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OOI Sensor Servicing, Tech Refresh, and Future Sensors

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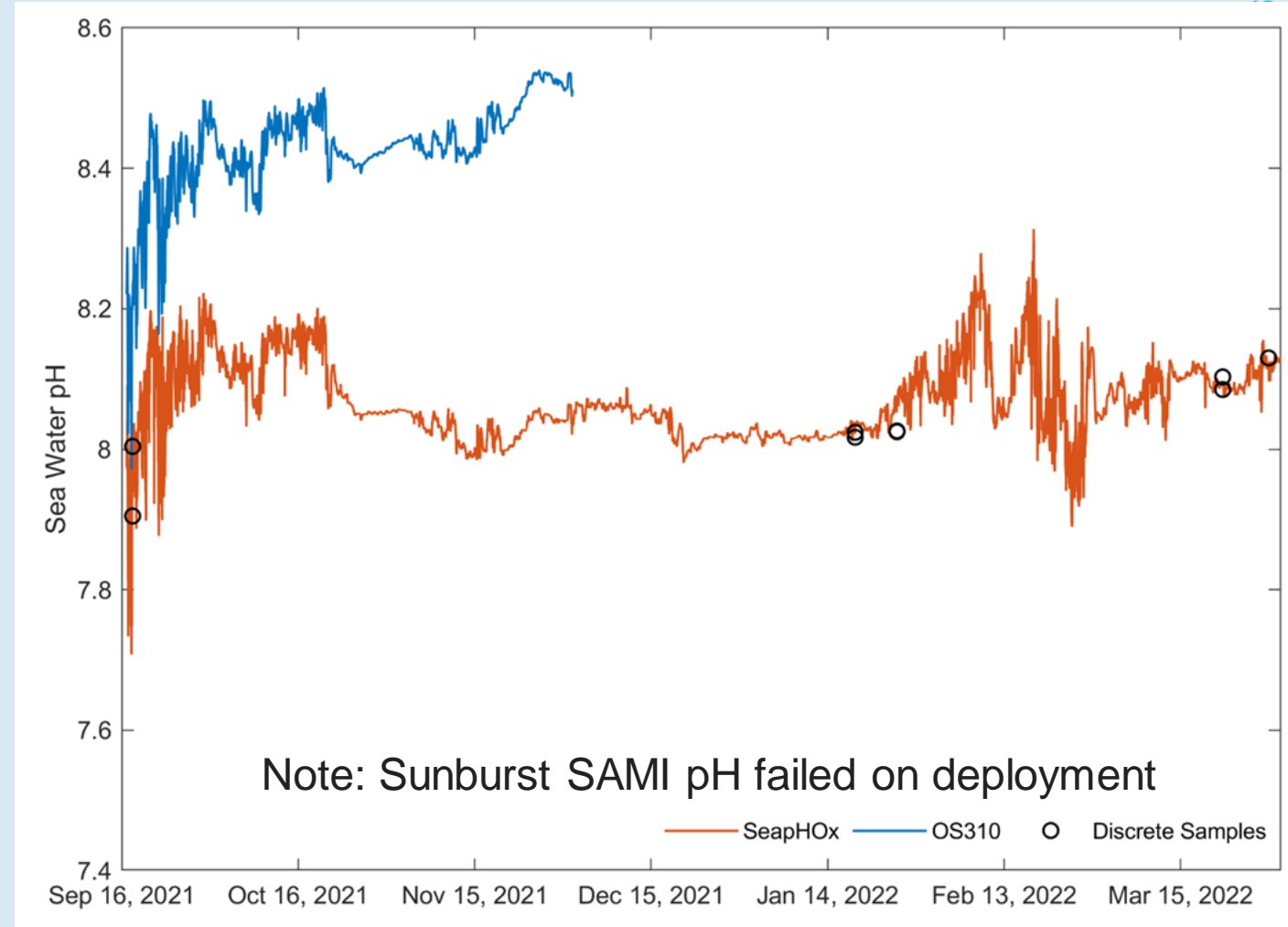
Outline

- Internally-driven refresh is driven by performance, historical servicing issues, etc. as quantified in the Instrument Tech Refresh evaluation matrix
 - pH testing
 - Other candidates
- Internally-driven instrument mounting and sampling changes driven by best practices
 - Low DO foil
 - Glider DO mount testing
- Vendor-driven refresh is driven by instrument obsolescence or improvements
 - Kongsberg EK60 (ZPLSC-B) is obsolete. RCA deployed EK80 during VISIONS 2023
 - Teledyne RDI custom 5-beam (VADCP) is obsolete. RCA completed tech refresh selection, procurement
 - Ocean Sonics icListen HF (HYDBB) transducer element upgrade test
 - Sea-Bird 26plus (PRESF) is obsolete
 - Teledyne RDI has a new WorkHorse II model to replace WorkHorse 75 and 300 kHz models (ADCPS- and ADCPT-). 150 kHz is now obsolete.
 - Sea-Bird is implementing new LED lamps for the AC-S (OPTAA) instrument
 - Nortek is moving to a next generation Aquadopp (ADCPU, VELPT)
 - Teledyne RDI Explorer DVL (ADCPA-M) obsolete – early stages of considering replacement, swapping existing DVL bays between gliders for now
- Recent vendor servicing issues



PHSEN Tech Refresh Update

- September 2020: RFI Issued
 - 3 vendors responded: Sunburst, **Sea-Bird**, Idronaut
- October 2020: RFI Evaluation meeting
- November/December 2020: Follow-up questions with vendors
- January 2020: Decided on test deployment, contacted vendors for loaners
- May 2021: Loaner instruments received and evaluated in the lab
- Oct 2021-Apr 2022: Test deployment on EA Oregon Shelf Surface Mooring
- Sea-Bird SeapHOx found to be the best instruments in terms of useability, robustness, and data quality



PHSEN Tech Refresh Update, cont.

- October 2022: SeapHOx production put on hold; Honeywell stopped production of ISFET and DuraFET components
 - PHSEN Tech Refresh put on hold
- April 2023: OSU received the ANB Sensors OC300 solid-state pH sensor
 - 3 driver and 5 interface updates since receipt
 - Interface update failed, requiring return to vendor
 - Deployed on CE02SHSM for Fall 2023, but failed immediately upon deployment. Suspect faulty transducer.
- August 2023: Sea-Bird restarted SeapHOx production
 - Honeywell restarted production of both the ISFET and DuraFET
 - Sea-Bird obtained and conducted validation tests on newly produced components
- September 2023: OSU and WHOI procured SeapHOx instruments for test deployments at the Coastal Endurance and Global Irminger Sea Arrays in 2024



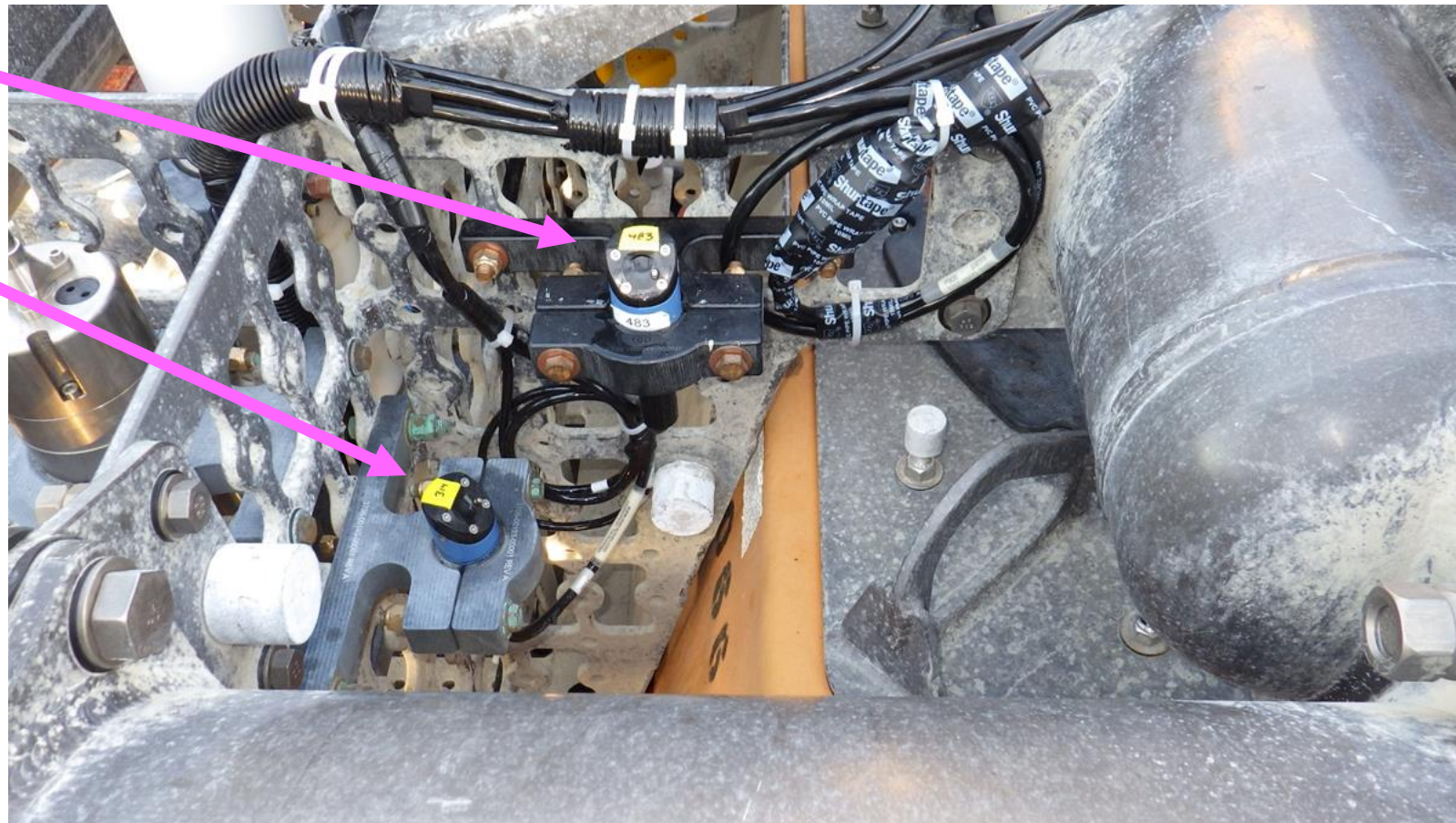
Upcoming Sensor Tech Refresh

- PCO2W - Next in priority on the Instrument Tech Refresh evaluation matrix
- PARAD - Issues with servicing Biospherical PARADK
- DOFST - Due to performance and servicing issues, CGSN/EA talking to McLane about Aanderaa optode (DOSTA) integration for coastal WFP as replacement for SBE-43 (DOFSTK)



Low DO DOSTA side by side test

- Slower response, higher accuracy foil
- Standard OOI DOSTA foil
- Deployed on Washington offshore MFN (542 m depth), fall 2023



Glider-related technical refresh

- Improved glider DO mount for in-situ air calibration/validation, initially on Global Irminger at suggestion of Hilary Palevsky
- Glider DO mount – testing new mounts for use with G3 and G2 radome fin gliders
- CGSN Worked through numerical modeling and several potential designs
- EA constructed and tested several prototypes in spring, summer and fall 2023
- Analyzing and reporting out at Ocean Sciences 2024



Vendor Tech Refresh

- Kongsberg EK60 (ZPLSC-B) is obsolete. RCA deployed EK80 during VISIONS 2023
- Teledyne RDI custom 5-beam (VADCP) is obsolete. RCA completed tech refresh selection, procurement in 2023
- Ocean Sonics icListen HF (HYDBB) transducer element upgrade evaluation test
- Sea-Bird 26plus (PRESF) is obsolete
- Teledyne RDI has a new WorkHorse II model to replace replace WorkHorse 75 and 300 kHz models (ADCPS- and ADCPT-). 150 kHz is now obsolete.
 - Includes a new board stack and new MCBH connector
- Sea-Bird is implementing new LED lamps for the AC-S (OPTAA) instrument
 - Bad calibration coefficients for some LED lamps noted in September 2023
- Nortek is moving to a next generation Aquadop (ADCPU, VELPT)
 - Meeting with Nortek October 16th to understand upgrades and timeframe
- Teledyne RDI Explorer DVL (ADCPA-M) Glider obsolete – early stages of considering replacement, swapping existing DVL bays between gliders for now



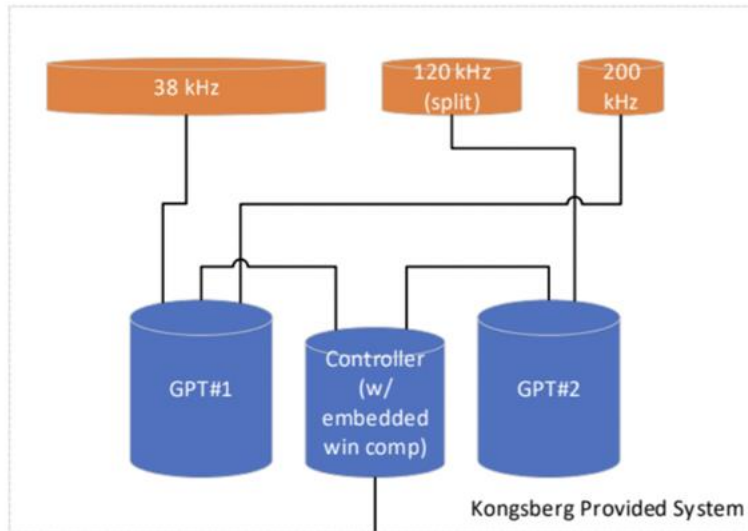


RCA Cabled Echosounder Upgrade to Simrad EK80

- Locations: Endurance Oregon Shelf Site (Seafloor; ~80 m water depth)
Endurance Oregon Offshore Site (200 m platform; ~600 m water depth)
- Reason: Kongsberg no longer supporting EK60 refurb (lack of custom board set)
- Upgrade: Both hardware and firmware/software changes
 - Transducers: 38 kHz changed from 7° to 18° (due to poor impedance)
re-use 120 kHz (split) and 200 kHz
 - Power/Coms: 1x to 2x 48 VDC; 100 MB to 2 x GB Ethernet
 - Transceivers: 2x General Purpose to 1x Wide-Band Tube
 - Ti Controller Housing: housing re-used by RCA as Ethernet switch and power pass-thru
 - Operating System: Changed from onboard embedded to Shore-based Windows Comp
- EK80 Op Modes: Traditional Discrete Frequencies (CW mode) – Community Std
Wide Frequency Bands “Broadband” Capability (FM mode) –
****New****
 - Interleave capability for CW and FM
- RCA preparing white paper on RCA EK80 operations and increased data storage needs



Obsolete - EK60

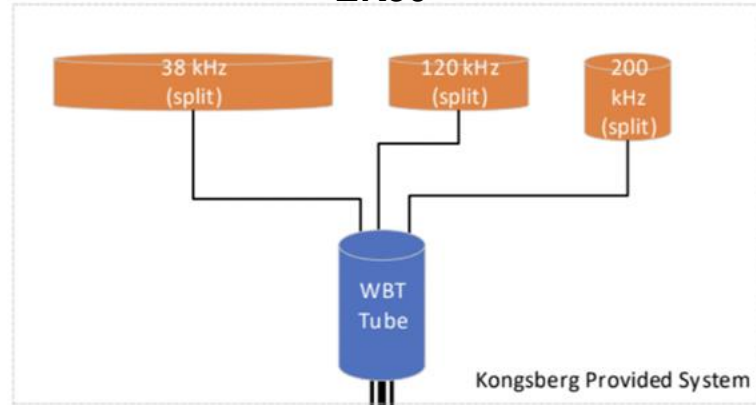


48 VDC
100 MB Ethernet



Onshore Terminal

EK80



2 x 48 VDC
2 x Gigabit Ethernet



48 VDC
Gigabit Ethernet





RCA Vertical-Beam ADCP (VADCP) Tech Refresh

- Locations: Slope Base (200 m platform; ~2600 m w.d)
Axial Base (200 m platform; ~2600 m w.d.)
- Reason: Teledyne RDI no longer supporting custom 5-beam ADCP
- Tech Refresh:
 - RFP released in December 2022
 - 2 proposals received
 - SSEB complete in March 2023
- Selection: Nortek Signature 500
- Units received by RCA from vendor, planned for deployment in summer 2024

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Signature500



Mean currents and turbulence, plus wave height, direction and ice tracking

The Signature500 ADCP is designed for flexibility. It measures current profiles at up to 8 Hz sampling frequency. It can also measure direct vertical velocity profiles, wave height and direction, and acoustic ranging to ice. The center beam also functions as a biological echosounder, enabling high-resolution measurements of biomass in the water column. All these features can be combined using Nortek's patented concurrent mode technology.



RCA Long-Term Test – Improved Broadband Hydrophone

- HYDBB Model: Ocean Sonics icListen Smart Hydrophone
6 units on Cabled Infrastructure
- Updated Model: Ocean Sonics icListen with in-house built transducer element
- Reason: Observed decrease in HYDBB sensitivity during RCA deployments
* 3rd Party Element is suspect
- 1-year side-by-side deployment of updated model with existing RCA instrument
- Vendor supplied updated model and Smart-Node (Y) connector at no-cost for easy integration
- Location: Endurance Oregon Offshore Site (Seafloor; ~600 m water depth)
- Data currently being collected/stored by RCA and CI will be collaboratively evaluated by vendor, RCA Team, and entrained SMEs



PRESF Tech Refresh

- SBE26plus is obsolete and Sea-Bird will stop servicing this instrument in the next year or two.
- WHOI requires a new shallow PRESF for the relocated Pioneer Array
- December 2022: RFI Issued
 - 2 vendors responded: RBR, AML
- April 2023: RFI Evaluation meeting
- Only the RBRquartz³ met the key science requirements
 - Uses the same technology as the SBE26plus
- New units procured for Pioneer MAB in June 2023
- OSU will phase in new PRESF units



The screenshot shows the Sea-Bird Scientific website. At the top, there is a navigation menu with links for PRODUCTS, MODEL LIST, APPLICATIONS, SUPPORT, SALES/SERVICE, BLOG, and ABOUT. A search bar is located on the right side of the header. The main content area features a breadcrumb trail: CTDs: Moored > SBE 26plus Seagauge Wave & Tide Recorder - DISCONTINUED. Below this is the product title "SBE 26plus Seagauge Wave & Tide Recorder - DISCONTINUED" in large, bold, dark blue text. A secondary navigation bar includes tabs for Overview, Downloads, Videos, and Accessories. The main text describes the SBE 26plus as a high-precision instrument for wave and tide recording, highlighting its accuracy and programmable features. To the right of the text is a "Request Info" button and a "Gallery" section with a magnifying glass icon. A large image of the SBE 26plus instrument is shown on the right side of the page.

Teledyne RDI Workhorse II

- Teledyne RDI has a new WorkHorse II model to replace the WorkHorse

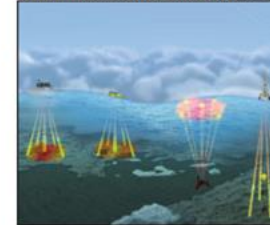
Workhorse II

300, 600, 1200 kHz direct-reading and self-contained ADCPs



The world's most trusted, reliable ADCP with the longest track record of performance

RD Instruments' Workhorse—the most sold ADCP in the world—just got better. We've enabled new features and even better performance across more applications and demanding environments.



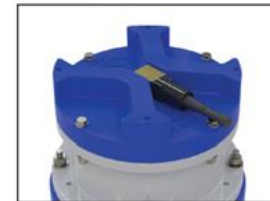
The most versatile ADCP platform

With the direct-reading Monitor, self-contained Sentinel, and vessel-mounted Mariner configurations, the Workhorse II is among the most versatile and capable ADCP platforms. Bottom tracking, directional waves, high-resolution, LADCP, and ice-tracking modes are available on any model, making any model capable of interdisciplinary use.



Better compass data mean better velocity data

We get it—when the ADCP goes over the side of the ship, you want assurance that you'll recover good data. RDI's proven MEMS heading and tilt sensors with 1° RMS heading accuracy at up to ±70 tilt, offers superior performance at the highest latitudes. Raw magnetic data can be logged for post-deployment calibration checks, and the new software makes post-deployment heading corrections a breeze.



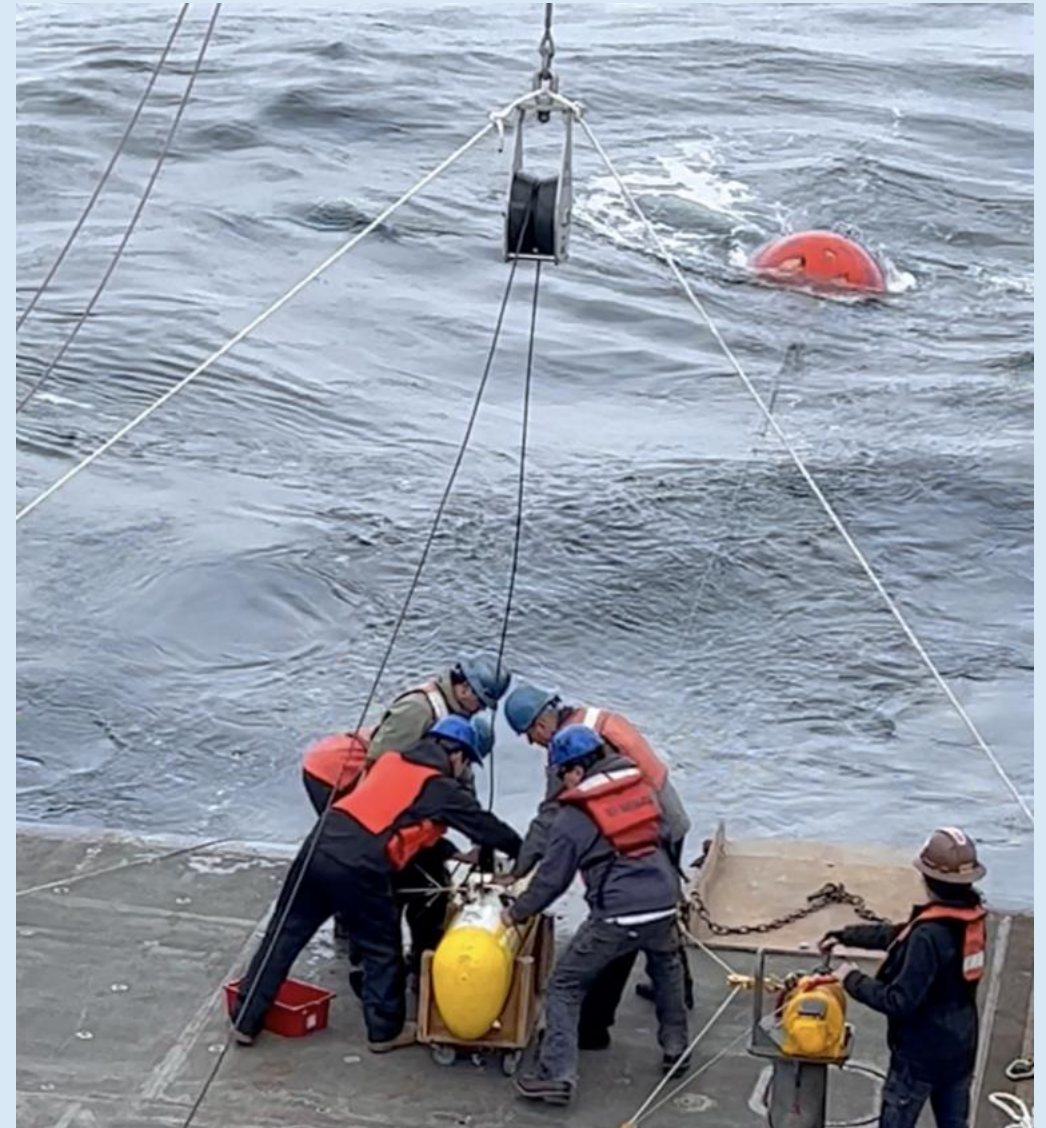
Feedback heard

Informed by experienced users, Workhorse II sports some simple yet significant features: Highly robust metal shell connector. New software. And original Workhorses can receive Workhorse II upgrades for many more years of successful deployments.



Vendor Servicing Issues

- The WET Labs facility in Philomath, OR was moved to Sea-Bird in Bellevue, WA (Sea-Bird, WETLabs, Satlantic all consolidated into Sea-Bird)
- Many vendors have had delays in servicing in PY V due to supply chain and personnel issues
 - 3-4 months turn around in some cases (Sea-Bird, Sunburst, Aanderaa)
 - Global Station Papa Array – Wire Following Profilers deployed in 2023 had FLORD instruments with older cals (Sea-Bird)



Vendor Servicing Issues, cont.

- Mitigations:
 - MIOs have been able to loan instruments to each other
 - Instruments with older calibration dates have been deployed
 - Working to send in instruments earlier if possible
 - Meet annually with vendors to talk through upcoming refurbishment schedule (next week)





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Questions?

