

NOAA Ocean Exploration and Research Program Update

Alan Leonardi, Director

Ninth Meeting

Ocean Exploration Advisory Board

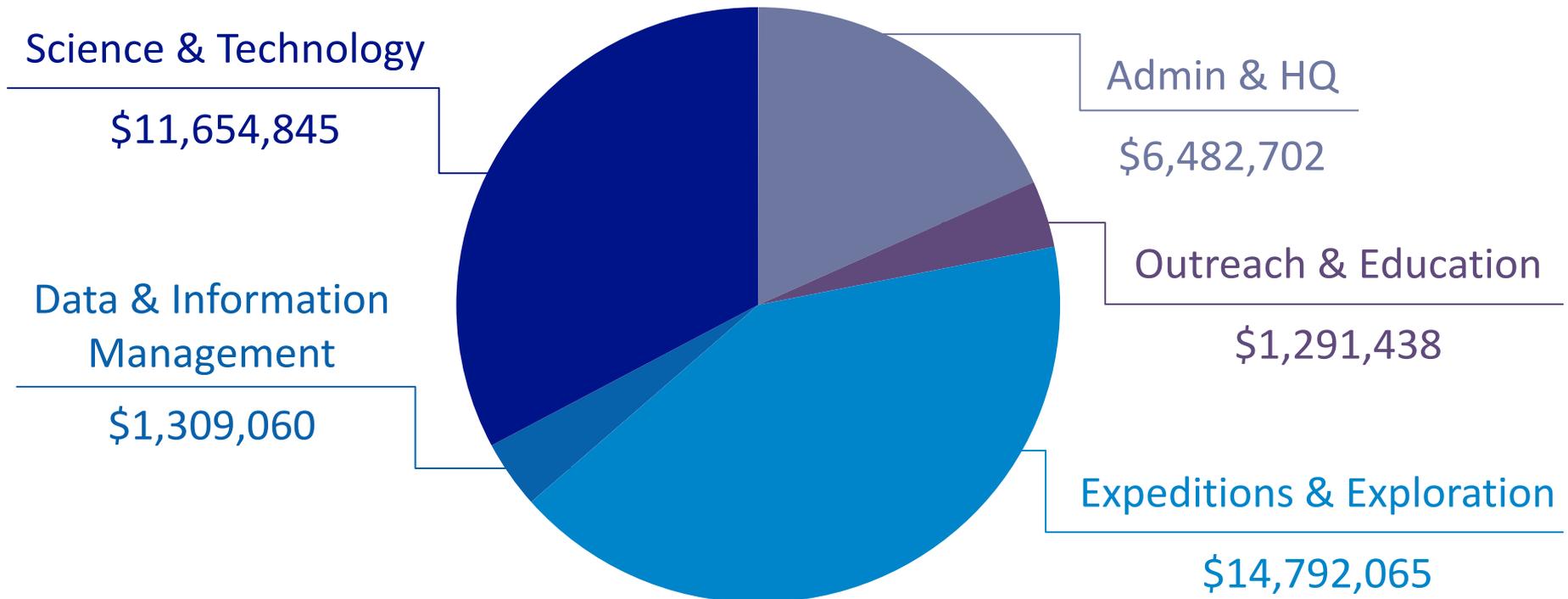
Seattle, Washington

January 30 – 31, 2018

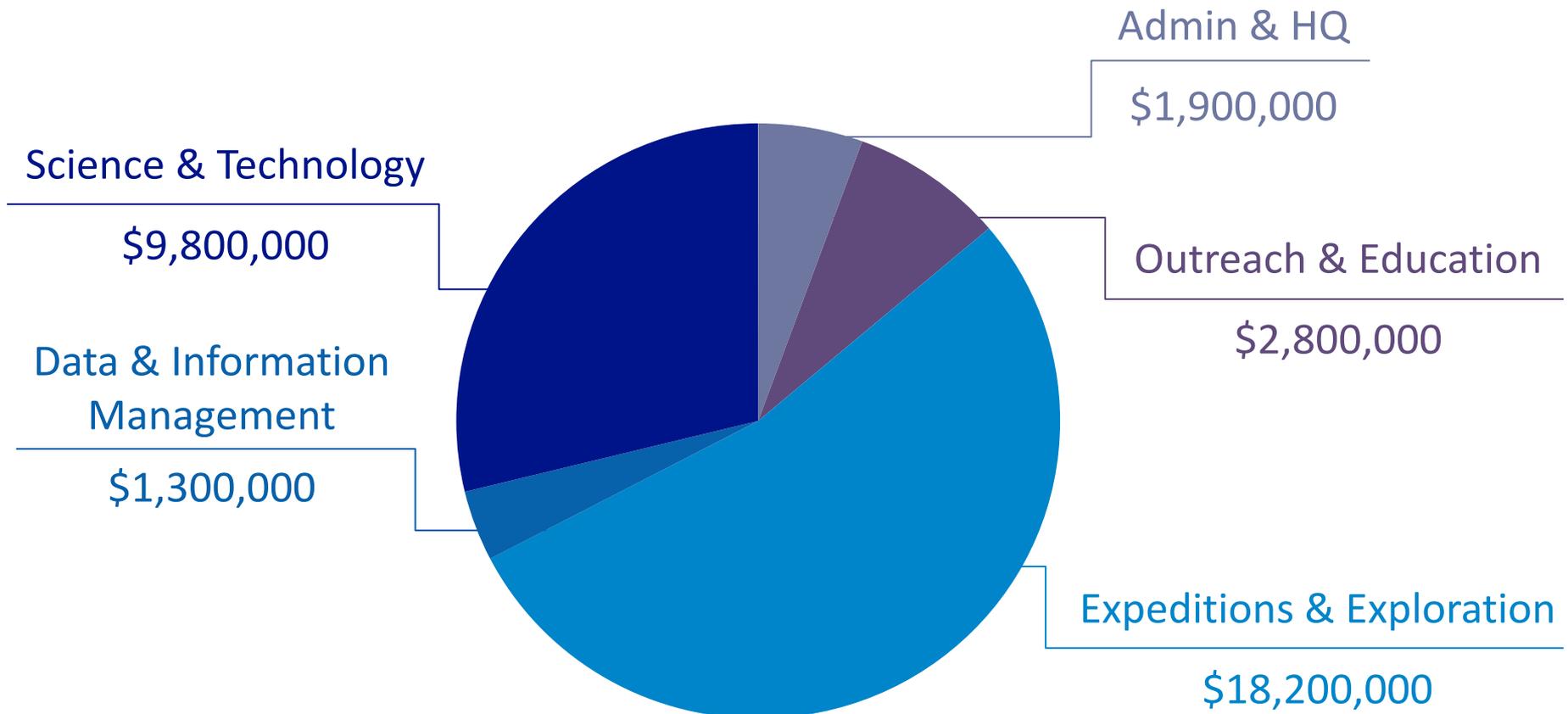
Overview

- FY17 and FY18 Budget Overview
- CAPSTONE Accomplishments
- International Partnerships
- 2017 Engagement Metrics
- 2018 Activities
 - Review of operations to date
 - What's next
- 2019 and 2020 Outlook

FY17 OER Budget by Strategic Categories

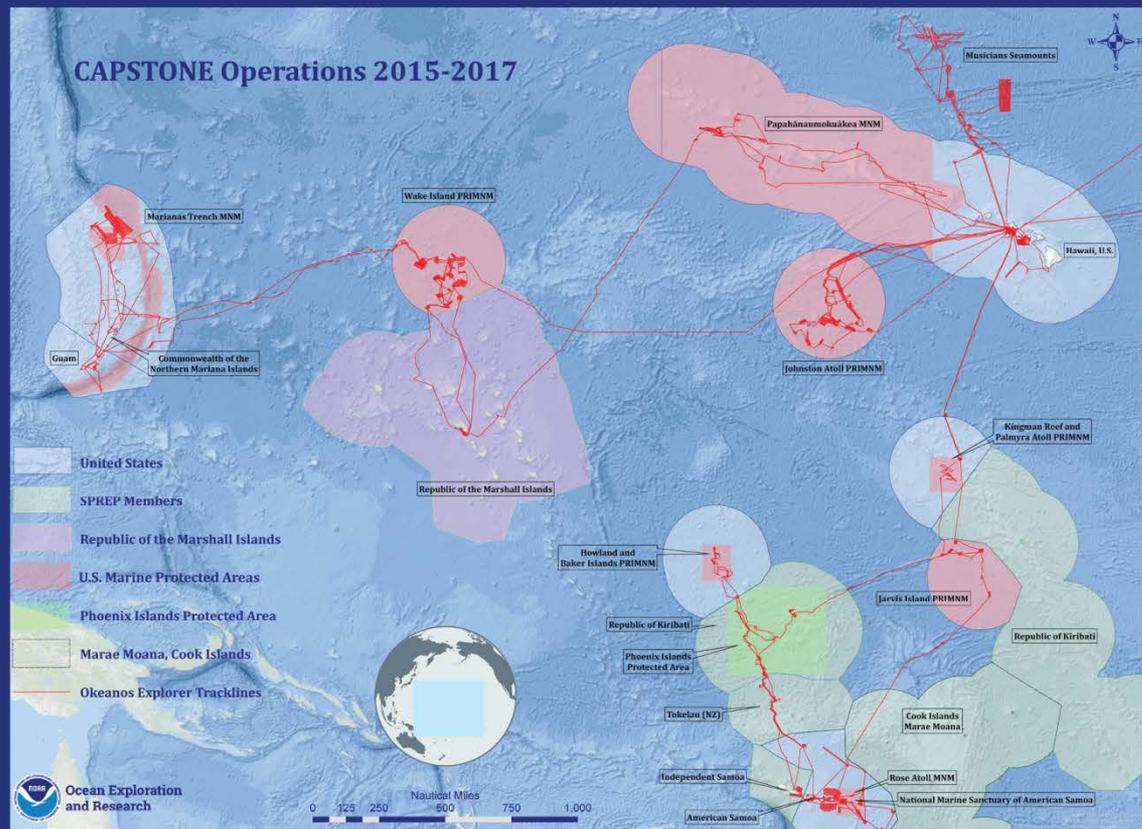


FY18 OER Budget by Strategic Categories



NOAA's Campaign to Address Pacific monument Science, Technology, and Ocean Needs (CAPSTONE)

NOAA Ship *Okeanos Explorer*, July 2015 - September 2017



over 635,000 km² of seafloor mapped

333 primary biological & 278 geological samples collected

187 ROV dives at a depth range of 250 - 6,000 meters

over 260 participating scientists, students, and managers

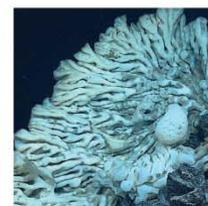
8.4 million live video views via YouTube and over 8 million additional live video views via other outlets such as Facebook



This gushing hydrothermal vent was videoed during the Deepwater Exploration of the Marianas. The 30-meter high underwater vent was spewing high-temperature liquid thick with metal particulates. The area around it is home to exotic species, including shrimp, squat lobsters, crabs, limpets, mussels, and snails.



On December 7, 2016, the 75th anniversary of the attack on Pearl Harbor, the NOAA Ship *Okeanos Explorer* team, in partnership with the NOAA Office of National Marine Sanctuaries, explored a Japanese mini submarine, five miles from the entrance to Pearl Harbor. Navy destroyer USS *Ward* sunk the sub on the morning of December 7, 1941, 90 minutes before Pearl Harbor was bombed by air.



The team aboard NOAA Ship *Okeanos Explorer* observed the largest sponge known in the world, found at a depth of 2,134 meters within the Papahānaumokuākea Marine National Monument. The sponge was close to 12 feet long and 7 feet wide, comparable in size to a minivan.



Ocean Exploration and Research

For more information about CAPSTONE and other NOAA ocean exploration work, please visit: <http://oceanexplorer.noaa.gov>

International Partnerships: Samoa



~5,600 km² of seafloor mapped

Scientific Highlights: Mapped extensive uncharted areas around the entire eastern half of Upolu. High resolution maps of the seafloor revealed the dramatically steep slopes off of Samoa as the seafloor quickly drops from 100 meters to over 4,500 meters.

Engagement Highlights: Reached nearly 220 individuals through ship tours and presentations in Apia, Samoa.



International Partnerships: American Samoa



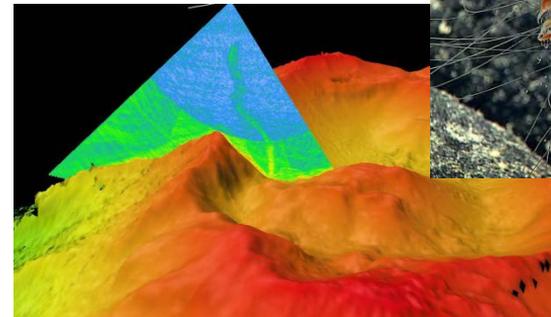
40,870+ km² of seafloor mapped



Conducted 13 ROV dives

Scientific Highlights: Observed deep-sea coral and sponge communities, hydrothermal vents, bottomfish habitats, seamounts, and the water column, including as many as 30 potential new species. Deepwater mapping efforts provided updated bathymetry along the pier at the port of Pago Pago and evaluated change in the crater of the Vailulu'u submarine volcano.

Engagement Highlights: Reached nearly 2,000 American Samoa residents and visitors through ship tours, presentations, and live telepresence interactions. Received news and media coverage from more than 60 news outlets.



International Partnerships: PIPA



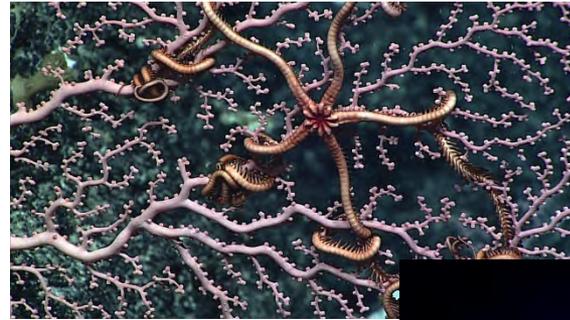
~25,200 km² of seafloor mapped



Conducted 8 ROV dives

Scientific Highlights: Observed high-density coral communities, areas of high biodiversity, and large octocoral fans. Provided new high resolution bathymetry maps of portions of ten seamounts and three prominent ridge and island flank features, as well as the first ever multibeam maps of the deepest feature within PIPA referred to as “Kinono” at 6,350 m deep.

Engagement Highlights: Australian Broadcasting Corporation aired three radio segments about expedition findings, including interviews with the PIPA Office in Tarawa, the lead scientists onboard, and the PIPA Scientific Advisory Committee Co-Chair.



International Partnerships: Tokelau



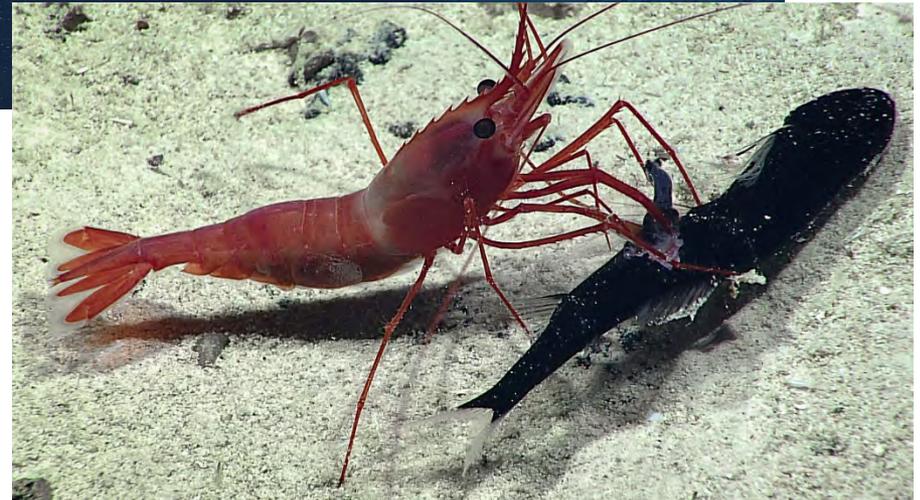
~13,300 km² of seafloor mapped



Conducted 2 ROV dives

Scientific Highlights: Observed a high diversity of coral and commercial fish at Pao Pao Seamount, as well as precious corals and unique behavior of a caridean shrimp predating on a midwater dragonfish at Ufiata Seamount. Mapping efforts included portions of nine seamounts and five highly prominent ridge features.

Engagement Highlights: Approximately 30 individuals from Tokelau engaged with the mission team during a ship tour while in-port in Apia, Samoa.



International Partnerships: Marae Moana (Cook Islands)



4,300+ km² of seafloor mapped



Conducted 2 ROV dives

Scientific Highlights: Discovered a previously unknown large scale high density deep sea coral community. Acquired multibeam data that, along with the ROV sampling, has the potential to indicate a connection between ridge features and the Manihiki Plateau.

Engagement Highlights: Hosted a telepresence interaction with Cook Islands schools, as well as a live telepresence interaction with media and participating scientists at New Zealand's Institute of Water and Atmospheric Research.





2017 Expeditions



NOAA Ship *Okeanos Explorer*

10 cruises

276,915 km² mapped
52,026 linear km mapped

85 ROV dives

643 hours of ROV time

424.5 hours on bottom

643 hours of video

273 samples collected
321 subsamples collected

5,862.9 m depth reached

286 participating scientists

24 cruises

349,898 km² mapped
77,249 linear km mapped

183 ROV dives

1,718 hours of ROV time

1,359.5 hours on bottom

1,718 hours of video

1,041 samples collected
2,042 subsamples collected

5,862.9 m depth reached

hundreds of participating
scientists

E/V *Nautilus*

14 cruises

72,983 km² mapped
25,223 linear km mapped

98 ROV dives

1,075 hours of ROV time

935 hours on bottom

1,075 hours of video

768 samples collected
1,721 subsamples collected

3,693 m depth reached

100+ participating scientists

2017 Engagement & Outreach



Ocean Exploration
and Research



OCEAN
EXPLORATION
TRUST

% change from FY16

	Website Visits	12,744,315	1,920,193	↓ 12.3% decrease
	Live Video Views	~3,700,000	~1,947,900	↓ 5.9% decrease
	Facebook Likes	~123,000	~86,200	↑ 17.6% increase
	Twitter Followers	~186,000	~17,800	↑ 117.4% increase
	Instagram Followers	~9,600	~12,800	↑ 132% increase
	Youtube Views	~6,200,000	~29,600,000	↑ 63.8% increase
	Youtube Subscribers	~65,000	~103,500	↑ 77.2% increase
	Educators Trained	770	168	↓ 17.5% decrease
	Reached Students	~90,000	~8,800	↓ 46.5% decrease
	Educator Workshops	34	4	↓ 20.8% decrease

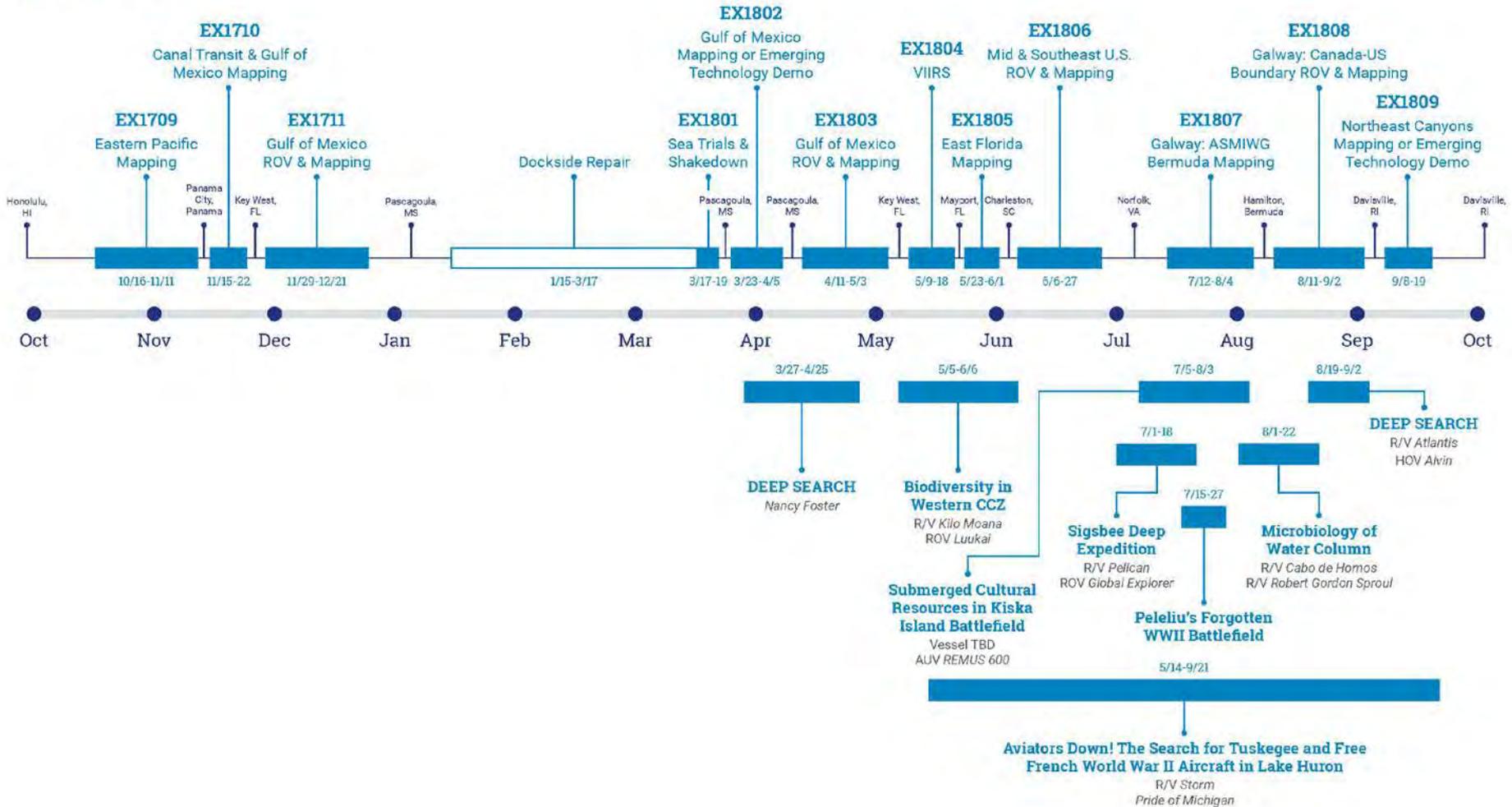


Media Mentions

Thousands of stories were generated from hundreds of outlets ranging from CNN, Fox News, The Economist, NBC, National Geographic, The New York Times, Gizmodo, Discovery, and Business Insider.

2017-2018 Expeditions

Last Updated: 1/24/18



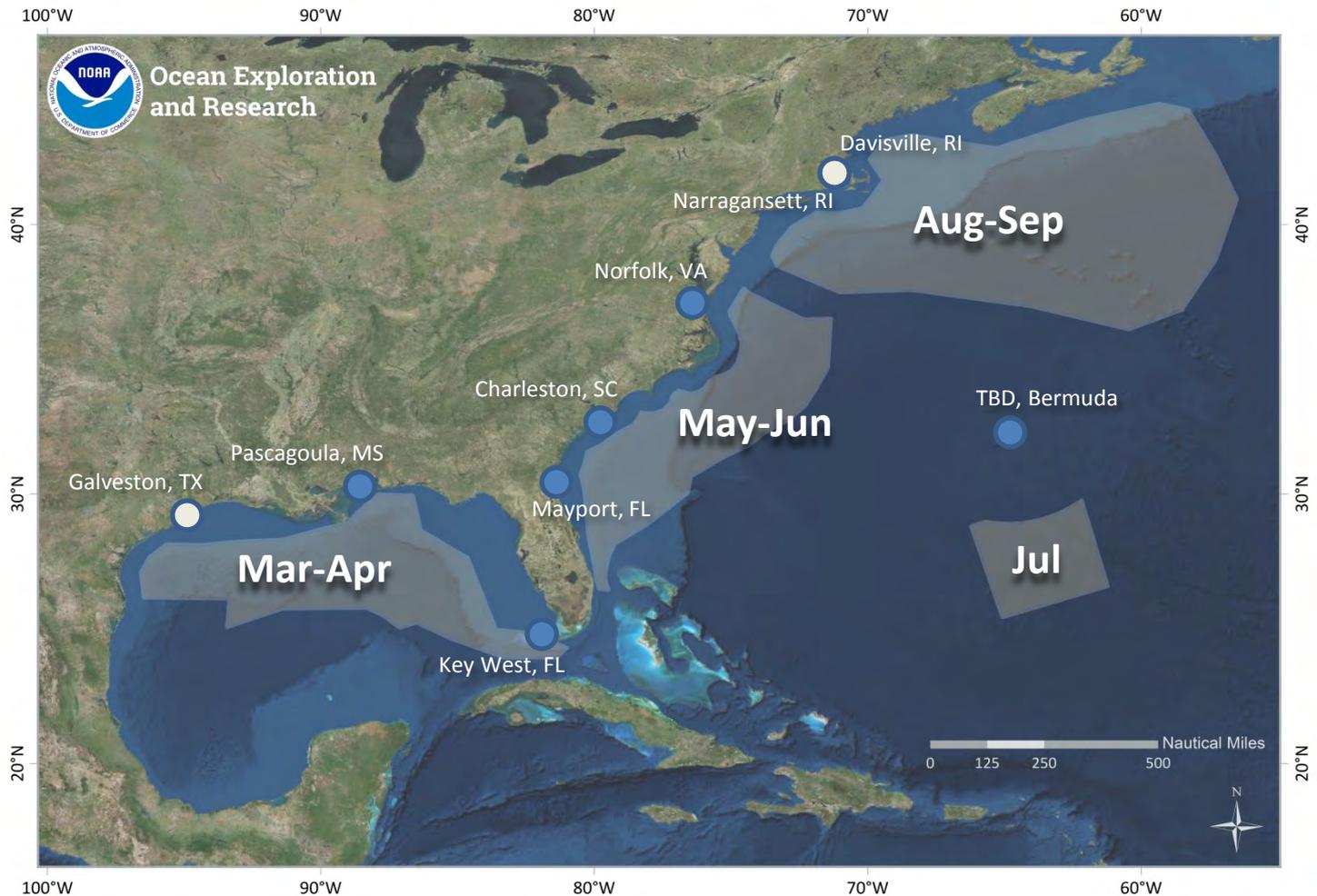
FY18 *Okeanos Explorer* Work To Date

- CAPSTONE Conclusion
- Two-Ship Ocean Exploration Celebration in HI
- Eastern Pacific Mapping and N2 Sensor Testing (McNeil)
- Transit through the Panama Canal Exploratory transit mapping through Caribbean and Gulf of Mexico (5 EEZs)
- Mapping of South East Deep Coral Initiative priority areas
- Gulf of Mexico ROV and Mapping



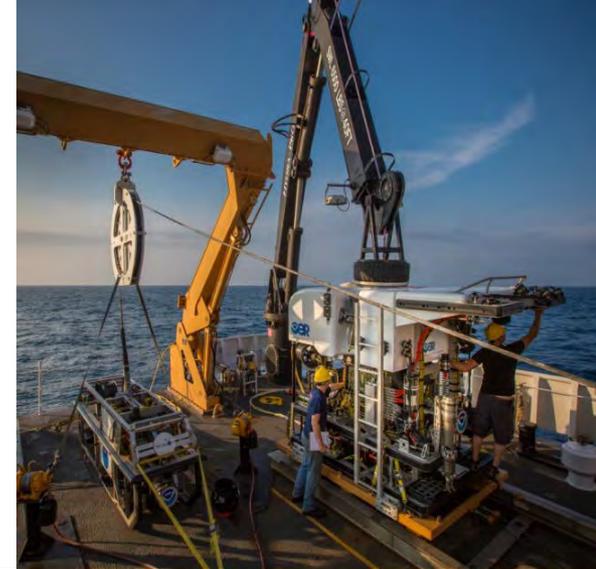
Credit: OER/Caitlin Bailey

Okeanos Explorer in 2018

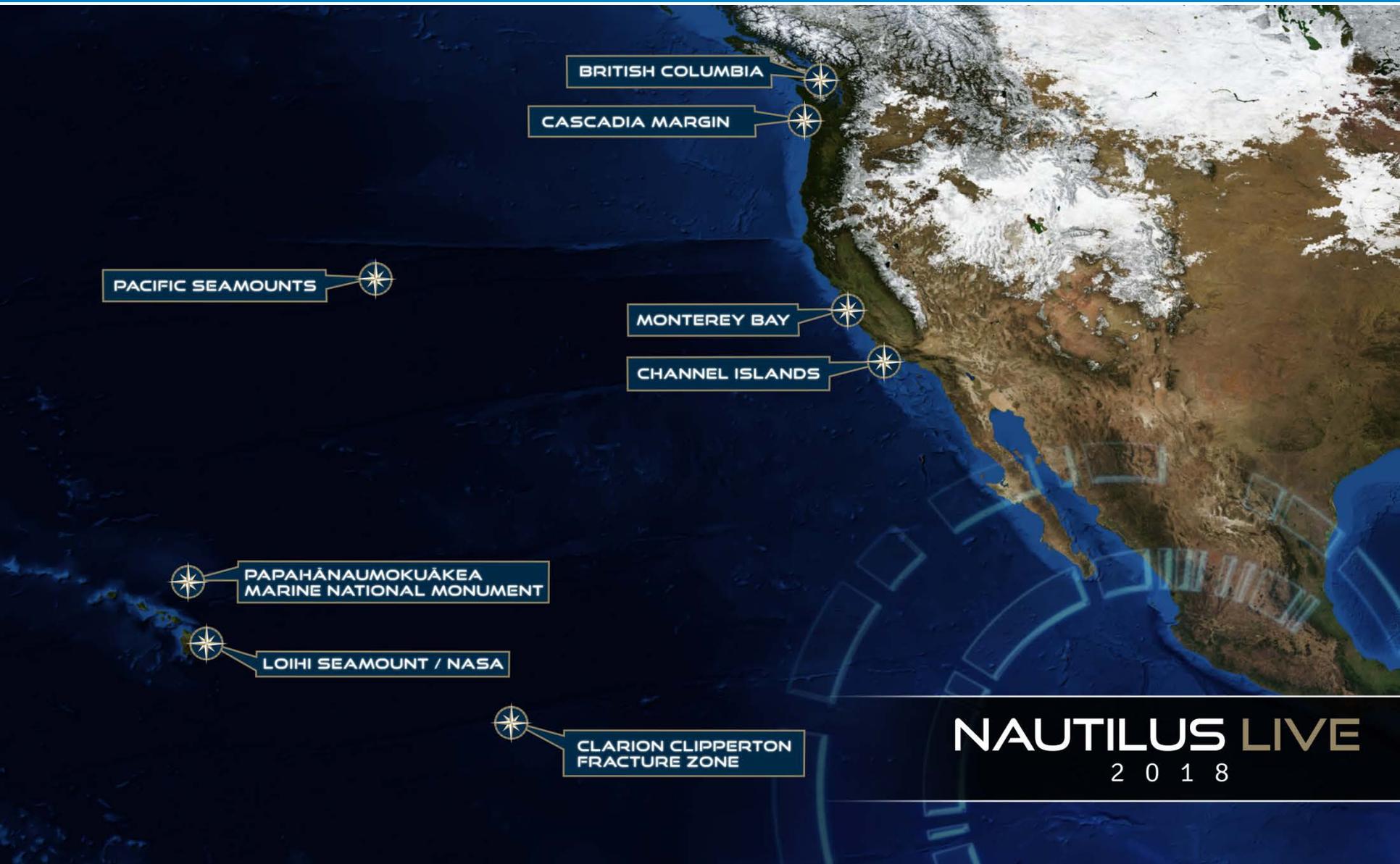


Okeanos Explorer in 2018

- Southeast Fisheries Science Center, Northeast Fisheries Science Center, ONMS, OER submitted an integrated package of ship time requests for ~182 DAS
- Subset of work to support new ASPIRE campaign
- Coordinating operations with BOEM-USGS, DSCRTP, DFO-Canada, Galway
- Public and VIP Port Events



E/V Nautilus



BRITISH COLUMBIA

CASCADIA MARGIN

PACIFIC SEAMOUNTS

MONTEREY BAY

CHANNEL ISLANDS

PAPAHĀNAUMOKUĀKEA
MARINE NATIONAL MONUMENT

LOIHI SEAMOUNT / NASA

CLARION CLIPPERTON
FRACTURE ZONE

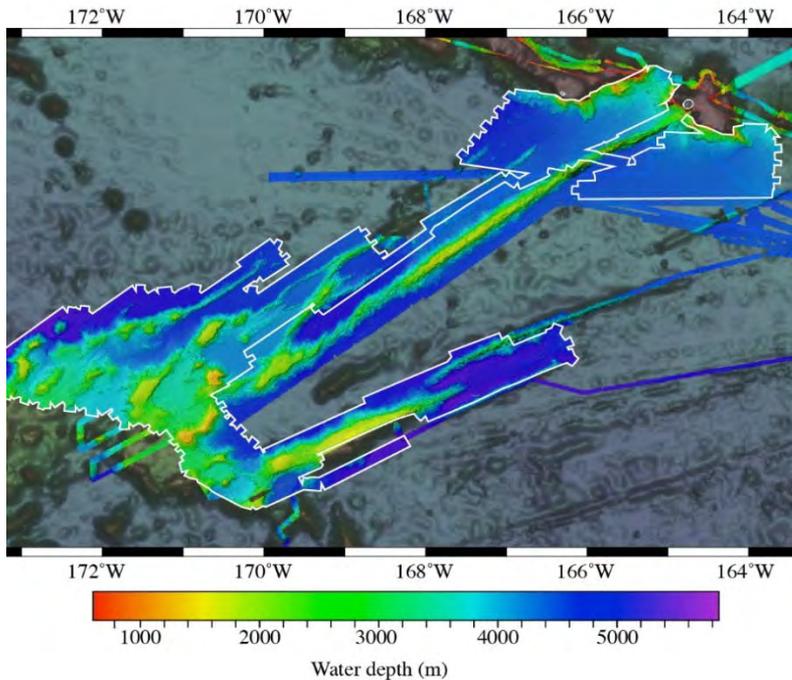
NAUTILUS LIVE

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Federally Funded Opportunities in 2018

PI	Institution	Dates
Drazen	University of Hawaii	May 5 – June 5, 2018
Lusardi	NOAA/Thunder Bay National Sanctuary	May 14 – Sep 21, 2018 (multiple legs)
Johnsen	Duke University	July 1 – 18, 2018
Terrill	Scripps Institution of Oceanography /UCSD	July 5 – Aug 3, 2018
Carrell	Ships of Discovery	July 15 – 27, 2018
Bartlett	Scripps Institution of Oceanography /UCSD	August 1 – 22, 2018
Roman	University of Rhode Island	TBD
Kaiser	Woods Hole Oceanographic Institution	TBD
Macelloni	University of Mississippi	N/A

Extended Continental Shelf in 2017: Necker Ridge Mid-Pacific Mountains



- R/V *Kilo Moana*, 11/15-12/21/2017
- Mapped 149,770 km² (8,376 line kilometers) of multibeam sonar data and concurrent subbottom profile data in the Necker Ridge area
- Extends ECS coverage into the Mid-Pacific Mountains area and along secondary ridge features extending back toward the Northwestern Hawaiian Islands.
- Resulted in new baseline information for Papahānaumokuākea Monument managers

Extended Continental Shelf in 2018

- Continuing management and archival of ECS data and derived products with US ECS Project Partners
- Drafting region-specific documents for ultimate submission to Commission on the Limits of the Continental Shelf
- 2018 Gulf of Alaska ship time at the request of the State Department
- Value for Ocean Exploration generally
 - New data management indexing and visualization tools
 - Investigation into using ECS multibeam data to classify habitat
 - Data availability for baseline characterization

ASPIRE: Atlantic Seafloor Partnership for Integrated Research & Exploration

- 2016 to ~2020 international campaign with focus on the North Atlantic
- Builds from previous OER and partner efforts
- Aligning existing and developing new plans
- NOAA efforts considered a major U.S. contribution to Galway Statement on Atlantic Ocean Cooperation
- Interagency participants include: BOEM, USGS, NOAA (SEFSC, NEFSC, OST, DSCRTP, NCCOS, ONMS, NCEI, OMAO, OER)
- International participants include: DFO Canada, EU Commission (Horizon 2020 projects ATLAS and SponGES), Ifremer

2013 Galway Statement

“cooperation is intended to increase our knowledge of the Atlantic Ocean and its dynamic systems. . . By aligning our ocean observation efforts to improve ocean health and stewardship and promote sustainable management of its resources.”

DEEP SEARCH and EXPRESS

- BOEM-USGS-NOAA partnership
- 4.5 years, ~\$12M study
- First fieldwork in 2017 with NOAA Ship *Pisces* and AUV *Sentry* heavily impacted by hurricane season
- Two cruises planned in FY18
- Coordinating Efforts with *Okeanos Explorer*
- EXPRESS: Emerging West Coast campaign with BOEM, USGS, and NOAA
- Building off of previous *Okeanos Explorer* and E/V *Nautilus* work in the region and Southern California Mapping Initiative (SCMI) – both OER-sponsored
- OER funding contributing 10 DAS in FY18 on NOAA Ship *Rainier*

ASPIRE Expeditions

Laurentian Channel

Canadian Healthy Oceans Network (CGS *Hudson*)

Northern Neighbors: Transboundary Exploration of Deepwater Communities

NOAA NMFS/Dalhousie University (NOAA Ship *Henry B. Bigelow*)

Canada-US Boundary ROV and Mapping

NOAA OER (NOAA Ship *Okeanos Explorer*)

Northeast Seamounts ROV and Mapping

NOAA OER (NOAA Ship *Okeanos Explorer*)

Carolina Canyons

NOAA NMFS (NOAA Ship *Pisces*)

DEEP SEARCH

BOEM-USGS-NOAA (NOAA Ship *Pisces*)

DEEP SEARCH

BOEM-USGS-NOAA (NOAA Ship *Nancy Foster*)

ASMIWG Pilot Area Mapping

NOAA OER (NOAA Ship *Okeanos Explorer*)

Mid and South Atlantic ROV and Mapping

NOAA OER (NOAA Ship *Okeanos Explorer*)

DEEP SEARCH

BOEM-USGS-NOAA (NOAA Ship *Ronald H. Brown*)

South Atlantic Mapping

NOAA OER (NOAA Ship *Okeanos Explorer*)

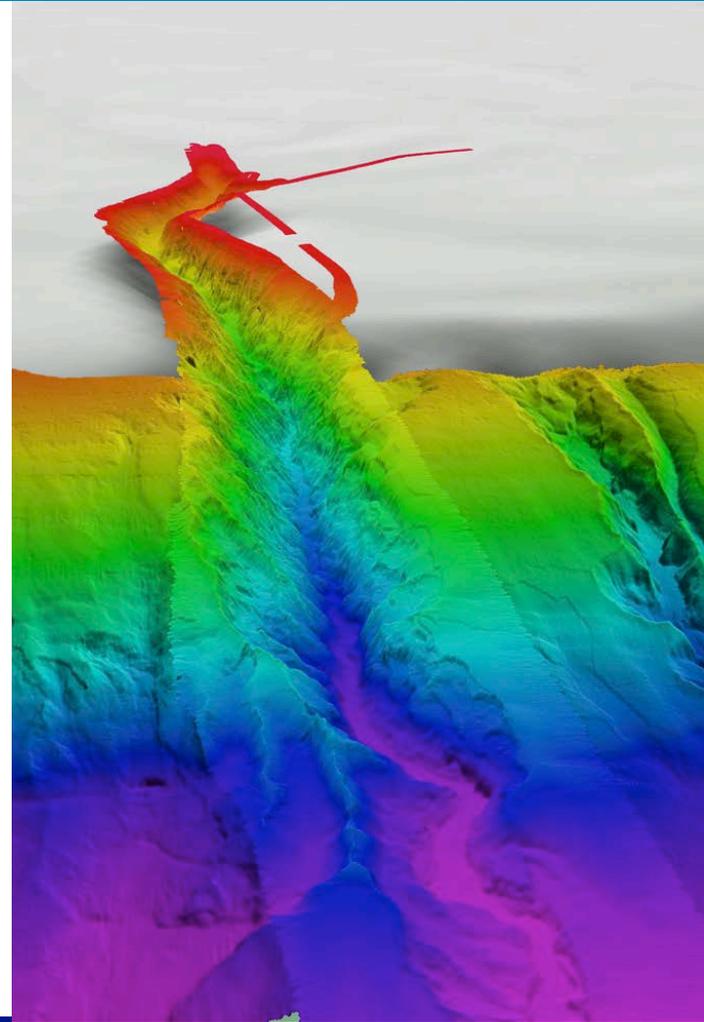
Mid-Atlantic Ridge Mapping

NOAA OER (NOAA Ship *Okeanos Explorer*)

Last updated: October 3, 2017

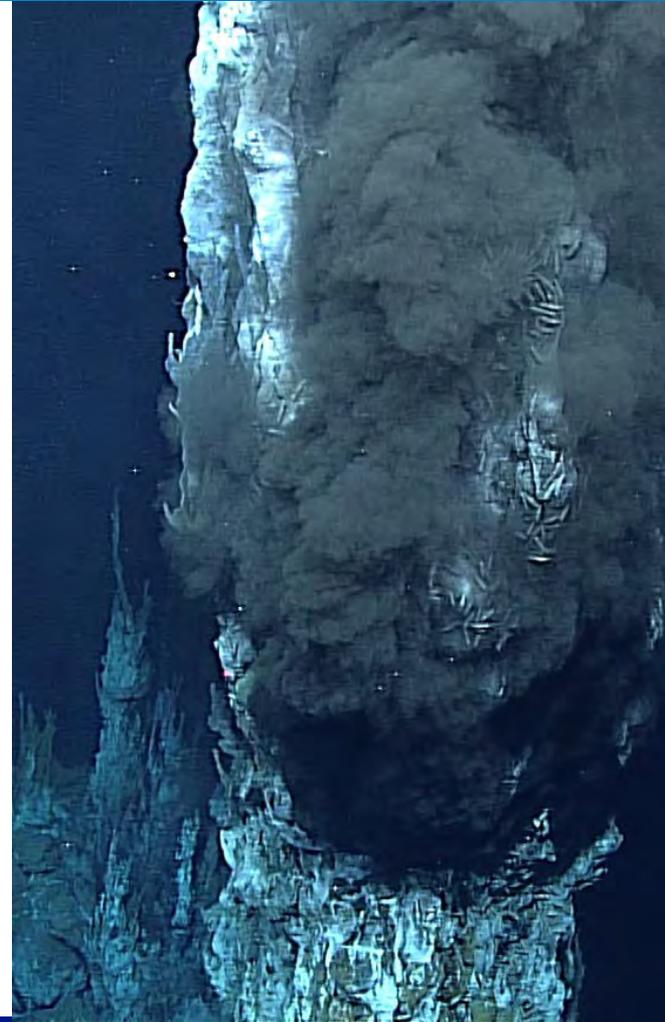
Okeanos Explorer Initial Plans for 2019

- South Atlantic Bight, Caribbean, Scheduled Maintenance/Repairs, Mid-Atlantic Ridge, NE Seamounts
- SEFSC, NEFSC, ONMS, OER submitted an integrated package of draft requests for ~183 DAS
- Placeholder for potential Cuba work
- Coordinating operations with BOEM-USGS, DSCRTP, DFO-Canada, Galway
- Placeholder for short emerging technology cruises. Details TBD
- Potential for international multi-ship effort focused on the Mid-Atlantic Ridge



Opportunities in 2019 and Beyond

- BOEM-USGS-NOAA Partnership
 - 3rd field season in 2019
 - *Ron Brown* with science-class ROV
- E/V *Nautilus* and Mobile System
 - Both Central and Western Pacific work
 - Extend and expand CAPSTONE
- IFREMER TransAtlantic
 - Support Galway and NOAA-IFREMER bilateral
- 400th Anniversary of *Mayflower* Crossing in 2020
- Schmidt Ocean Institute
- NIWA and the Cook Islands
- FFO, MBON, ECS, Marine Archaeology



Questions?

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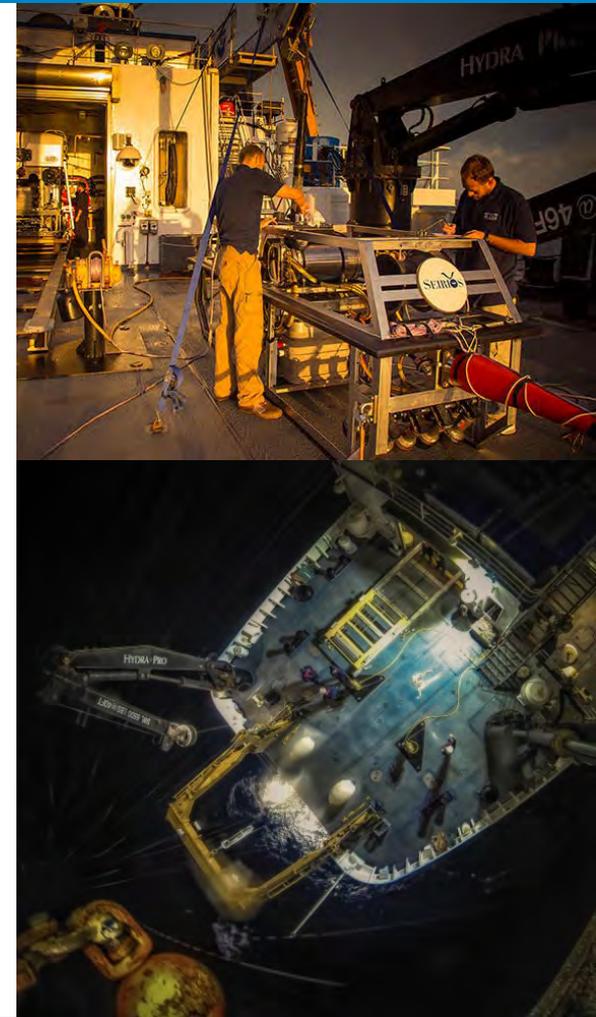
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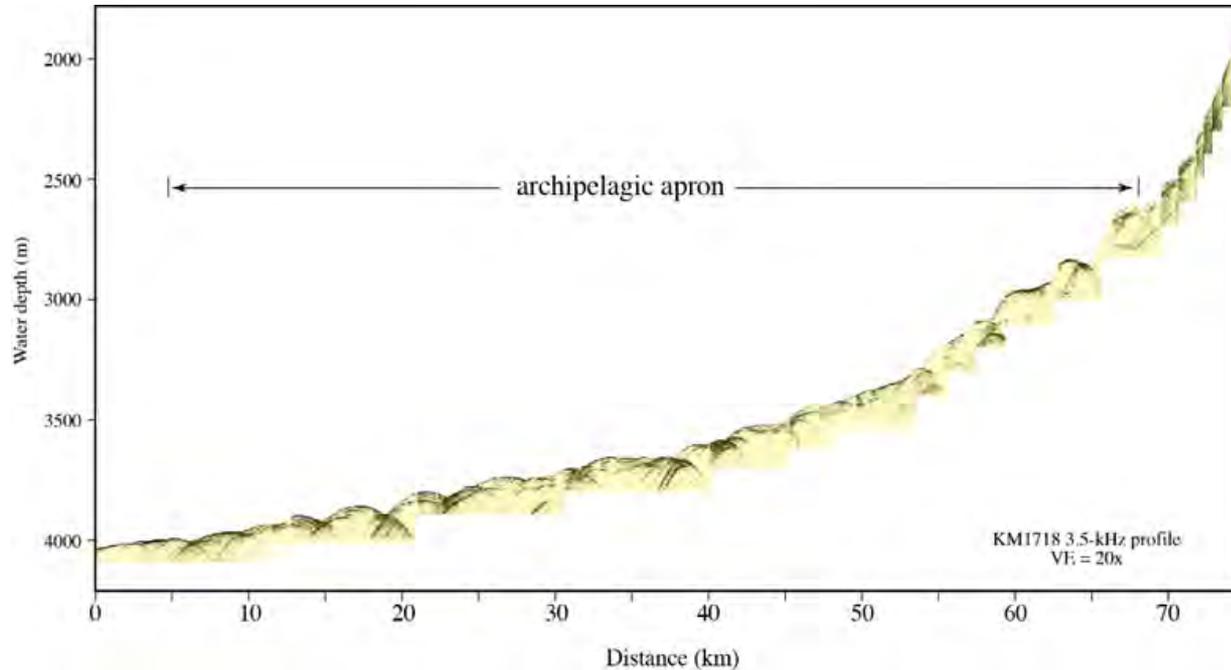
**Ocean Exploration
and Research**

Okeanos Explorer in 2018

- **Jan-Mar:** Dockside Repairs (new GFOE network/computers, 2nd VSAT, routine maintenance, new .68 umbilical cable)
- **Mar:** Emerging technology demonstrations/mapping in Gulf of Mexico
- **Apr:** Gulf of Mexico ROV and Mapping Exploration
- **May-Jun:** VIIRS, East Florida/South Atlantic Bight ROV and Mapping Exploration
- **Jul:** Sargasso/Bermuda
- **Aug:** Canada-US Boundary ROV and Mapping
- **Sep:** Return to Homeport (after 3.5 yrs away); NE Canyons Mapping and Emerging Tech Demo



Extended Continental Shelf in 2017: Necker Ridge Mid-Pacific Mountains



The southern flanks of Necker Island show an extensive archipelagic apron has formed from mass-wasting events over the past 70 to 80 Myr. An example of one of the 3.5-kHz subbottom profiler across the archipelagic apron shows the bedforms, developed by the gravity-driven mass-wasting events, have wave heights of ~ 20 m and wavelengths of ~ 1000 m and extend out more than 60 km onto the basin.

Return on Investment: MBON Explorer and Infographic Online Tools

14 LIFE
BELOW WATER



Live Demo

Explorer (global)



Infographic (local)



marinebon.org