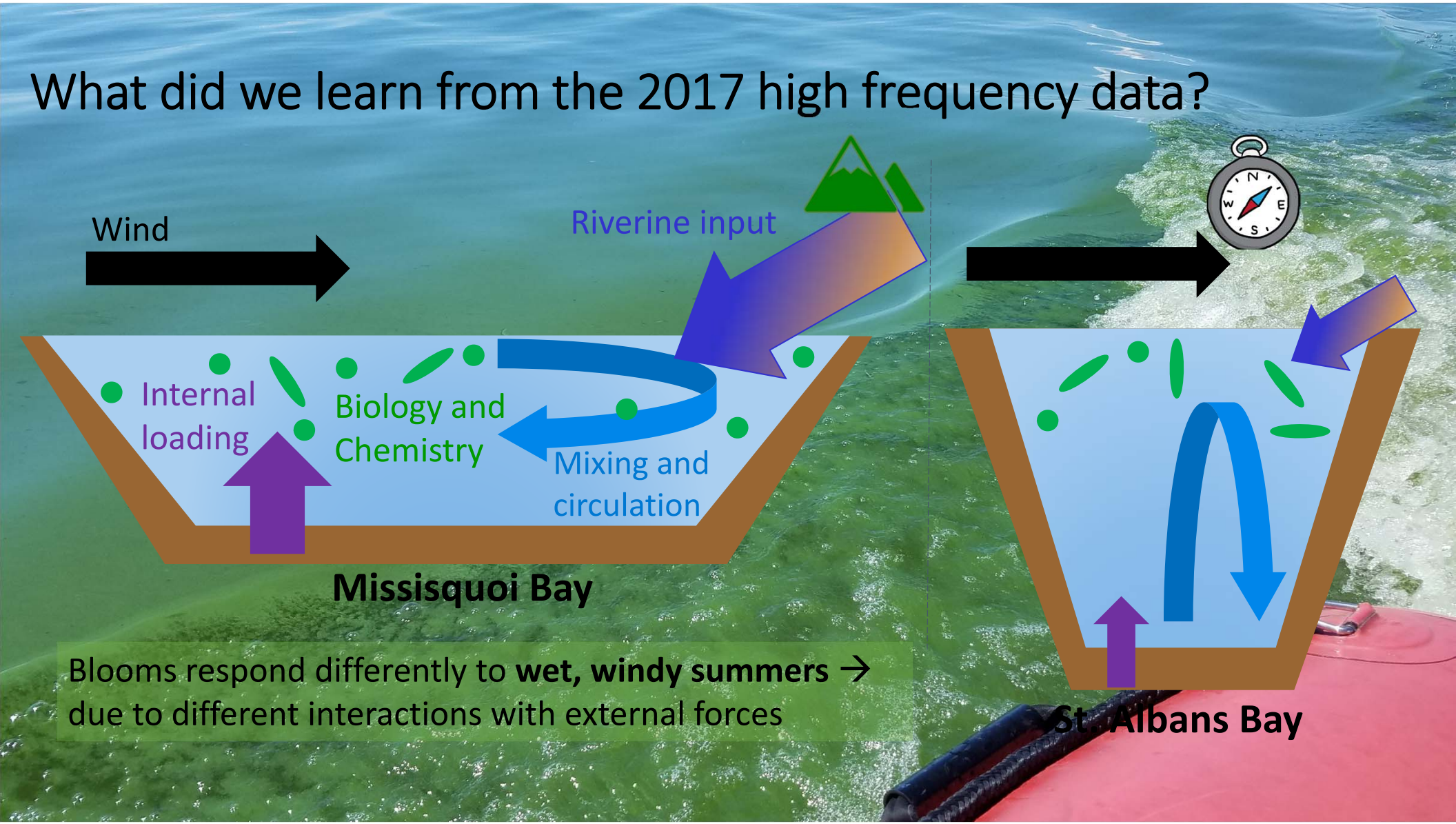






*Composite images of weekly maximum values for each pixel

What did we learn from the 2017 high frequency data?

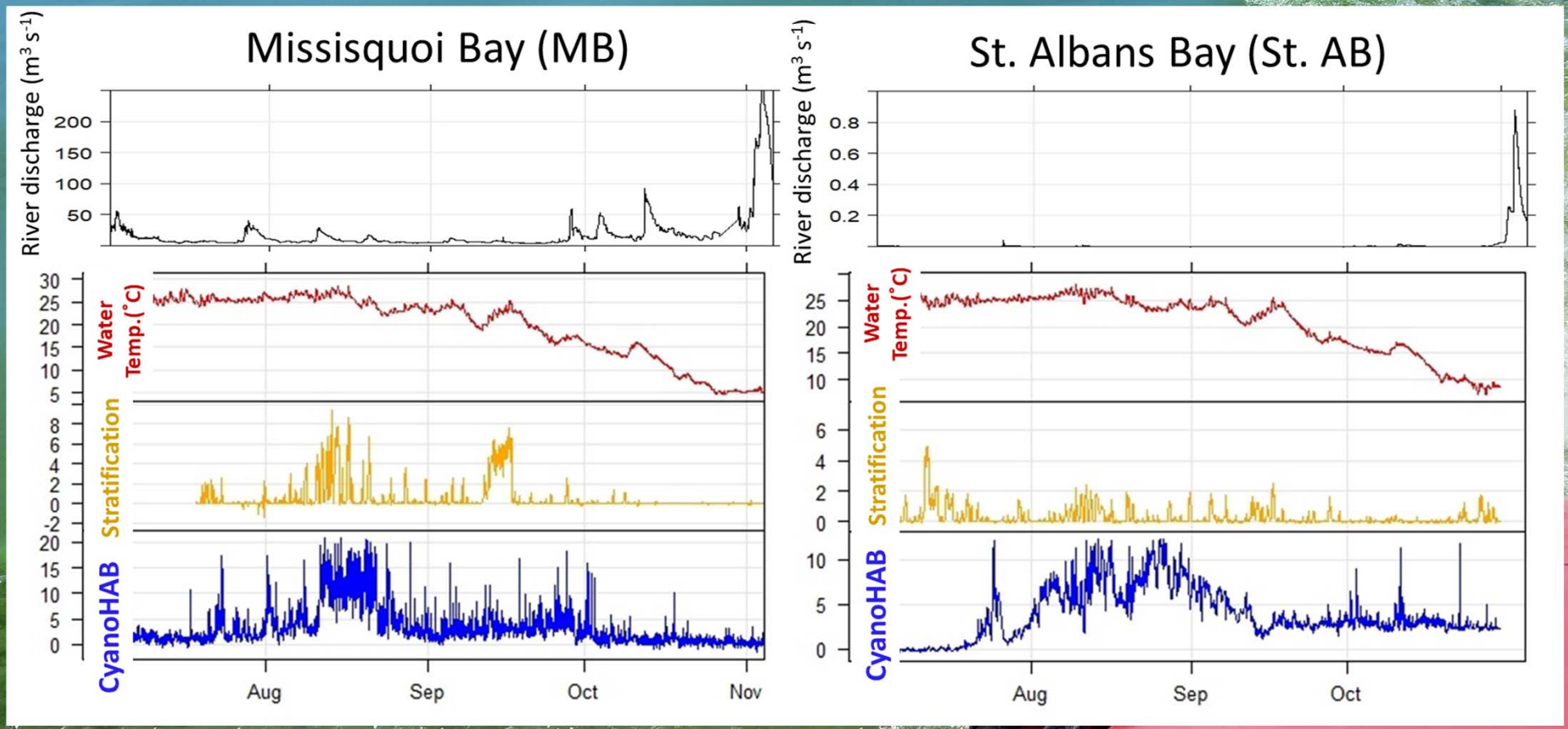


Blooms respond differently to **wet, windy summers** → due to different interactions with external forces

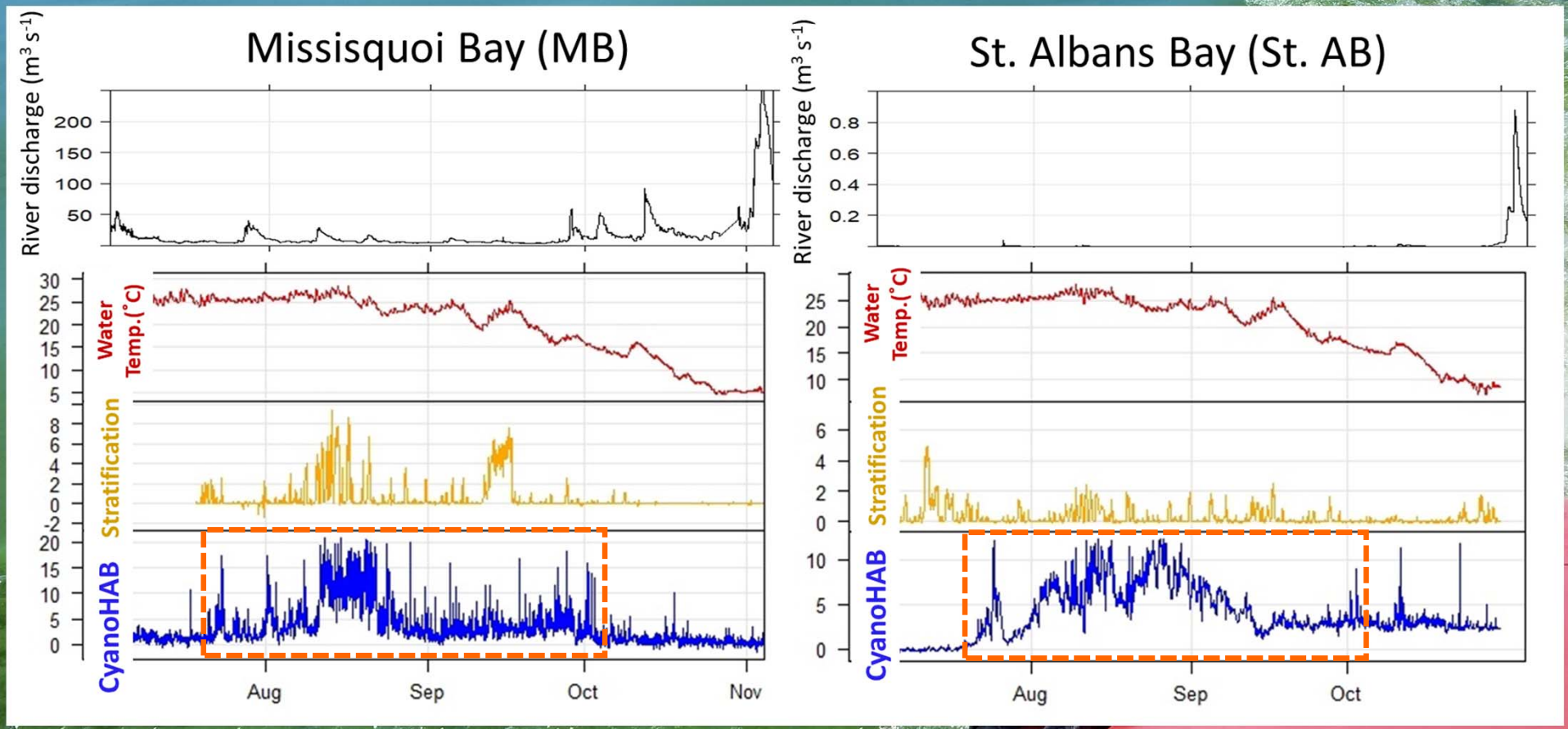
Today's objectives

- What did we learn from 2017 field campaign?
- How do our buoy sensors pair with remote sensing technologies?
- How did our perspective on bloom dynamics evolve with another year of high-frequency buoy data?

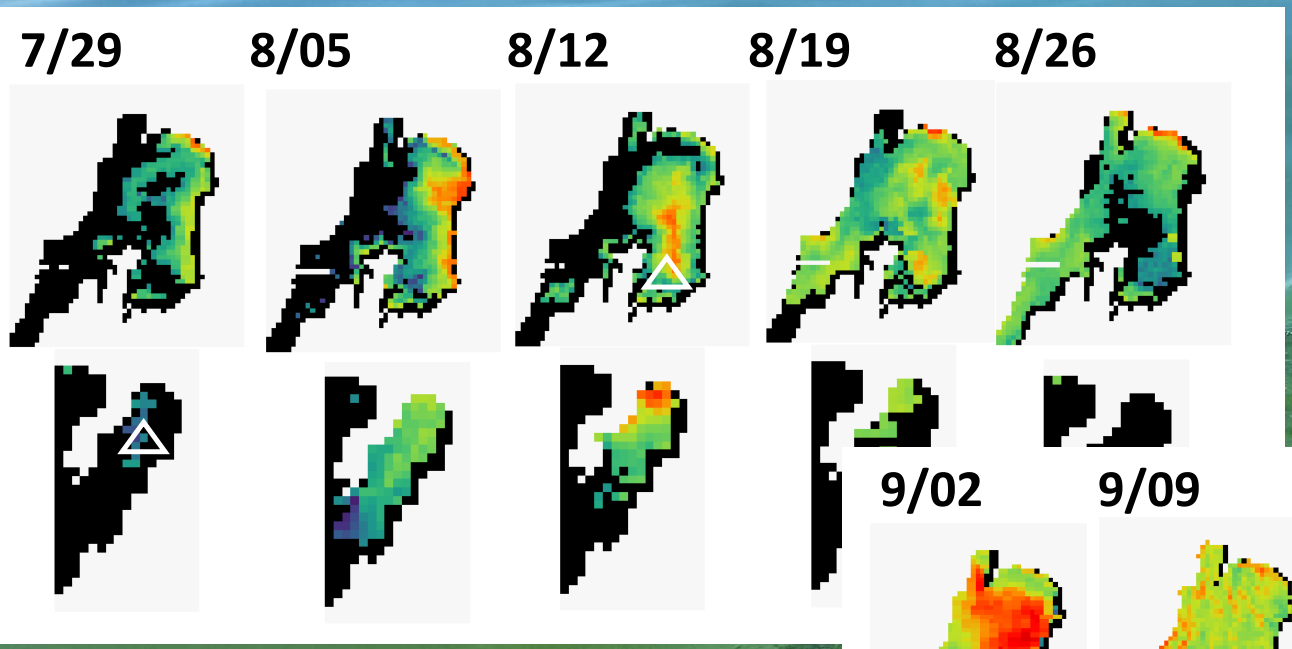
2018 bloom earlier than 2017 and similar timing between bays

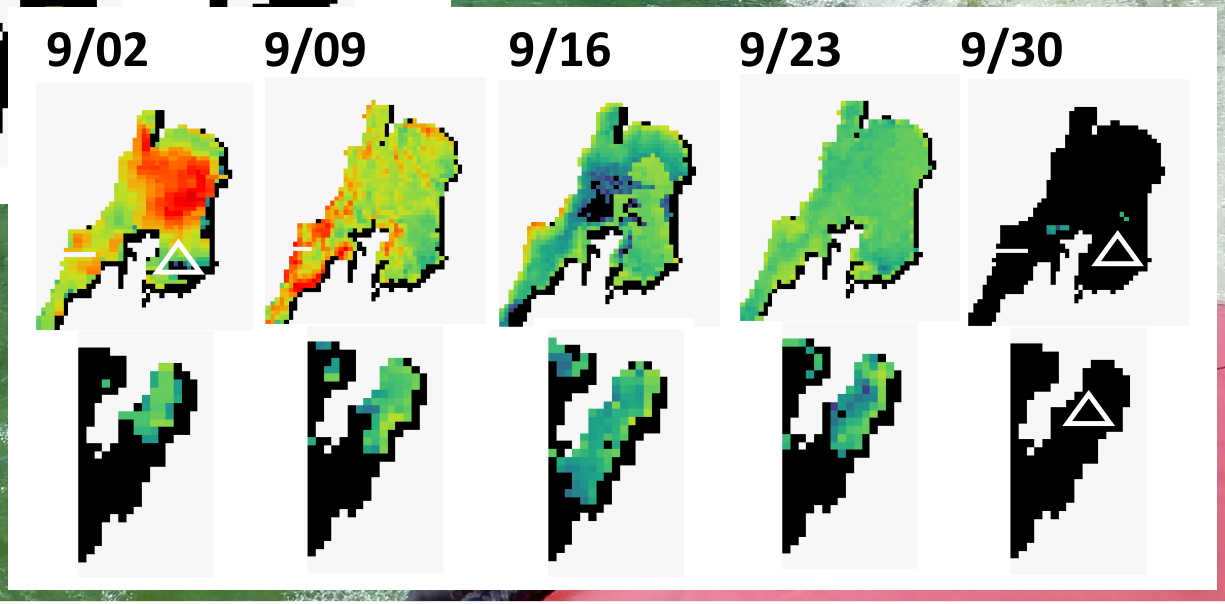


2018 bloom earlier than 2017 and similar timing between bays



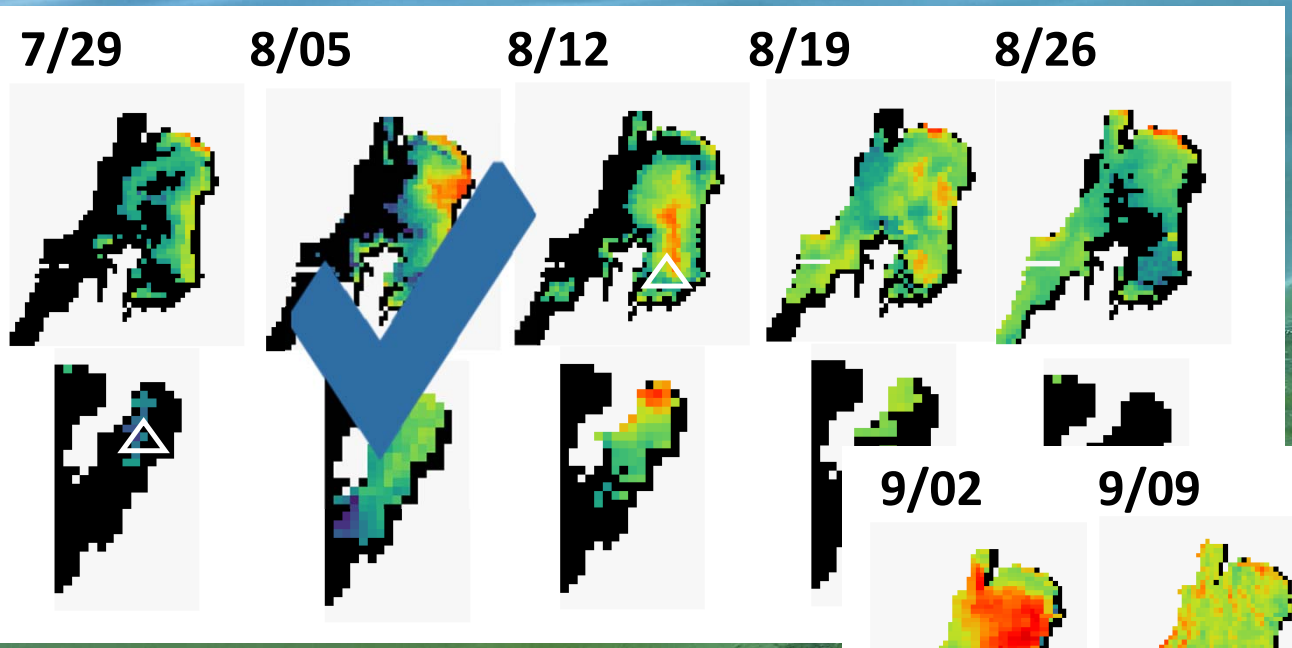
2018 bloom earlier than 2017 and similar timing between bays

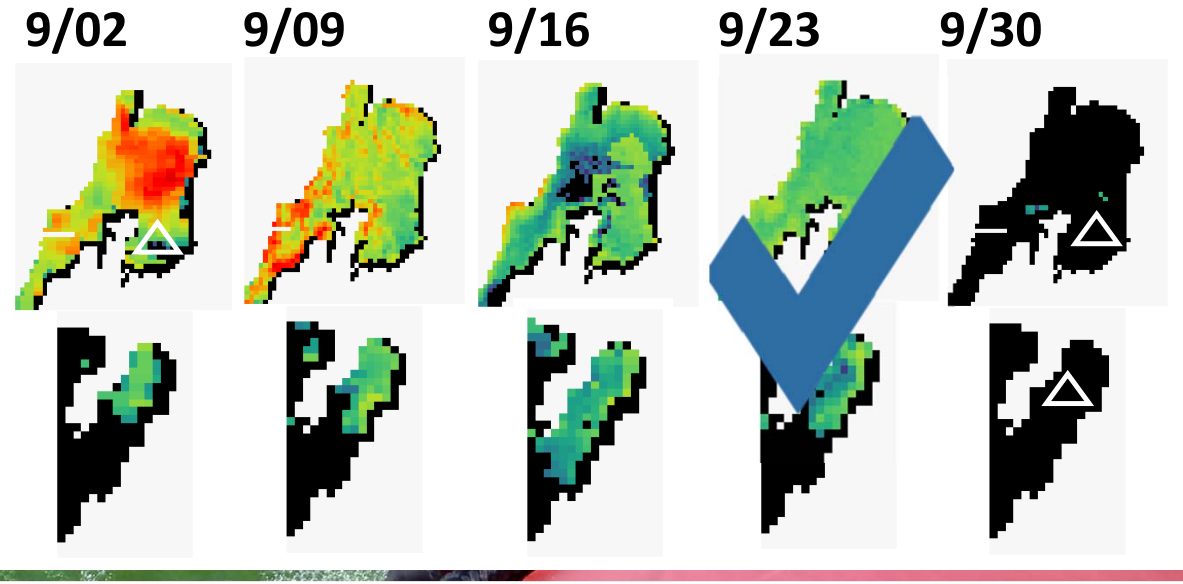




*Composite images of weekly maximum values for each pixel

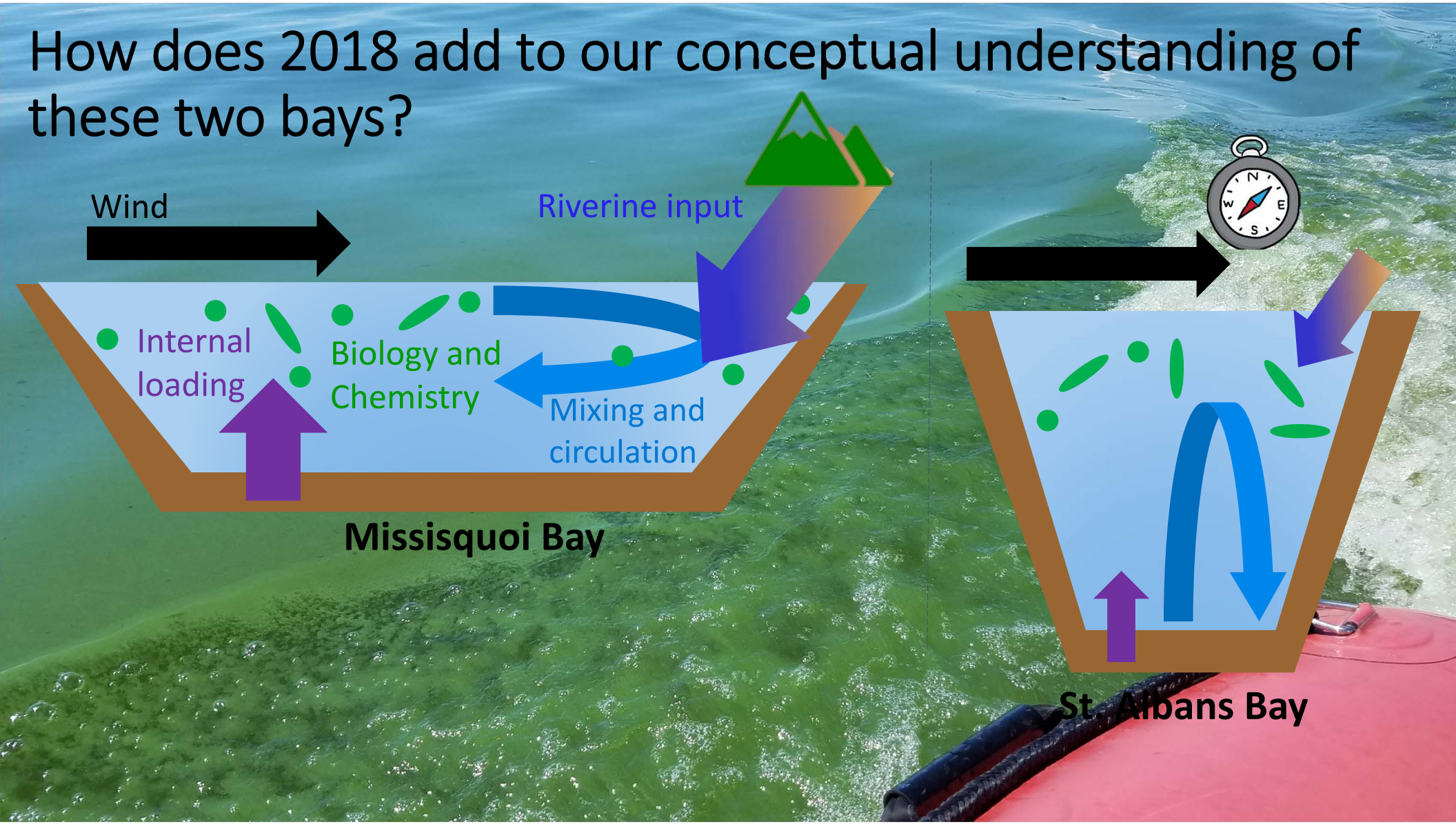
2018 bloom earlier than 2017 and similar timing between bays



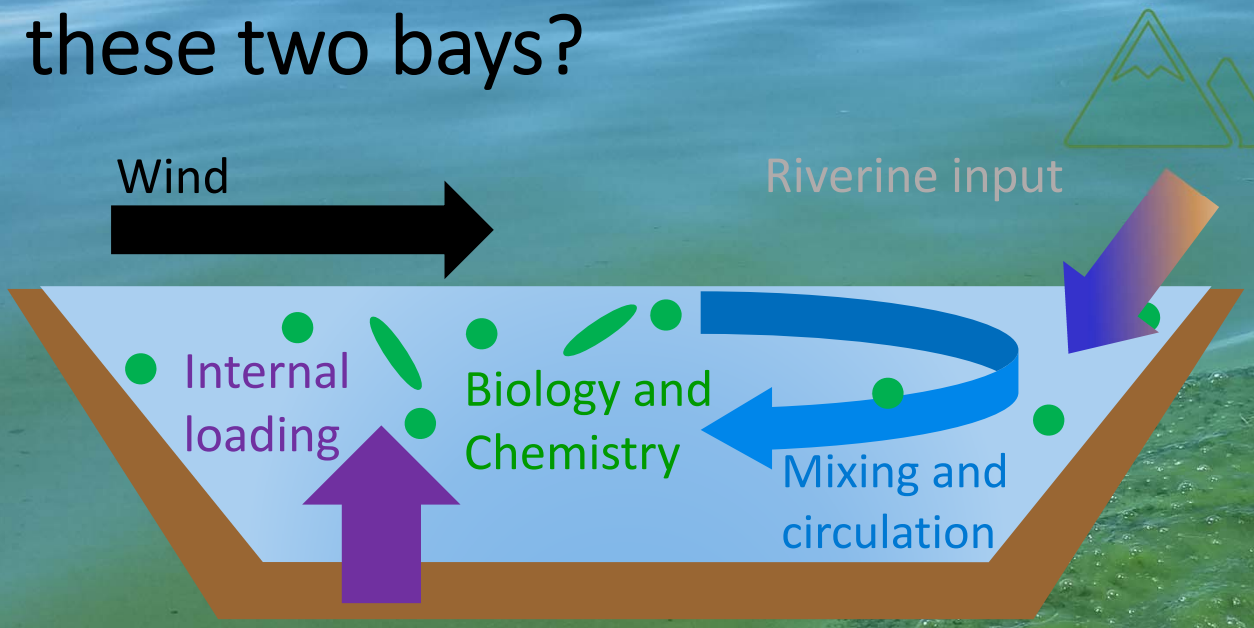


*Composite images of weekly maximum values for each pixel

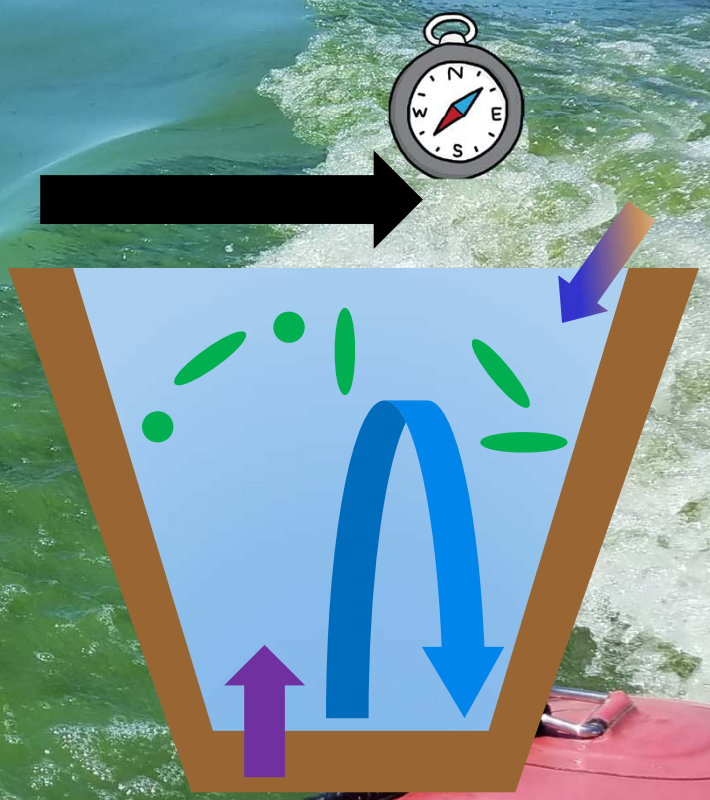
How does 2018 add to our conceptual understanding of these two bays?



How does 2018 add to our conceptual understanding of these two bays?



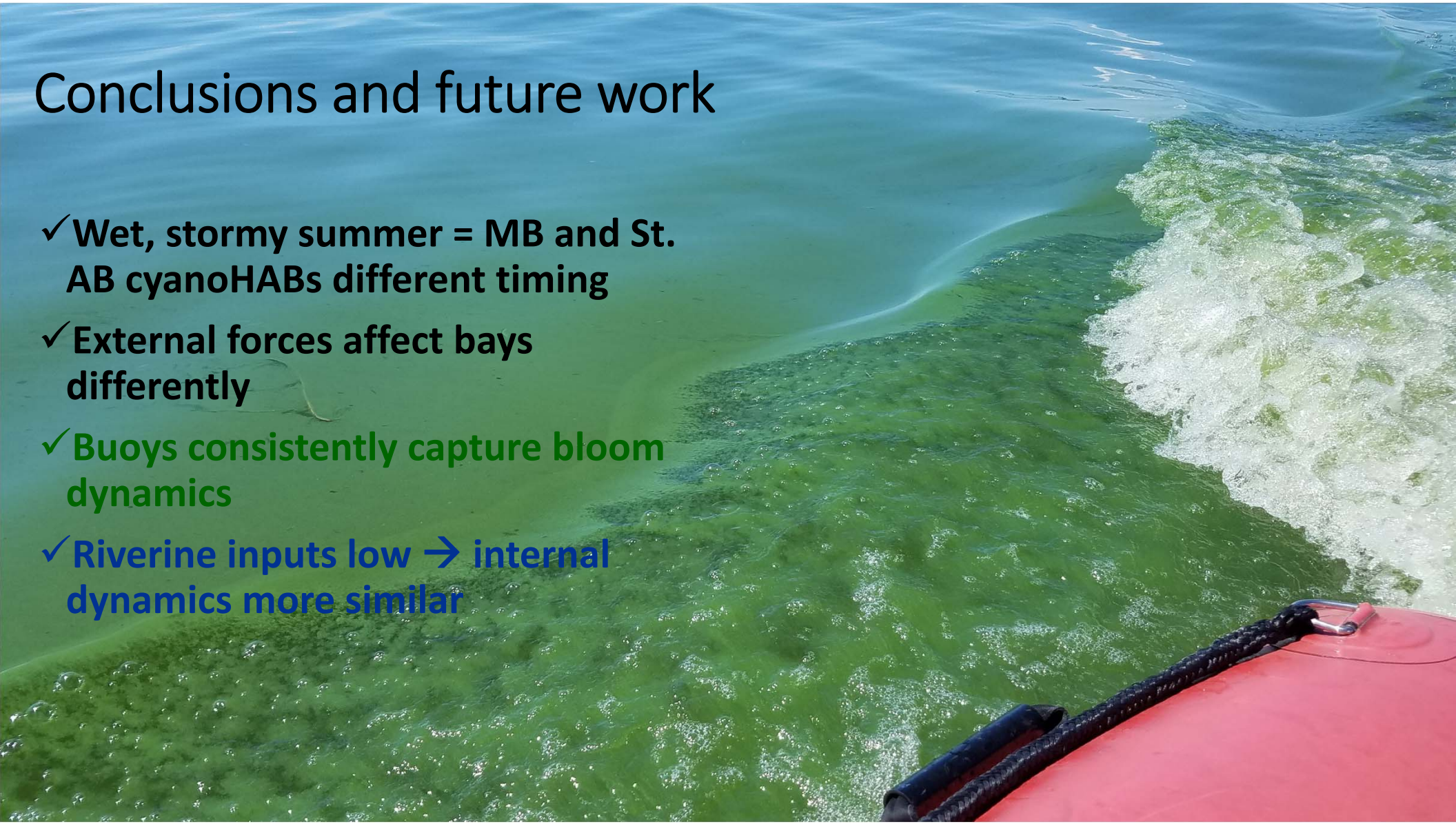
Missisquoi Bay



St. Albans Bay

When riverine inputs are muted during **dry, hot summers**
→ internal processes are more similar

Conclusions and future work



- ✓**Wet, stormy summer = MB and St. AB cyanoHABs different timing**
- ✓**External forces affect bays differently**
- ✓**Buoys consistently capture bloom dynamics**
- ✓**Riverine inputs low → internal dynamics more similar**

Conclusions and future work

- ✓**Wet, stormy summer = MB and St. AB cyanoHABs different timing**
- ✓**External forces affect bays differently**
- ✓**Buoys consistently capture bloom dynamics**
- ✓**Riverine inputs low → internal dynamics more similar**

Conclusions and future work

- ✓**Wet, stormy summer = MB and St. AB cyanoHABs different timing**
- ✓**External forces affect bays differently**
- ✓**Buoys consistently capture bloom dynamics**
- ✓**Riverine inputs low → internal dynamics more similar**