Chesapeake Bay Water-Column Hypoxia Monitoring

An Update to the Chesapeake Bay Program to STAR

September 28, 2023

NOAA Chesapeake Bay Office

Deployments/System Maintenance

Data Server Update

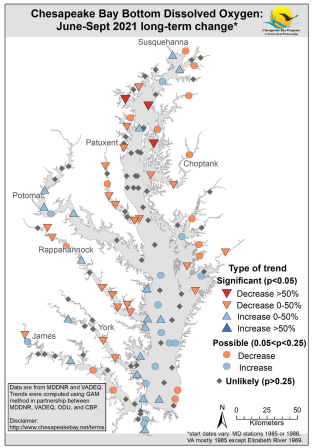
QC Protocols

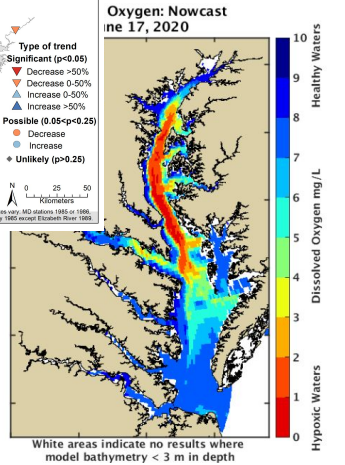
Living Resources

Next Site Selection Exercise

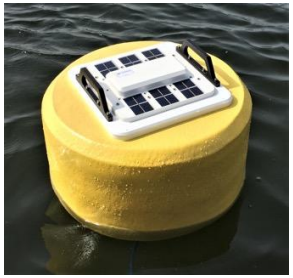
Expected Outcomes

- Increase understanding of temporal and spatial variability of dissolved oxygen in deep and shallow water
- Improve validation for the models used in annual hypoxia reporting
- Establish sampling design and monitoring needed to assess TMDL water quality attainment criteria
- Provide data to develop improved habitat suitability models for multiple species (Striped bass, forage, blue crab)





Data Servers and Visualizations



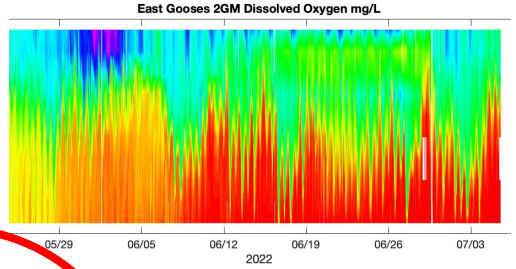
Buoy

S9
Raw Data

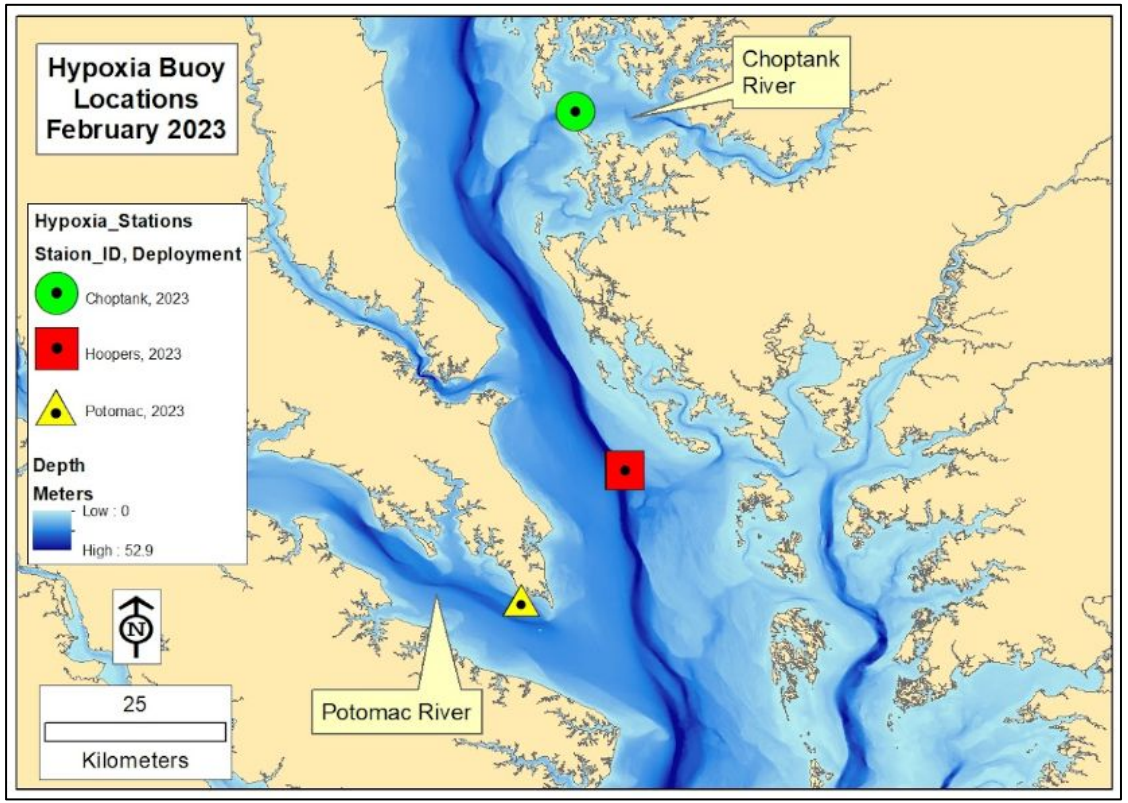
NCBO
Raw Data & QC
(flagged) Data

Axiom
Deliver Raw & QC
Visualizations & Data

Axiom
Visual QC &
Download
Tool



2023 Deployment Map



Lower Choptank River
- Sensors at 1m, 5m, 8m
- Deployed 4/26

Mid Bay
- Sensors at 5m, 9m, 13m, 17m
- Deployed 5/15

Lower Potomac River
- Sensors at 3m, 7m, 10m
- Deployed 5/25

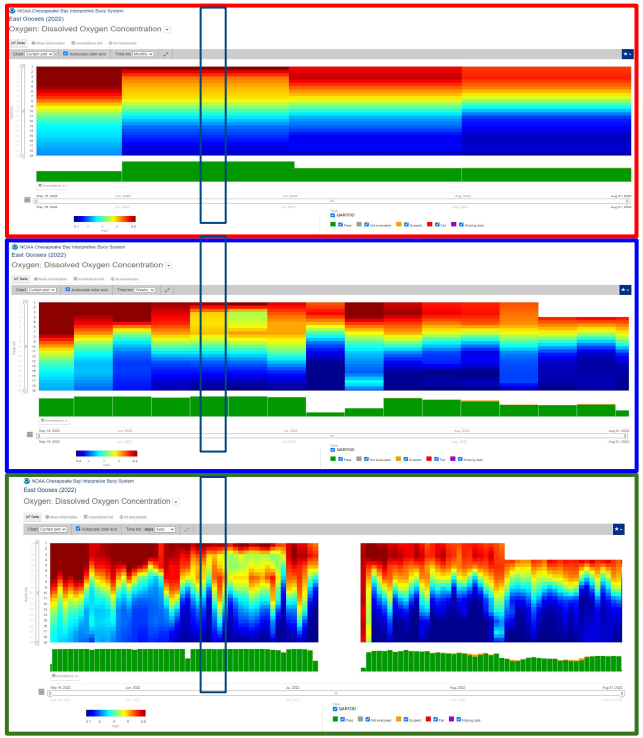
Maintenance Visits & Issues

Anti-Fouling

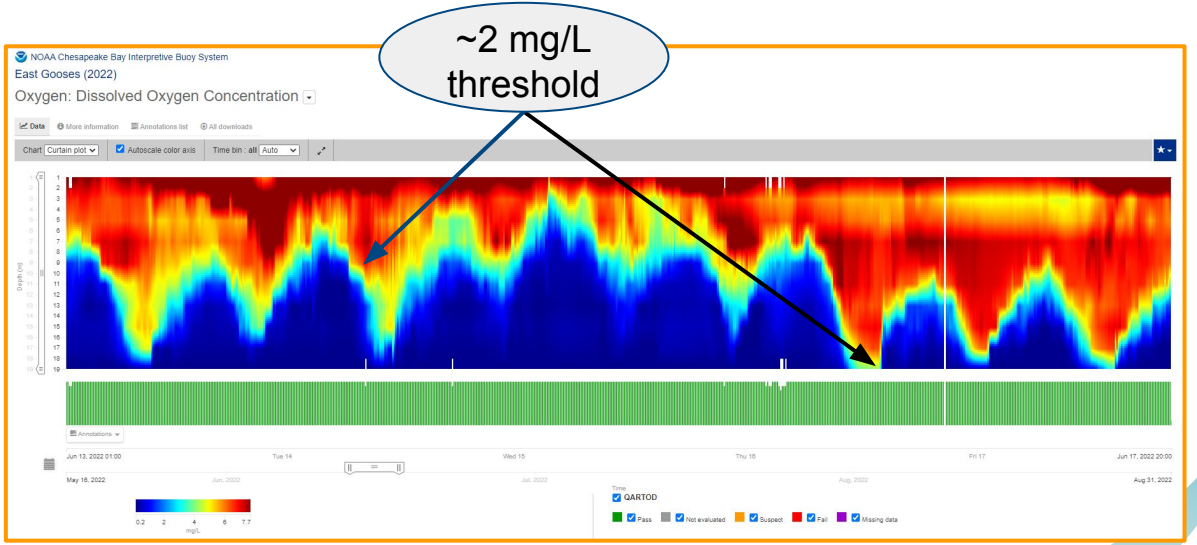
- Copper wire mesh covering the face and a copper tape wrap (top left)
- Barnacle season requires more frequent visits; vinegar solution flush (bottom right)
- Weekly visits kept us ahead of serious fouling
- Additional fine copper mesh nested around sensors (top right)

The Difference is Temporal Resolution

Monthly (top left), Weekly (middle left), Daily (bottom left), 10 min (middle right)



3.5 months (left plots) vs 5 days (right plot)



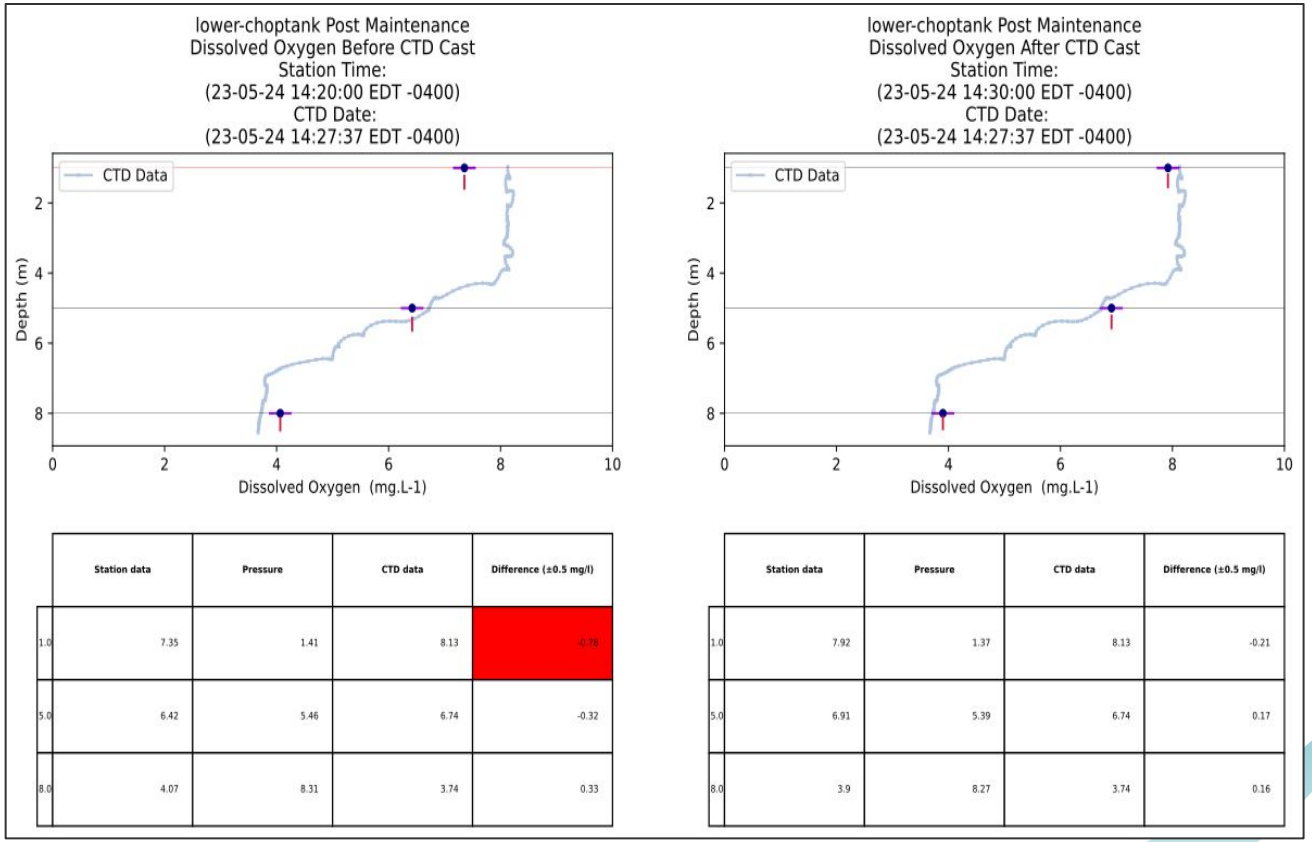
QA/QC Measures

Current Tests Evaluated- Sensor Variable Thresholds Under Review

- Location Test
- Spike Test
- Gross Range Test
- No Data Test
- Flat Line Test
- Rate of Change Test

QA/QC

CTD-DO Validation An Example of On-Water QC Routines both pre and post Maintenance

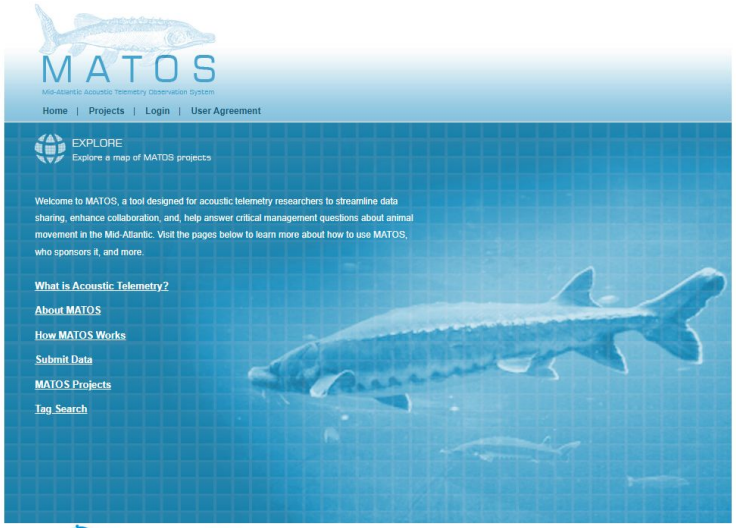


	Station data	Pressure	CTD data	Difference (±0.5 mg/l)
1.0	7.35	1.41	8.13	-0.78
5.0	6.42	5.46	6.74	-0.32
8.0	4.07	8.31	3.74	0.33

	Station data	Pressure	CTD data	Difference (±0.5 mg/l)
1.0	7.92	1.37	8.13	-0.21
5.0	6.91	5.39	6.74	0.17
8.0	3.9	8.27	3.74	0.16

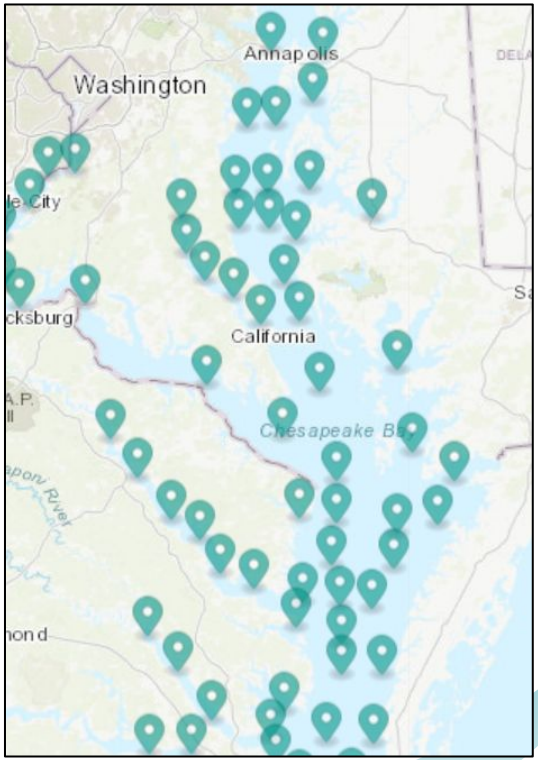
Observations & Living Resources

- Acoustic telemetry receivers are a component of all CBIBS (small buoys and hypoxia arrays) platforms
- Data is archived within the Mid-Atlantic Acoustic Telemetry Observation System (MATOS)
- Opportunities exist to tie species presence data with continuous water column habitat (DO, Temp, Salinity) data



Planning & Budgeting for a Wider Array Network

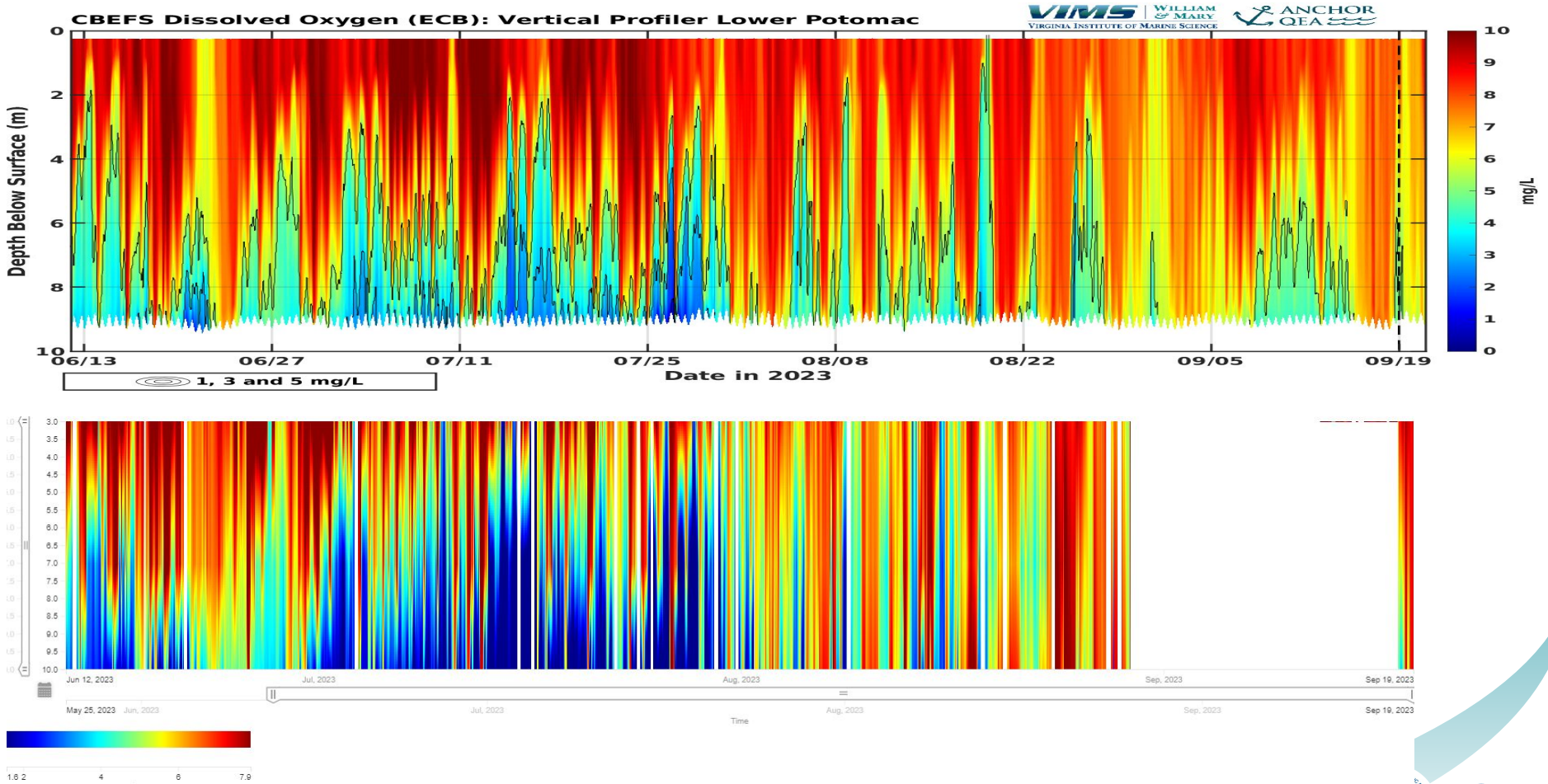
- EPA confirms 2 years of funding
- NCBO provides overall project oversight and management
- NCBO acquires equipment and supplies for a 10-array system this fall
- Engage the Hypoxia Collaborative Workgroup to evaluate network expansion options
- Operate and maintain a maximum of 7 arrays in the 2023 sampling season (March-Dec)



Questions?

Contact Jay.Lazar@NOAA.gov for additional information

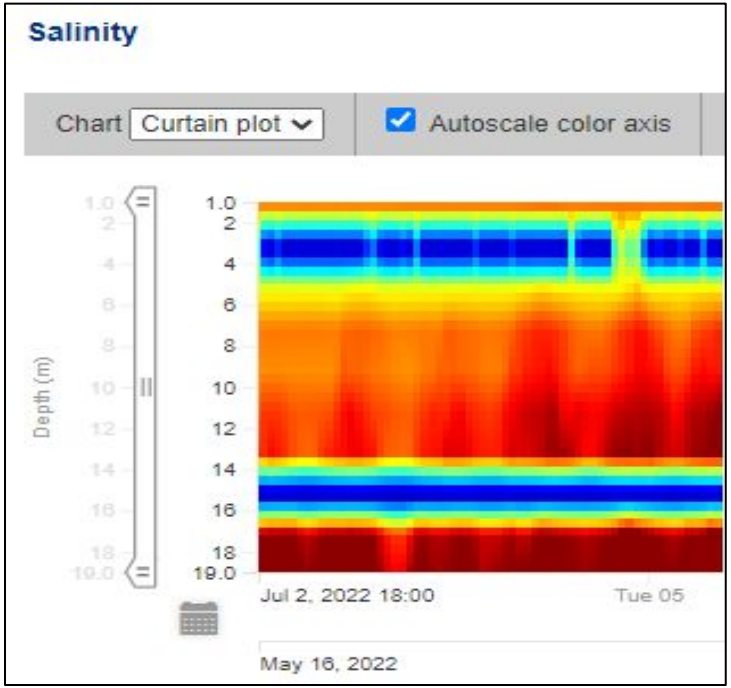
Backup



NOAA FISHERIES

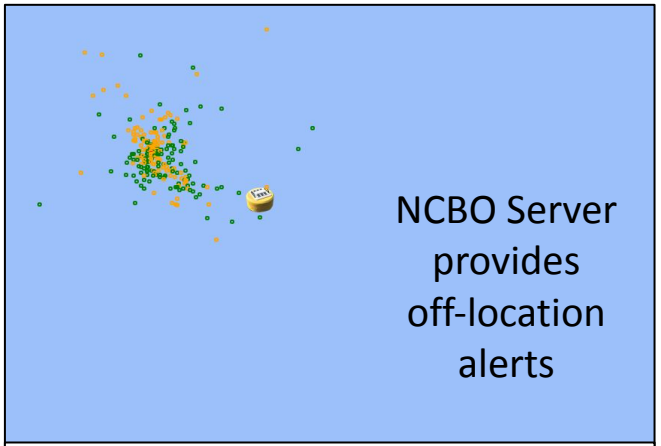
Maintenance Visits & Issues

Bad Sensor Readings



- Bad conductivity cells at 3m & 15m on East array (2022)
  - 15m conductivity cell became a problem on May 22, less than a week after deployment
  - 3m conductivity cell became a problem on July 1 likely due to barnacle fouling
  - Eventual course of action will be to replace the sensors and either remove biofouling or return for maintenance
  - NCBO display server will interpolate through the bad data at 3m & 15m (see 'clean' visualizations)
  - Raw and QC'd data will be retrievable through IOOS pages

Data Server Alerts



NCBO Server provides off-location alerts

dante@s9server.com
to darius, me, doug

SData:ReportLog:Calculations:GPS Distance:Distance = 187142.2 is above specified maximum value of 100;

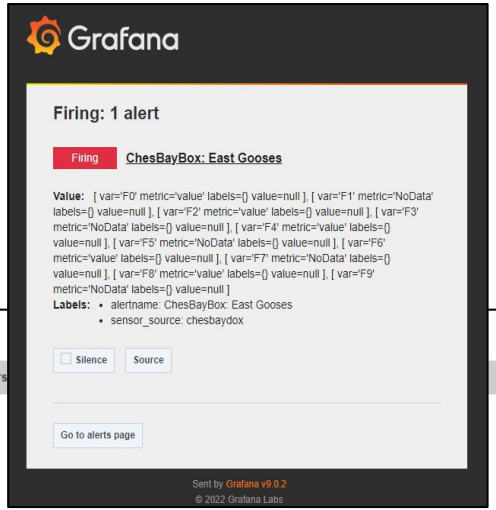
dante@s9server.com
to darius, me, doug

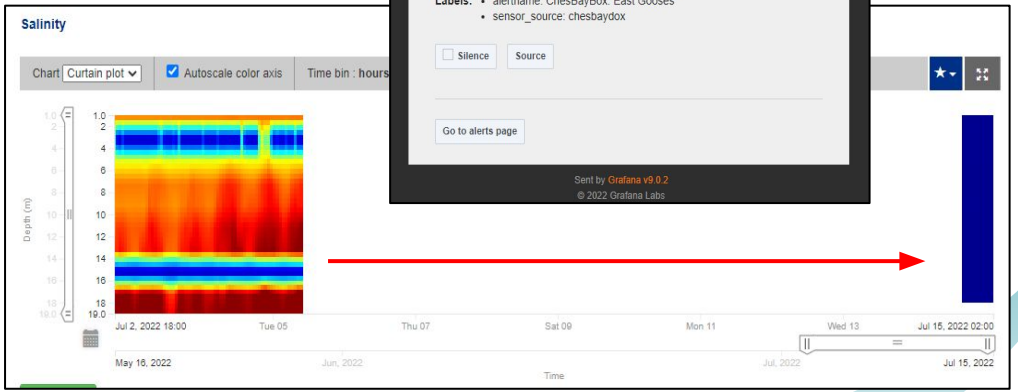
SData:ReportLog:Calculations:GPS Distance:Distance = 186852.8 is above specified maximum value of 100;

dante@s9server.com
to darius, me, doug

SData:ReportLog:Calculations:GPS Distance:Distance = 186882.7 is above specified maximum value of 100;

Axiom Server provides “no data” alerts





QA/QC

Annual Report Flagging to Identify Questionable and Bad Data per Variable per Depth per Station