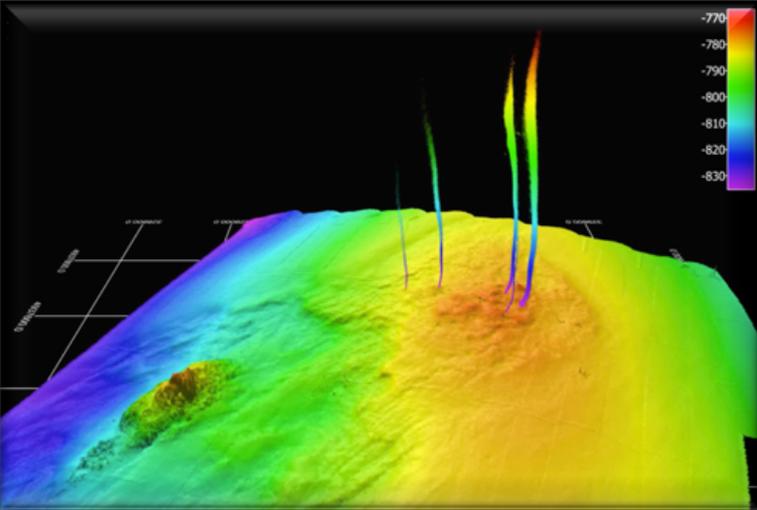


NSF's Ocean Observatories Initiative Regional Cabled Array Maintenance Cruise AT42-12 May 30 – June 12, 2019

DESSC
December 8, 2019

Debbie Kelley & RCA Team
Director/PI Regional Cabled Array
University of Washington
dskelley@uw.edu



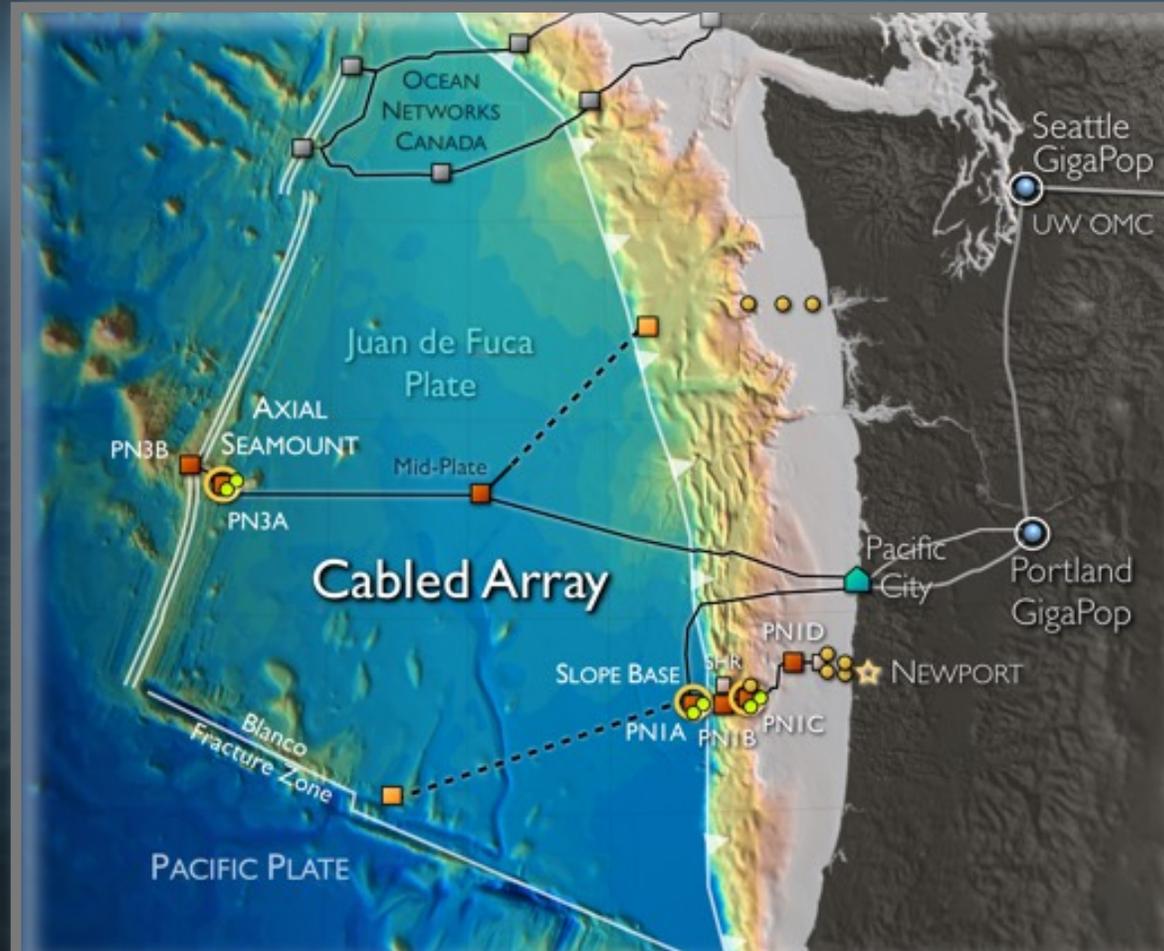
NSF-OOI Regional Cabled Array

Primary Infrastructure

- ▶ 900 km of high bandwidth (10 Gbs) and high power (8 kW) **primary** cables & nodes

Secondary Infrastructure

- ▶ 18 junction boxes providing 375V and 1 Gbs
- ▶ 6, up to 2700 m tall instrumented moorings with wire crawlers connected to the cable
- ▶ > 140 instruments now providing 24/7 real-time data with two way communication - response capabilities. *Data on oceanobservatories.org*
- ▶ highly expandable for science, industry, education

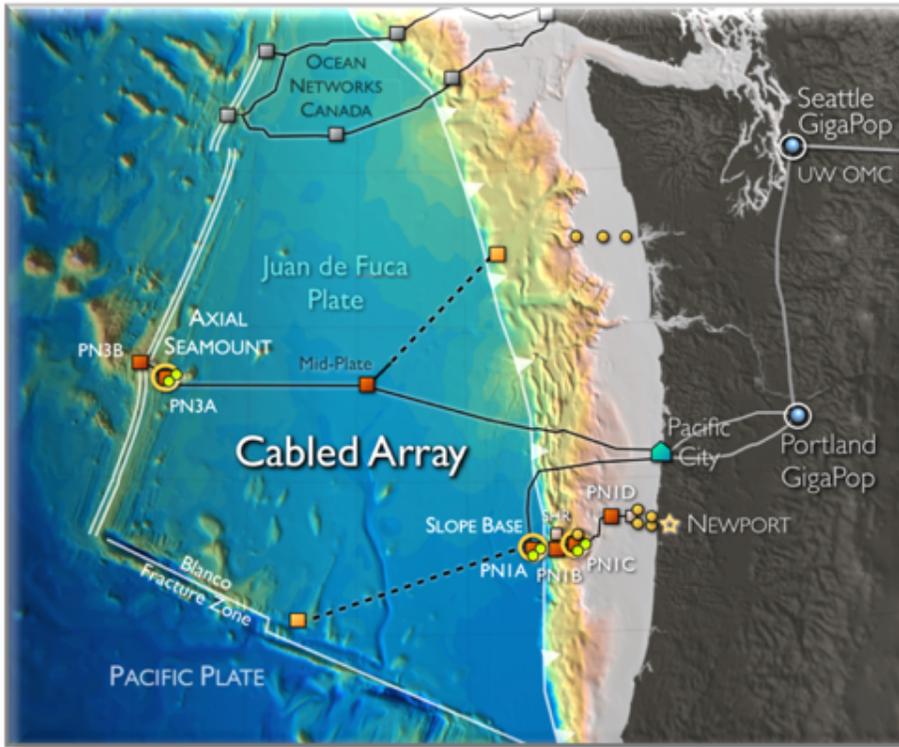


Built on time and under budget

BRINGING POWER AND THE INTERNET INTO THE OCEAN

R/V Atlantis and ROV Jason AT42-12 May 30-July 12, 2019

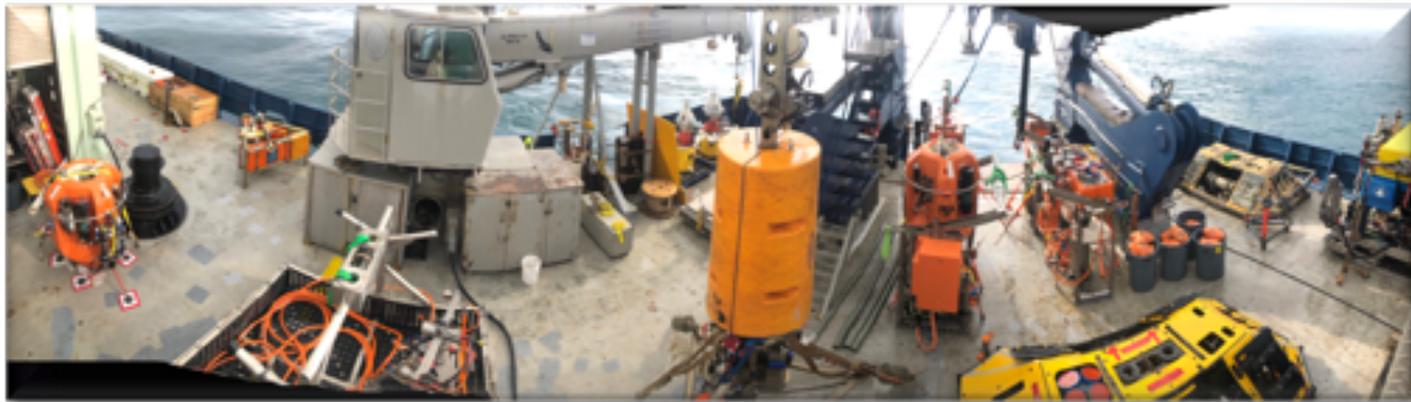
Newport – Newport (NOAA) – 4 legs



- Sixteen 48 ft trailers, six flatbed trucks moved 166 tons of RCA equipment from Seattle WA to Newport OR
- Onboard staffing 52 personnel (13 students)
- A record 20 *Jason* dives in five days (Leg 2); 58 total dives
- Installed 113 RCA Instruments & 8 PI Instruments
- Recovered 100 RCA Instruments
- Turned 2900 m-tall, two legged mooring; 6 science pods and 3 Deep Profiler vehicles

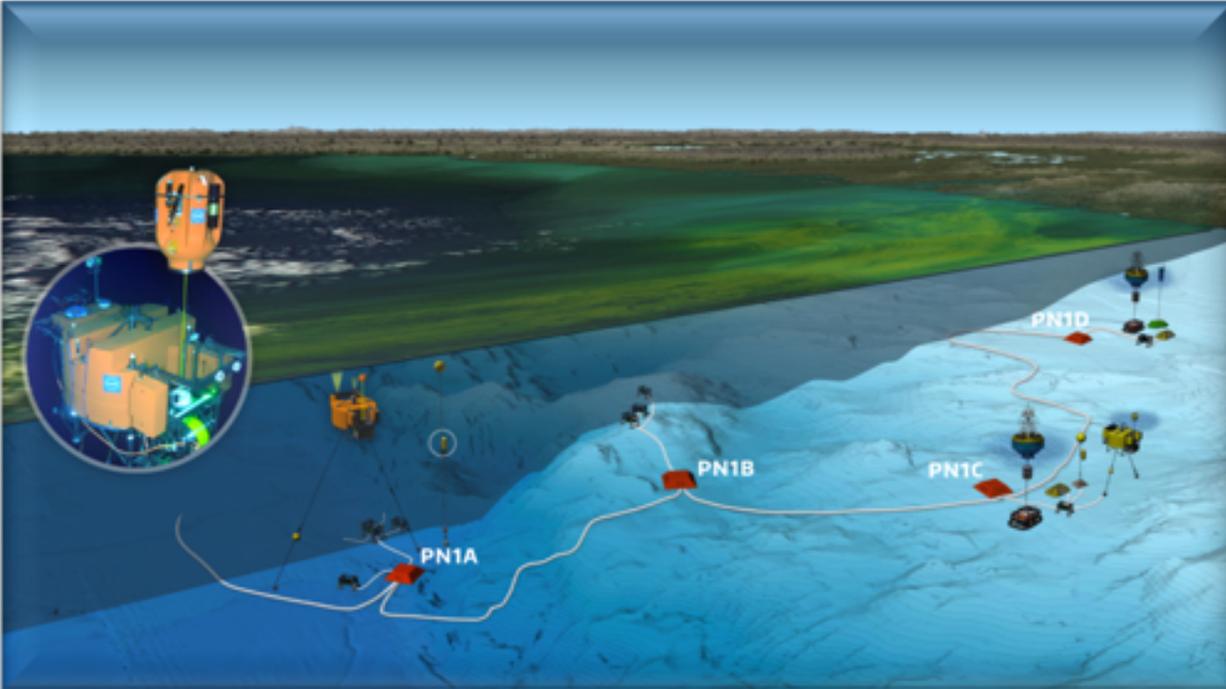
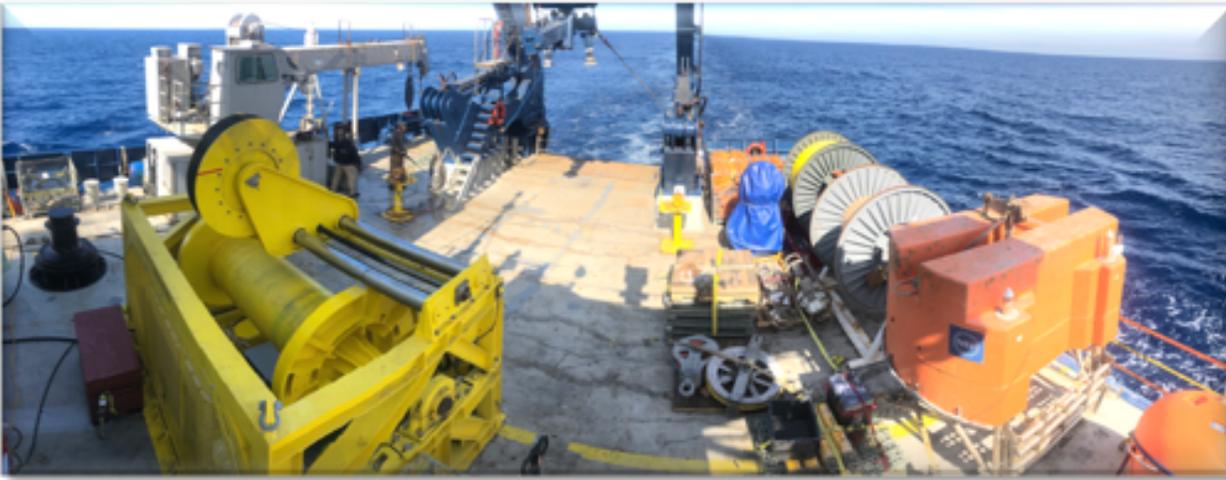


Intense mobilization

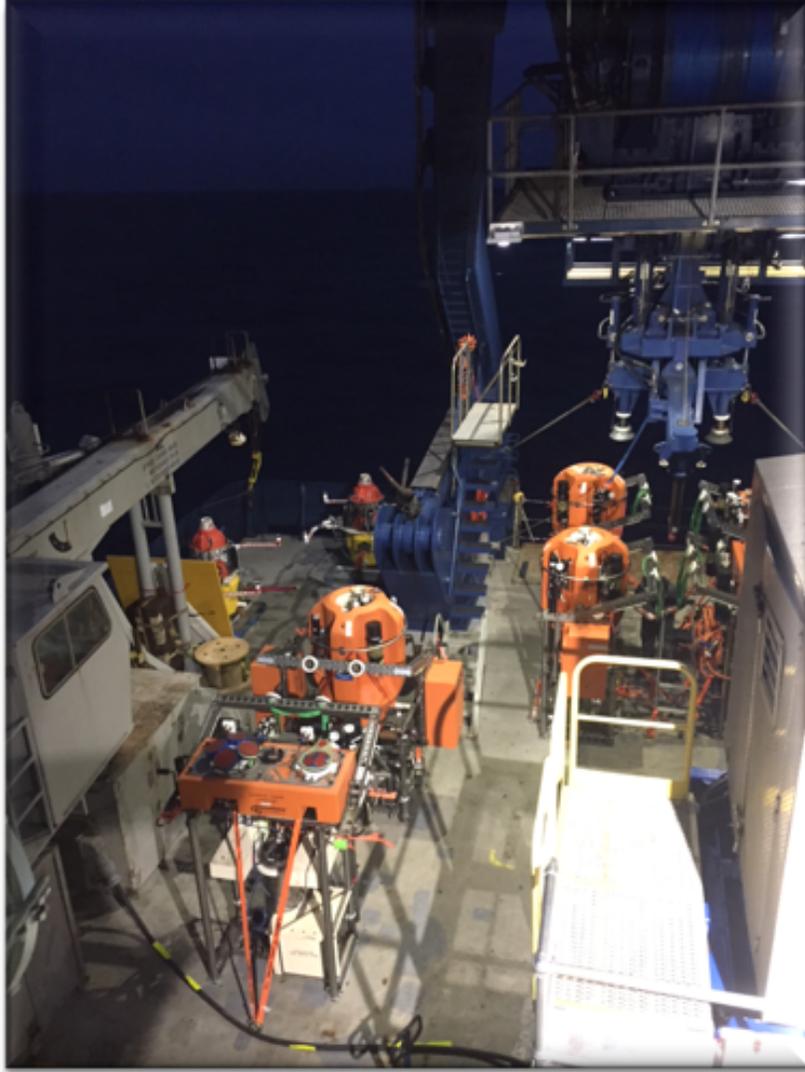


Leg 1: Recovery/Installation of Shallow Profiler mooring

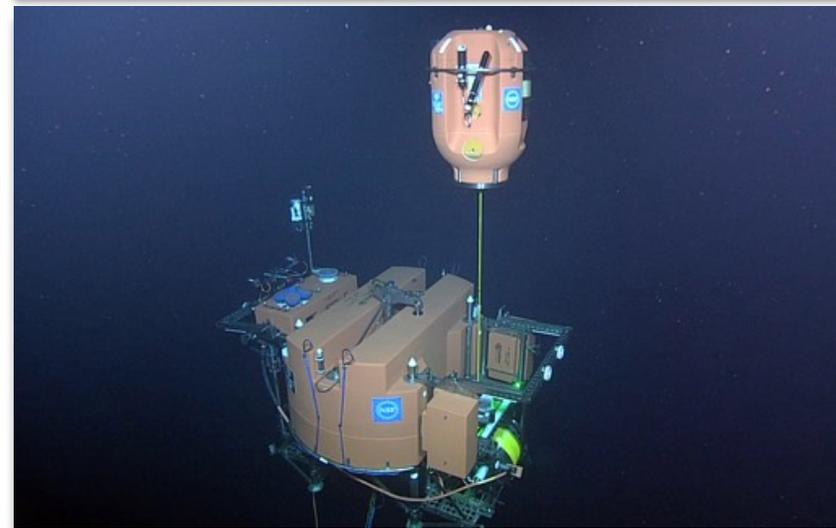
- 2 legged mooring, 2900 m water depth with 12 ft across, 7,000 lb platform at 200 m water depth



Shallow Profiler Science Pods (6)



1 body with latching sled



- Record turn around ~1 hr for a pod
- Includes up to 18 instruments (e.g. pH, CO₂, O₂, zooplankton sonar, broadband hydrophone)
- Each instrument full out (1 to 240 measurements per second), two-way communication with real-time data flow
- Since 2015, >40,000 profiles from 200 m to ~ 5 m water depth



Deep Profiler Moorings

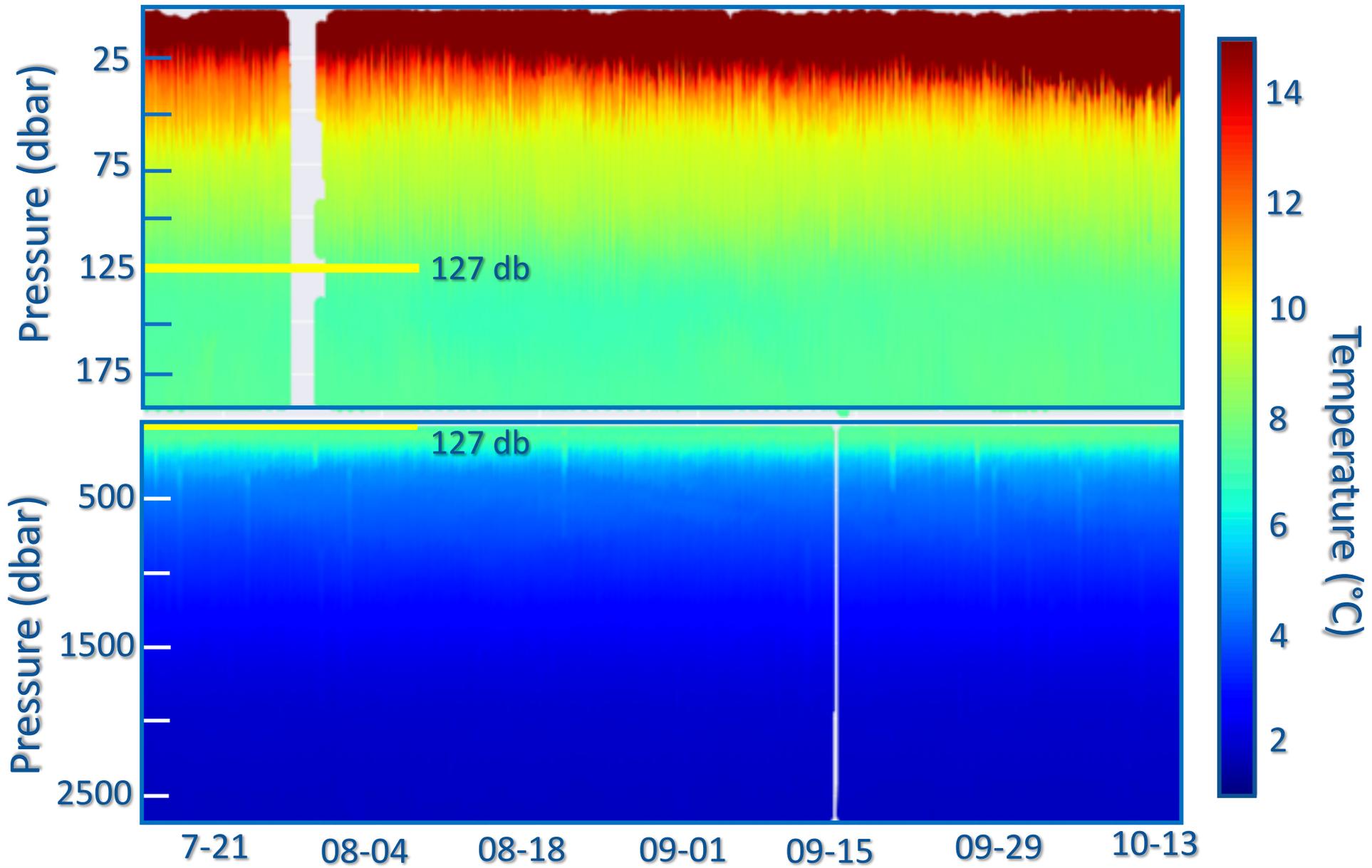
- Turned 3 vehicles using specialized “clam shell” on *Jason*
- Cod frenzy at Oregon Offshore – 600 m



Deep Profiler Moorings

- Turned 3 vehicles using specialized “clam shell” on Jason
- Fish frenzy at Oregon Offshore – 600 m
- Axial Base: fully operational for ~17 months transiting 2 times/day 50-2700 m; overlap now from seafloor to 5 m beneath surface with Shallow Profiler



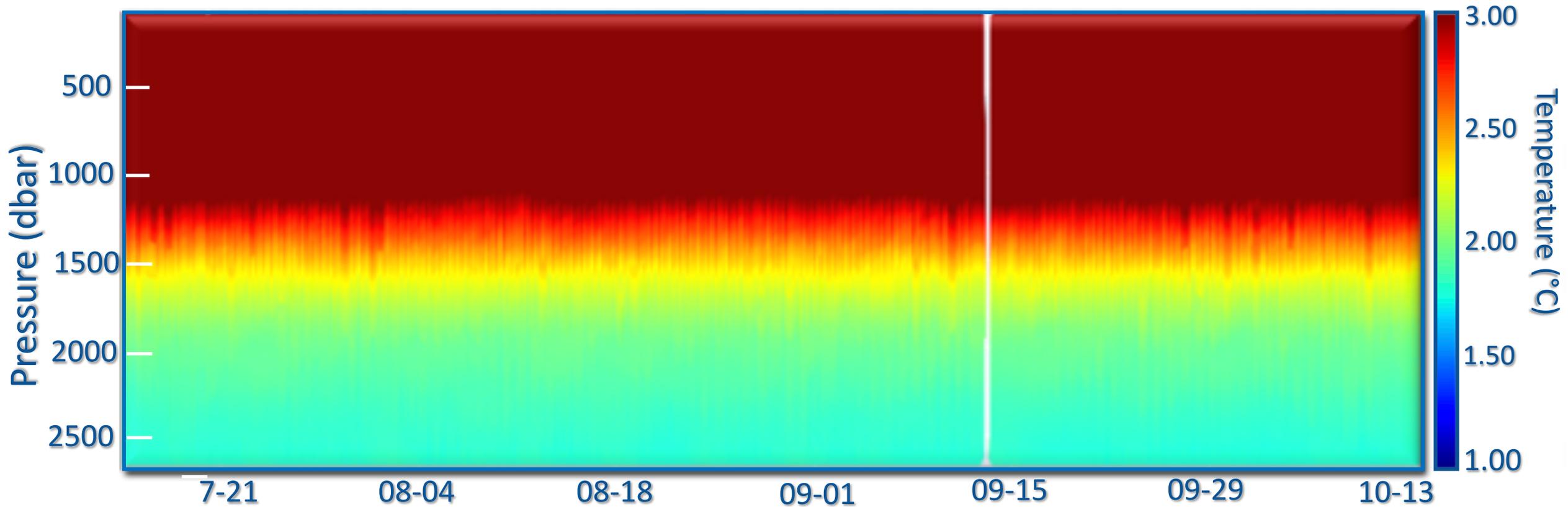


Shallow Profiler
(9 times/day)

Axial Base
2019

Deep Profiler
(2 times/day)

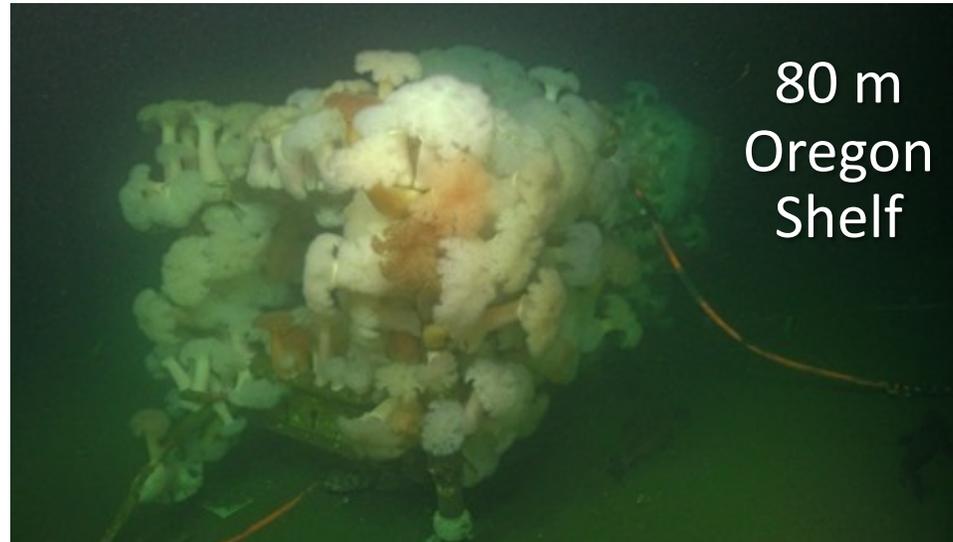
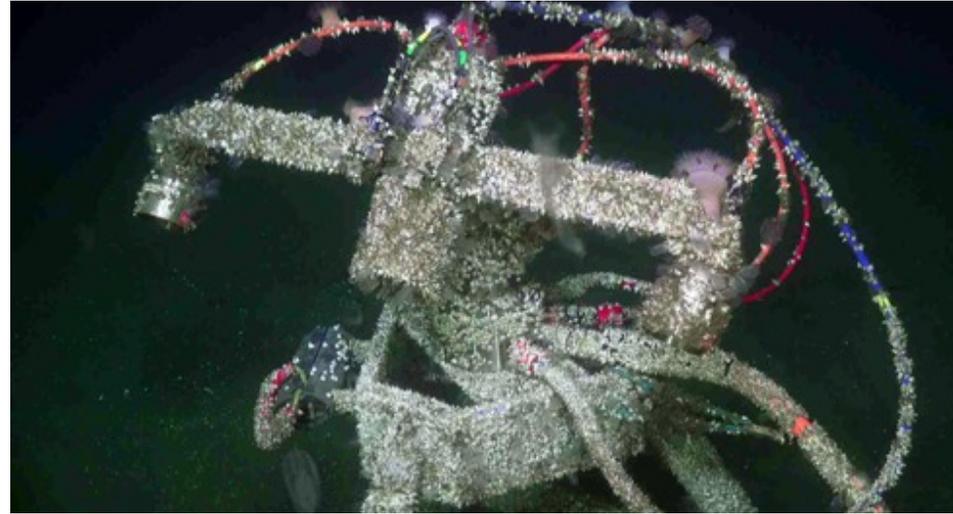
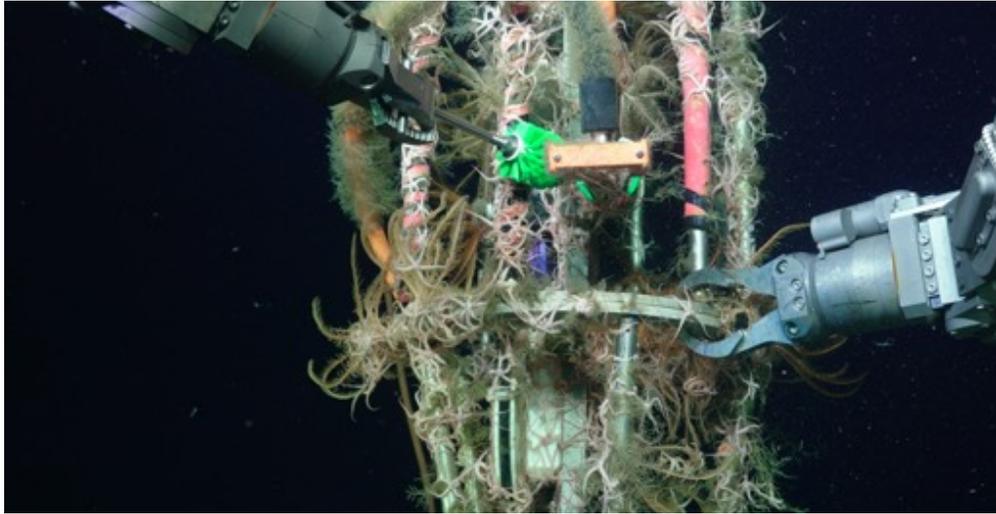
Axial Base Deep Profiler August-October 2019



Amazing structure even at ~1000-2000 m



“Interesting” colonization



2019 O&M Cruise: Externally-funded Instruments

Bemis (Rutgers) Flow imaging Sonar (COVIS) & 2 thermistor arrays

Wilcock (UW) A-O-A self calibrating pressure sensor

NSF

Chadwick (NOAA-OSU) 1 CTD - 2 additional in 2020

Zumberg & Sasagawa (SIO-UCSD) Self calibrating pressure sensor

Wilcock (UW) Flipping tilt meter

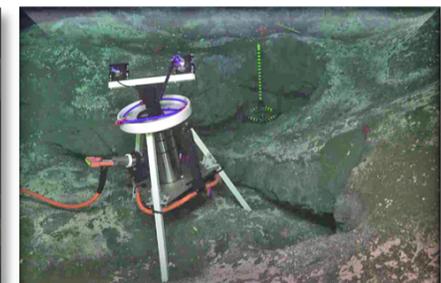
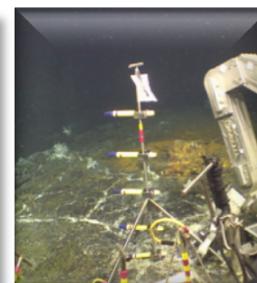
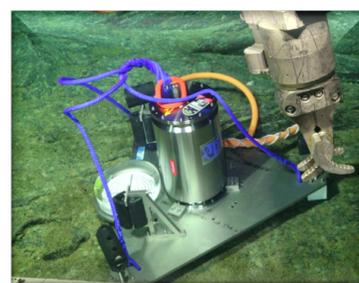
Breedlove (Creare) Digital Still Camera – Vent Energy Extraction Platform 2020

ONR

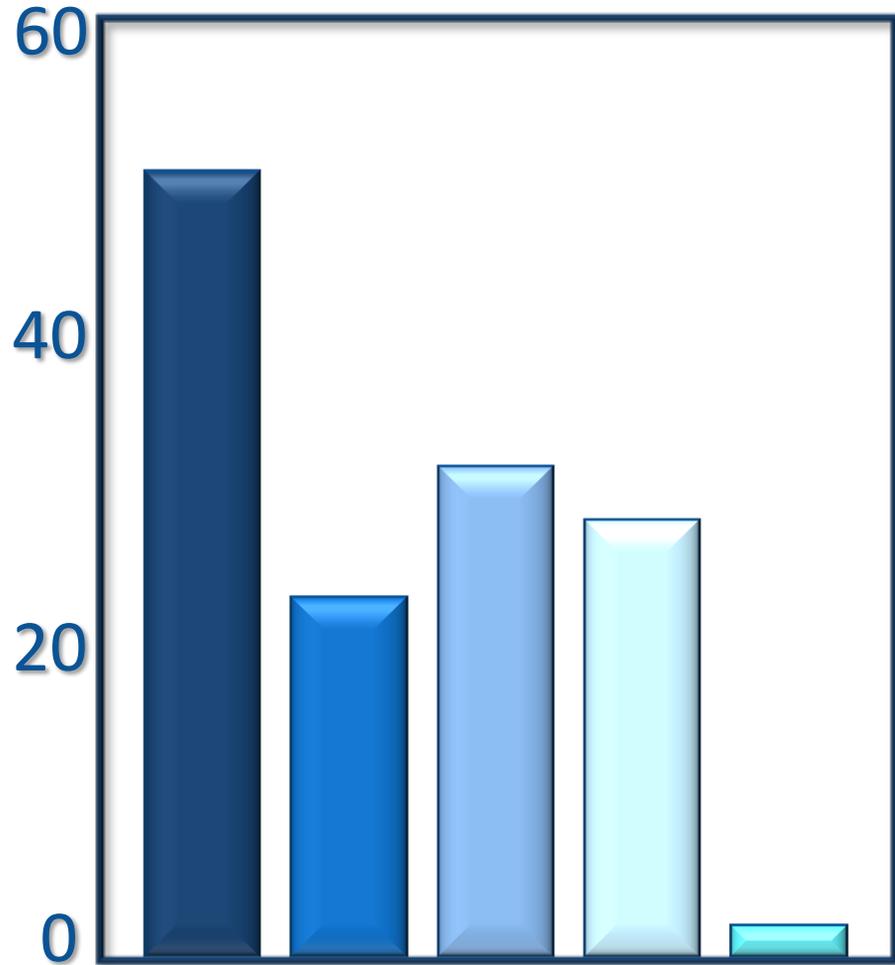
Reimers (OSU) & Girguis (Harvard) Benthic Observer Platform

Borhmann & Marcon (MARUM-Germany) Overview sonar, quantification sonar, 4K camera and CTD

Germany



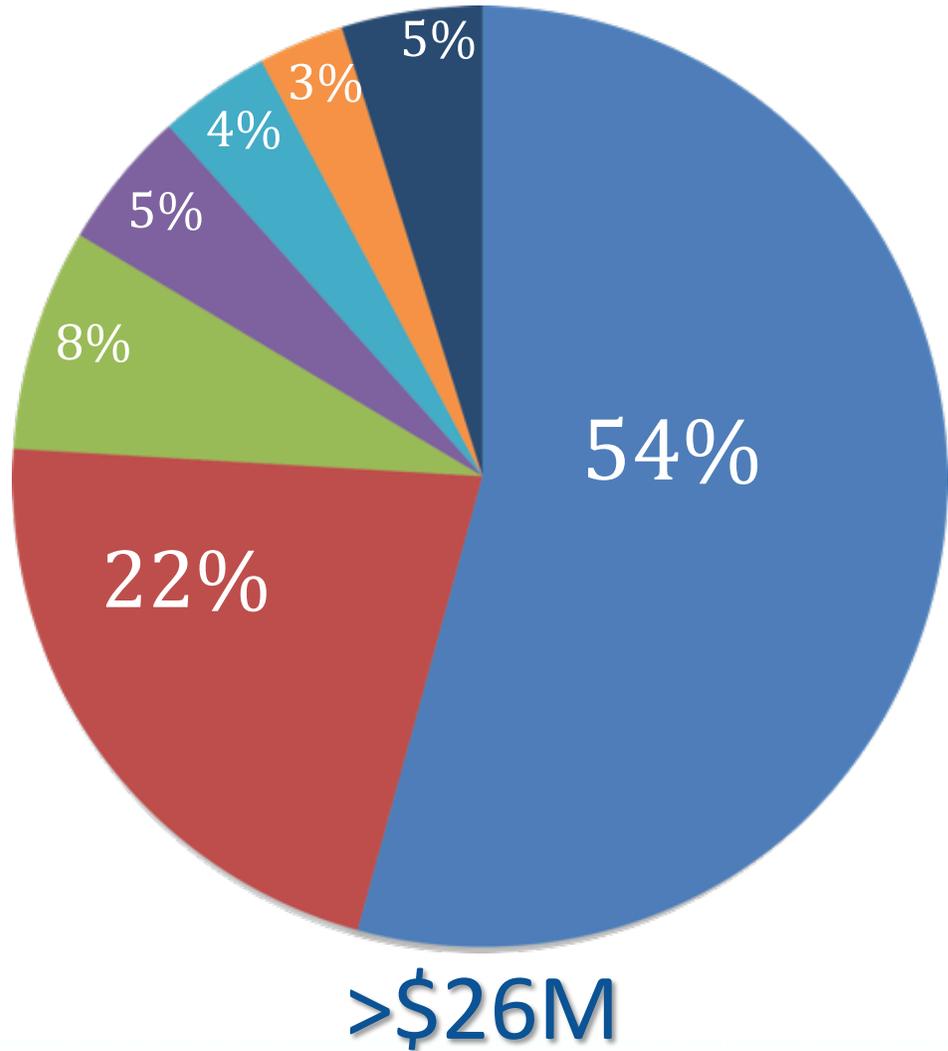
Regional Cabled Array Funded Community 2016-2019



- 50 Awards-Subawards since 2016
- 23 PI's
- 31 Co PI's
- 28 Institutions (including JPL and UNAVCO)
- 2 Industry Awards



Regional Cabled Array External Awards 2016-2019

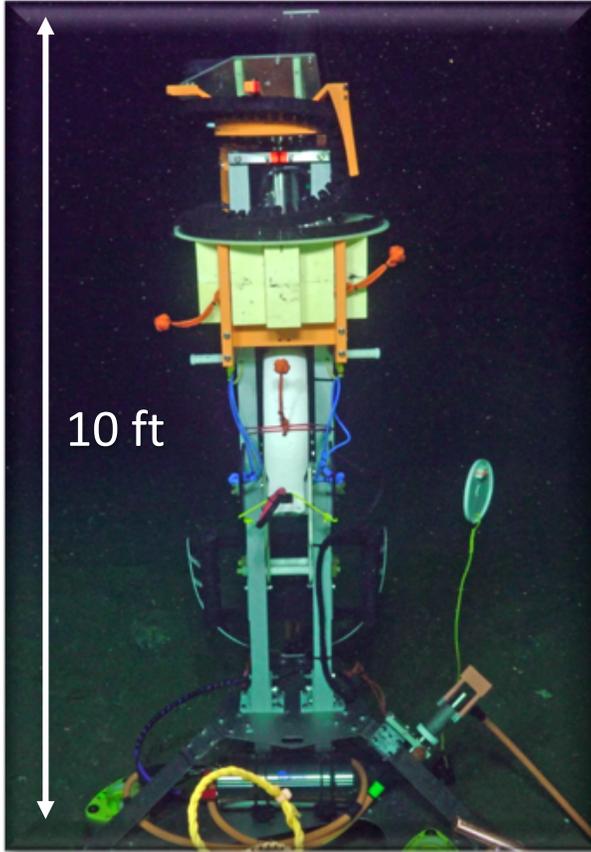


*“If you build it they will come”
M. Leinen 2006 OOI CDR*

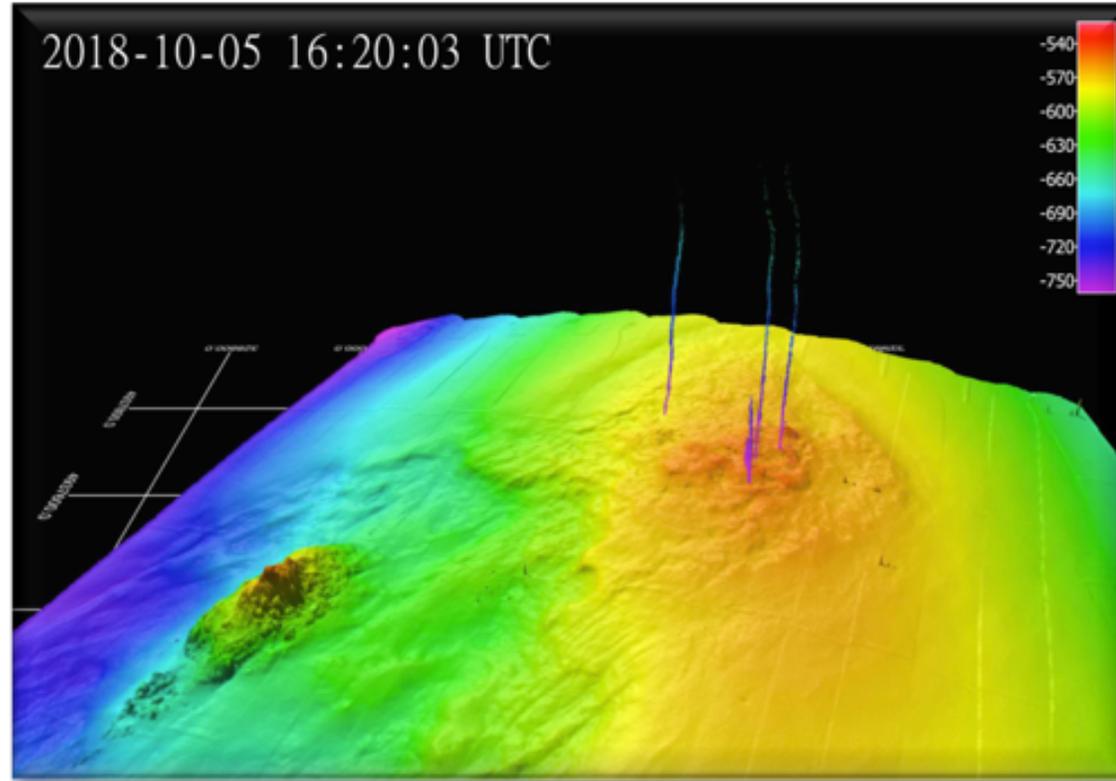
- PI Instruments added to the RCA
- RCA data focused
- Education using RCA data
- Adjacent uncabled instruments
- Development (Moore-Sloan Foundation)
- Associated Field Programs (NSF)
- Other (e.g. workshops)



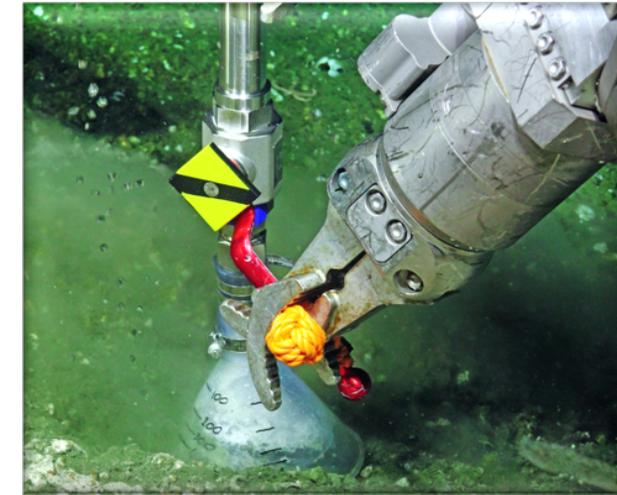
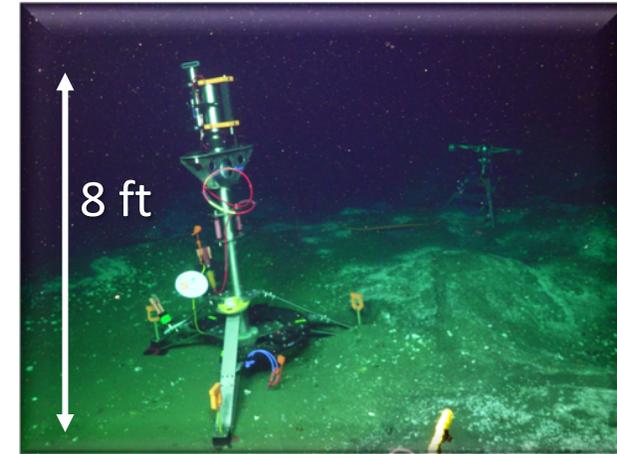
MARUM: Quantifying Gas Emissions At Southern Hydrate Ridge



Multibeam sonar, 700 m range, every 2 hrs for ~ 12 minutes



Provides unprecedented 360° imaging of all methane plumes issuing from SHR. First flux measurements.



NASA Exobiology: P. Sobron (SETI Institute) InVADER 2020

In Situ Analyses Divebot for Exobiology Research (4-5 year award); 9 Co-PI's

- Design, build and implement ~ 4.6 m tall platform with three raman laser systems and 2 imaging instruments for real-time visualization to:



InVADER Target
2020,2021, 2022

- validate strategies and adaptive missions, and signatures for life in extreme environments (on other watery planets)
- Hydrothermal fluid and rock sampling (development of ROV rock drill), fluid gas and chemical analyses, microbial genomic characterization, extensive site characterization, machine learning and creation of “virtual” world (Postdoc)
- Significant outreach component in collaboration with Citrus College, JPL and UW



RCA-OOI-UW Educational Efforts



● VISIONS at-sea experiential learning program:

>160 undergraduate and graduate students have participated; 13 on VISIONS'19; diverse population – socioeconomic, ethnic, and educational (i.e. numerous first generation; K12 schools of 130 students) backgrounds.

- ▶ All students complete a science and/or engagement projects honed to meet their educational, outreach, and leadership goals
- ▶ Numerous senior thesis projects – some four years in duration; numerous AGU talks (outstanding student presentation awards); many gone onto graduate school; present projects in student symposium – AGU style presentations.
- ▶ PY1: 4 VISIONS students working with RCA team all year, participated on the cruise
- ▶ Susan Casey (NY Times Best Selling Author e.g. The Wave) and Middle School teacher participated on VISIONS'19



Undergraduate-Generated Biology Catalogue

VISIONS Expeditions
@VISIONSops

Recent @UW_CoEnv graduate Katie Bigham leading #Jason dive on Southern Hydrate Ridge yesterday, exploring Neptunia snail colonies!



12:57 PM · 3 Aug 2017

1 Retweet · 5 Likes

Tweet your reply

Trends for you
#DETROITmovie Promoted by DETROIT #LOBTbabes Dolores Park #GrandJury #NationalWatermelonDay Jim Justice #craig #FutureReady #dmsa Cal State

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Led by K. Bigham – now
Ph.D program - New
Zealand, Wellington



Coastal Biology

Cataloging the inhabitants of Coastal Environments
Description

[Read More +](#)



Biology at Axial Seamount

Axial Seamount is the most volcanically active deep-sea volcano on the Juan de Fuca spreading ridge having erupted in 1998, 2011, and again in 2015. It also hosts numerous vigorously venting hydrothermal vent fields.

[Read More +](#)

More Videos



Interactiveoceans Website and Data Portal

The screenshot shows the homepage of the Interactiveoceans website. At the top, there is a navigation bar with the logo 'OCEANOGRAPHIC CABLED ARMY' and a 'DATA PORTAL' button. Below the navigation bar is a large image of an underwater scene. A secondary 'DATA PORTAL' button is located below the image. The main content area is titled 'Eyes on the Ocean' and features several article cards. One card is titled 'Pythias Oesic: An Underwater Spring Unlike Any Other' and another is 'A Record-Setting Operations and Maintenance Regional Cabled Array Cruise'. At the bottom of the page, there is a section titled 'And this is why our cable is here...' with a 'Learn More' button and a map showing a cable route. The footer contains links for 'Interactive Map', 'Visualize Data', 'Contact', 'NSF Disclaimer', and 'Privacy & Terms'.

The screenshot displays the Interactiveoceans Data Portal interface. At the top, a message states: 'This data portal is in beta and currently a work in progress. Please try it out and let us know if you run into any problems, what you like, and what you would improve. Thanks! Send Feedback'. Below this is a search bar labeled 'Search Here' with the text 'Enter keyword'. A 'Research Sites' list includes: Oregon Slope Base, Southern Hydrate Ridge, Oregon Offshore, Oregon Shelf, Azalea Base, Azalea Canyons, and Mid-Plate. A 'Visualize Data' button is located below the list. The main area is a bathymetric map of the ocean floor, showing depth contours in various colors (blue, green, yellow, orange, red). A white line indicates the cable route. The map includes a coordinate display at the top: 'Latitude: 47.44551 Longitude: -127.80457'. A 'Send Feedback' button is visible in the top right corner of the map area.

Interactiveoceans Website and Data Portal

