

Two continuous high frequency water quality data acquisition systems on Otsego Lake

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Financial support from: Otsego Lake Association; SUNY 4E Grant, SUNY Oneonta & Biological Field Station; National Science Foundation; U.S. Geological Survey - NYS Water Resource Institute

Logistical support/approval from: Otsego County Conservation Association; Glimmerglass Condominium Homeowners' Association; Otsego County Sheriff's Office; NYS Parks, Recreation and Historic Preservation; collaborators from the SUNY Lakes Ecological Observatory Network (SUNY LEON), Global Lake Ecological Observatory Network (GLEON), and Northeastern North America GLEON (NeNA GLEON); SUNY BFS Summer Interns

Originally presented at the 2017 Otsego Lake Association annual membership meeting

*Questions and comments? Please contact Kiyoko Yokota at

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607-436-3742

Fivemile Point temp and light string – semi-automated, logging at 15-min. interval, manual data download



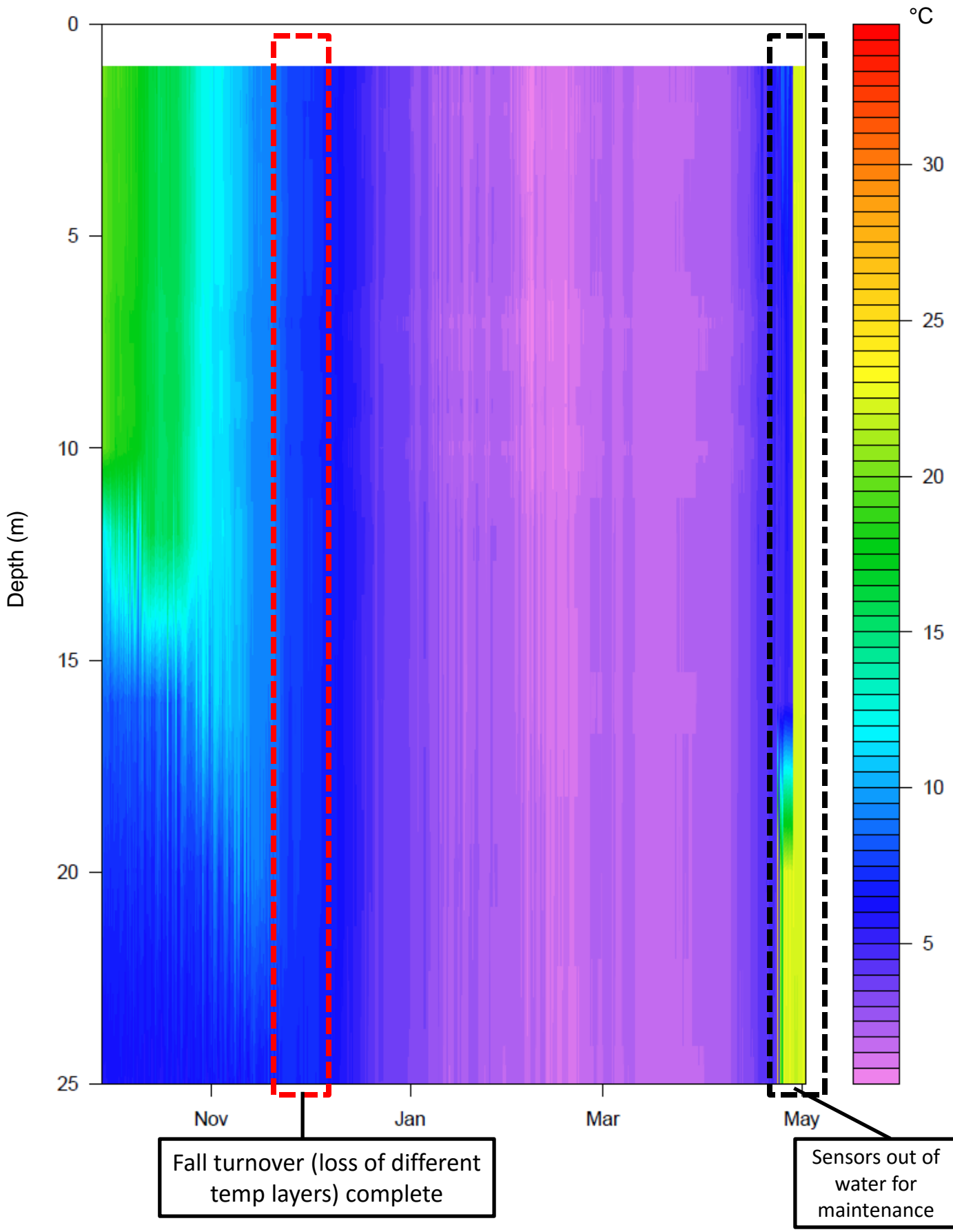
<http://www.onsetcomp.com/products/data-loggers/ua-002-08>



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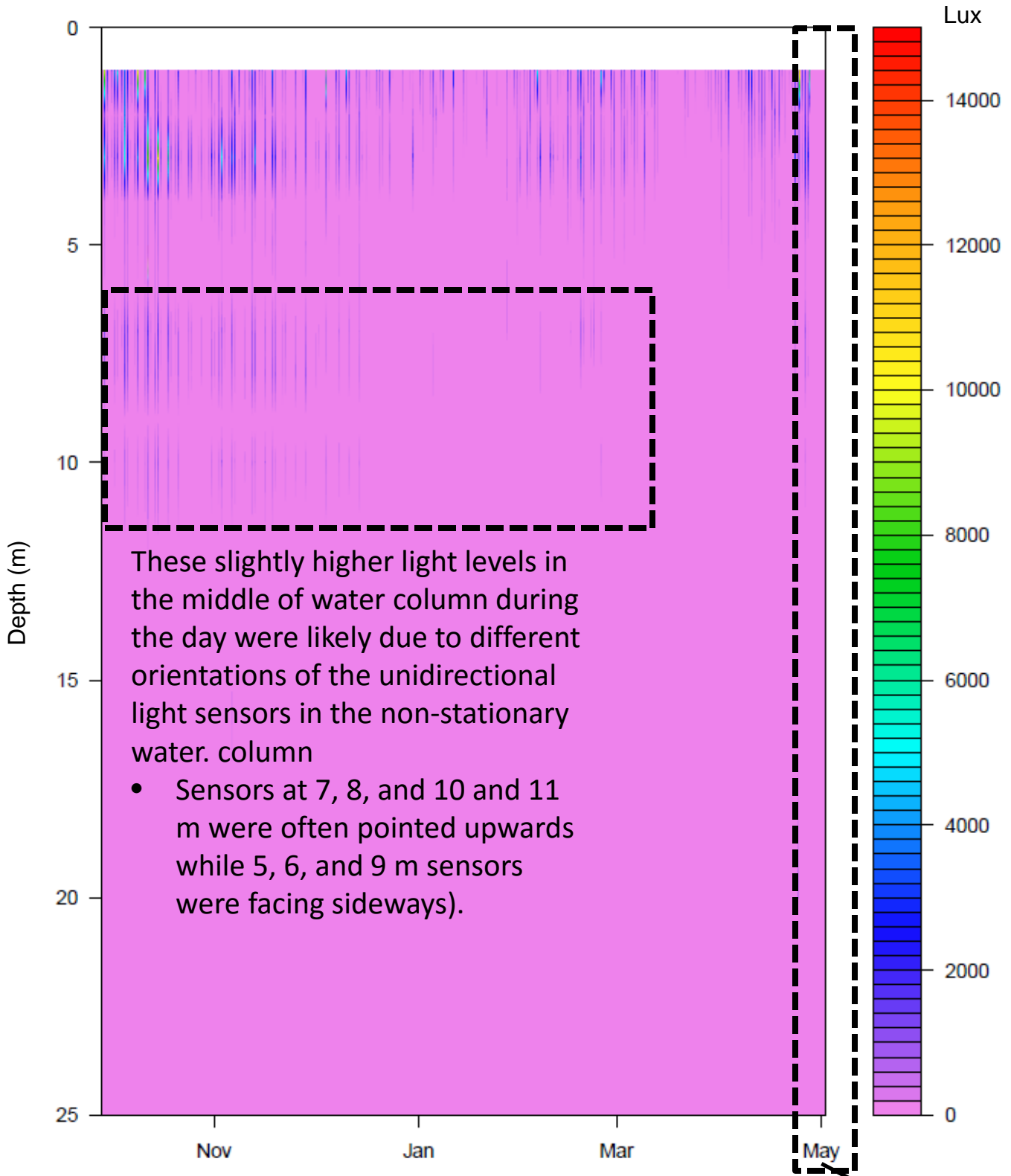
Five Mile Point 28/09/2016 – 02/05/2017 Heat Map



Fall turnover (loss of different temp layers) complete

Sensors out of water for maintenance

Five Mile Point 28/09/2016 – 02/05/2017 Light Intensity



The water column was predominantly dark in winter months.

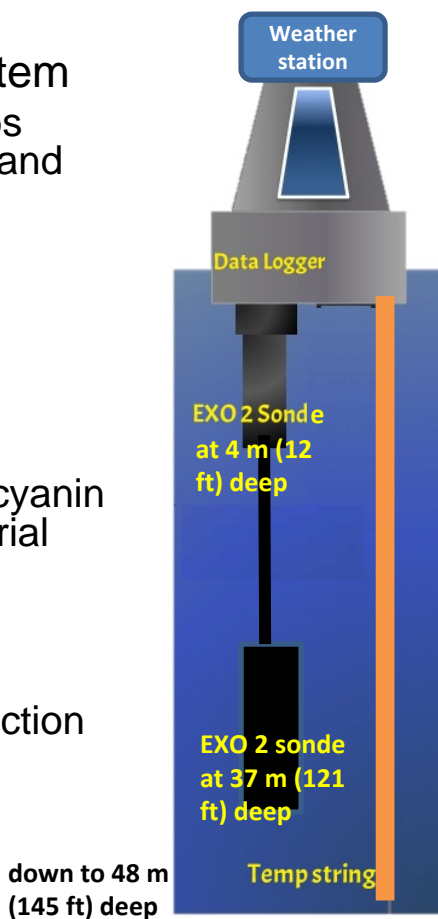
Sensors out of water for maintenance

Otsego Lake Automated Buoy

Funded by the National Science Foundation



- Nexsens CB-950 system
 - attached to two 70 lbs anchors with chains and cables
- Sonde
 - pH
 - Temperature
 - Conductivity
 - Oxygen
 - Chlorophyll & phycocyanin (algal & cyanobacterial abundance)
 - Organic material
- Weather Station
 - Wind speed and direction
 - Light
 - Precipitation



Modified from jpbuoy.com



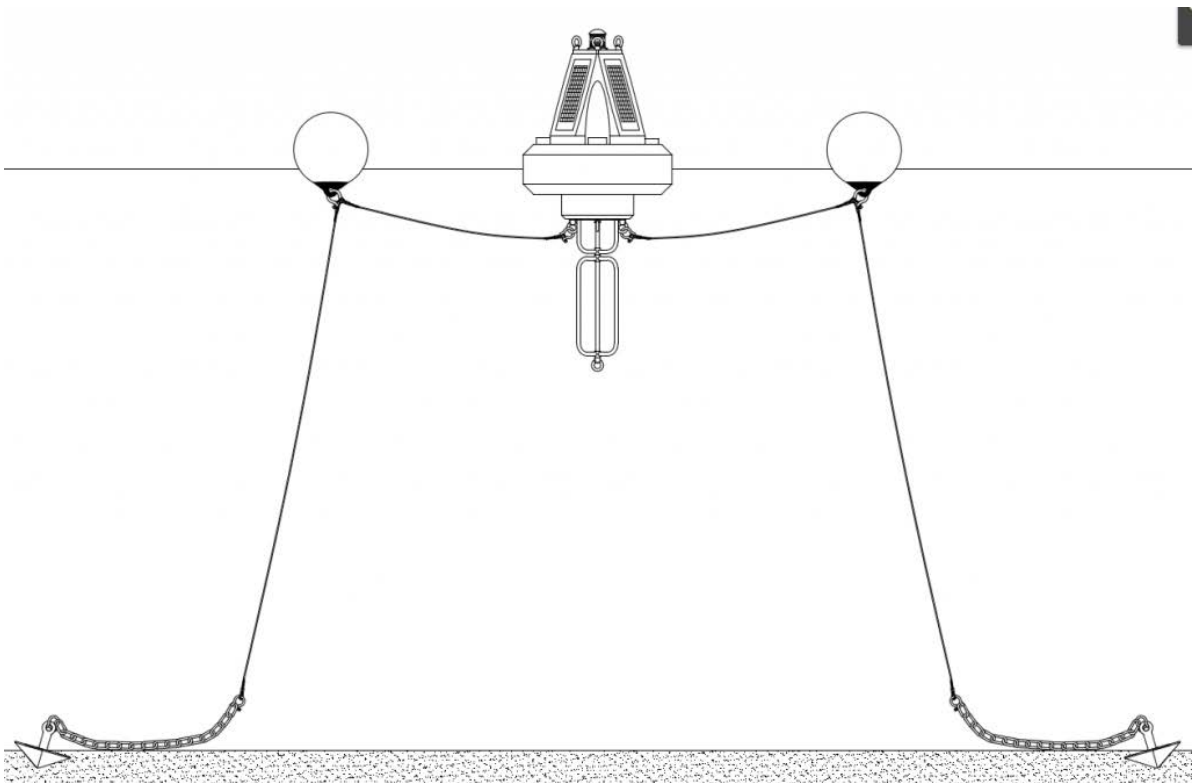
EXO 2 sonde with multiple probes for different water quality parameters



Nexsens CB-950 buoy frame

NEXSENS Technology

2-point mooring of the NSF buoy



<http://www.nexsens.com/wp-content/uploads/2013/02/Two-Point-Mooring-Setup-1024x669.png>

2-point mooring of the NSF buoy



NSF buoy – fully automated system, logging at 15 min. interval, data transmitted via cell signal

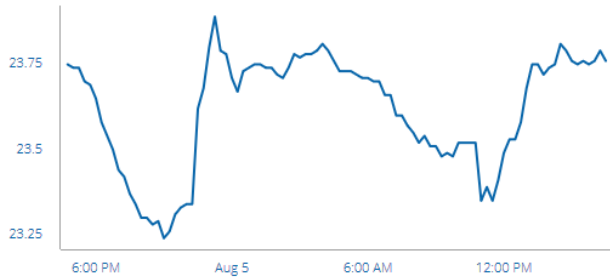


Otsego Lake, NY, USA - X2-CB-C-VZ3G-20002 | 42.773, -74.89

Cooperstown: 70°F

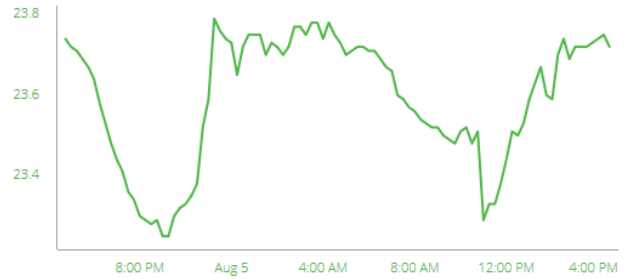


Temp00 0 m 23.76 C
D_Avg: 23.62 D_Min: 23.24 D_Max: 23.89 2017-08-05 16:30:00



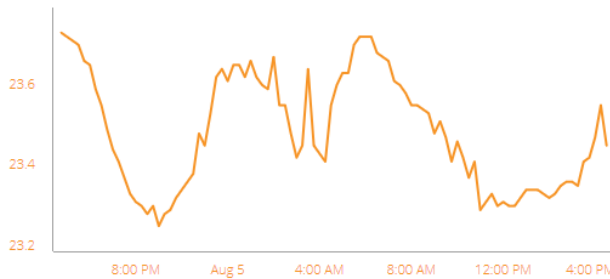
... **D** W M Y

Temp01 2 m 23.72 C
D_Avg: 23.59 D_Min: 23.25 D_Max: 23.79 2017-08-05 16:30:00



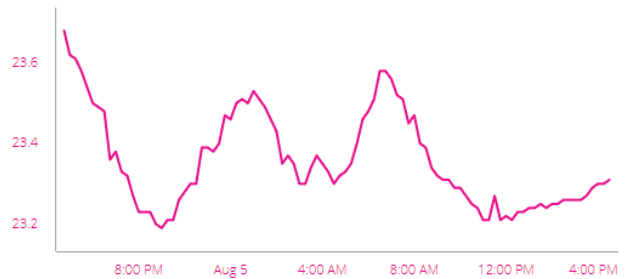
... **D** W M Y

Temp02 4 m 23.45 C
D_Avg: 23.48 D_Min: 23.25 D_Max: 23.73 2017-08-05 16:30:00



... **D** W M Y

Temp03 6 m 23.31 C
D_Avg: 23.36 D_Min: 23.19 D_Max: 23.68 2017-08-05 16:30:00



... **D** W M Y

Temp04 8 m 23.35 C
D_Avg: 23.02 D_Min: 21.54 D_Max: 23.41 2017-08-05 16:30:00



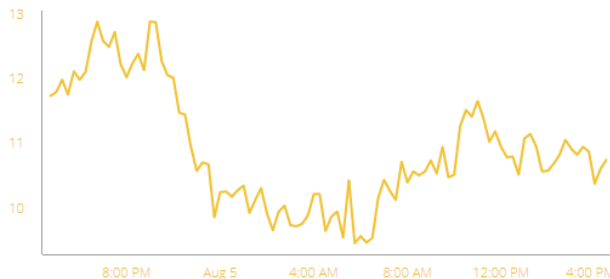
... **D** W M Y

Temp05 10 m 16.28 C
D_Avg: 14.93 D_Min: 12.42 D_Max: 17.01 2017-08-05 16:30:00



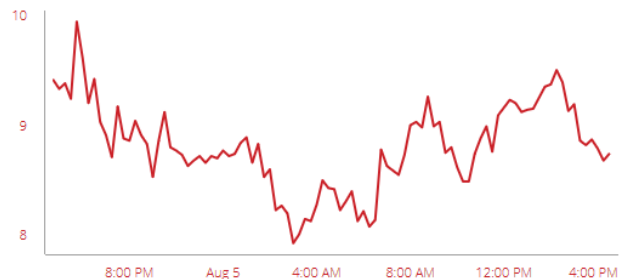
... **D** W M Y

Temp06 12 m 10.76 C
D_Avg: 10.90 D_Min: 9.47 D_Max: 12.90 2017-08-05 16:30:00



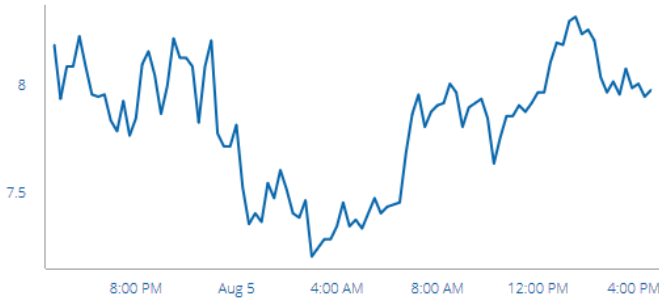
... **D** W M Y

Temp07 14 m 8.75 C
D_Avg: 8.82 D_Min: 7.94 D_Max: 9.95 2017-08-05 16:30:00



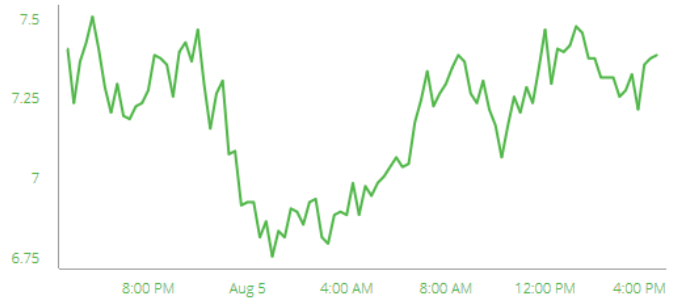
... **D** W M Y

Temp08 16 m 7.98 C
D_Avg: 7.83 D_Min: 7.21 D_Max: 8.32 2017-08-05 16:30:00



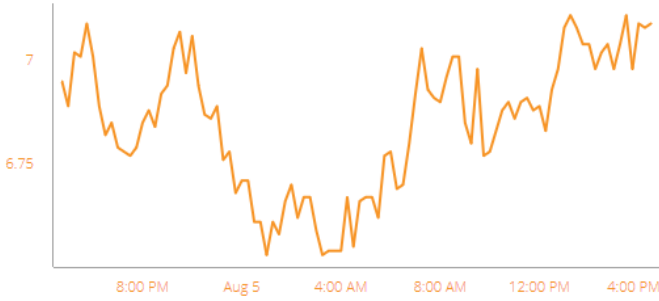
⋮ D W M Y

Temp09 18 m 7.39 C
D_Avg: 7.19 D_Min: 6.76 D_Max: 7.51 2017-08-05 16:30:00



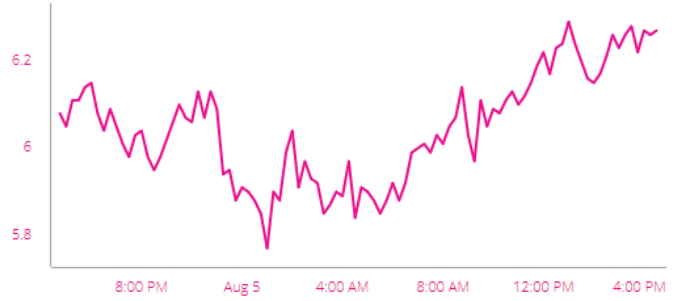
⋮ D W M Y

Temp10 20 m 7.09 C
D_Avg: 6.85 D_Min: 6.53 D_Max: 7.11 2017-08-05 16:30:00



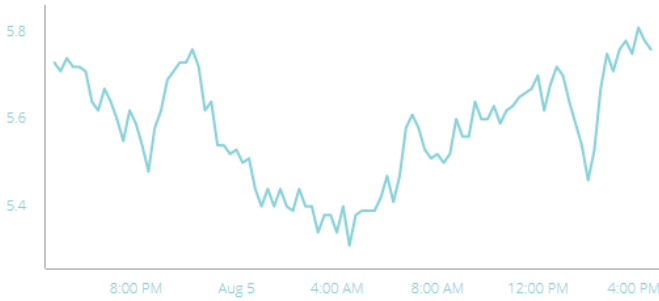
⋮ D W M Y

Temp11 25 m 6.27 C
D_Avg: 6.05 D_Min: 5.77 D_Max: 6.29 2017-08-05 16:30:00



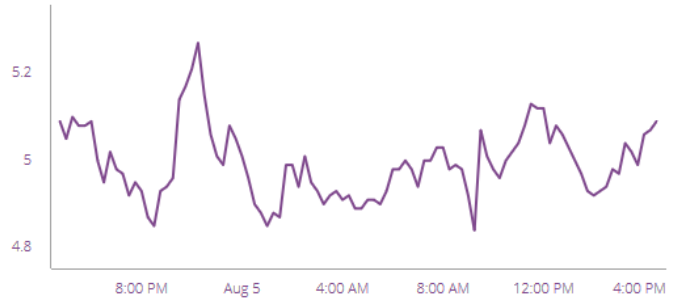
⋮ D W M Y

Temp12 30 m 5.76 C
D_Avg: 5.57 D_Min: 5.31 D_Max: 5.81 2017-08-05 16:30:00



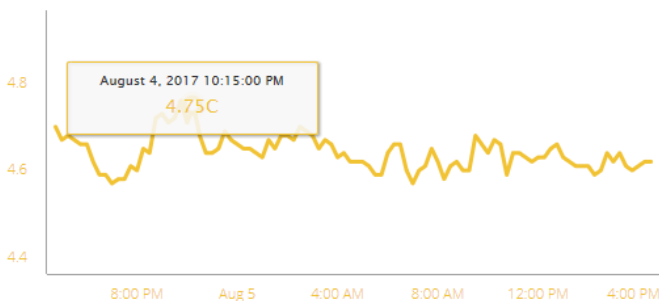
⋮ D W M Y

Temp13 35 m 5.09 C
D_Avg: 4.99 D_Min: 4.84 D_Max: 5.27 2017-08-05 16:30:00



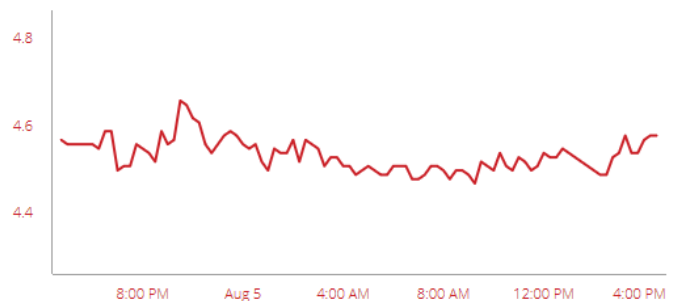
⋮ D W M Y

Temp14 40 m 4.62 C
D_Avg: 4.64 D_Min: 4.57 D_Max: 4.76 2017-08-05 16:30:00



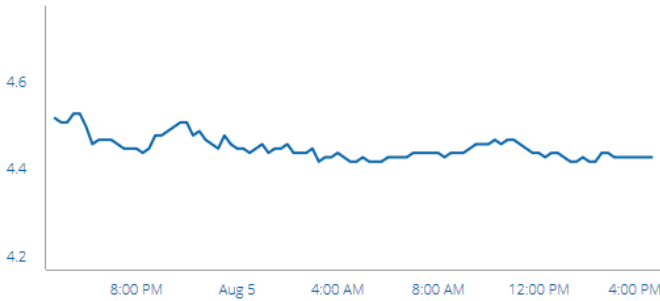
⋮ D W M Y

Temp15 42 m 4.58 C
D_Avg: 4.54 D_Min: 4.47 D_Max: 4.66 2017-08-05 16:30:00



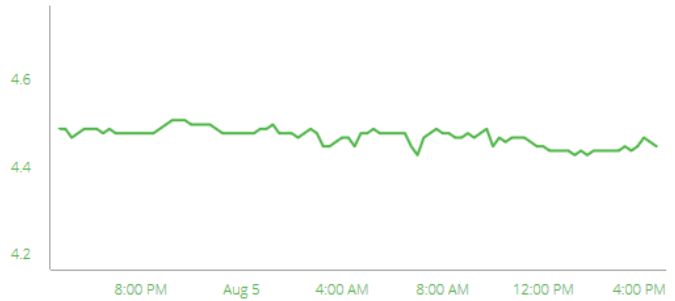
⋮ D W M Y

Temp16 **44 m** **4.43 C**
D_Avg: 4.45 D_Min: 4.42 D_Max: 4.53 2017-08-05 16:30:00



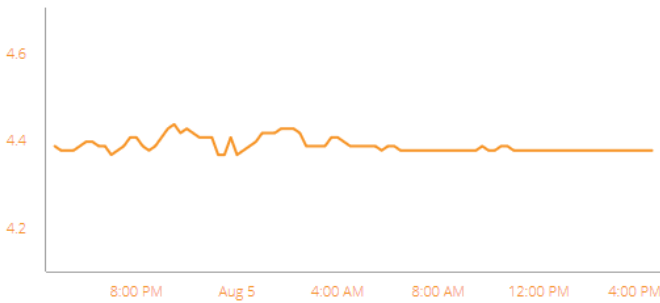
... D W M Y

Temp17 **46 m** **4.45 C**
D_Avg: 4.47 D_Min: 4.43 D_Max: 4.51 2017-08-05 16:30:00



... D W M Y

Temp18 **48 m** **4.38 C**
D_Avg: 4.39 D_Min: 4.37 D_Max: 4.44 2017-08-05 16:30:00



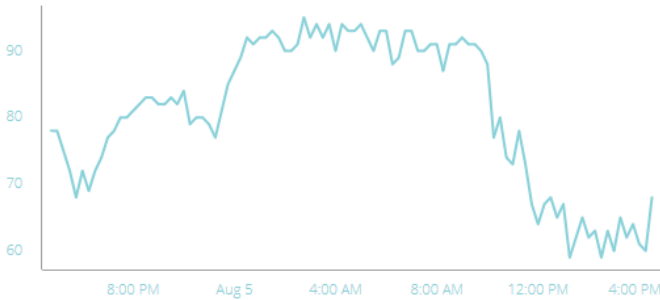
... D W M Y

Air Temperature **0 m** **19.50 C**
D_Avg: 20.93 D_Min: 18.60 D_Max: 26.00 2017-08-05 16:30:00



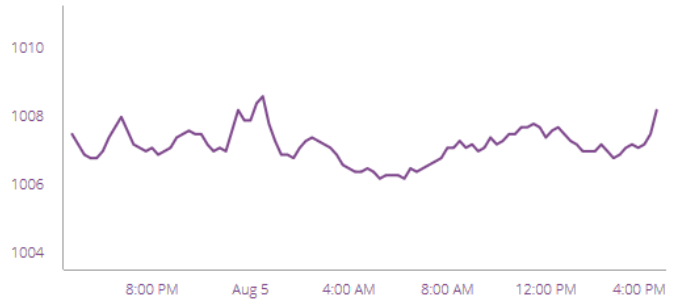
... D W M Y

Relative Humidity **0 m** **68 %**
D_Avg: 80.69 D_Min: 59.00 D_Max: 95.00 2017-08-05 16:30:00



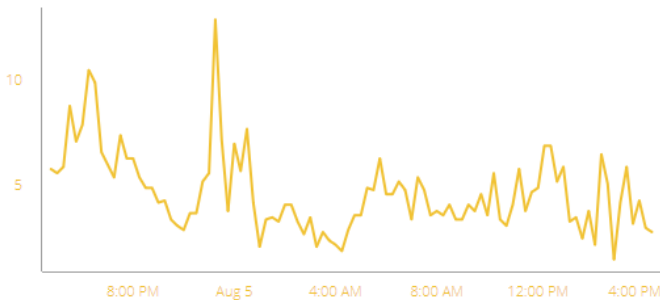
... D W M Y

Rel. Barometric Pressure **0 m** **1008.2 hPa**
D_Avg: 1007.17 D_Min: 1006.20 D_Max: 1008.60 2017-08-05 16:30:00



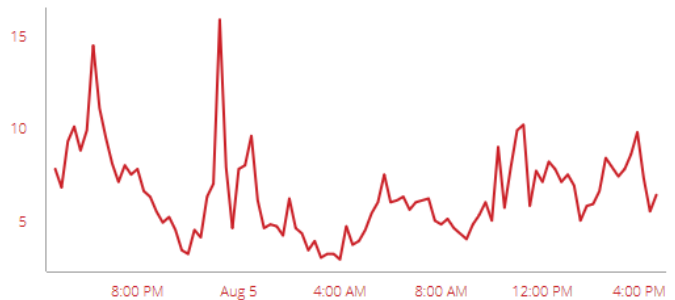
... D W M Y

Wind Speed **0 m** **2.8 m/s**
D_Avg: 4.68 D_Min: 1.50 D_Max: 12.90 2017-08-05 16:30:00



... D W M Y

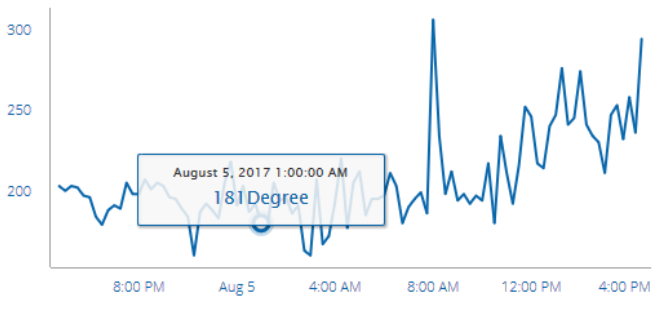
Max Wind Sp **0 m** **6.5 m/s**
D_Avg: 6.57 D_Min: 3.00 D_Max: 16.00 2017-08-05 16:30:00



... D W M Y

Wind Direction 0 m 295 Degree

D_Avg: 207.51 D_Min: 161.00 D_Max: 307.00 2017-08-05 16:30:00

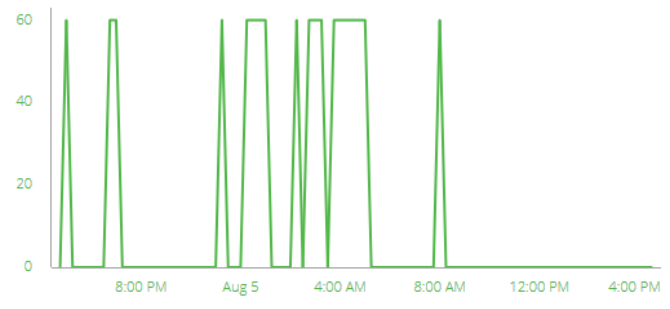


8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

Precip Type 0 m 0

D_Avg: 11.88 D_Min: 0.00 D_Max: 60.00 2017-08-05 16:30:00

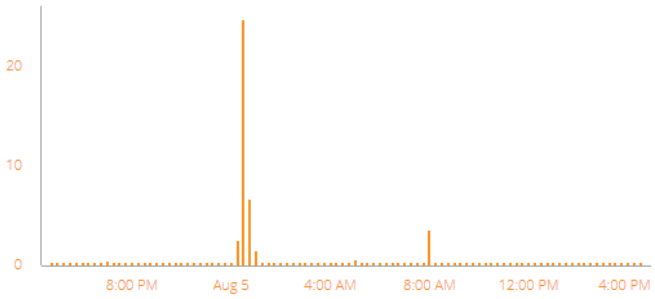


8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

Rain Intensity 0 m 0.0 mm/h

D_Avg: 0.44 D_Min: 0.00 D_Max: 24.80 2017-08-05 16:30:00

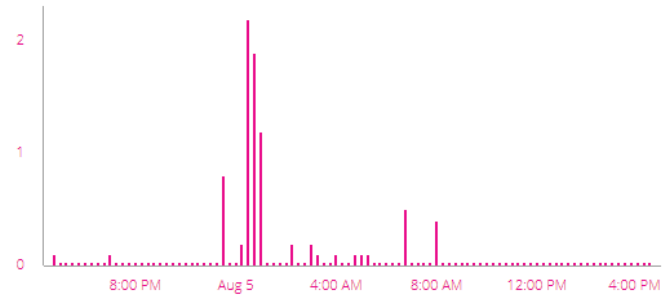


8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

Interval Rain 0 m 0.0 mm

D_Avg: 0.09 D_Min: 0.00 D_Max: 2.20 2017-08-05 16:30:00



8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

Heading 0 m 355.0 Degree

D_Avg: 354.60 D_Min: 348.00 D_Max: 357.00 2017-08-05 16:30:00

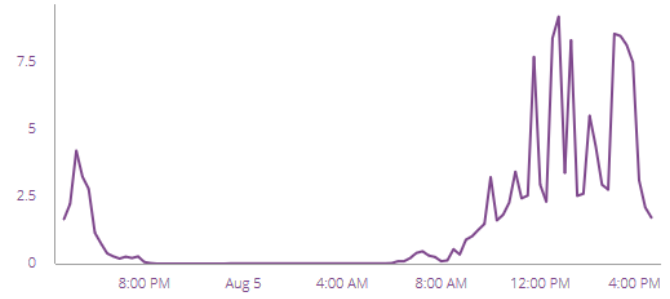


8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

mv 0 m 1.71 mV

D_Avg: 1.51 D_Min: 0.00 D_Max: 9.18 2017-08-05 16:30:00

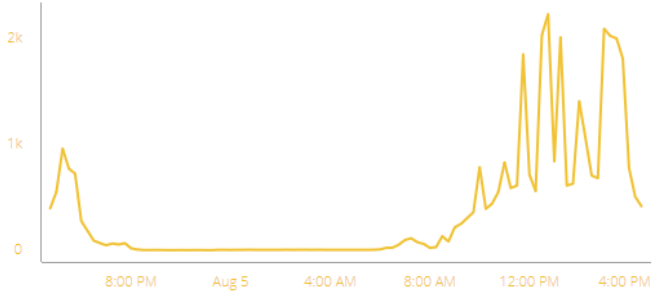


8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

PAR 0 m 414 umol/s/m2

D_Avg: 367.24 D_Min: -1.00 D_Max: 2230.00 2017-08-05 16:30:00

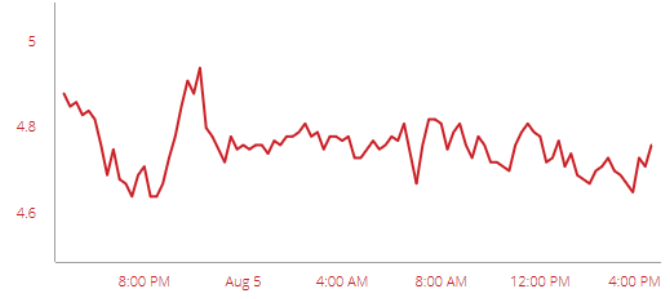


8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

Temperature 37 m 4.76 C

D_Avg: 4.76 D_Min: 4.64 D_Max: 4.94 2017-08-05 16:30:00



8:00 PM Aug 5 4:00 AM 8:00 AM 12:00 PM 4:00 PM

... D W M Y

Sp Cond

37 m

308 uS/cm

D_Avg: 308.94 D_Min: 308.00 D_Max: 310.00

2017-08-05 16:30:00



... D W M Y

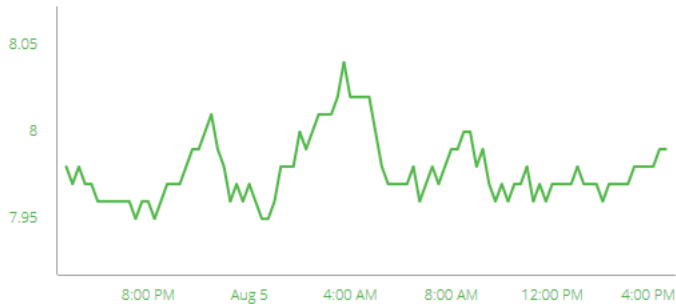
pH

37 m

7.99

D_Avg: 7.98 D_Min: 7.95 D_Max: 8.04

2017-08-05 16:30:00



... D W M Y

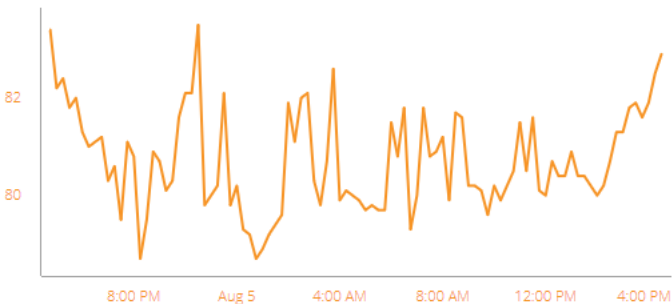
ODOSat

37 m

82.9 %

D_Avg: 80.72 D_Min: 78.70 D_Max: 83.50

2017-08-05 16:30:00



... D W M Y

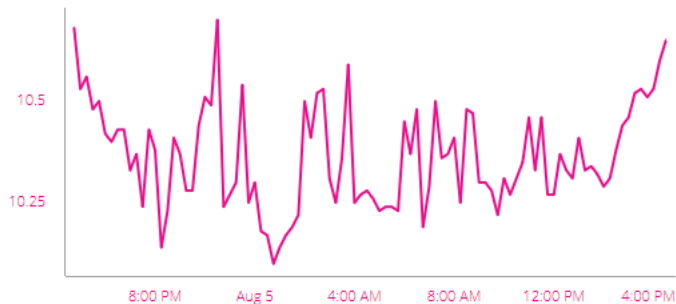
ODO

37 m

10.65 mg/L

D_Avg: 10.36 D_Min: 10.10 D_Max: 10.70

2017-08-05 16:30:00



... D W M Y

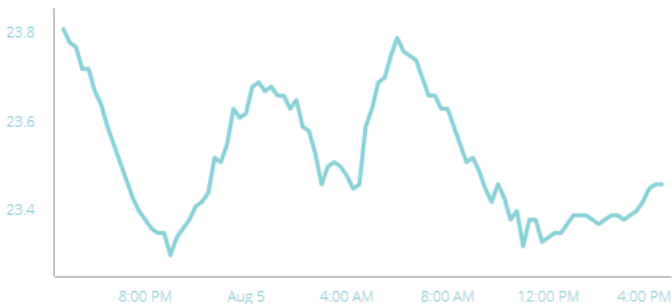
Temperature

4 m

23.46 C

D_Avg: 23.52 D_Min: 23.30 D_Max: 23.81

2017-08-05 16:30:00



... D W M Y

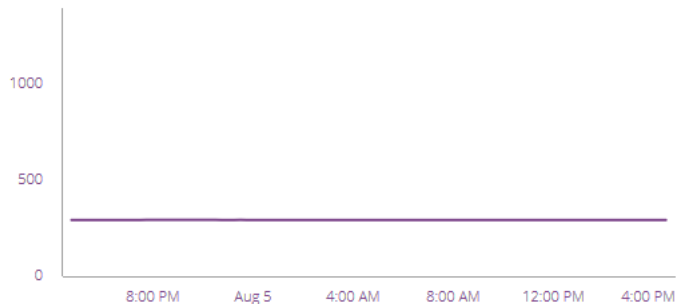
Sp Cond

4 m

292 uS/cm

D_Avg: 292.14 D_Min: 292.00 D_Max: 293.00

2017-08-05 16:30:00



... D W M Y

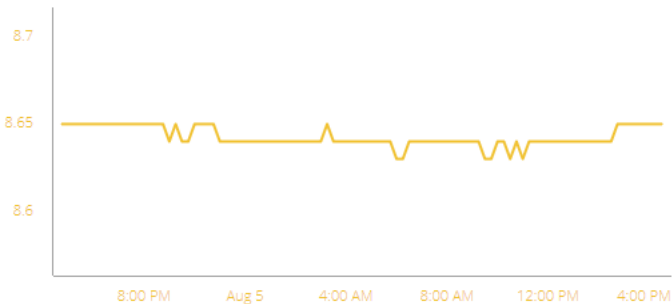
pH

4 m

8.65

D_Avg: 8.64 D_Min: 8.63 D_Max: 8.65

2017-08-05 16:30:00



... D W M Y

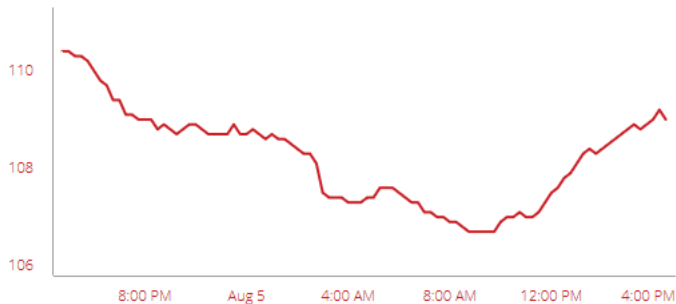
ODOSat

4 m

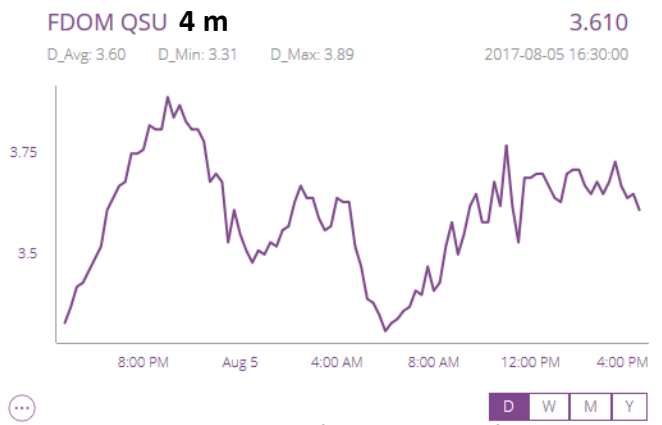
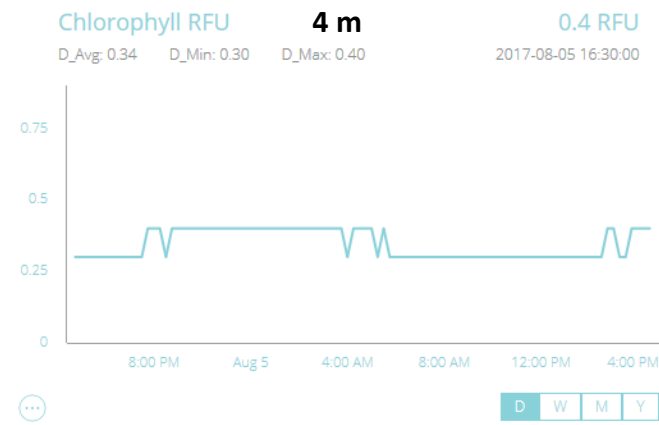
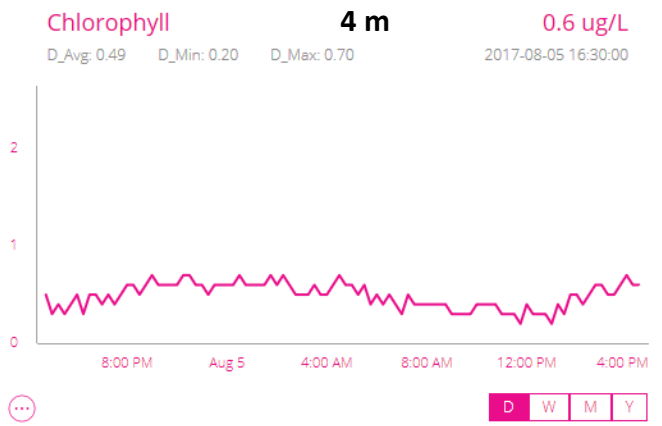
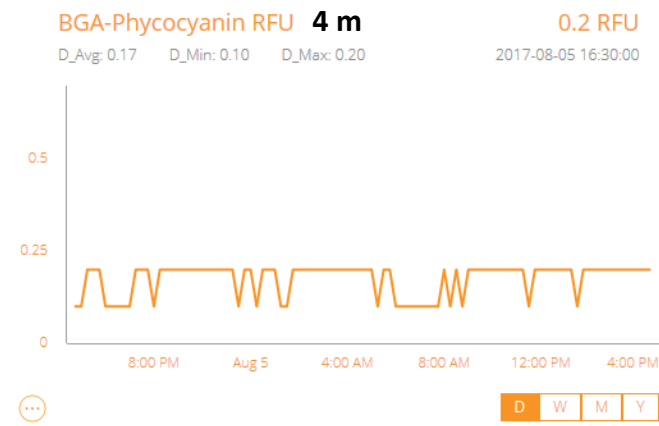
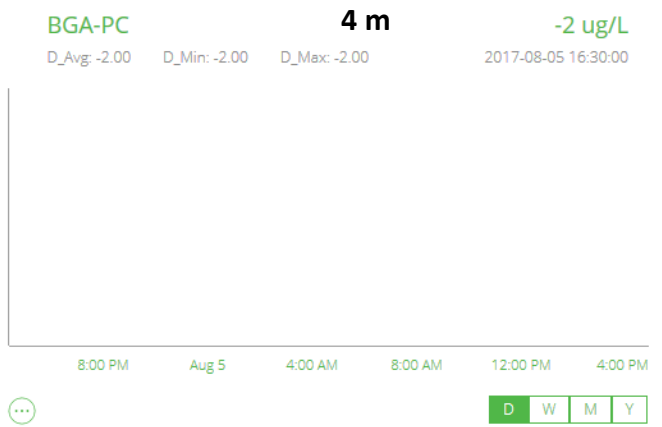
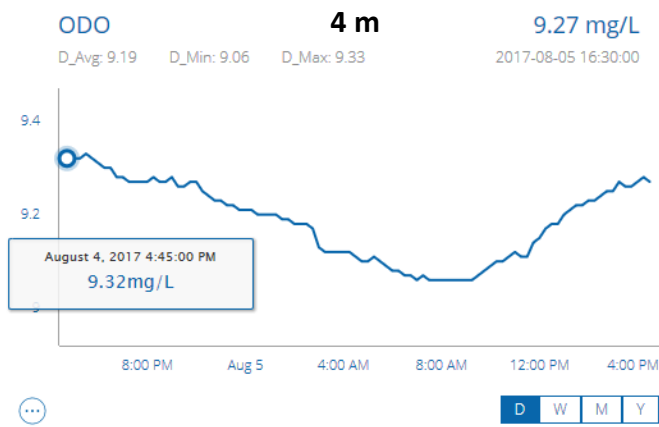
109.0 %

D_Avg: 108.21 D_Min: 106.70 D_Max: 110.40

2017-08-05 16:30:00



... D W M Y



1 QSU = 1 ppb quinine sulfate, surrogate for CDOM

Thermistors at 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 42, 44, 46, 48 m

	Temp0	Temp1	Temp2	Temp3	Temp4	Temp5	Temp6	Temp7	Temp8	Temp9
z (m)	0	2	4	6	8	10	12	14	16	18
			Epi sonde							
	Temp10	Temp11	Temp12	Temp13	Temp14	Temp15	Temp16	Temp17	Temp18	
z (m)	20	25	30	35	40	42	44	46	48	
				Hypo sonde @ z = 37 m						

Ongoing efforts & future plans (added Sept 2017)

- International & regional research on how changing climate is affecting lake stratification and spring-summer productivity across regions
 - Collaborative international projects (> 20 lakes) through the Global Lake Ecological Observatory Network (GLEON)
 - Two summers of coordinated nutrient limitation experiment data through the Northeastern North America GLEON (> 10 lakes)
- Collaborate with IT professionals/faculty & students to make a user-friendly web interface for the public to view select weather and water quality parameters
 - Raw data access is through paid subscription account under the name of the lead researcher (Yokota).
 - The NSF Field Station and Marine Labs grant program covered only the initial acquisition of equipment – leads on additional resources to make this happen will be appreciated.
- Increase awareness about the lake data collection buoys among lake users
 - Prevent accidents and damage
 - Regular updates