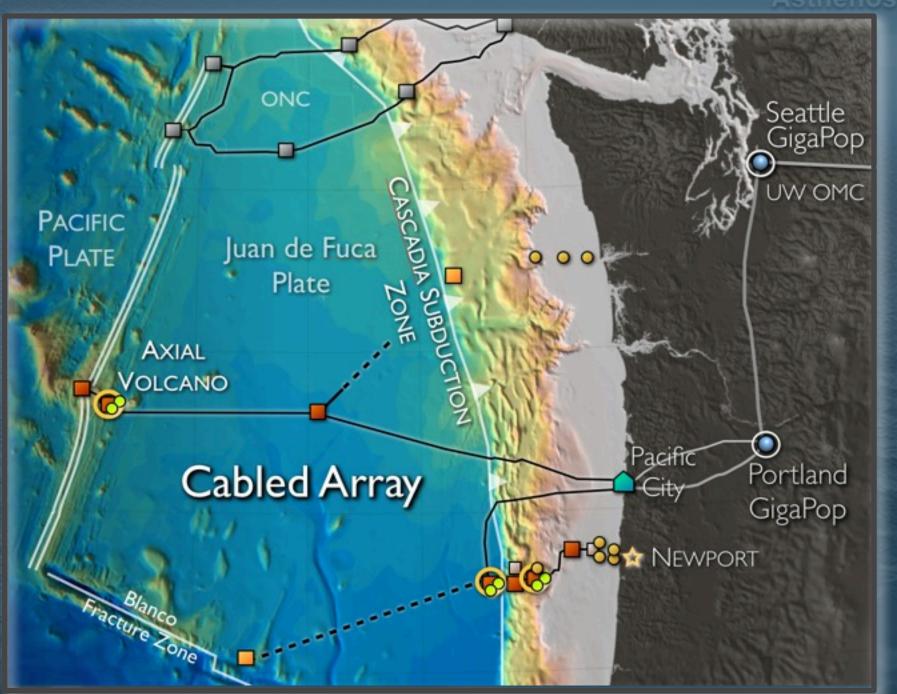
Ocean Crus

REGIONAL CABLED ARRAY OOIFB September 26, 2017





D

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VISIONS'I7 - 23 undergraduate and graduate students: UW, Western WA University, Queens College

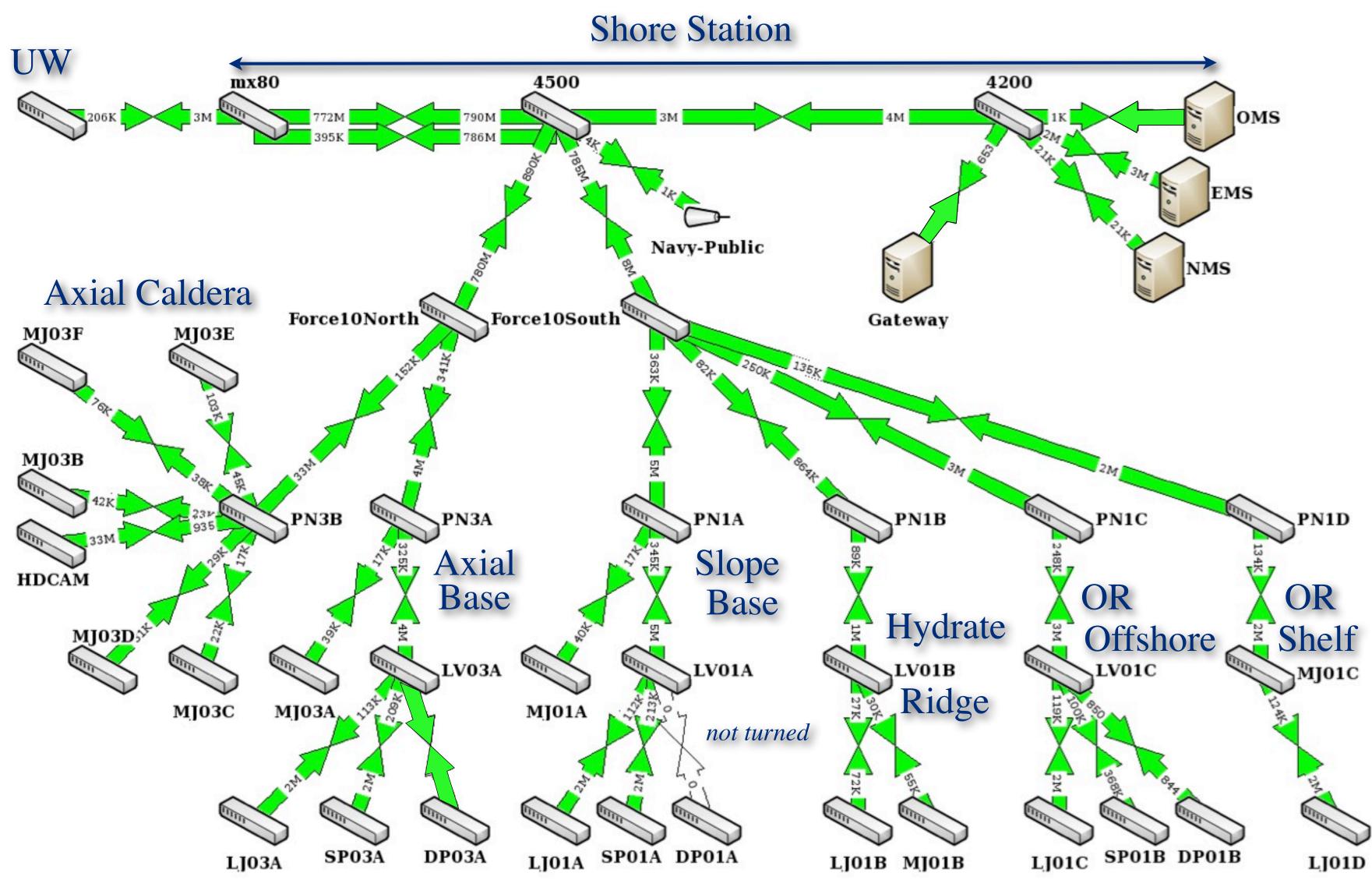
Continental Crust

Deb Kelley and UW Cabled Array Team

3rd Operations and Maintenance Cruise July 25 to August 29, September 9-11, 2017

- R/V Revelle and ROV Jason 45 dives
 - Turned 3 Junction Boxes $\overline{\mathbf{b}}$
 - Shallow Profiler Platform Assemblies, 3 Shallow Profiler Science Pods
 - 2 Benthic Experiment Platforms D
 - 116 instruments turned-installed D
 - I Deep Profiler mooring installed, I turned, I uplugged (Slope Base)

REGIONAL CABLED ARRAY: INFRASTRUCTURE OPERATIONAL STATUS



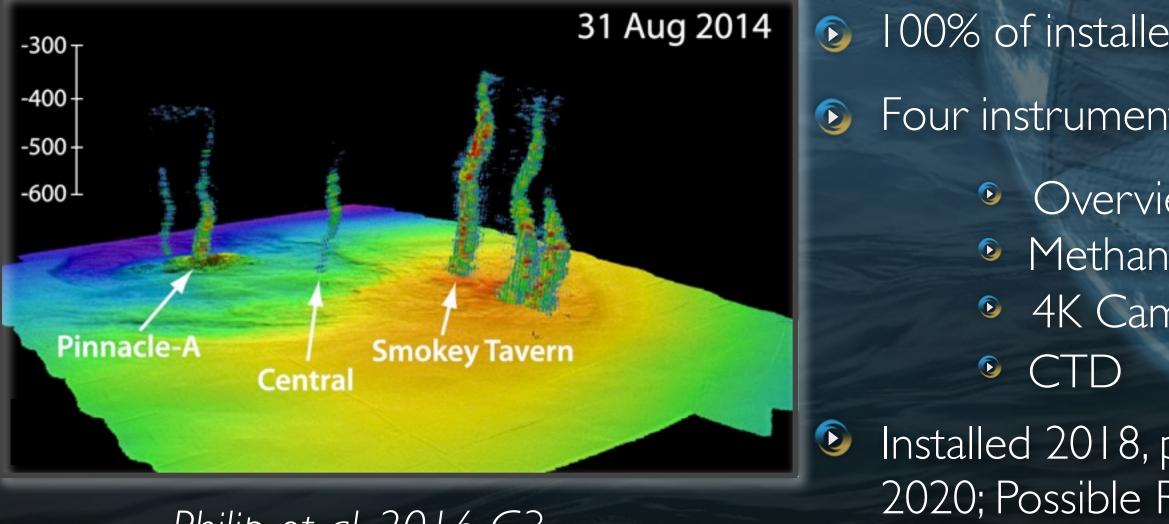
All Primary Nodes and 18 Junction Boxes Operational

Ocean Crust

REGIONAL CABLED ARRAY: HYDRATE RIDGE

REGIONAL CABLED ARRAY INFRASTRUCTURE STATUS 2014 - 2017

Version 1.0 D.S. Kelley 6/12/2017		Ope	ration	al		Partia	al Fun	ctiona	ality		Failed		Т	roubl	le Sho	oting			Offlir	ne		Reco	vered	Т	Turn	ed		Not	deplo	oyed							1
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Cruise dates								0			7/4 - 8	3/7											7/8 -	8/15											7/25	- 8/29	9/9
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Primary Node PN1B																																					
Junction Box LV01B			2																				Т														
Junction Box LJ01B			1																																		
Junction Box MJ01B			-																				т														
Short Period Seismometer - OBSSPA101					T.																																
Short Period Seismometer - OBSSPA102																																					
Short Period Seismometer - OBSSPA103																																					
Broadband Seismometer - OBSBBA101																																					
Low Frequency Hydrophone - HYDLFA104																													8								
Current Meter + Temperature - VEL3DB104				1																			T1												т		
Pressure Sensor - PRESTB102																																			т		
ADCP 75 kHz - ADCPSK101																							т												т		
Digital Still Camera Lights/Pan/Tilt - CAMDSB103																							т												т		
Mass Spectrometer - MASSPA101										-													Т												Т		
Osmotic Fluid Sampler - OSMOA101 (uncabled)																							T1							1	0				Т		
Benthic Flow Meter - Mosquito - FLOBNM101 (uncabled)											1												T1												Т		
Benthic Flow Meter - CAT - FLOBNC101 (uncabled)										1													T1		i (Ū.						Т	1	



Philip et al, 2016 G3

I 00% of installed infrastructure operational

Core

Four instruments funded by Germany-MARUM will be added next year

Overview Sonar - 360° scans covering ~ entire SHR active sites
Methane Flux Quantification Sonar 360°C, ~ 10-50 m (Einsteins' Grotto
4K Camera - Stills and buffered 4K video

Installed 2018, potential with permission for refreshed sonar 2019 to remain until 2020; Possible R/V Sonne Field program 2020



REGIONAL CABLED ARRAY: OR OFFSHORE

REGIONAL CABLED ARRAY INFRASTRUCTURE STATUS 2014 - 2017

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Primary Node PN1C																																						Т	
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Low Power Junction Box LJ01C																																							
Shallow Profiler Mooring Platform Interface PC01B												Т												Т														Т	
Shallow Profiler Mooring Winched Profiler SF01B	Cannan											Т												r1														Т	
Deep Profiler DP01B																											2	2										Т	
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Digital Still Camera Lights/Pan/Tilt - CAMDSB106	3							1																														Т	
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Broadband Hydrophone - HYDBBA105							-					Т												т														Т	
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Current Meter + Temperature - VEL3DA107	- 2											т												т														т	
pH - PHSEND107												т						1						т														т	
Optical Attenuation - OPTAAC104												т			1			10000						т		2												т	
Partial Pressure Carbon Dioxide - PCO2WB104												т												Т														т	
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pH - PHSENA106	9 <u>6</u>											T												Т													Т		
CTD-CTDPFA109												т												т													т		
Partial Pressure Carbon Dioxide - PCO2WB105												т												т													т		
Dissolved Oxygen - DOSTAD109												т												т													т		
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Nitrate - NUTNRA102	1			-								т												т													Т		
pH - PHSENA108				1								т												2													Т		
Optical Attenuation - OPTAAD105												т				1								т	1												т		
Spectral Irradiance - SPIKRA102												т												т													т		
Photosynthetic Active Radiation - PARADA102	1											т												т													т		
Partial Pressure Carbon Dioxide - PCO2WA102	1											т												т													т		
Current Meter + Temperature - VELPTD106											1	т												т													т		
Fluormeter 3 wavelength - FLORTD104												т												т													т		
				-						Deep	Profile	r Moorin	g DP	01B																									
CTD-CTDPFV105											Т														T1													Т	
Dissolved Oxygen - DOSTAD105											Т														т													Т	
Current Meter + Temperature - VEL3DA105		1									Т														т													Т	
Colored Dissolved Organic Matter Fluorometer - FLCDRA103	1	100									Т					-									т													Т	
Chlorphyll Fluorometer/Backscatter - FLNTUA103											Т														т													Т	
	_																_		-																				

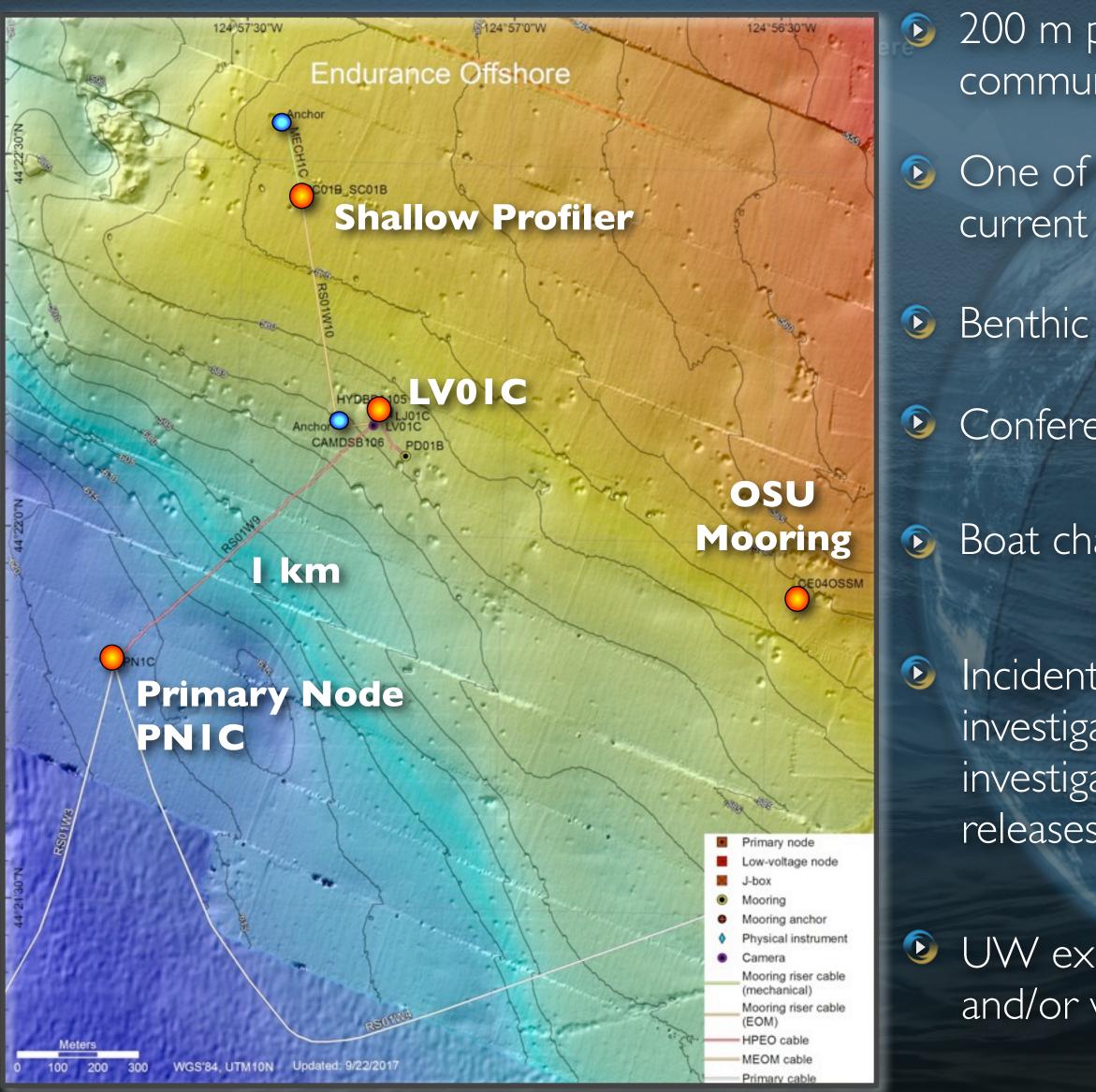
Shallow Profiler was trawled by a fishing boat September 16,0515 PDST taking 15 instruments offline

Charging unit on Deep Profiler failed taking 5 instruments (were working) off line



Ocean Crust

REGIONAL CABLED ARRAY: SHALLOW PROFILER TRAWL



Continental Crust

200 m platform was pulled down to 400 m, then rose to 100 m before communications lost, secondary node experience 5° pitch

One of two cables may have parted and/or anchors repositioned current state and position of platform and science pod unknown

Benthic Experiment Platform and camera continue to operate

Conference call 1000 PDST (UW, OFCC, COL); Hazard notification to USCG

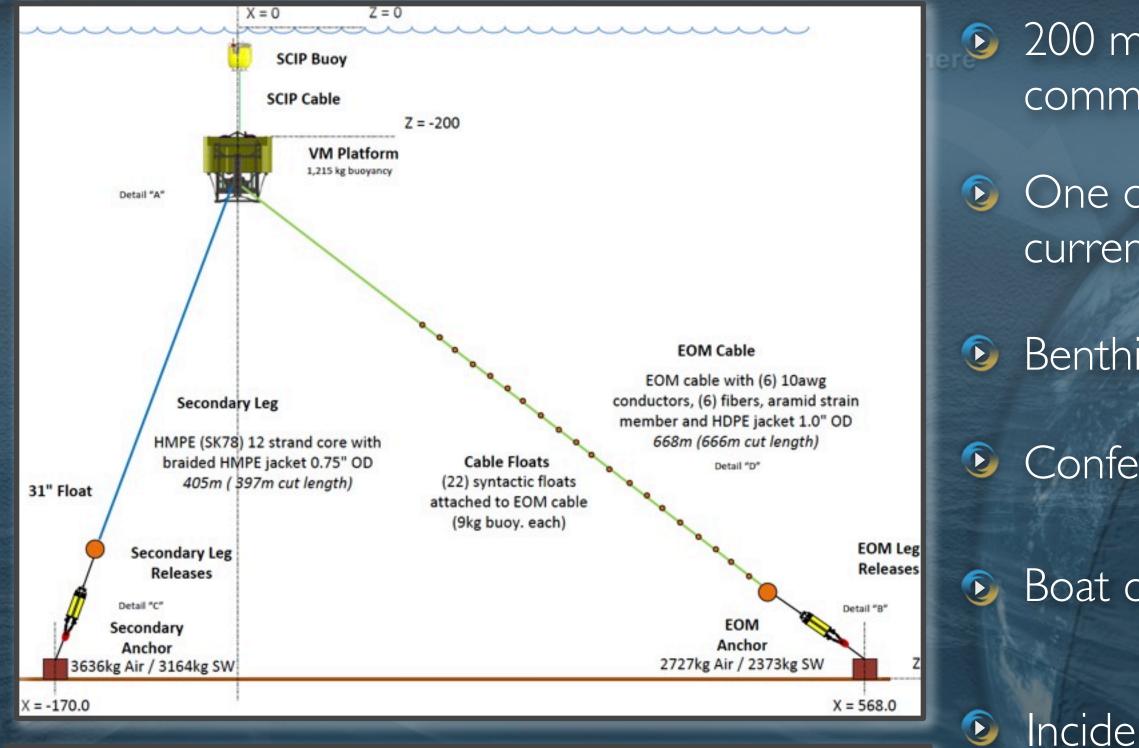
Boat chartered to survey on 9/17 to see if surface expression - negative

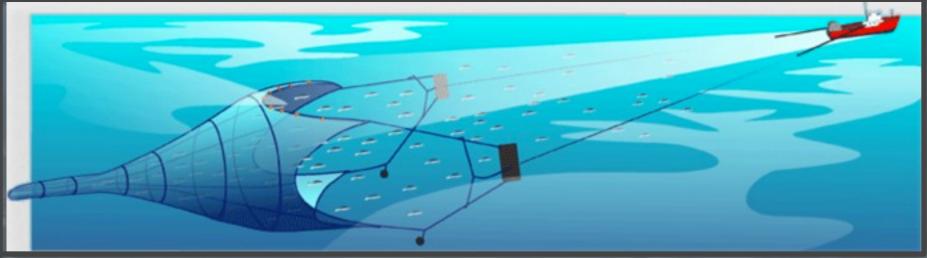
Incident boat identified (member of OFCC), fisherman lost his gear, investigated by OFCC; UW working with OSU to conduct multibeam survey, investigating local industry ROV-Ship to conduct survey, will range on acoustic releases on the Cabled Inspection cruise onboard the R/V Sentinel

UW exploring Automatic Identification System (AIS) notification on mooring and/or virtual - 2 km radius

Ocean_ Crust

REGIONAL CABLED ARRAY: SHALLOW PROFILER TRAWL





Incident boat identified (member of OFCC), fisherman lost his gear, investigated by OFCC; UW working with OSU to conduct multibeam survey, investigating local industry ROV-Ship to conduct survey, will range on acoustic releases on the Cabled Inspection cruise onboard the R/V Sentinel

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Benthic Experiment Platform and camera continue to operate

Conference call 1000 PDST (UW, OFCC, COL); Hazard notification to USCG

Boat chartered to survey on 9/17 to see if surface expression - negative

Ocean Crus

TE SubCom

Global Sentinel - 477 ft in length & ROV - ST-200

Sites determined in coordination with Oregon Fisherman Cable Committee (OFCC)

Inspection of 16 sites on 7 cable segments, total lenght 36.33 km with up to 3.6 km reburial

Total duration up to 9 days D

D

D

Loaded with Hawaiki cable for installation from Pacific City (OOI Cable D Station) linking Hawaii, Australia and New Zealand. Pacific City Shore Station now shared (CoastCom - WAVE)

REGIONAL CABLED ARRAY: CABLE INSPECTION

Oregon Department of State Lands Special Use Lease - permit holder shall conduct an ROV burial verification inspection nor more than 5

years following installation of the Cabled Array Primary Infrastructure

2 UW and 2 OFCC representatives onboard

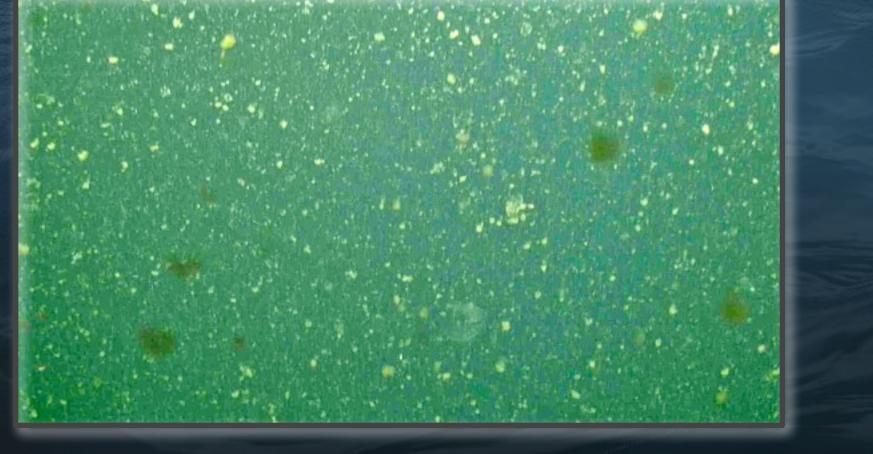
Solid

Continental Crust

REGIONAL CABLED ARRAY: OR SHELF

REGIONAL CABLED ARRAY INFRASTRUCTURE STATUS 2014 - 2017

Version 1.0 D.S. Kelley 6/12/2017		Oper	ation	al		Partia	al Fun	ctiona	ality		Failed		Т	roub	le Sho	oting		(Offlin	ne		Reco	vere	d T	Turn	ed		Not	deplo	oyed	Č.	1	ĺ,				
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Cruise dates											7/4 - 8	3/7											7/8	- 8/15											7/25	5 - 8/2	9 9/9
										Or	egon	She	lf - I	PN1	D																						
Primary Node PN1D (18 km run to MJ01C)	(Common				hannan																																Т
Medium Power Junction Box - MJ01C																																					т
Low Power Junction Box - LJ01D	E																																				Т
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Zooplankton - ZPLSCB2101									1		Т													T1												т	
Digital Still Camera Lights/Pan/Tilt - CAMDSB107											Т					-							Т													Т	
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CTD-CTDBPN106											Т									1	4		Т	2													Т
Dissolved Oxygen - DOSTAD106											т									1	4		T2														Т
Broadband Hydrophone - HYDBBA106											т												Т														Т
300 kHz Acoustic Doppler Current Profiler - ADCPTB104											т												т														Т
Current Meter + Temperature - VEL3DC108											т												т														Т
pH - PHSEND103											т												т														т
Optical Attenuation - OPTAAD106											Т						1						Т														Т
Partial Pressure Carbon Dioxide - PCO2WB103					Juni						Т								1				Т														Т



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- \mathbf{b}
- \bigcirc

80 m "snow" storm

Ocean Crus

100% infrastructure installed and operational

Installation delayed due to issues with Jason and very low visibility

Thanks to UW, REVELLE-SIO, Jason-WHOI, UNOLS and NSF-COL! a response cruise took place 9/9-9/10

Visibility and weather not optimal but work was complete



REGIONAL CABLED ARRAY: AXIAL BASE

REGIONAL CABLED ARRAY INFRASTRUCTURE STATUS 2014 - 2017

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Low Power Junction Box LJ03A																							Т							—								
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Low Frequency Hydrophone - HYDLFA301																																						
Pressure Sensor - PRESTA301																																						
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Conductivity-Temperature-Depth - CTDPFB301										т													т														т	
Dissolved Oxygen - DOSTAD301										т													т														т	
Optical Attenuation - OPTAAC303										т								1					Т				1										т	
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Broadband Hydrophone - HYDBBA303													т										Т														т	
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Dissolved Oxygen - DOSTAD303													Т										Т														т	
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Digital Still Camera - CAMDSC302													1										T			1										_	T	
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Spectral Irradiance - SPIKRA301											cne	CK	- -				1															2					+	
Photosynthetic Active Radiation - PARADA301													Ť										- +															
Partial Pressure Carbon Dioxide - PCO2WA301													T										T						1								T	
Current Meter + Temperature - VELPTD302													T										Ť														T	
Fluormeter 3 wavelength - FLORTD301													T										Ť														Ť	
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Dissolved Oxygen - DOSTAD304																																					T	
Current Meter + Temperature - VEL3DA303																																					т	
Optical Attenuation - OPTAAC302	1																																				т	
Colored Dissolved Organic Matter Fluorometer - FLCDRA302																																					т	
Chlorophyll Fluorometer/Backscatter - FLNTUA302																																					т	

○ 100% installed and operational including 34 sensors, and the Deep Profiler (2 trips/day since installation).



Ocean Crust

REGIONAL CABLED ARRAY: AXIAL SUMMIT

REGIONAL CABLED ARRAY INFRASTRUCTURE STATUS 2014 - 2017

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Cruise dates											7/4	- 8/7											7/8 -	8/15													29 9/9
					-			-		A			mit -	PN3B					_							-			_							/-	
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Junction Box MJ03B																								Т													
Junction Box MJ03C																																					
Junction Box MJ03D																								т													
Junction Box MJ03E																																					
Junction Box MJ03F																																					
Thermistor Array -TMPSFA301	3 10 10			5																																	
Short Period Seismometer - OBSSPA301																																					
Short Period Seismometer - OBSSPA302																																					
Short Period Seismometer - OBSSPA303																																					
Short Period Seismometer - OBSSPA304																																					
Short Period Seismometer - OBSSPA305																																					
Bottom Pressure-Tilt - BOTPTA301				_																																	
Bottom Pressure-Tilt - BOTPTA302																																					
Bottom Pressure-Tilt - BOTPTA303																																					
Bottom Pressure-Tilt - BOTPTA304																													_								
CTD - CTDFB304																NS	SF Cha	dwick Add	dition	2017																	
Broadband Seismometer - OBSBBA301																																					
Broadband Seismometer - OBSBBA302																																					
Low Frequency Hydrophone - HYDLFA304																																					
Low Frequency Hydrophone - HYDLFA305																																					
HD Camera - CAMHDA301																								Т											1	Т	
Digital Still Camera - CAMDSB303												т												т												т	
Current Meter + Temperature - VELSDB304																								т												т	
Mass Spectrometer - MASSPA301												T1												т												т	
Temp-H2S-pH - TRSPHA301												1												2												Т	
Temp-Resistivity - TRHPHA301					1							т												т												т	
3D Thermistor Array - TEMPSFA301																																				т	
Remote Access Fluid Sampler - RASFLA-301												т												т												т	
DNA Sampler - PPSDNA301												т												т												т	
OSMO Fluid Sampler (uncabled)												Т												T1												T1	

● 100% installed and operational (25 sensors)

Two NSF-funded sensors installed (Chadwick): Bottom pressure tilt and CTD -ASHES

• Chadwick will ask that they become Core



Axial Caldera 24 instruments

Bottom Pressure -Tilt

Low Frequency Hydrophone

Broadband Seismometer

Central

Caldera

MJ03B

ASHES

250m

128/ m

Short-period Seismometer

3-D Thermistor Array

Osmotic Fluid Sampler

Bottom Pressure Tilt Current Meter

HD Video Camera & Lights

Short-period Seismometer



Bathymetry: MBARI AUV Data from D. Caress and D. Clague EM302 Multi-beam from University of Washington 10m contour lines

Fluid - Microbial DNA Samplers Mass Spectrometer Digital Still Camera and Lights **Temperature-Resistivity** pH - H2S - Temperature

MJ03F

-2700

Short-period Seismometer

Broadband Seismometer

Low Frequency Hydrophone

Bottom Pressure - Tilt

Eastern

Caldera

PN3B

Short-period Seismometer

*

MJ03E

MJ03C

INTERNATIONAL M|03D DISTRICT

Current Meter - 3D Single Point

Short-period Seismometer

Bottom Pressure -Tilt

NSF-Funded Additions Intalled in 2017

CABLE TYPES

RSN Primary

Primary Node

Medium Power Electro-Optical

Electrical Extension

NODES and J-BOXES



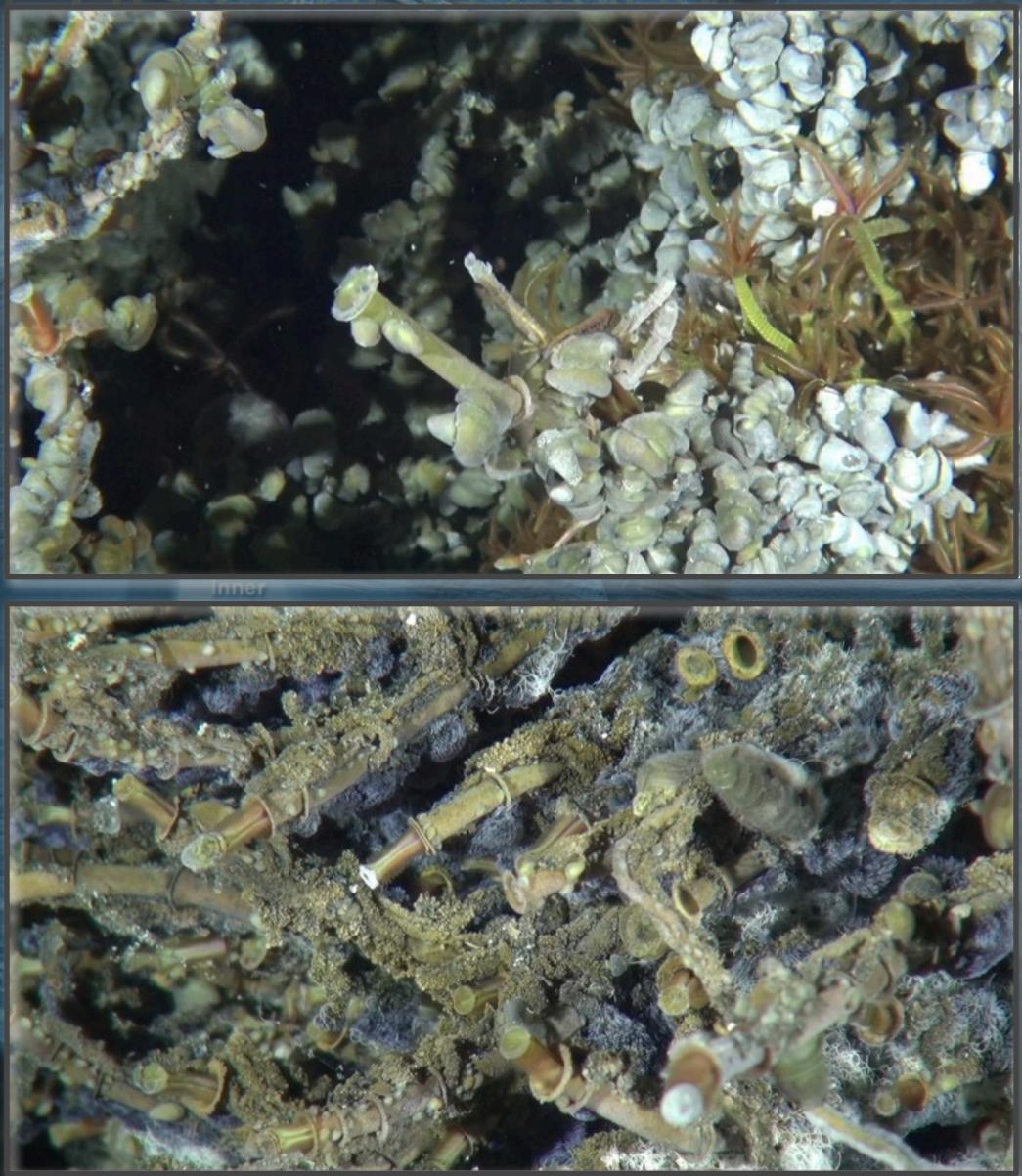
Ocean Crust

REGIONAL CABLED ARRAY: HD CAMERA ONLINE

New "Face" brush

Overview mosaic - low resolution: ECR to mosaic(s)

Continental Crust



Screen grabs of HD imagery - limpets size of thumbnail

Axial Caldera

Bottom Pressure - Tilt

Low Frequency Hydrophone

Broadband Seismometer

Central

Caldera

MJ03B

ASHES

Pressure-Self Calibrating Flipping Tilt Meter

250m

128/ m

MJ03F

Mass Spectrometer

Short-period Seismometer

3-D Thermistor Array

Osmotic Fluid Sampler

Bottom Pressure-Tilt

Current Meter

Power Generator

COVIS Plume Sonar

HD Video Camera & Lights

Short-period Seismometer

1300

Bathymetry: MBARI AUV Data from D. Caress and D. Clague EM302 Multi-beam from University of Washington 10m contour lines

-2700

Short-period Seismometer

Broadband Seismometer

Low Frequency Hydrophone

Bottom Pressure - Tilt

Eastern

Caldera

PN3B

Short-period Seismometer

MJ03C

MJ03E

Fluid - Microbial DNA Samplers

Digital Still Camera and Lights

*

Temperature-Resistivity

pH - H2S - Temperature

INTERNATIONAL M|03D DISTRICT

Current Meter - 3D Single Point

Short-period Seismometer

Bottom Pressure -Tilt

NSF & ONR Additions Funded for 2018 Installation



NODES and J-BOXES

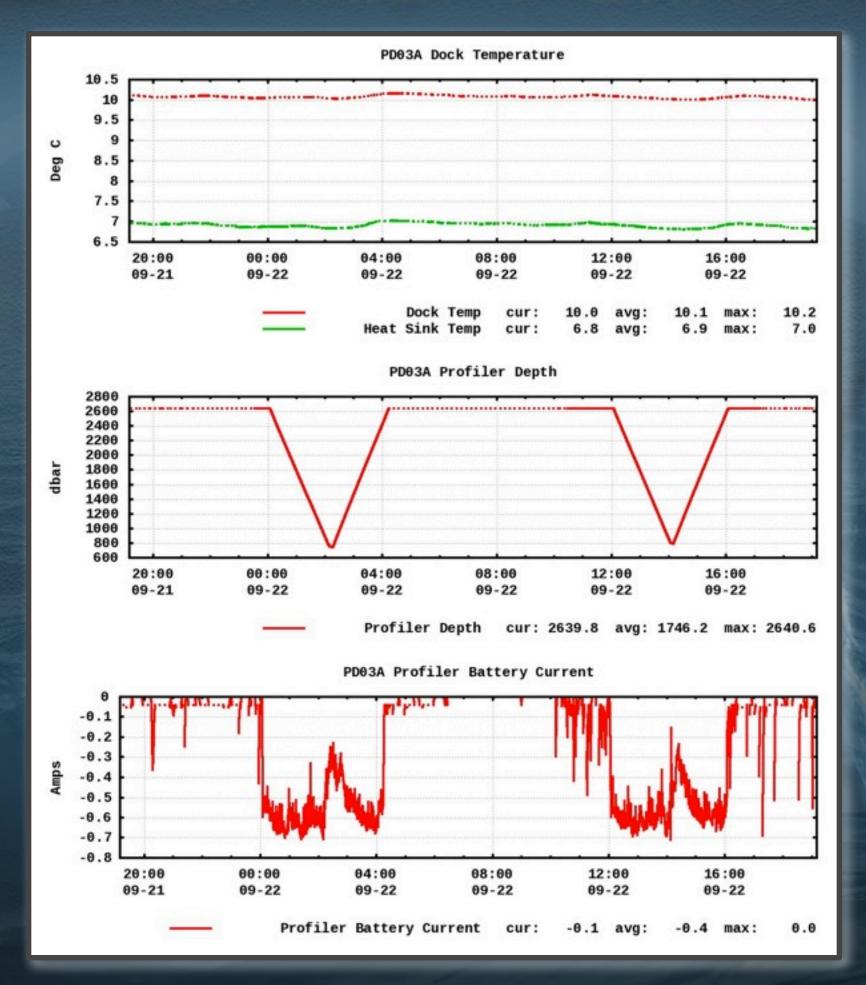
CABLE TYPES

Primary Node

RSN Primary

REGIONAL CABLED ARRAY - DEEP PROFILER STATUS

 $\mathbf{\hat{b}}$





Ocean

Crust



• Axial Base Deep Profiler is installed and has been running two missions/day - fully operational

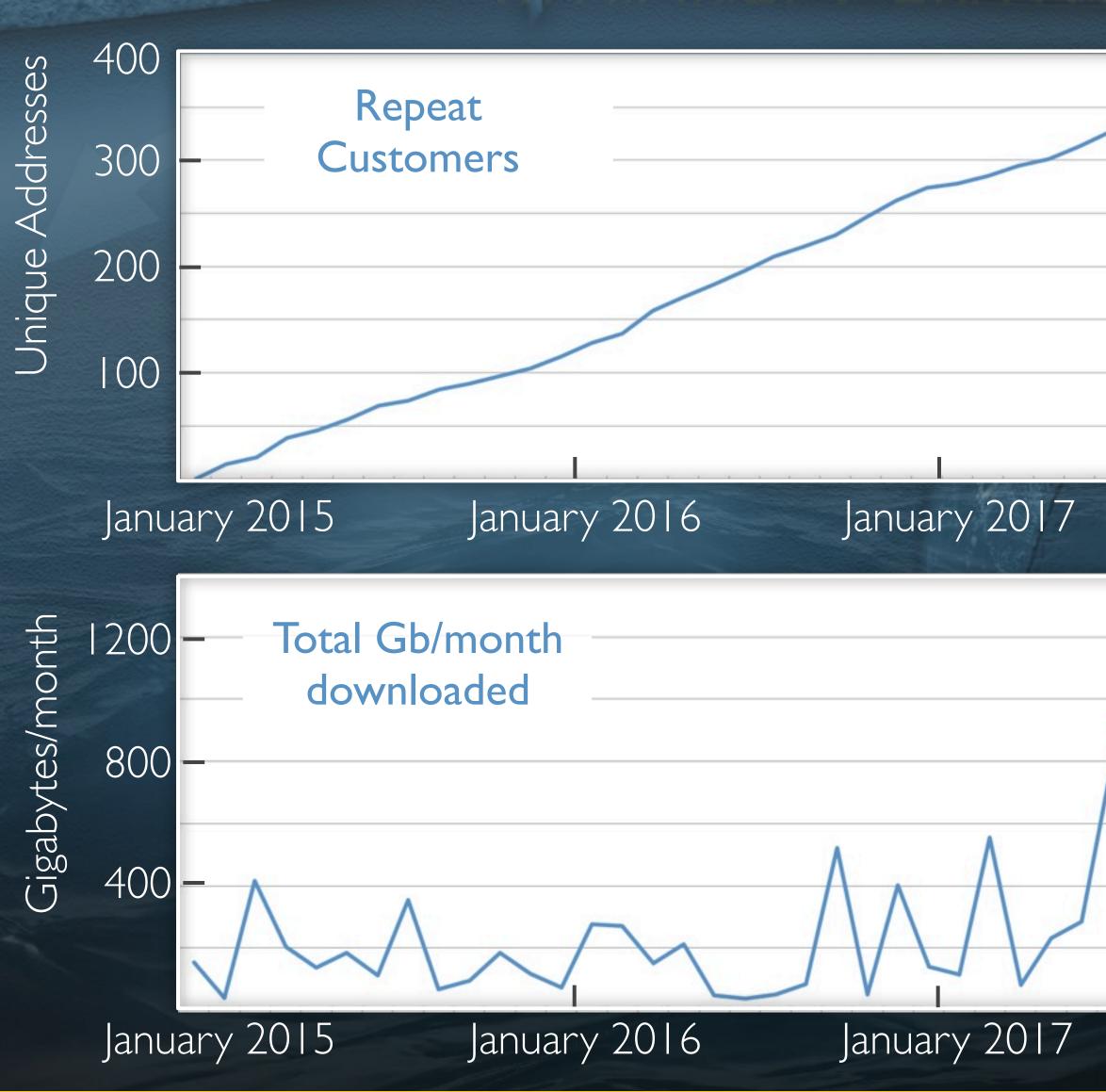
S Oregon Offshore Deep Profiler turned. Inductive charger on dock failed, can communicate with dock, but vehicle can not run missions, instruments working

Slope Base Deep Profiler, unplugged but not turned due to lost Jason & weather time

tal Crust



REGIONAL CABLED ARRAY - IRIS USERS

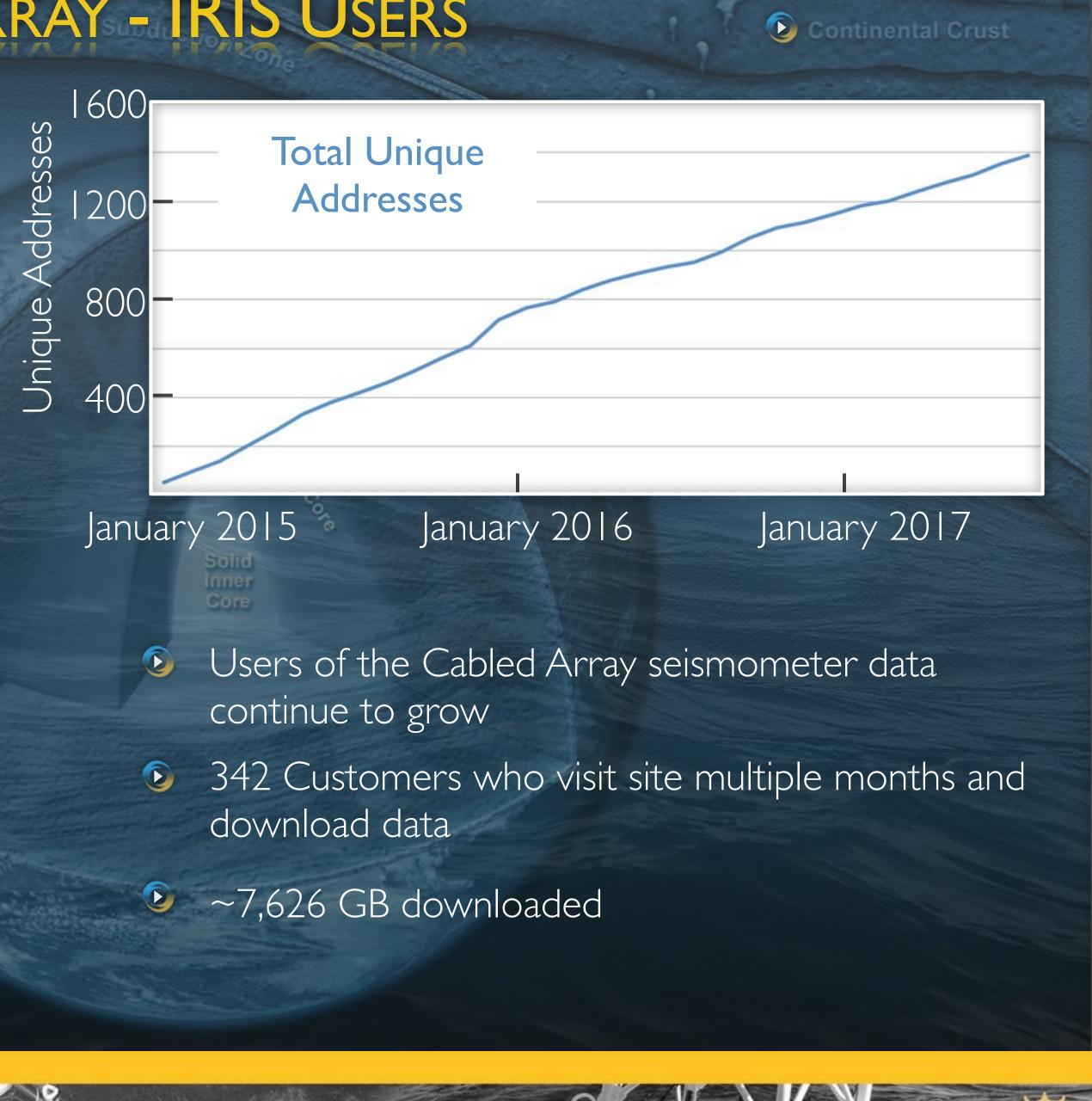




Ocean

Crust





Ocean_ Crust

REGIONAL CABLED ARRAY - CAPTURING NEAR AND FAR-FIELD EARTHQUAKES

8 samples/second

Slope Base Broadband

Hydrate Ridge Broadband

Short period

Short period

Short period

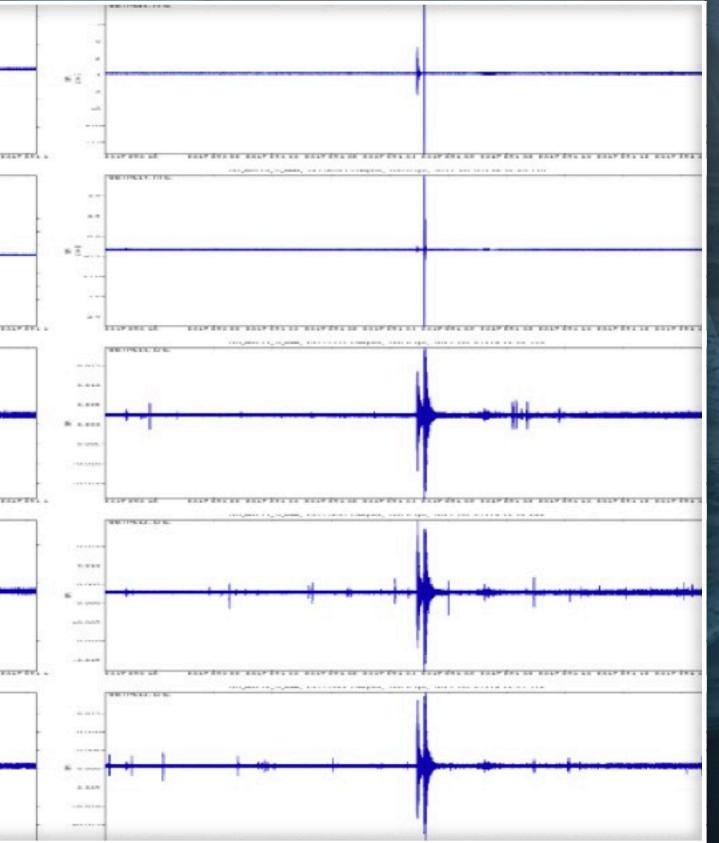
867 882 58 - 8357 885 8	11 3119 (91 34 	8 2 2 4 9 1 1 2 1		2219 / N 2 18
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B 119 EV1 18	110/101.0
VUTIFICAL PRIN				
107103-07 11070011 9017602-072			#11P EVI 18	invita.
10100-0 - 1101001			A 11 P E 9 1 24	

MEXICO 7.1 MA EARTHQUAKE SEPTEMBER 8, 2017





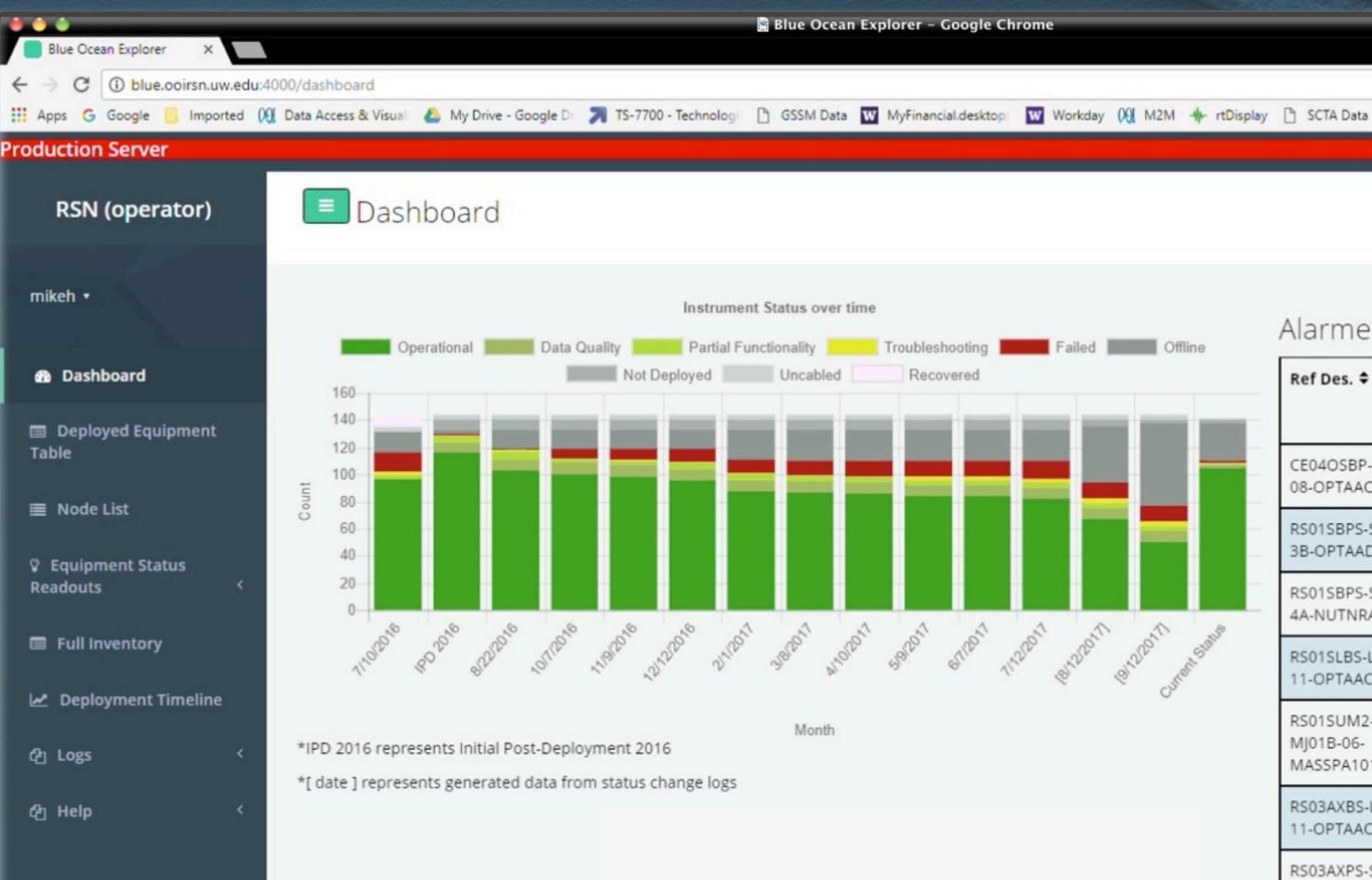
200 samples/second



Melting

Continental Crust

REGIONAL CABLED ARRAY - HEALTH & STATUS PROGRESS



 \mathbf{b} Will be fully operational this fall D

Alarmed Instruments

Ref Des. 🕈	Item Code \$	Manual Status ≑	last BPS ¢	Status Table ¢
CE04OSBP-LJ01C- 08-OPTAAC104	OPTAAC104	Operational	0	Link
RS01SBPS-SF01A- 3B-OPTAAD101	OPTAAD101	Operational	0	Link
RS01SBPS-SF01A- 4A-NUTNRA101	NUTNRA101	Operational	0	Link
RS01SLBS-LJ01A- 11-OPTAAC103	OPTAAC103	Operational	0	Link
RS01SUM2- MJ01B-06- MASSPA101	MASSPA101	Operational	0	Link
RS03AXBS-LJ03A- 11-OPTAAC303	OPTAAC303	Operational	0	Link
RS03AXPS-SF03A- 3B-OPTAAD301	OPTAAD301	Operational	0	Link
RS03AXPS-SF03A- 4A-NUTNRA301	NUTNRA301	Operational	0	Link

0 1 1 1 1

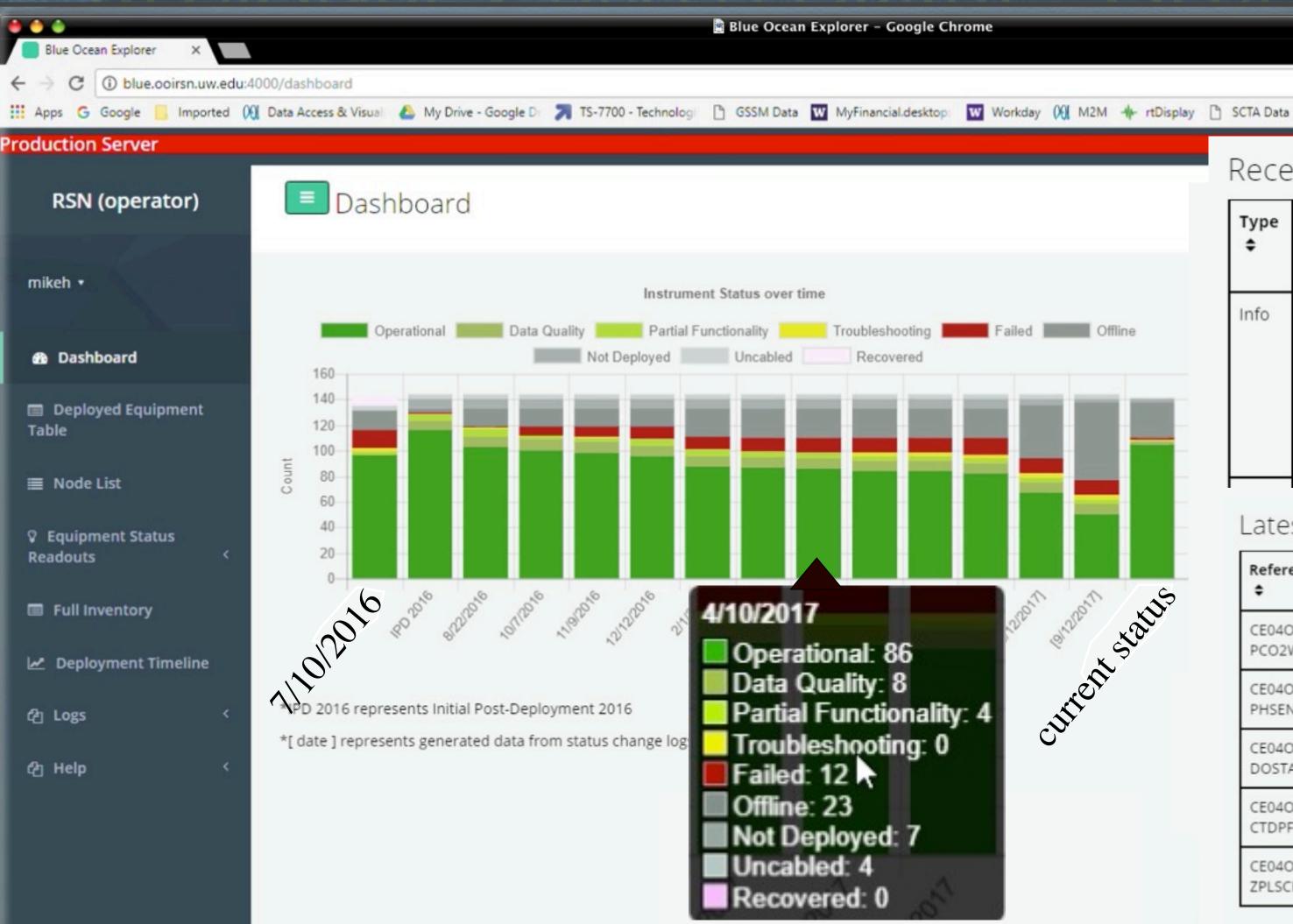
Other bookmarks

Mike Harrington (UW-APL) and undergraduate engineering student developed Health-Status-Monitoring





REGIONAL CABLED ARRAY - HEALTH & STATUS PROGRESS



Operational Logs for event descriptions, changes in state D Inventory of infrastructure and state

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Recent Operator Logs

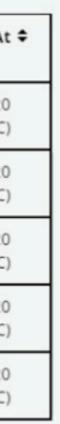
Type ¢	Reference Designator \$	Description \$	RSN_ATN ¢	Event Date 🕏
Info	RS01SUM1- LJ01B-05- OBSBBA101	Releveled sensor by using "DEPLOY" command in FORTH terminal.	ATAPL- 58328- 00004	2018/08/27 23:30 (UTC)

Latest Status Changes

63

Reference Designator \$	Old State 🕏	New State 🖨	Reason 🗢	User ¢	Event Date 🗢	Created At
CE04OSPS-PC01B-4D- PCO2WA105	Operational	Offline	Shallow Profiler at Endurance was trawled	mikeh	2017/09/16 12:00 (UTC)	2017/09/20 17:41 (UTC)
CE04OSPS-PC01B-4B- PHSENA106	Operational	Offline	Shallow Profiler at Endurance was trawled	mikeh	2017/09/16 12:00 (UTC)	2017/09/20 17:41 (UTC)
CE04OSPS-PC01B-4A- DOSTAD109	Operational	Offline	Shallow Profiler at Endurance was trawled	mikeh	2017/09/16 12:00 (UTC)	2017/09/20 17:41 (UTC)
CE04OSPS-PC01B-4A- CTDPFA109	Operational	Offline	Shallow Profiler at Endurance was trawled	mikeh	2017/09/16 12:00 (UTC)	2017/09/20 17:41 (UTC)
CE04OSPS-PC01B-05- ZPLSCB102	Operational	Offline	Shallow Profiler at Endurance was trawled	mikeh	2017/09/16 12:00 (UTC)	2017/09/20 17:40 (UTC)





REGIONAL CABLED ARRAY - HEALTH & STATUS PROGRESS

Blue Ocean Explorer X		B	lue Ocean Explo
← → C () blue.ooirsn.uw.edu:4	000/statusTable Data Access & Visual 🛛 🙆 My Drive - Google Dr	🔊 TS-7700 - Technologi 🗎 (SSM Data 👿 M
roduction Server			
RSN (operator)	Deployed Equipmed	ent Status <mark>Tabl</mark> e	e
mikeh •	LJ01D		
🙆 Dashboard	Reference Designator 🗢	RSN ATN 🗢	Description
Deployed Equipment	CE02SHBP-LJ01D-06-CTDBPN106	ATOSU-69827-00003	Conductivity,
Table	CE02SHBP-LJ01D-06-DOSTAD106	ATOSU-58320-00020	Dissolved Oxy
■ Node List	CE02SHBP-LJ01D-07-	ATOSU-69829-00003	Current Mete
Q Equipment Status	CE02SHBP-LJ01D-08-OPTAAD106	ATOSU-69943-00012	Optical Atten
Readouts <	CE02SHBP-LJ01D-09-PCO2WB103	ATOSU-70570-00001	Partial pressu
Full Inventory	CE02SHBP-LJ01D-10-PHSEND103	ATOSU-70571-00001	pH - BEP
🗠 Deployment Timeline	CE02SHBP-LJ01D-11-HYDBBA106	ATOSU-58324-00014	Broadband h
	CE02SHBP-MJ01C-05-LJ01D	ATAPL-65310-820-0006	Benthic Exper
දි Logs <			
දා Help <			

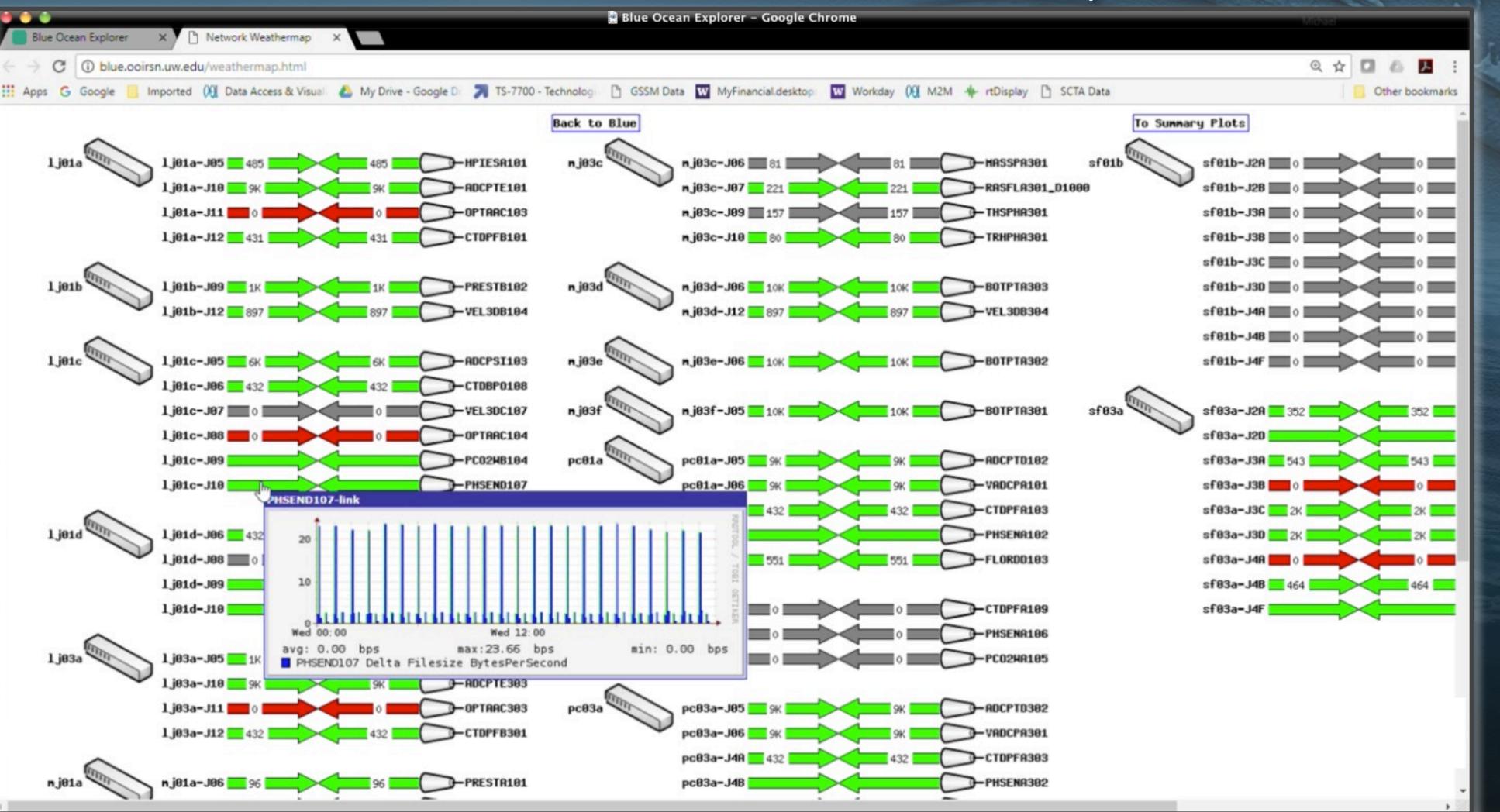
Search and edit capabilities (lat, long, events etc)

orer – Google Chrome 0 1 0 0 1 MyFinancial.desktop: 👿 Workday 🕅 M2M 🚸 rtDisplay 🗋 SCTA Data Other bookmarks Action Auto Status 🗘 Manual Status 🖨 y, Temperature, Pressure (Depth) - BEP Operational Troubleshooting Log Undeploy View Log Undeploy xygen Optode Data Quality? Unmonitored View Log Undeploy ter + Temperature Operational View Unmonitored nuation and Absorption - shallow View Log Undeploy Failed Failed sure CO2 - BEP View Log Undeploy Operational Operational View Log Undeploy Operational Operational hydrophone View Log Undeploy Unmonitored Operational eriment Package - Shelf View Log Undeploy Operational Unmonitored « < 1 > »





REGIONAL CABLED ARRAY - HEALTH & STATUS PROGRESS Interactive "weather map"



Instant look at system status by instrument and if "data" flow is as expected (e.g. File Size Bytes/Second) D Also visualization for several individual instruments at once by day on same page D



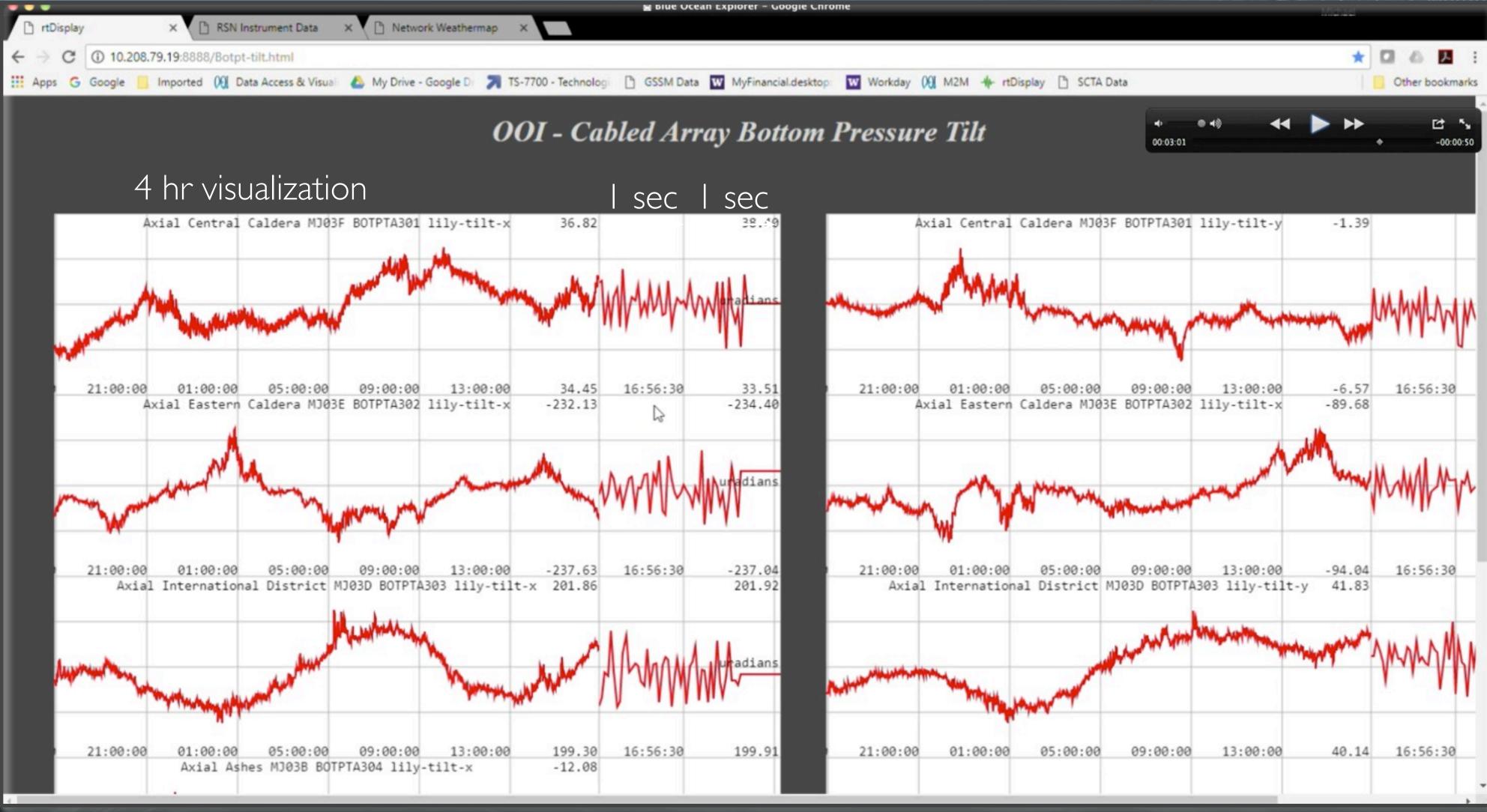


REGIONAL CABLED ARRAY - M2M REAL-TIME DATA FLOW AND VISUALTIZATION

Ocean

Crust

D



M2M is robust and working very well - Cabled Array pulling in almost all data! and visualizing it

Continental Crust

Ocean REGIONAL CABLED ARRAY - VISIONS 7 EDUCATION



Research

About

HOME



Education

Technoloav

VISIONS'17 EXPEDITION

July 25th to August 29th, 2017

@VISIONSops

LIVE VIDEO



A Flurry of Activity

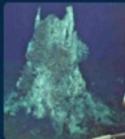
D

D

Days 3 and 4 of the final leg of the 2017 OOI Cabled Array O&M Cruise were filled with a wide variety of activities. Jasor Dive J2-1007 visited the International District Hydrothermal Field







Enhanced satellite bandwidth (thank you NSF and UCSD-SIO)

SEARCH CONTACT US PEOPLE NEWS NSF DISCLAIMER PRIVACY TERMS

Expeditions Blogs Resources



 \odot

Embed

Leg 3 Begins

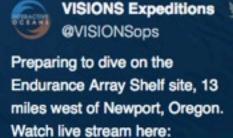
The final leg of the 2017 OOI Cabled Array Cruise got underway at approximately 12:30 pm PDT on Sunday as the R/V Revell ...

Onward We Go About to Sta

Leg 2 has come to a close and preparations are underway for Leg 3 of the NSF-funded Ocean Observatories Initiative Region ...

Lighting up Axial Seamoun

We arrived at Axial Seamount after a 19 hr steam to find the seas a bit . To use the unie wisely until we cou ...



Biology

interactiveoceans.washington.edu/ story/V_17_Live

Aug 24, 2017



All instruments at International District deployed and at

View on Twitter

Live streaming of ROV video (YouTube failed, still have bugs to work out - audio and metadata)

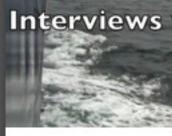
REGIONAL CABLED ARRAY - VISIONS 7 EDUCATION



Grays Harbor College, and UW Tacoma Professors, Kingston Middle School Teacher

Student 4 hr watches in ROV van, worked on deck, developed science and outreach projects - will continue Fall to Spring quarter

O Director's Choice



Oceanographer

Have you ever wondered if you would like to become an Oceanographer?

24 students - UW, Western Washington, Queens College NY - 3 graduate students; I high school junior, I just graduated high school

Interviews with Ocean Scientists

At Sea: Paths to Becoming an

DIEL VERTICAL MIGRATION DURING A SOLAR ECLIPSE

https://www.ocean.washington.edu/

Ocean_ Crust

REGIONAL CABLED ARRAY: NEXT YEAR



3rd week of June start

ASHES (2) D

47 Day's on schedule - intense cruise (41 days at sea)

 Will turn Shallow Profiler two-legged mooring (HL and ML winches both onboard R/V Revelle)

Marum 4 instruments added onto Southern Hydrate Ridge (1)

ONR Breedlove Vent Power Generation Creare -ASHES (2)

NSF Bemis COVIS Rutgers - ASHES (2)

NSF Wilcock Flipping Tilt Meter UW - Central Caldera (1)

NSF Zumberge Self Calibration Pressure Sensor
SIO - Central Caldera (1)

Continental Crust