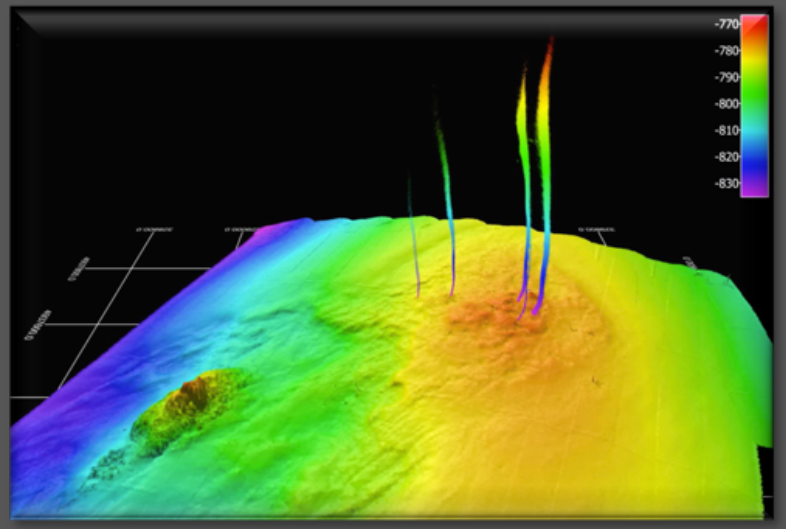
NSF's Ocean Observatories Initiative
Regional Cabled Array Maintenance Cruise AT42-12
May 30 – June 12, 2019



DESSC
December 8, 2019

Debbie Kelley & RCA Team
Director/PI Regional Cabled Array
University of Washington
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NSF-OOI Regional Cabled Array

Built on time and under budget

Primary Infrastructure

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

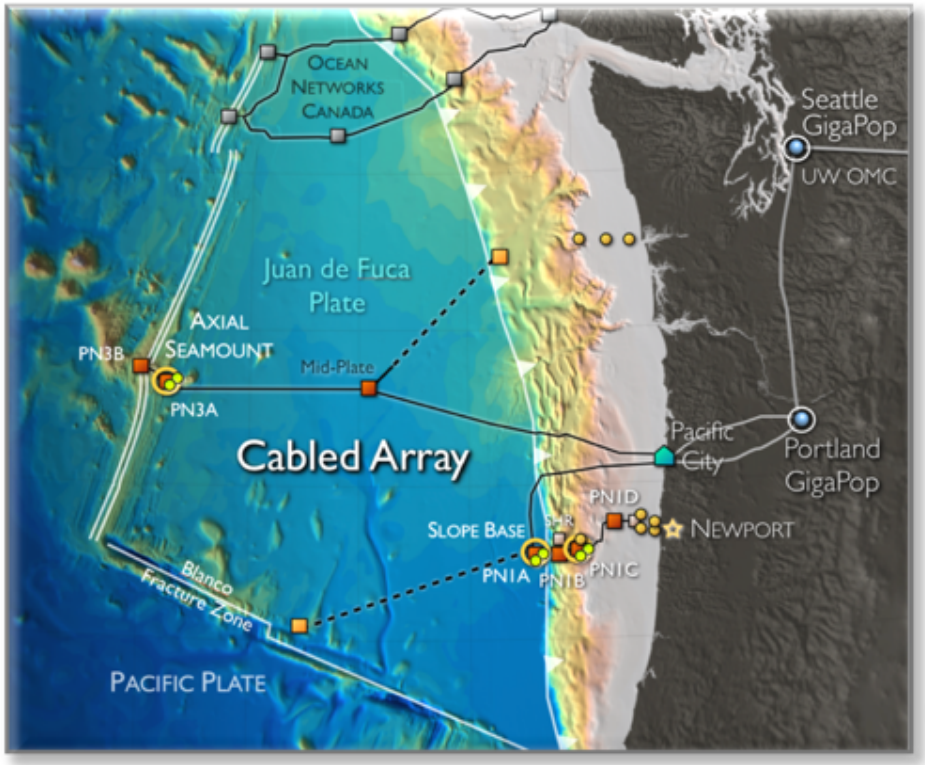
Secondary Infrastructure

- 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

BRINGING POWER AND THE INTERNET INTO THE OCEAN

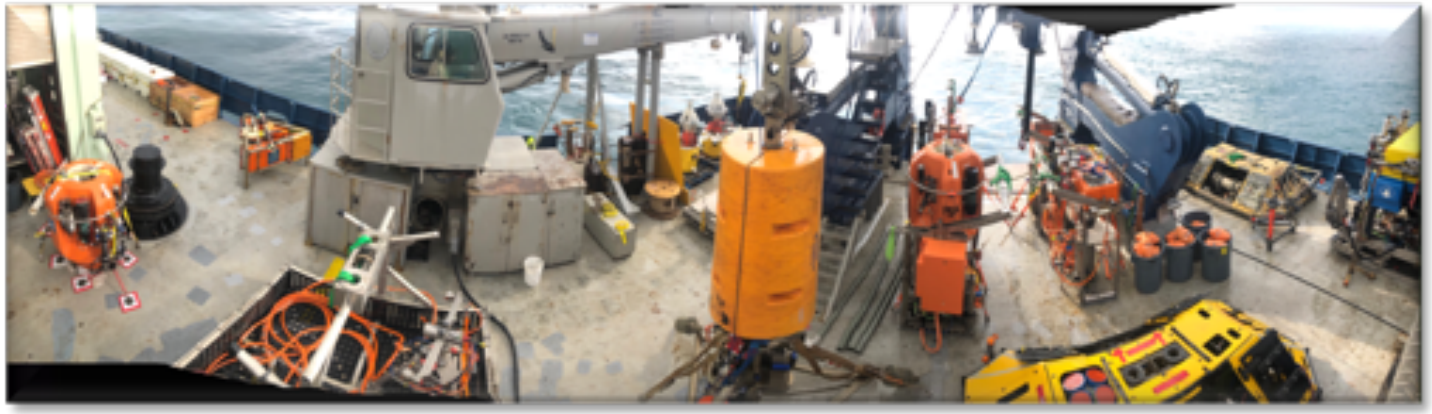
R/V Atlantis and ROV *Jason AT42-12 May 30-July 12, 2019*

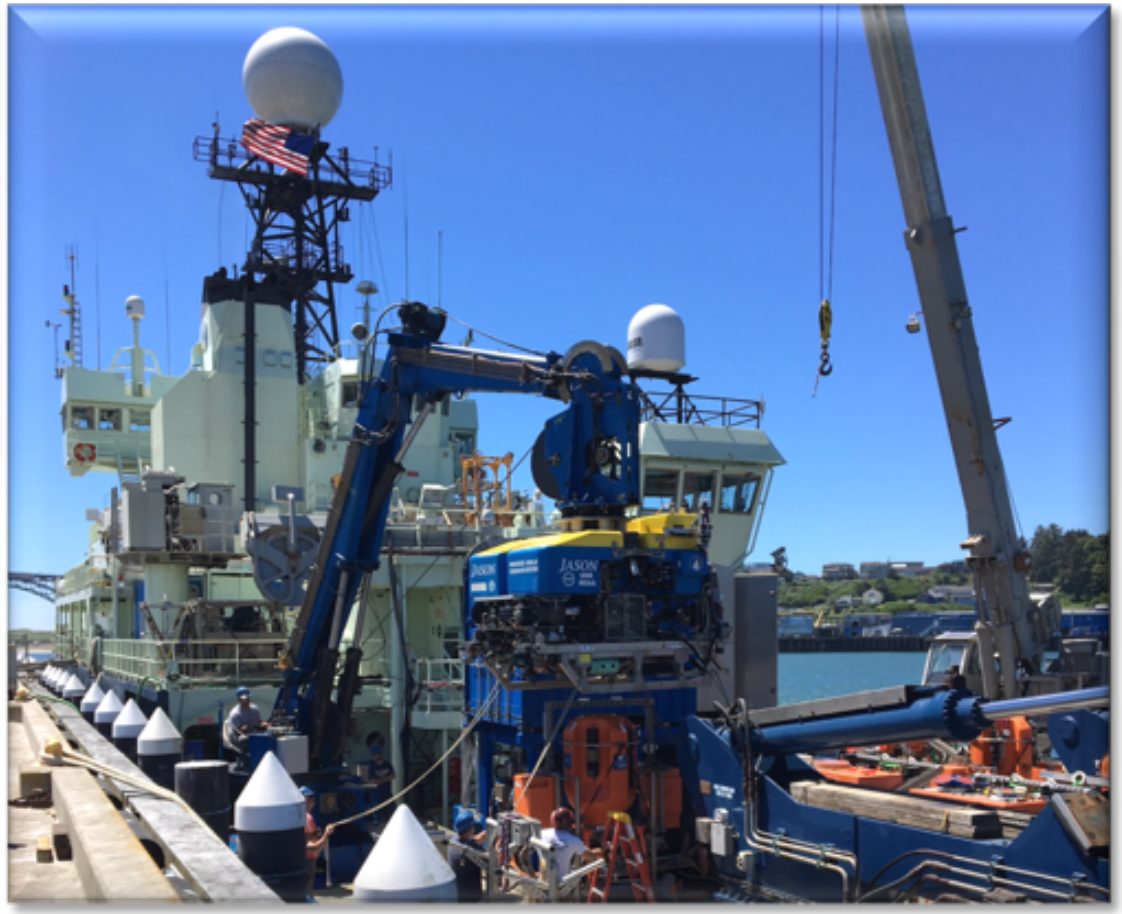
Newport – Newport (NOAA) – 4 legs



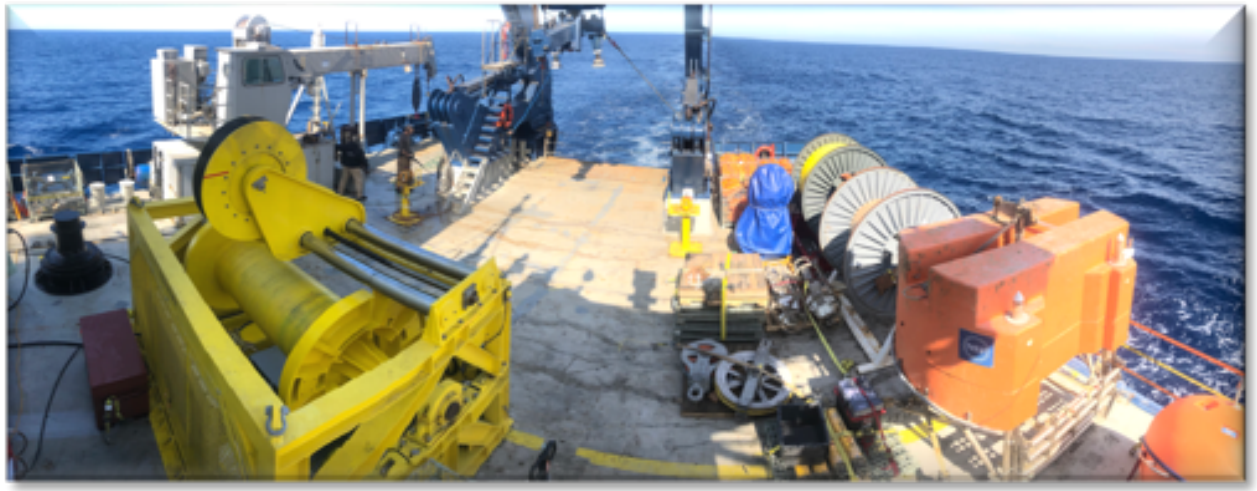
- Sixteen 48 ft trailers, six flatbed trucks moved 166 tons of RCA equipment from Seattle WA to Newport OR
- Onboard staffing 52 personnel (13 students)
- A record 20 *Jason* dives in five days (Leg 2); 58 total dives
- Installed 113 RCA Instruments & 8 PI Instruments
- Recovered 100 RCA Instruments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

Intense mobilization

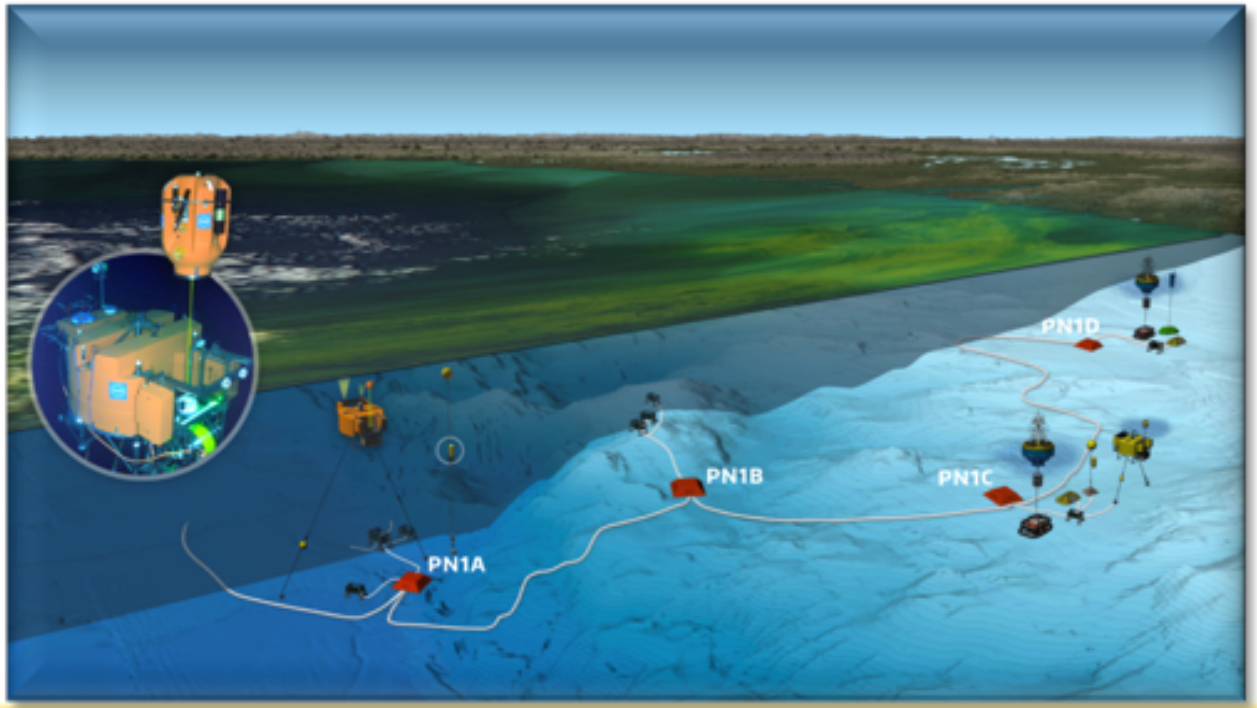




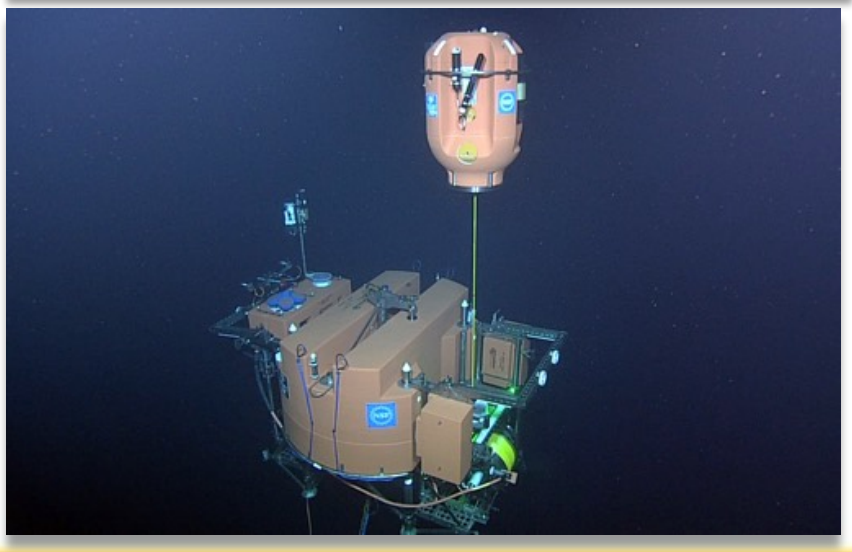
Leg 1: Recovery/Installation of Shallow Profiler mooring



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



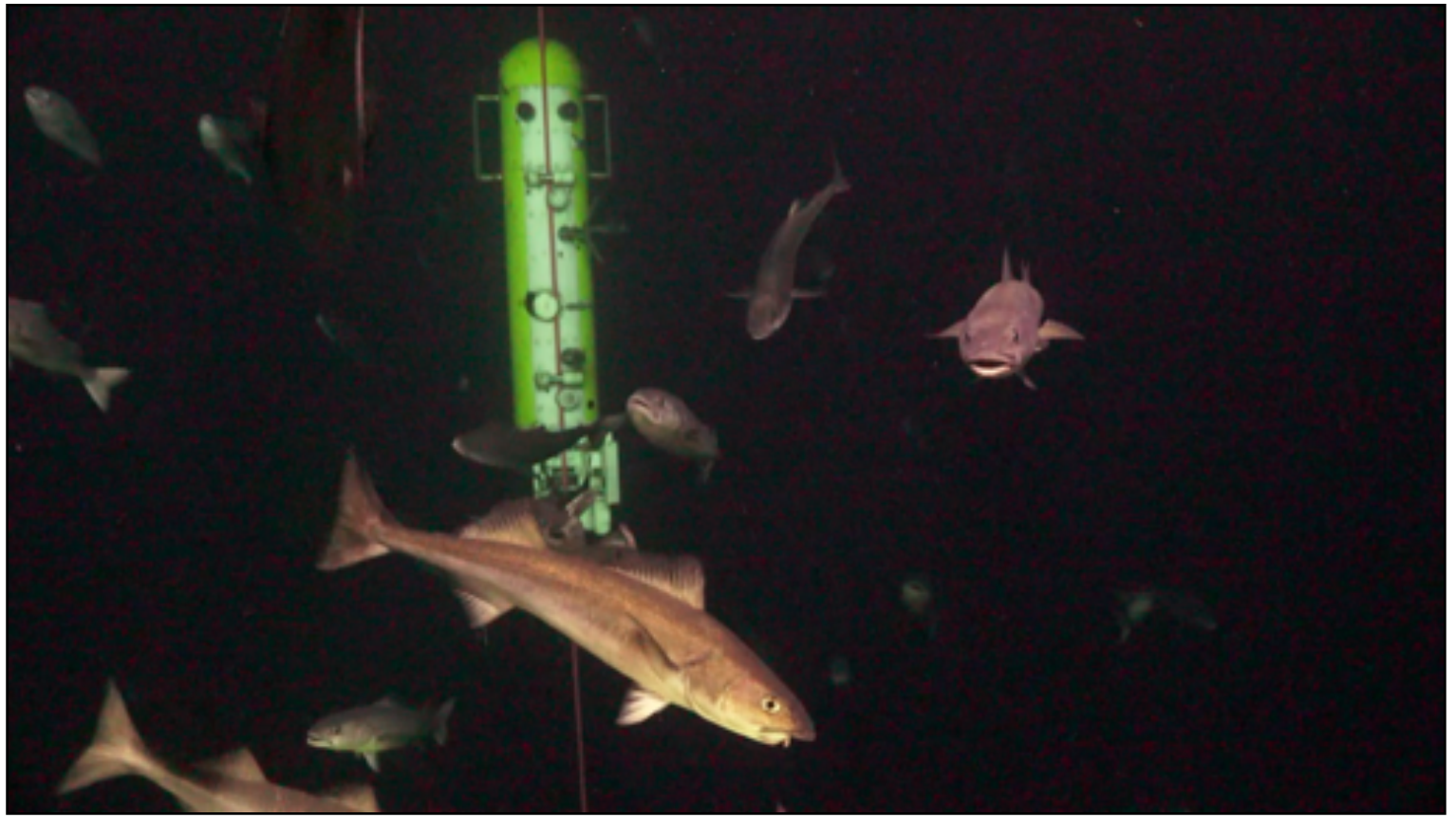
Shallow Profiler Science Pods (6)



- Record turn around ~1 hr for a pod
- Includes up to 18 instruments (e.g. pH, CO_2, O_2, 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

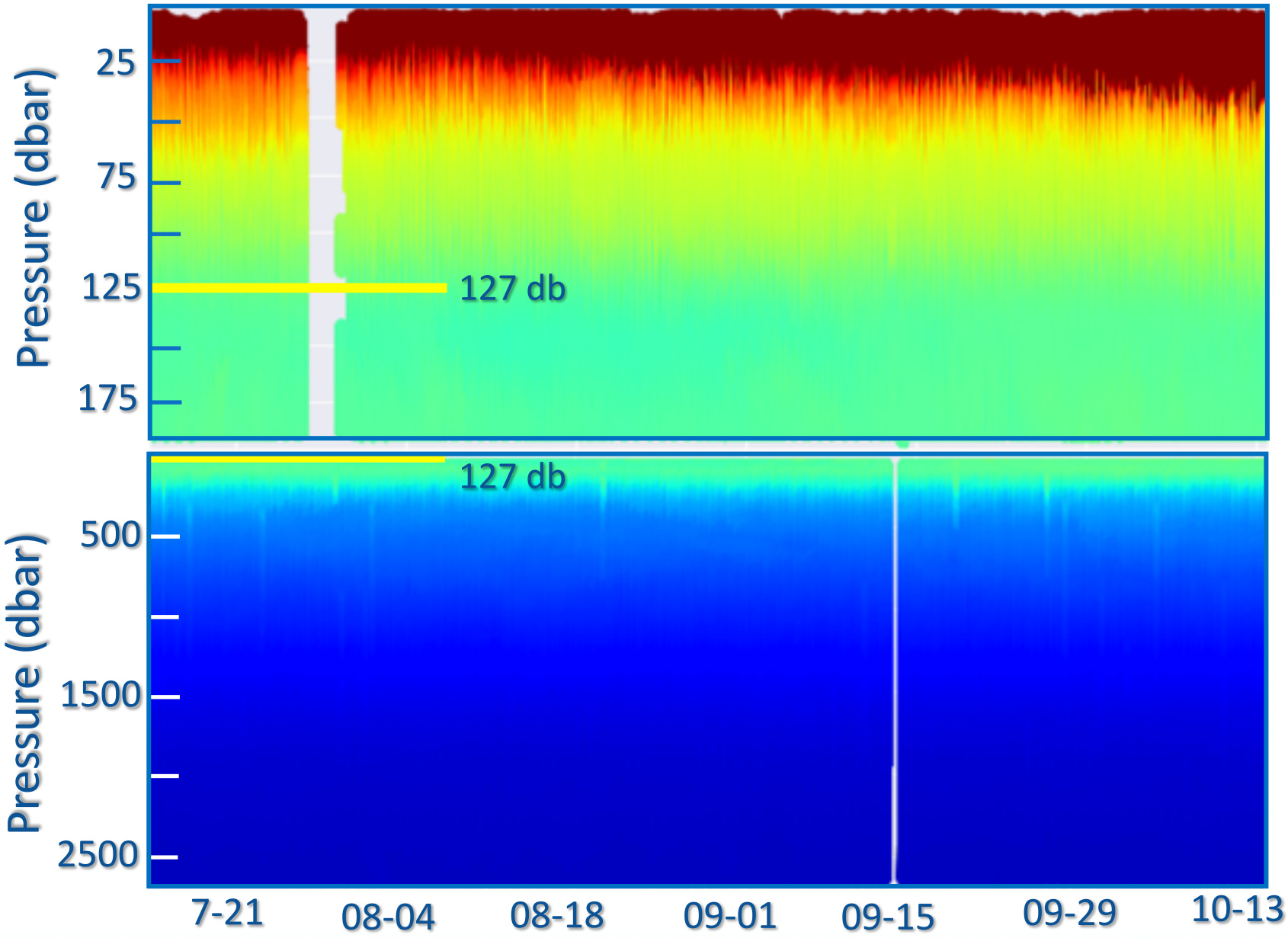
Deep Profiler Moorings

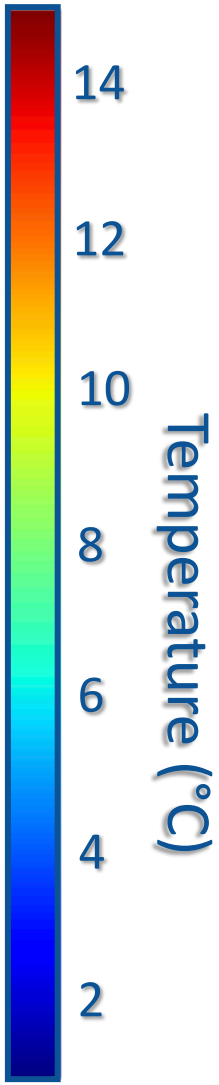
- Turned 3 vehicles using specialized “clam shell” on *Jason*
- Cod frenzy at Oregon Offshore – 600 m



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



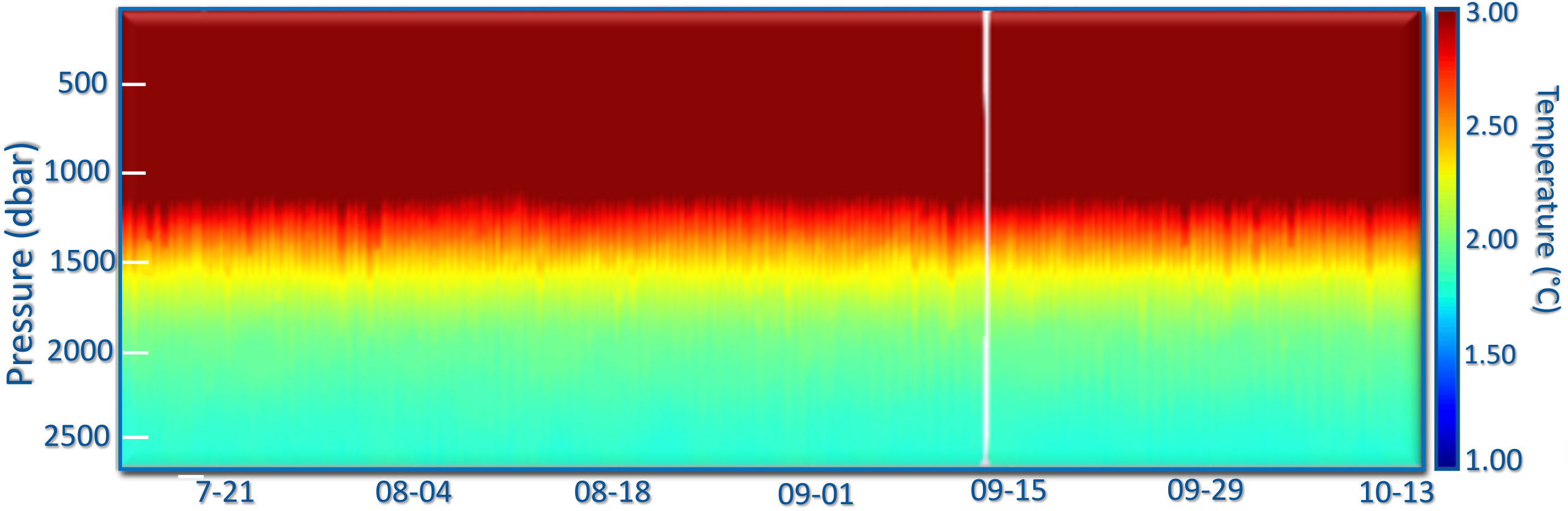


Shallow Profiler
(9 times/day)

Axial Base
2019

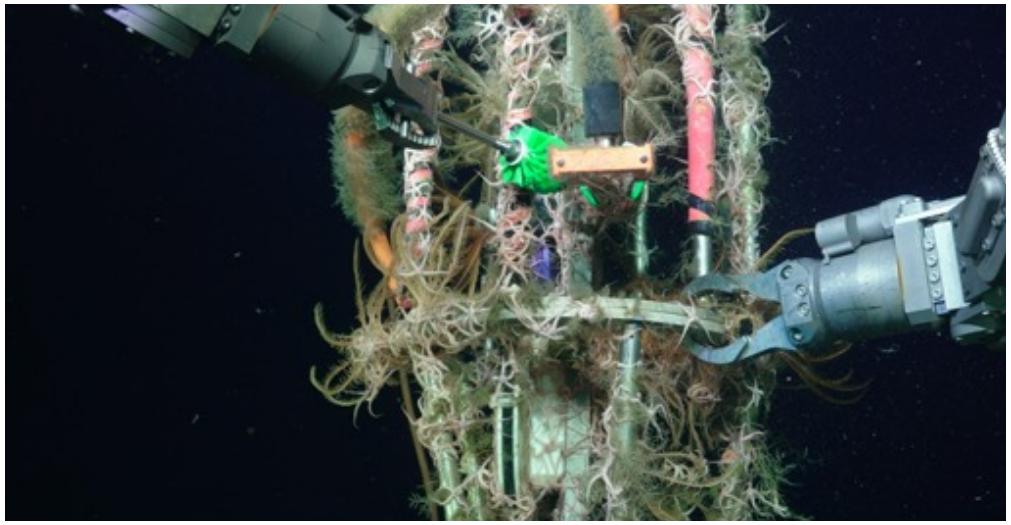
Deep Profiler
(2 times/day)

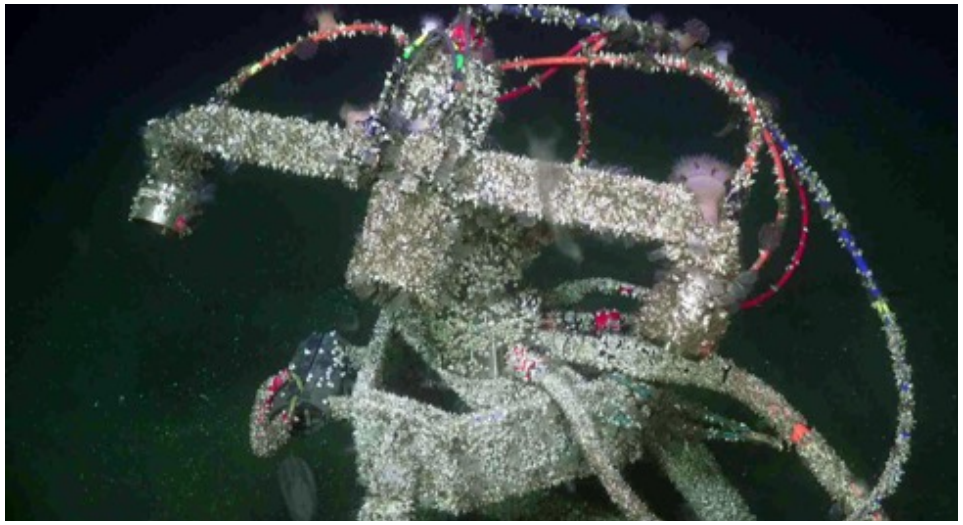
Axial Base
Deep Profiler August-October 2019

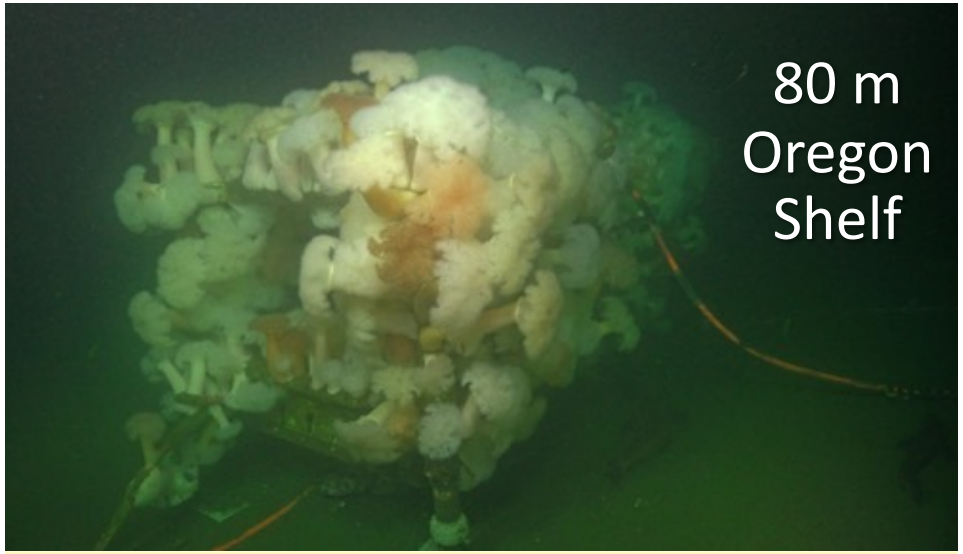


Amazing structure even at ~1000-2000 m

“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

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

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

Wilcock (UW) Flipping tilt meter

NSF

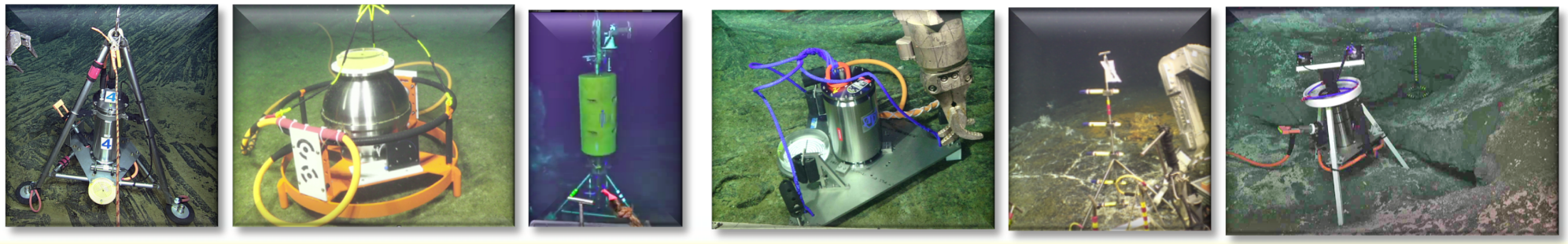
Breedlove (Creare) Digital Still Camera – Vent Energy Extraction Platform 2020

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

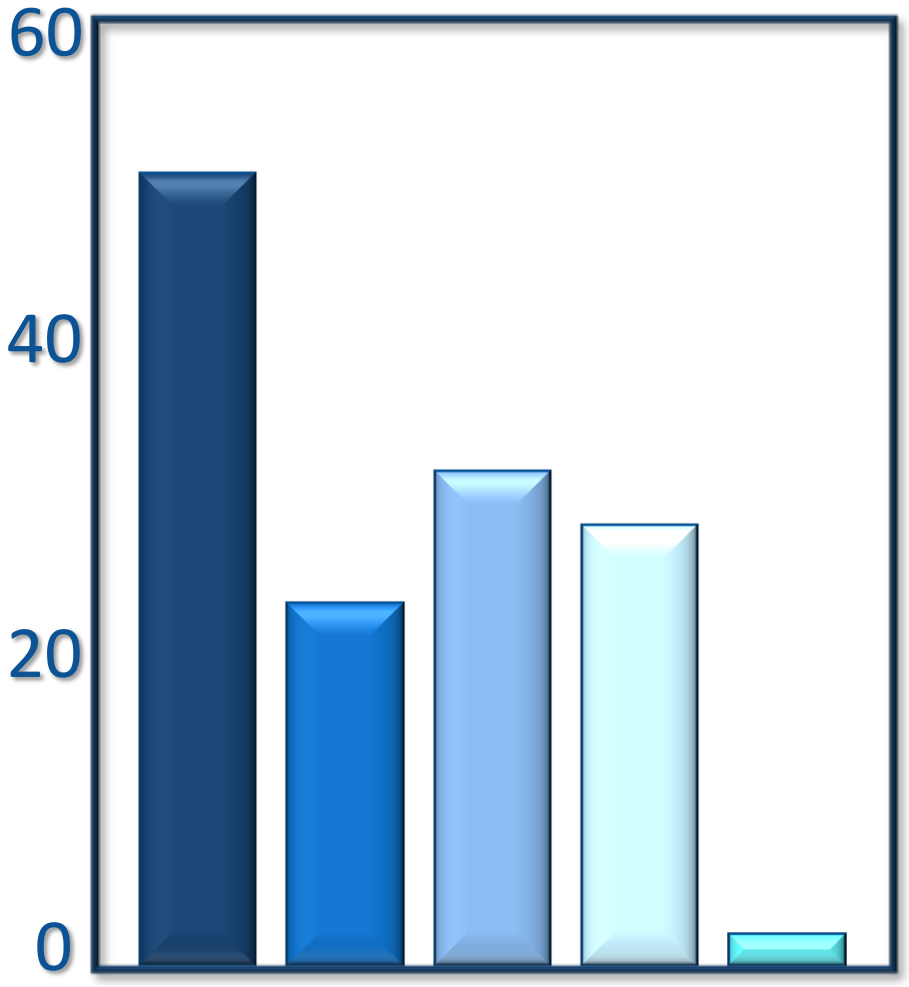
ONR

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

Germany

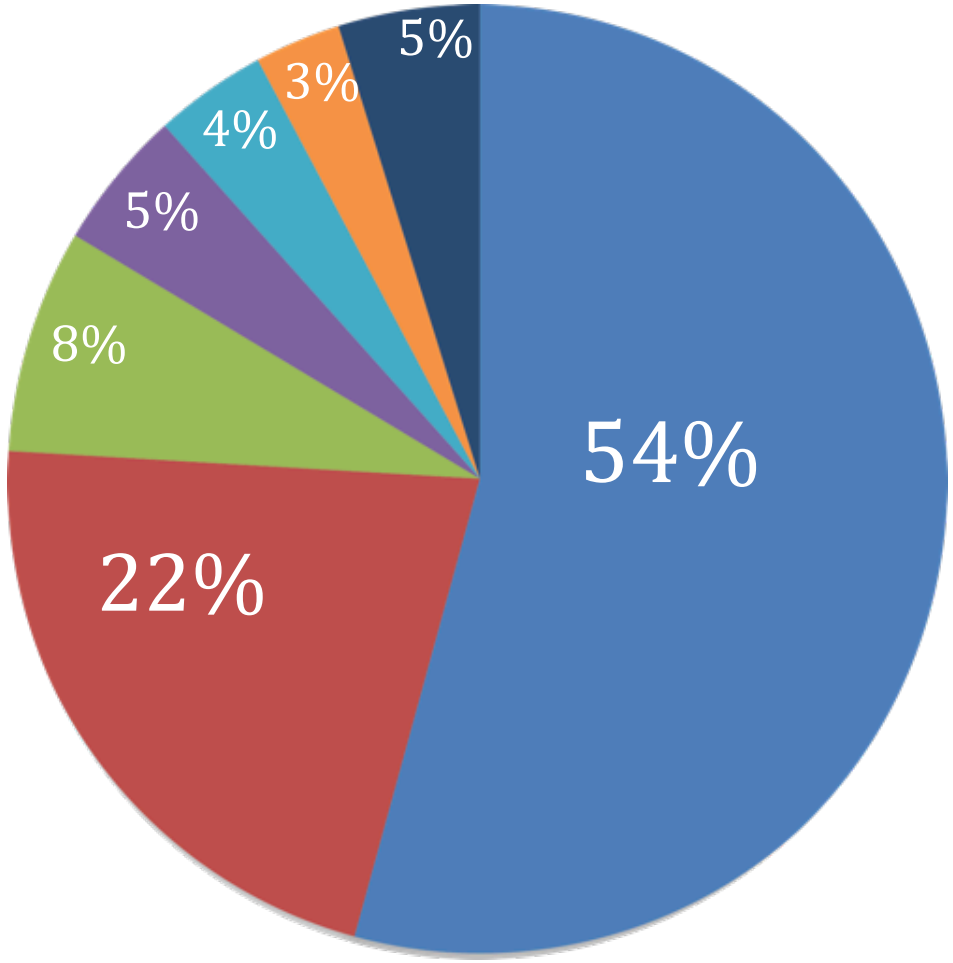


Regional Cabled Array Funded Community
2016-2019



- 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

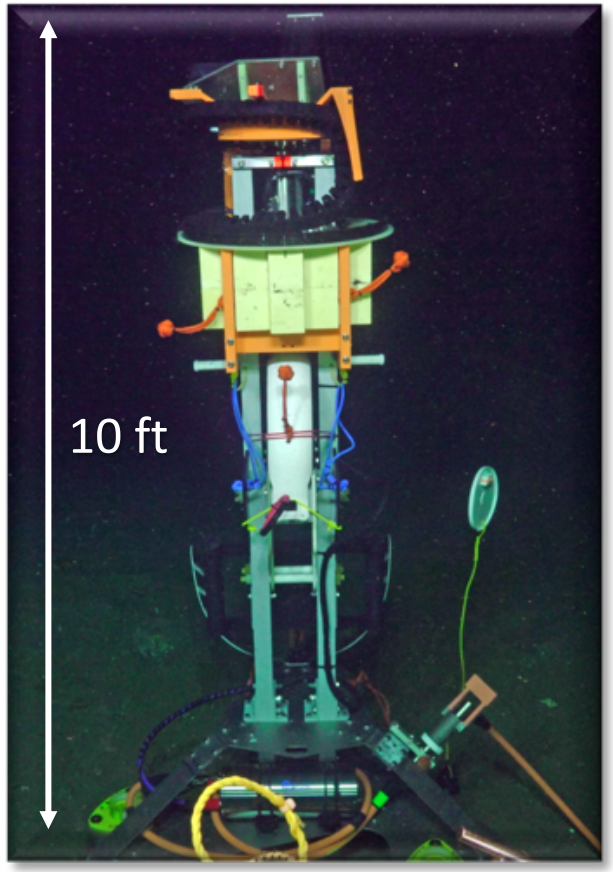


>$26M

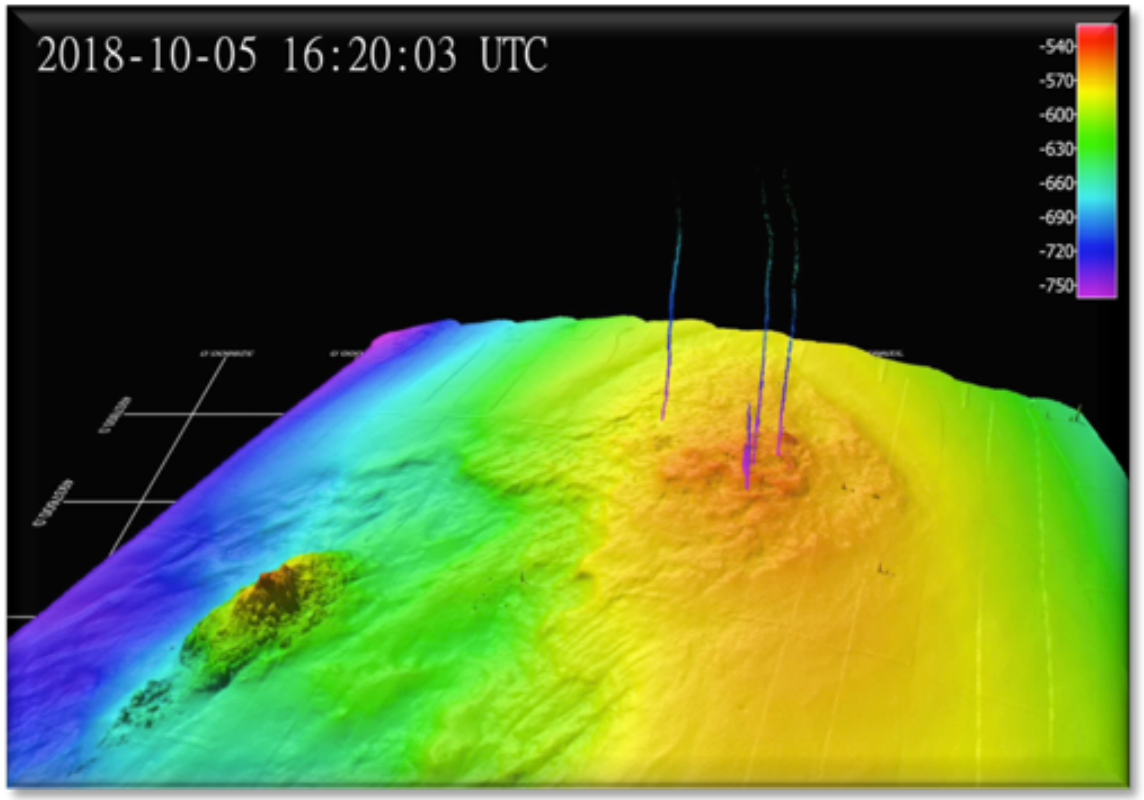
"If you build it they will come"
M. Leinen 2006 OOI CDR

- 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)

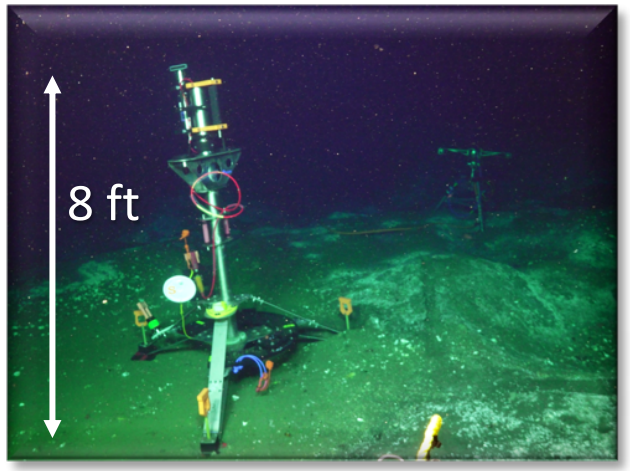
MARUM: Quantifying Gas Emissions At Southern Hydrate Ridge



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

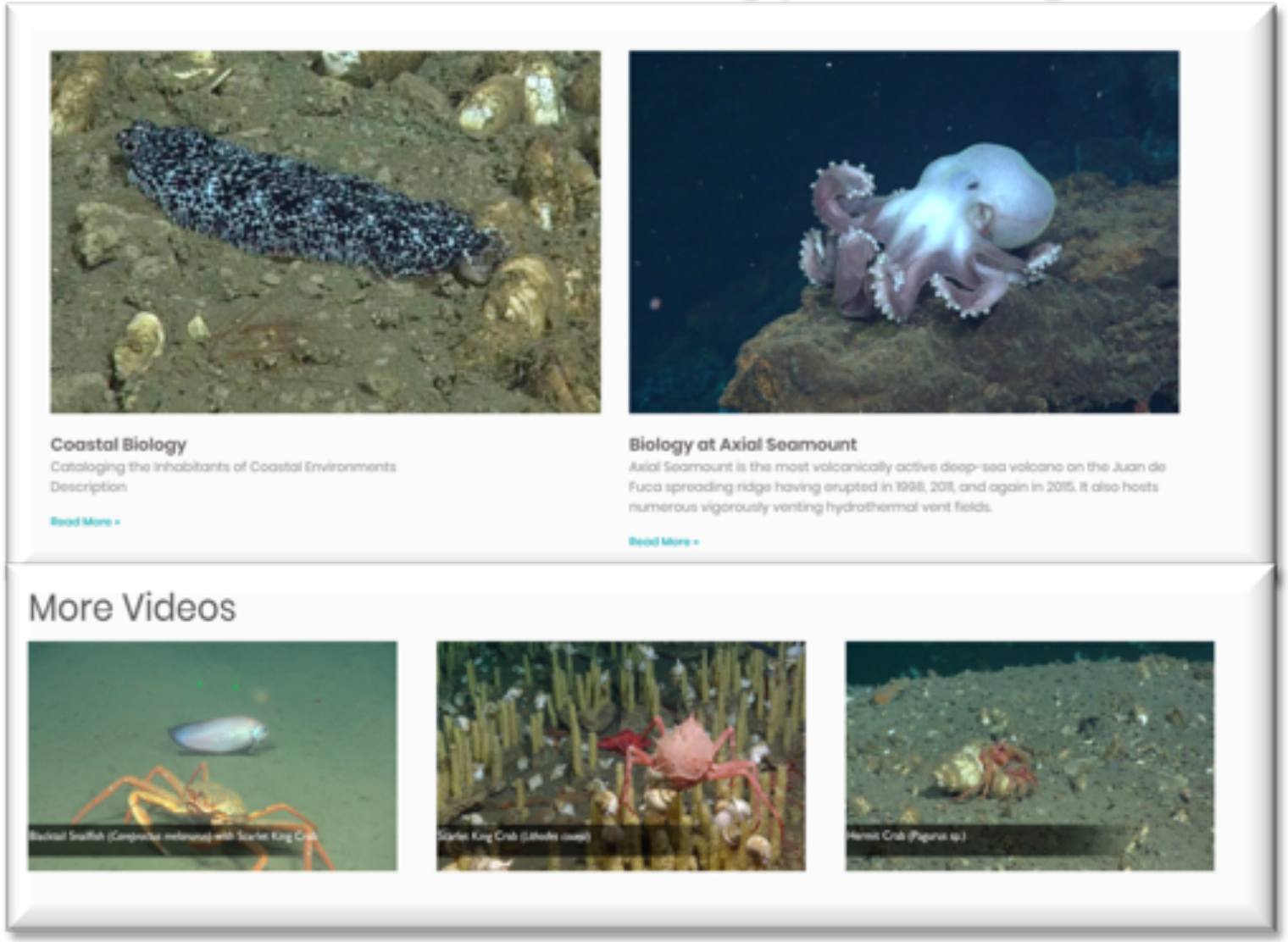
- validate strategies and adaptive missions, and signatures for life in extreme environments (on other watery planets)
- Hydrothermal fluid and rock sampling (development of ROV rock drill), fluid gas and chemical analyses, microbial genomic characterization, extensive site characterization, machine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

RCA-OOI-UW Educational Efforts

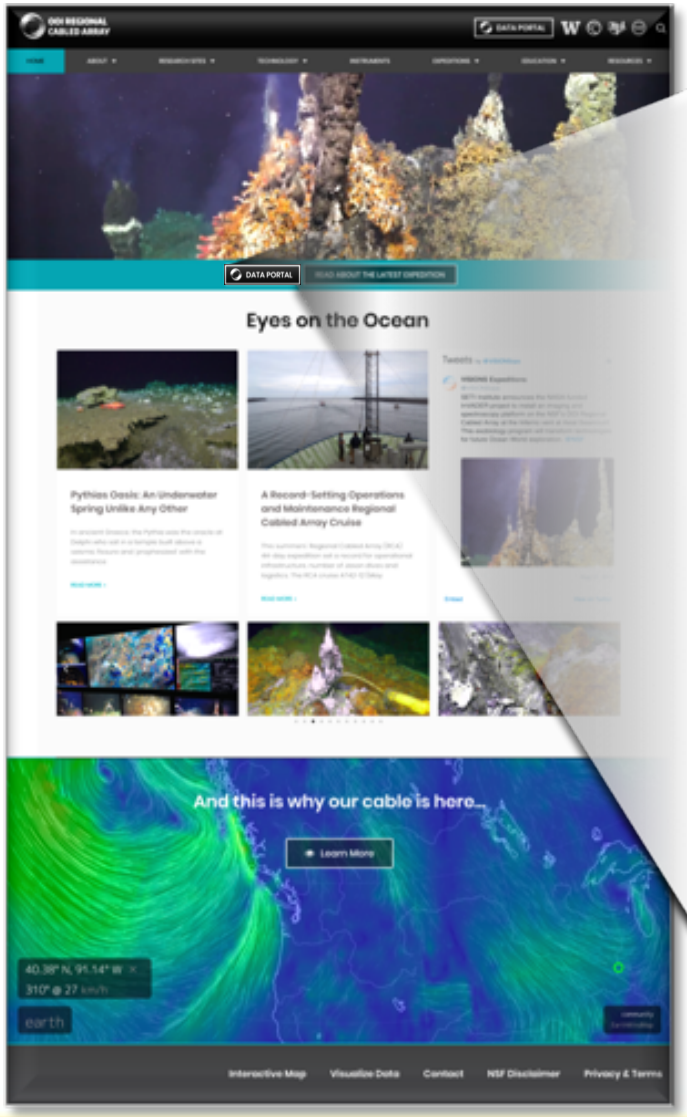
- VISIONS at-sea experiential learning program:
  - >160 undergraduate and graduate students have participated; 13 on VISIONS'19; diverse population – socioeconomic, ethnic, and educational (i.e. numerous first generation; K12 schools of 130 students) backgrounds.
  - All students complete a science 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

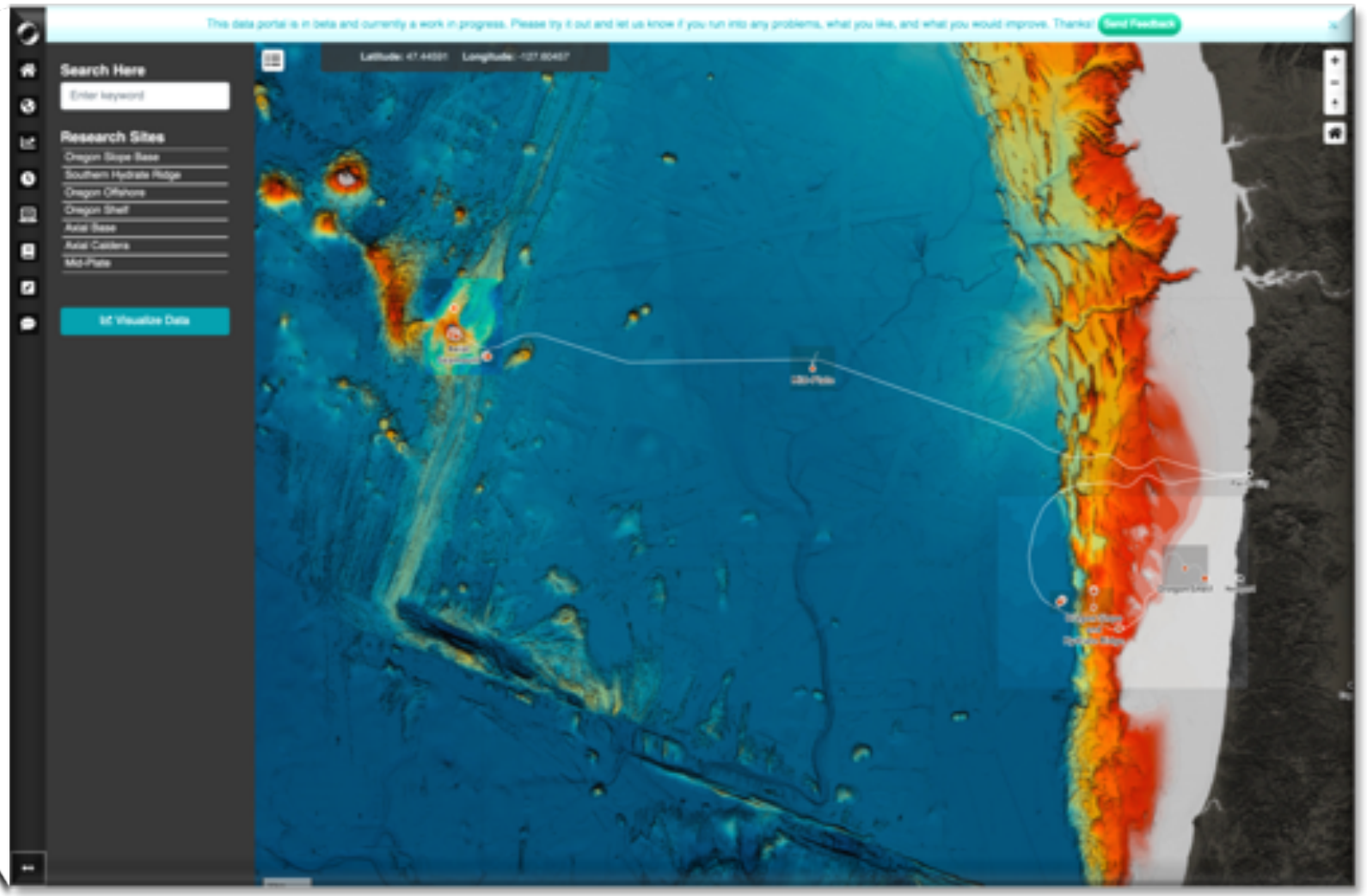
Undergraduate-Generated Biology Catalogue

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



Interactiveoceans Website and Data Portal





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