Oyster Biodeposit and Bottom Sediment Interactions

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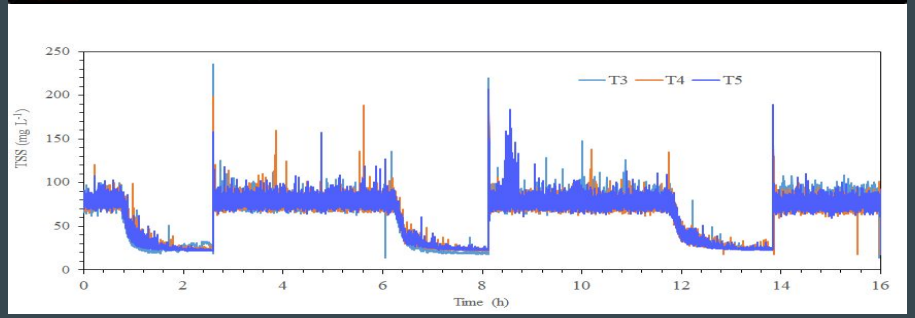
Background - What is the Purpose of our Experiment?

- *Crassostrea Virginica* Oysters benefit the Chesapeake Bay
  - Habitat
  - Denitrification/water filtering
  - Food
- Oyster Biodeposit has not been well studied
  - High flow areas
  - Resuspension
  - Decrease water clarity and health

We are studying the effect of biodeposit resuspension on water quality

Background - Experiment

- 6 S.T.U.R.M. Tanks
  - 3 receive Biodeposit; 3 do not.
- Each holds 1000L of water and 10 cm of bottom sediment
- Realistic tidal exchange simulation
- Special designed mixing system to simulate shear stress
- Systems run 24/7!
  - Data logging



Questions

- How do the nutrients from the oyster biodeposition interact with the sediment and what does that entail?
- Will the addition of oyster biodeposit promote phytoplankton growth in a high flow environment?

Hypothesis: The addition of the oyster biodeposit with the sediment in the tanks will promote the growth of phytoplankton due to increased nutrient availability.

Objectives

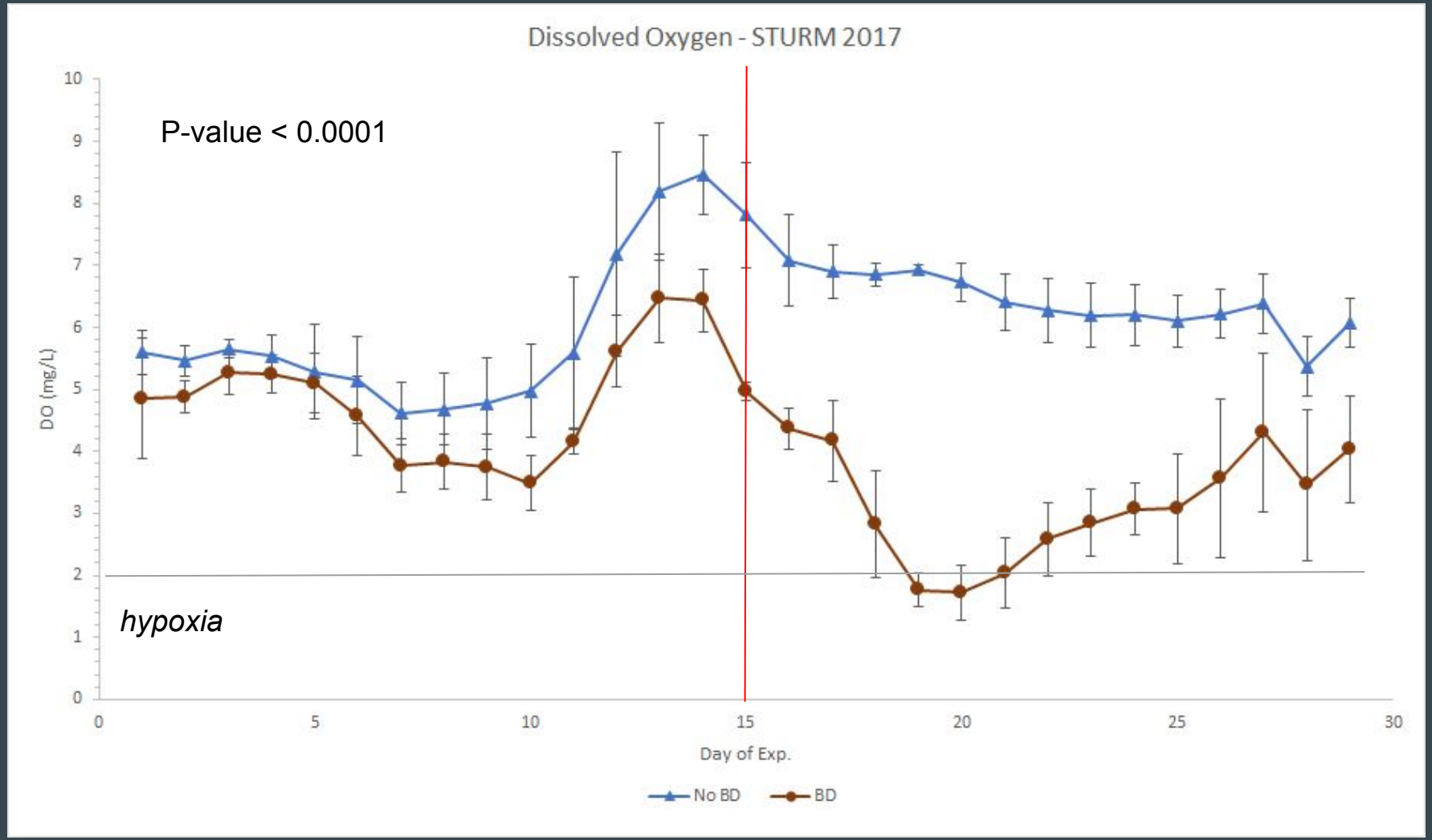
- *Successfully* conduct the STURM Experiment with bottom sediment for 30 days
- Assess the relationship between phytoplankton and oyster biodeposit resuspension (not yet complete)
- Analyze the nutrient fluxes within the STURM system.
    - New for 2017

Gain more insight on how oyster biodeposit affects water quality

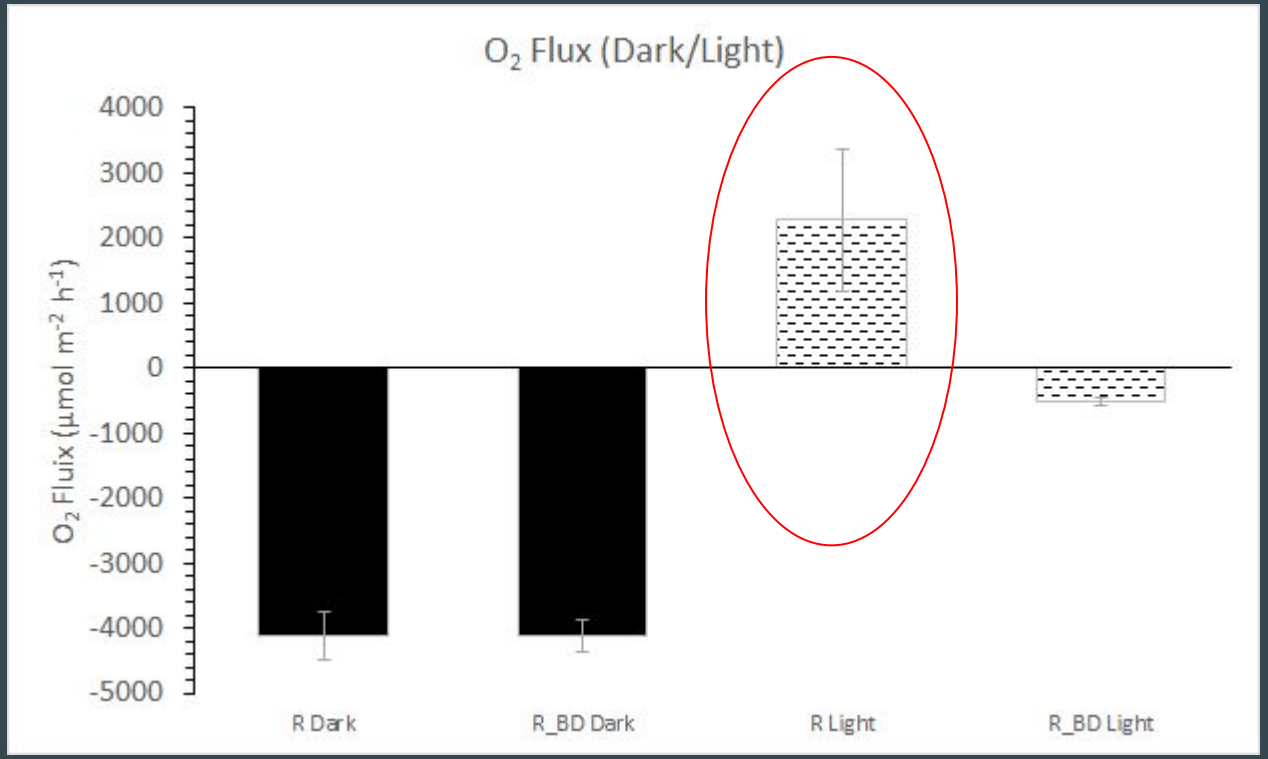
Procedures

- Daily measurements (YSI, Secchi, in vivo), biodeposit additions, 10% water exchange, OBS, and Temp
- Bi-weekly water sampling and filtering to assess nutrient and TSS conditions.
- Nutrient Flux analysis

Sediment Core

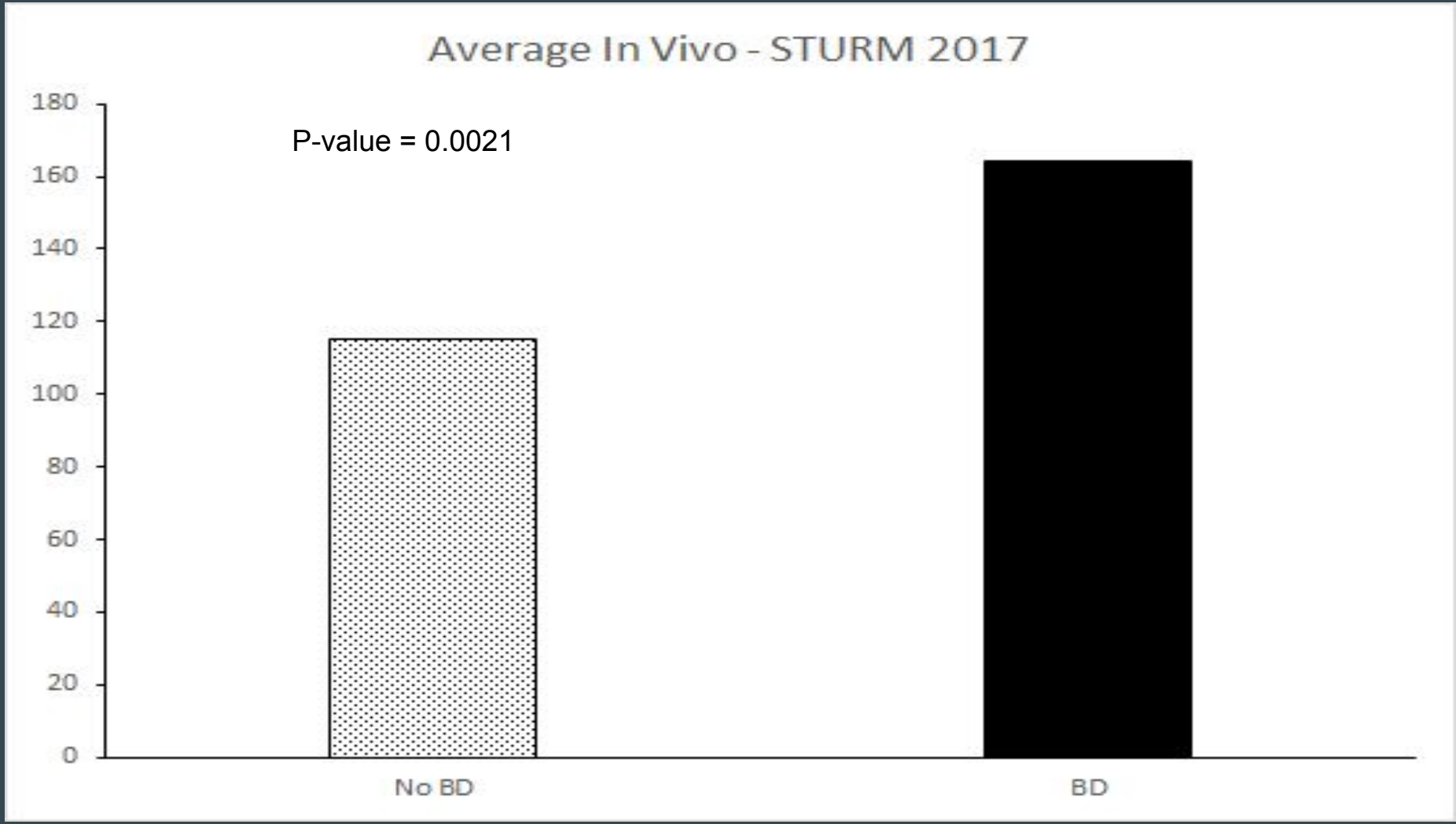

Dissolved Oxygen - STURM 2017
P-value < 0.0001
hypoxia
DO (mg/L)
Day of Exp.
No BD
BD

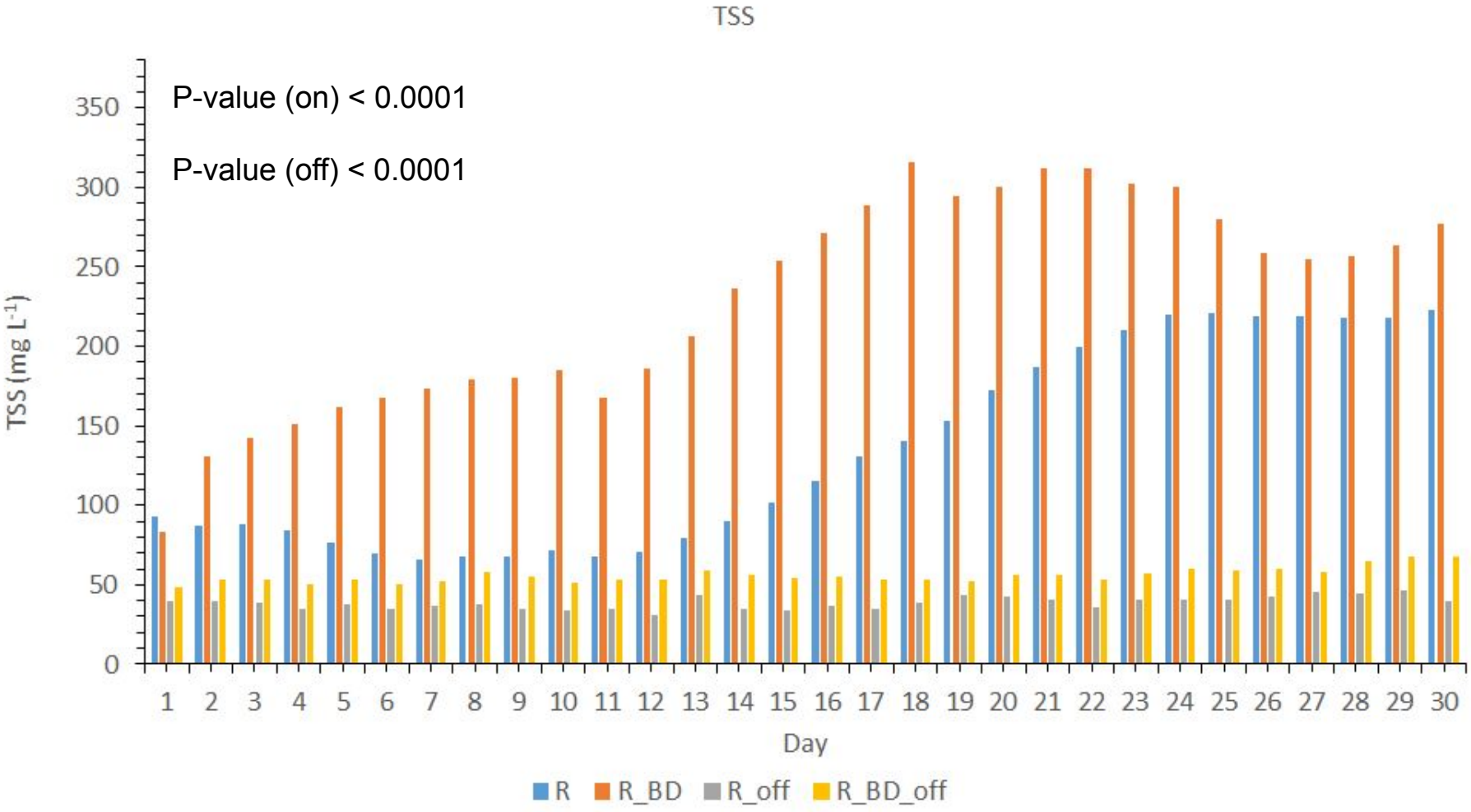
Where Does the Oxygen Go?

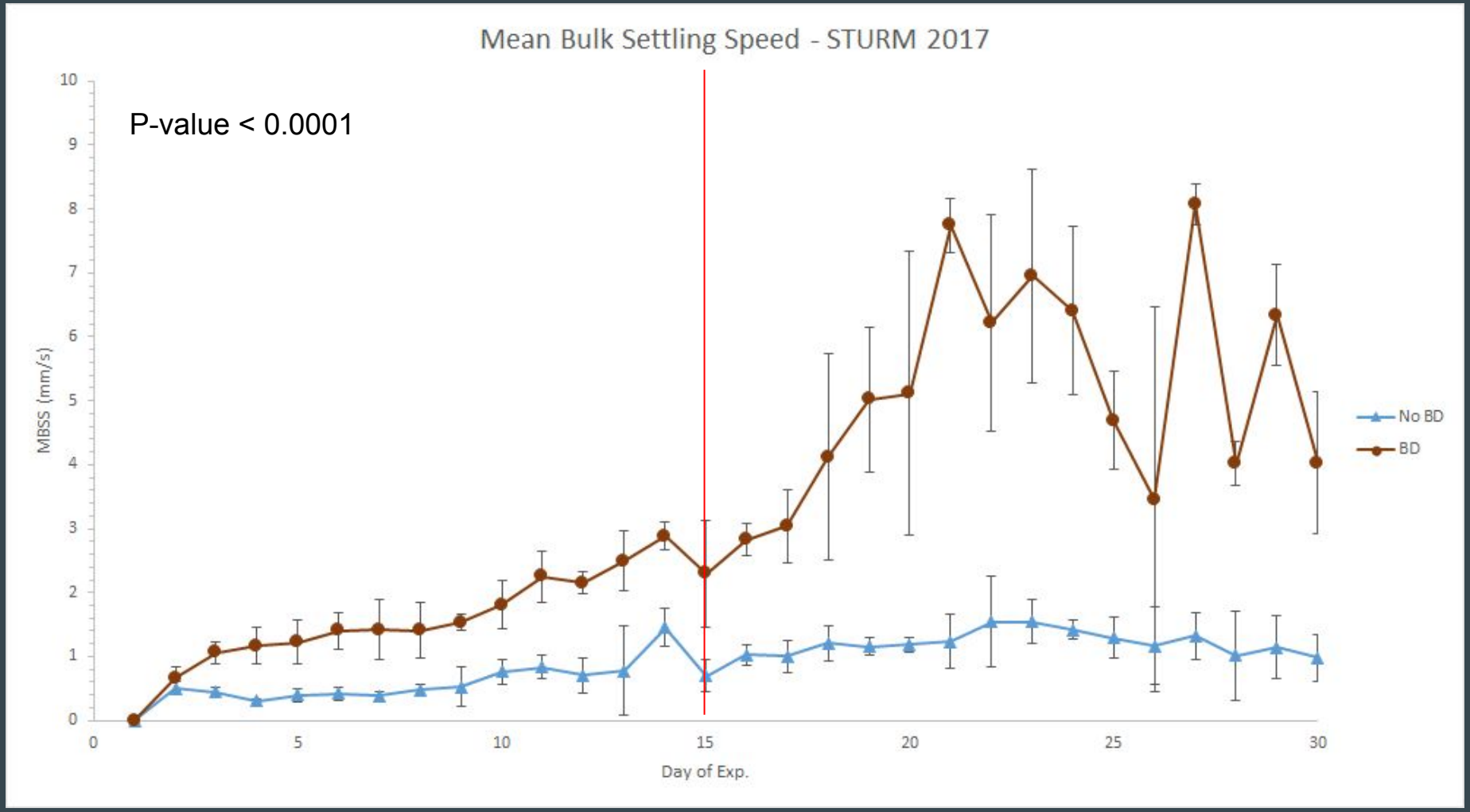


↑ To Water Column

↓ To Bottom Sediment


Average In Vivo - STURM 2017
P-value = 0.0021
180
160
140
120
100
80
60
40
20
0
No BD
BD


TSS
P-value (on) < 0.0001
P-value (off) < 0.0001
TSS (mg L-1)
0
50
100
150
200
250
300
350
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Day
R
R_BD
R_off
R_BD_off

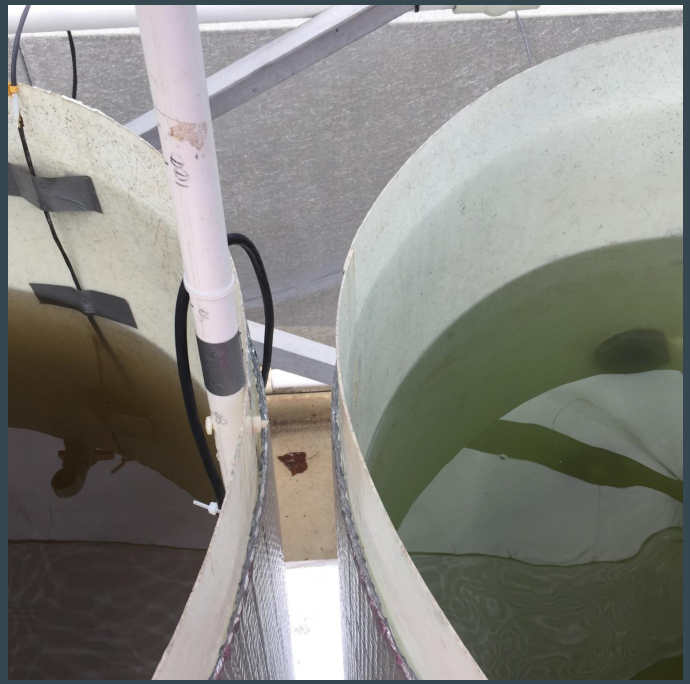

Mean Bulk Settling Speed - STURM 2017
P-value < 0.0001
MBSS (mm/s)
Day of Exp.
No BD
BD
0
1
2
3
4
5
6
7
8
9
10
0
5
10
15
20
25
30

Summary of Results:

Biodeposit Tanks had…

1. Less DO in the water column
2. More photosynthetic activity
3. Higher levels of TSS
4. Faster settling speeds
5. Equal denitrification

...when compared to the control.



BD

No BD

Conclusions - STURM 2017

- Phytoplankton growth may have been stimulated from increased nutrients
- Biodeposit tanks had less DO, indicating lower water quality.
- Biodeposit tanks exhibited faster settling speeds due to aggregation of particles.
- Denitrification was similar between both systems.

Nutrient analysis is ongoing

Acknowledgements

- Dr. Elka Porter
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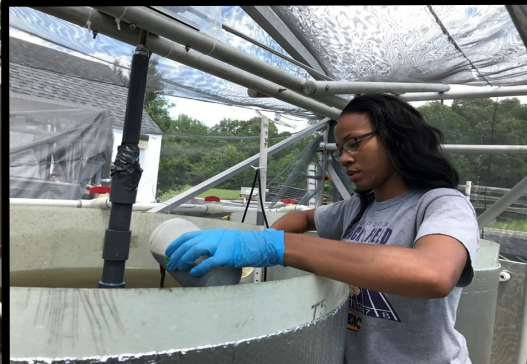

Thank You!

Questions?