

Chesapeake Bay Hypoxia Profiling Buoy

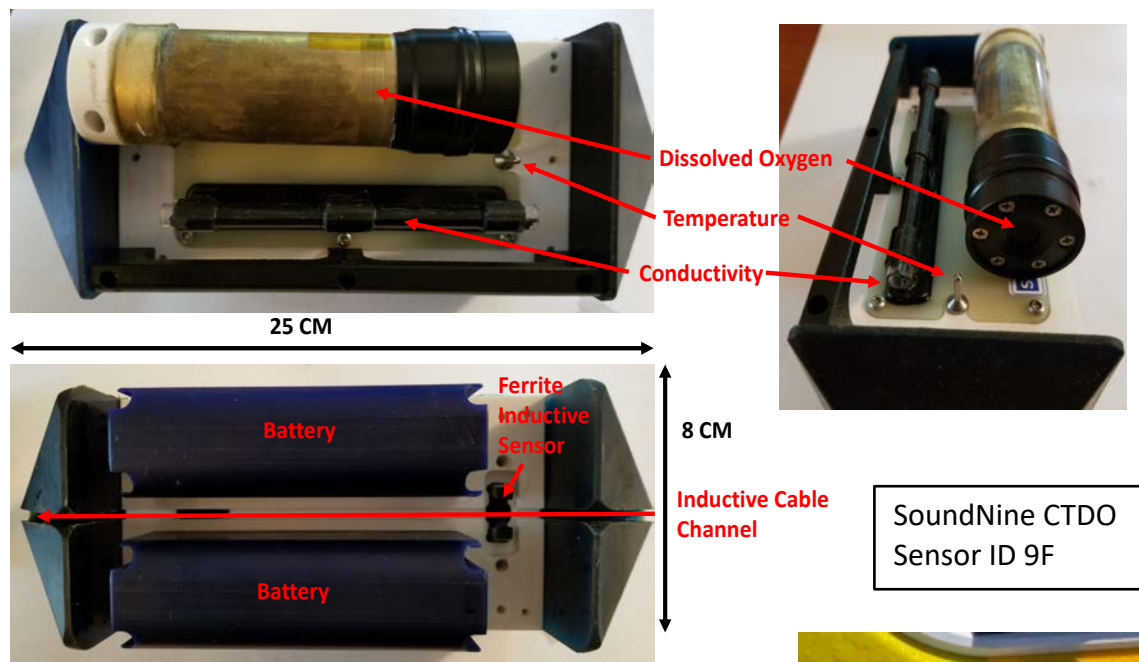
Test Deployment

Deployed 30 May 2020 1545 UTC

Recovered 19 June 2020 1645 UTC

38 33.3600 N 76 23.4870 W 22 m



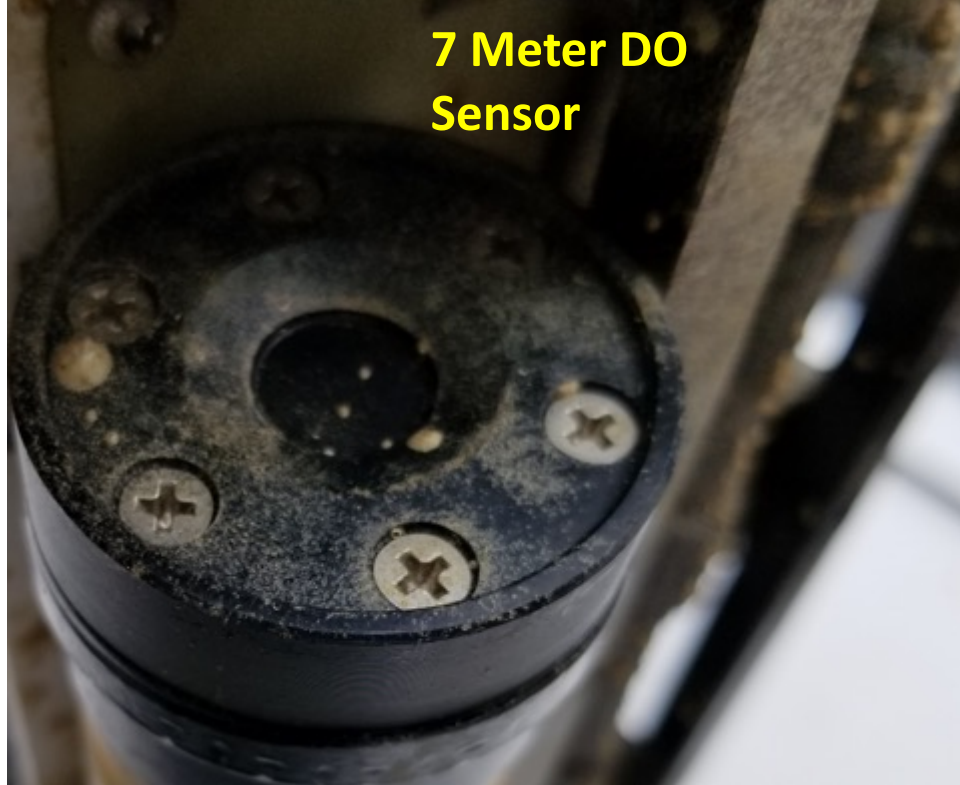


**Sound Nine CTDO
instruments and
UltiBuoy**



For now there is no cover, just
wrap of heavy copper mesh for
protection and antifouling

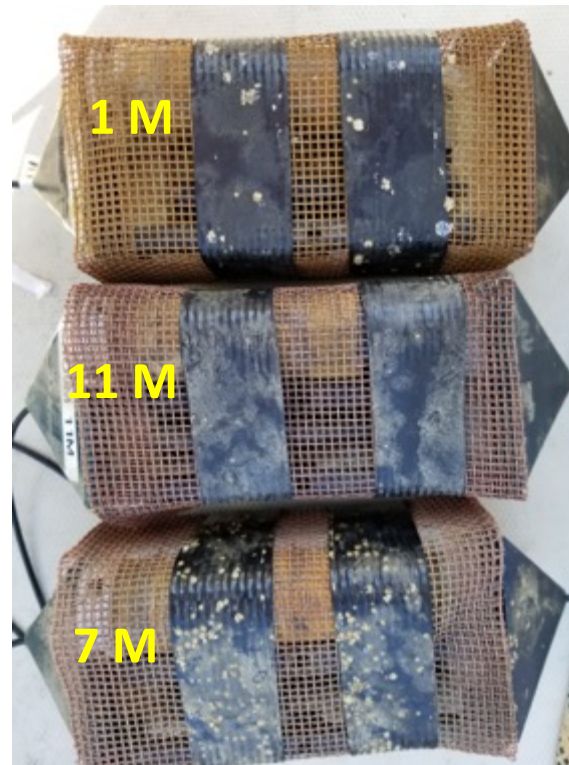
**7 Meter DO
Sensor**



1 M

11 M

7 M



Post Recovery



35 # Dor-Mor

**7 Meter S9
CTDO Sensor**



**Wire
Termination**

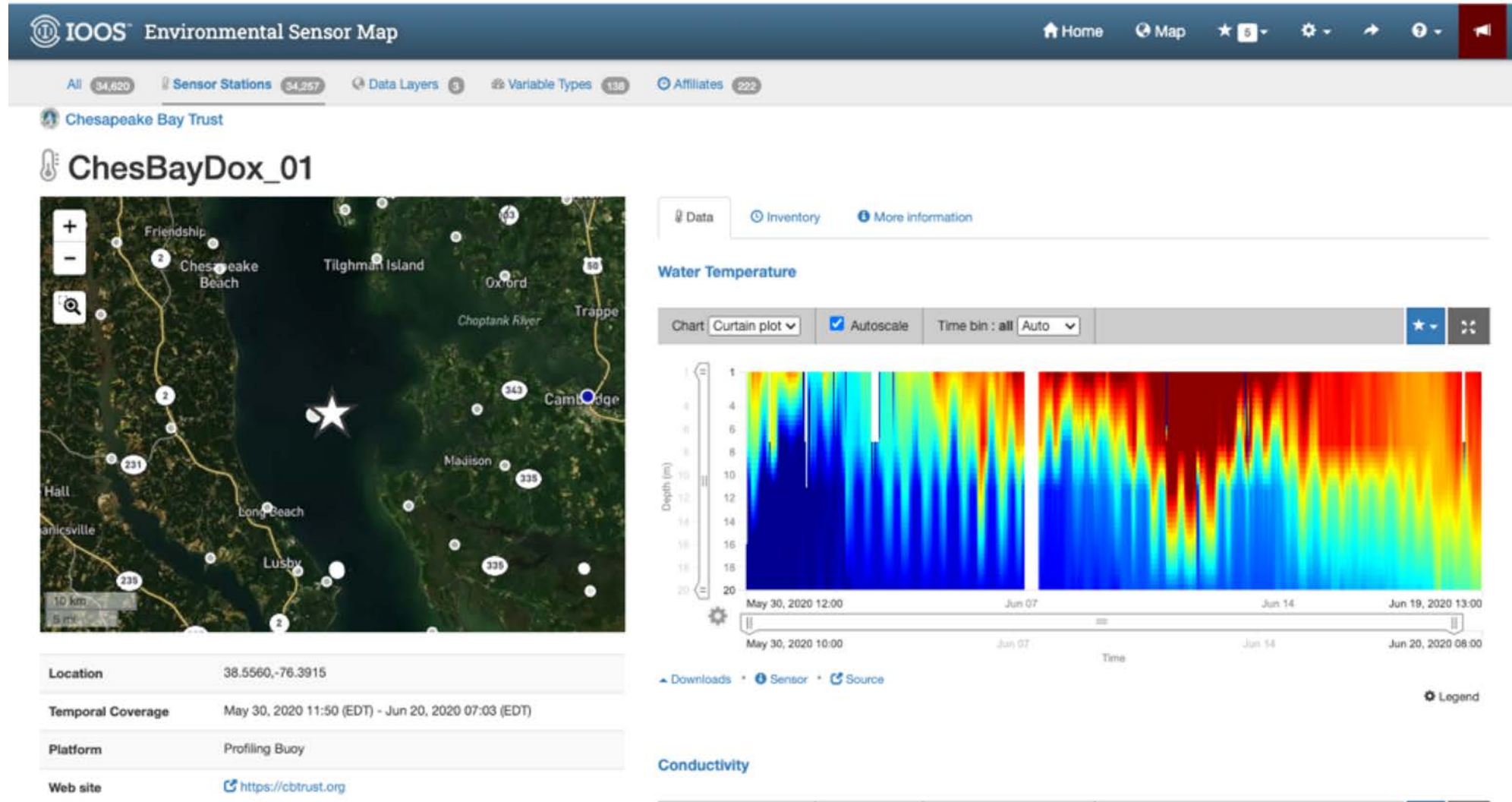
**and Inductive
Ground Plate**



Ulti-Buoy



Data are downloaded every 10 minutes by cellular communications to SoundNine Cloud Server database
Web Site <https://sensors.ioos.us/?#metadata/103543/station/data>
Part of IOOS Environmental Sensor Map
Provided by AXIOM Data Science
Allows multiple visualization and access options as well as IOOS QARTOD data QC



Things we learned:

Mooring

Fully deployable and recoverable from 19 ft center console vessel with 2 persons

Secure with 35 lb Dor-Mor Pyramid anchor and 10' 3/8 " (14 lb) chain

Dor-Mor required tug with vessel motor to break loose from mud

Mooring properly configured for location; CTD and Depth Sounder agreed at 22m /

72 ft ; instrument near termination had mean depth of 20 m

Controller maintained full battery voltage with solar charging over 3 weeks

Buoy provided adequate flotation for configuration

One cellular data disruption of 6 hr – otherwise 100%

Background inductive noise level was low -> high data returns

Pettit non-copper antifouling Bottom paint worked well

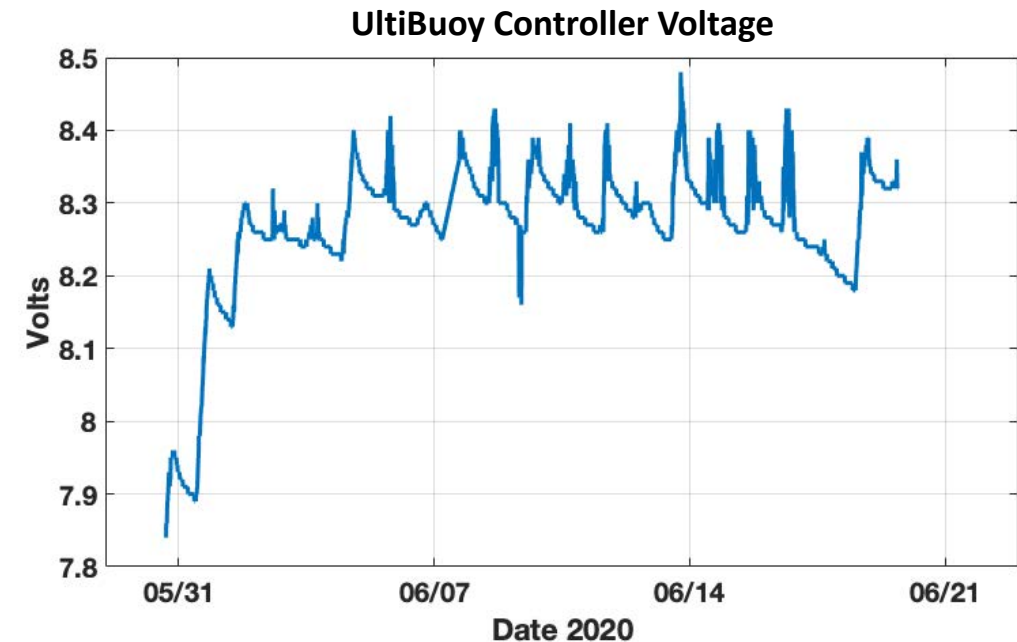
No wear on buoy-cable joint

Would deploy again with exact configuration

Consider navigation flashing light for longer term deployment
have light, need to fabricate mount



Essential Recovery Tool –
Tyler Cable Grip



Things we learned:

Sensors

Performance:

- S9 CTDO sensors performed to specifications except: the PME Microdot Oxygen sensor on S9F at 1 m failed after 1 hour. Transmitted data (including valid temperature) but invalid Oxygen concentration. Returning to PME for diagnosis.
- SBE37 9820 failed after several hours. Post – recovery examination revealed loose internal battery pack (screw not properly tightened). Works now and can be re-deployed.
- Sensor internal alkaline battery pack voltage drop over 3 weeks of 10-minute sampling was minimal (approximately 0.016 V); estimated deployment duration at this rate is >10 years.
- Sensors provide tilt and acceleration data not presently used

Fouling:

- Copper mesh reduced fouling and kept organisms out but does not protect from larval barnacle ingress and subsequent attachment to instrument surfaces. Will need to cover surfaces with copper tape.
- Returned 9F to Soundnine to examine interior of conductivity sensor and perform post-calibration.
- Barnacle fouling at 1m and 7m only, not deeper (due to more prevalent hypoxia, less light)
- Screw holes will be added in instrument body to secure copper mesh.
- Some growth on Oxygen sensor face; will add copper covers as on PME MiniDOTs.

Things we learned:

Data return / management / access

SoundNine Inductive modem

- Low inductive noise on wire and message checksum provided minimal logged data errors
- SBE37 Measure once / broadcast twice improved returns (no checksum)
- Collecting data on system noise

SoundNine UltiBuoy controller

- Provides programmable modem controller, bidirectional cellular data service, and GPS position
- Logs data as backup to real-time transmission

SoundNine S9VIS data access Software

- Parses incoming data strings and stores in SQL (MariaDB open source SQL)
- S9VIS is Java module (runs on Mac!) to access database, make plots, and download database.

AXIOM Web Viewer

- Axiom Data Services is used by US IOOS and Regional Alliances to collect and present data
- Pulls regularly from S9 SQL server, provides multiple visualization and access capabilities
- Adds metadata, places in IOOS catalog, and provides QARTOD Quality Control checks

Next Steps:

Minor upgrades to buoy and instruments

- New batteries in SBE 37s
- Diagnosis on failed 9F MicroDOT Oxygen sensor
- Receive TWO more S9 CTDO sensors
- Add antifouling to sensors (copper tape on surfaces, better copper mesh attachment)

Make sure all data manipulations programmed in S9 database to covert raw sensor data to engineering values (particularly Pressure, Conductivity, and Salinity)

Minor fixes to database variable names and units

Check all metadata and links on IOOS Sensor Page

Next deployment to run through September

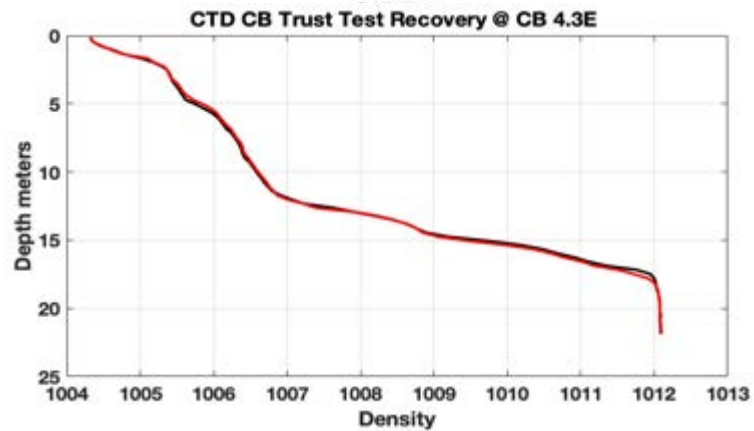
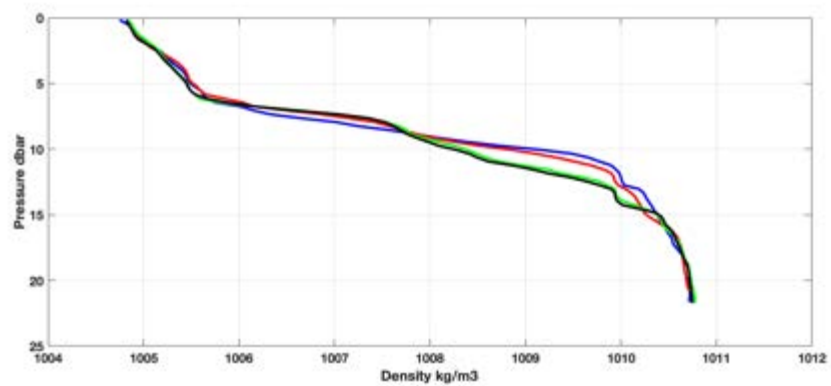
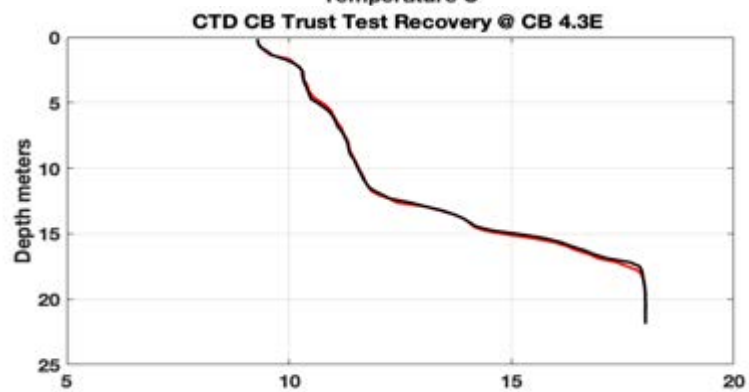
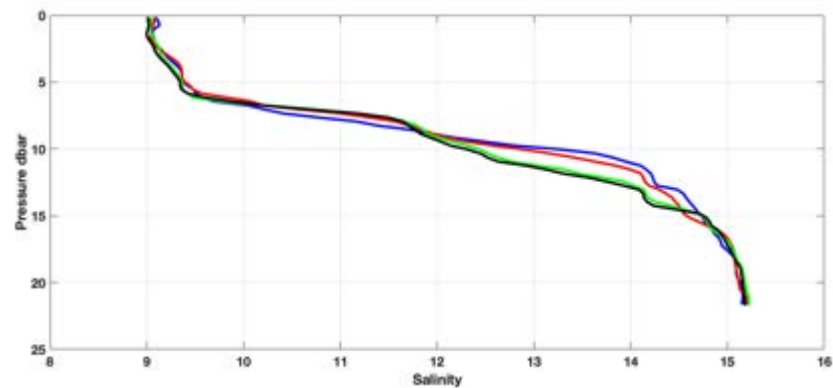
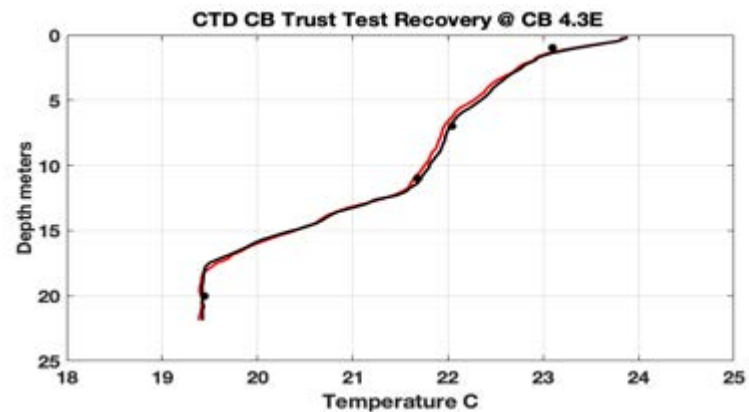
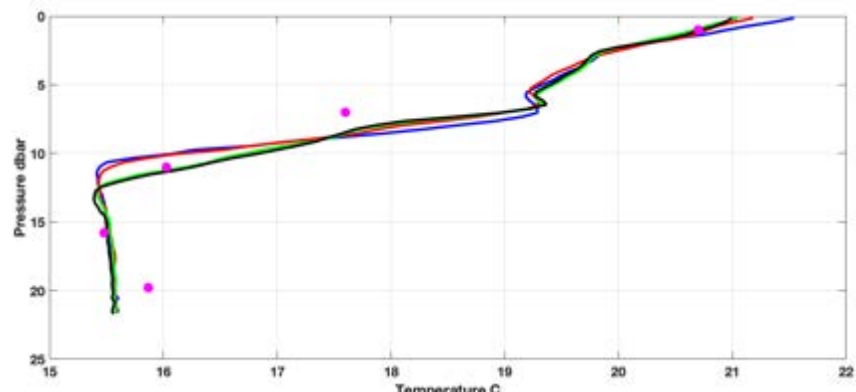
Proposed Sensor Depths [1 7 11 14 17 20] m

Contact VIMS for comparison model values

Some CTD plots from deployment / Recovery

Beginning 30 May 2020

End 19 June 2020

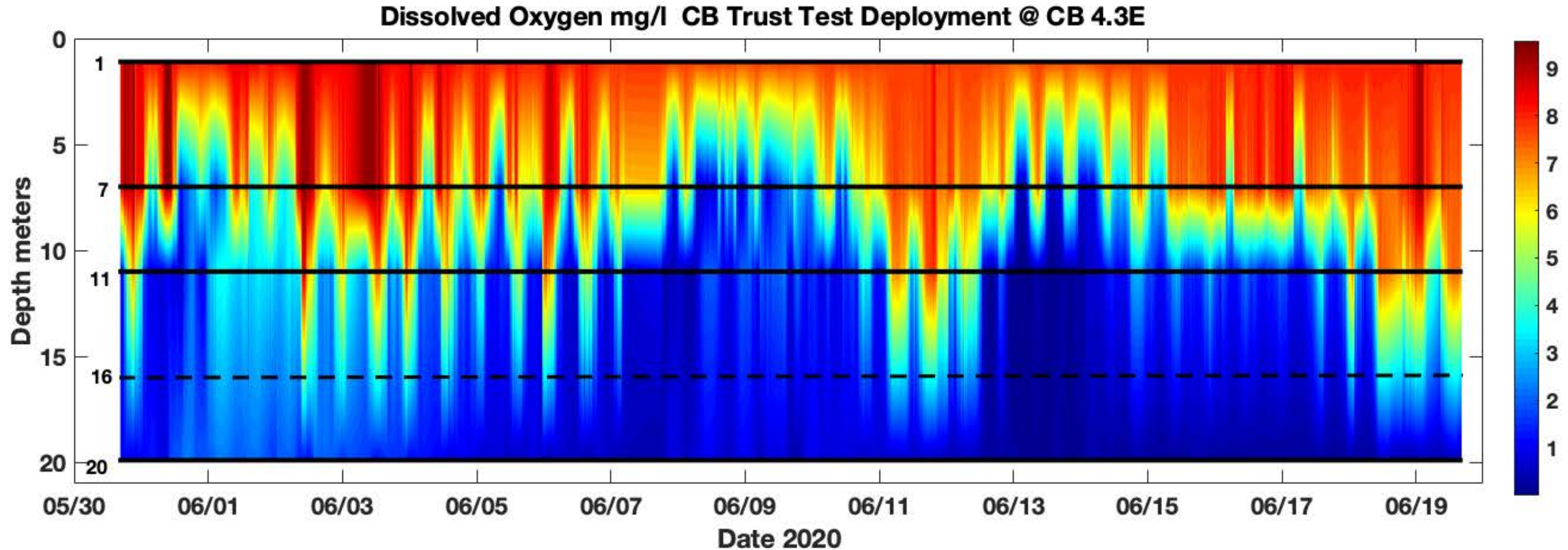
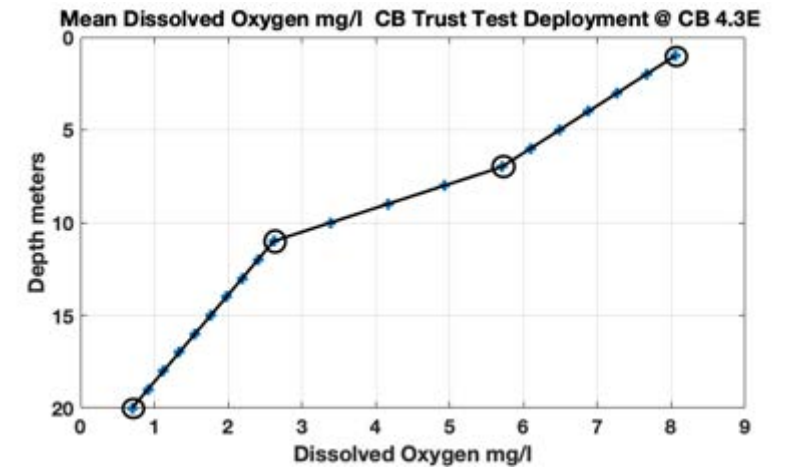


Some plots from deployment; see website for others

Missing data at 1m filled in with greater value of
<100 % saturation OR measured value at 7 m>

16 m data missing

Strong semidiurnal tidal signal often mixes surface DO to at
least below 11m sensor. Need to correlate with wind from
CBIBS Gooses Reef to explain variability in mixing depth.



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