High Resolution Deep-Sea Imaging and Camera-Guided Sampling Using EPO-Ocean Imaging Systems and WHOI-MISO/SSSG Integrated Camera Systems

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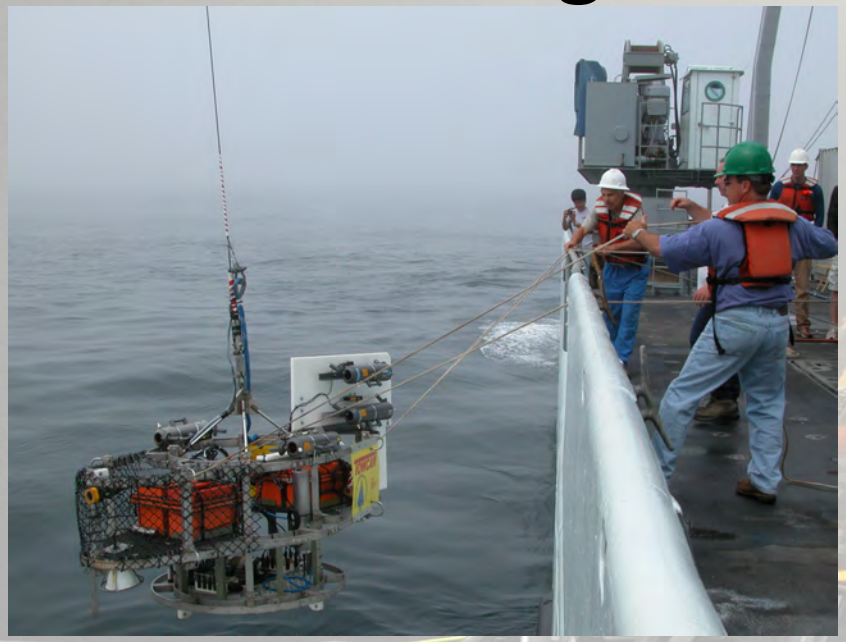
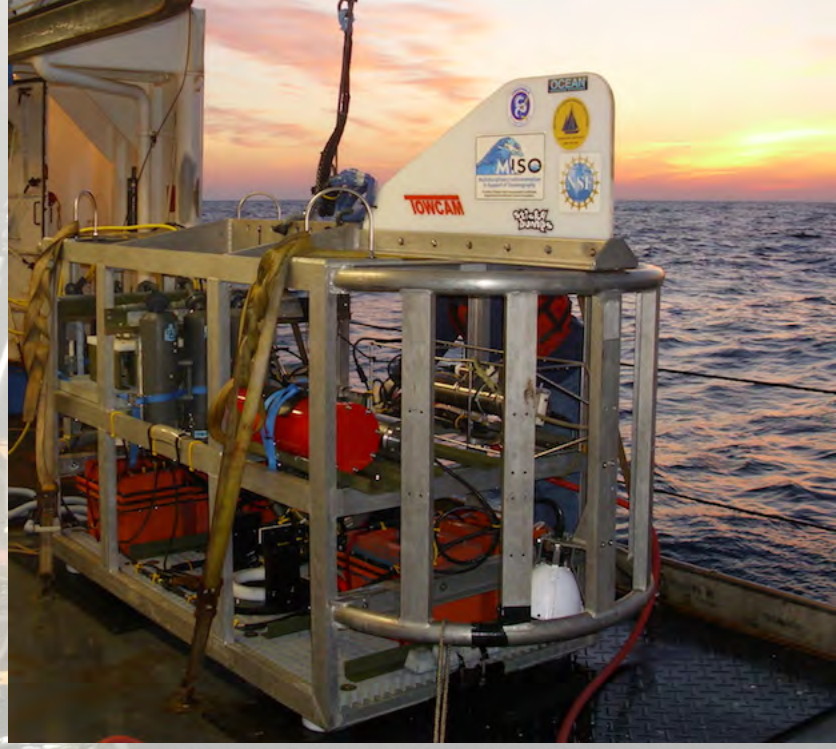
INMARTEC 2018 Meeting

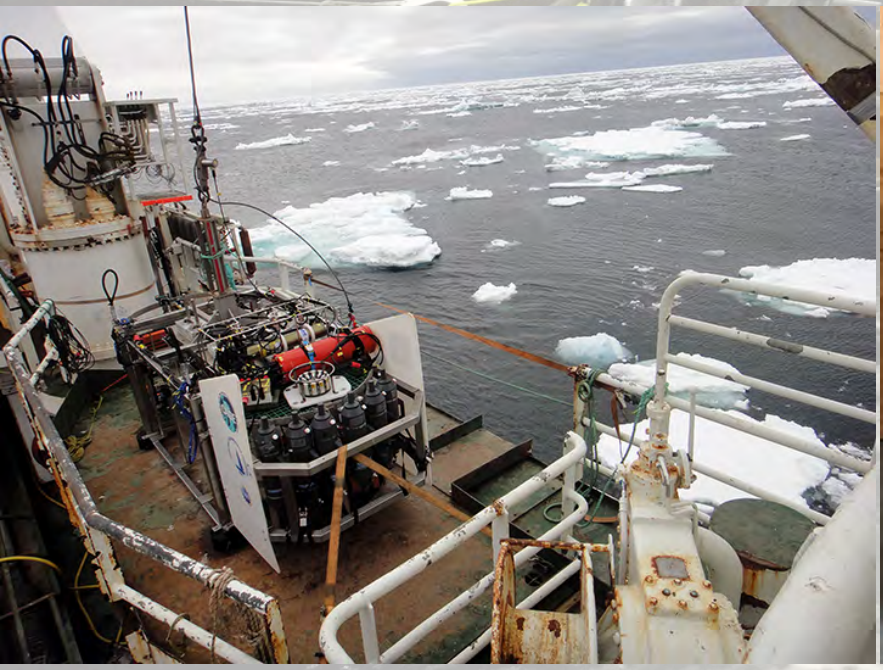
Motivation

- Improve scientific data collection by providing routine deep-sea imaging capabilities that be used on many ships
- Improve sampling capabilities through camera guided, real-time operations
- Improve safety of sampling operations to both equipment and personnel through real-time monitoring/sensing of instrument packages

TowCam Configurations







June – RV Armstrong - Science Verification Cruise – TowCam

Supported by Dan Fornari and Cliff Pontbriand – WHOI

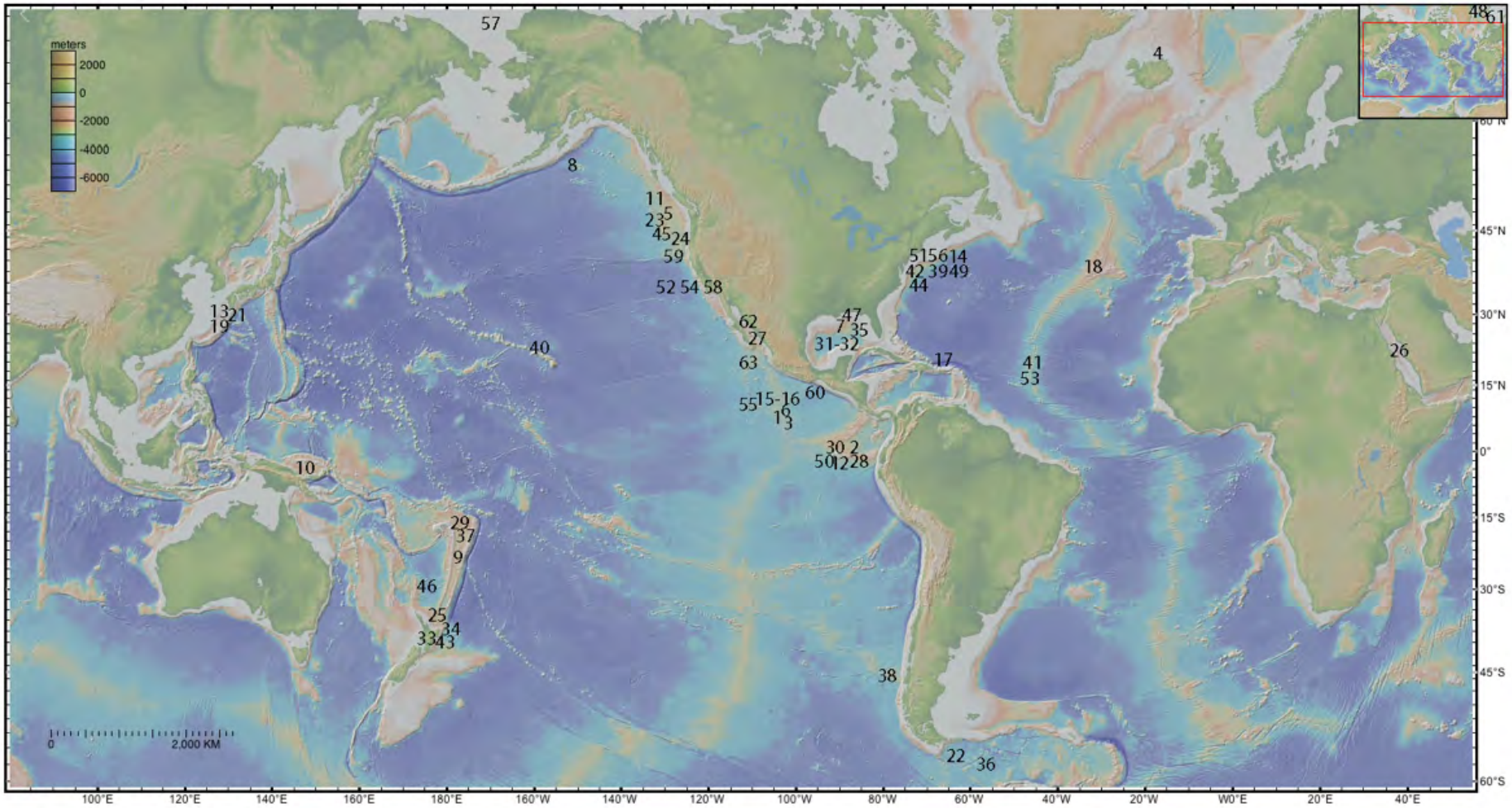
Upper Right – LDEO seismometer in trawl-resistant frame – upside-down on seafloor after failed deployment at ~80 m depth.

Lower Right – Anemones and Lobsters around small rock - ~500 m depth at shelf slope south of Woods Hole, Lasers 20 cm apart

Scientists from the following institutions have used the WHOI MISO *TowCam* and related MISO instrumentation over the years: Penn State U.; U. Washington; U. Hawaii; Georgia Tech. Univ.; George Mason U.; NOAA, Smithsonian Institution, U. Tromsø, Norway, National Taiwan University, Oregon State U.; Taipei, Taiwan, IPGP U. Paris, France; KAUST; Duke University; Navy Research Lab.; Scripps Institution of Oceanography; GNS New Zealand; U. New Hampshire; U. Rhode Island, UC-Santa Cruz; USGS; Stanford U.; and WHOI. **24 Institutions**

Funding for these activities is provided by US federal agency grants, WHOI internal grants, and occasionally foreign research institutions and funding agencies to support science activities, technology development, and shipboard technical support. **NSF-OCE-OI has supported technology development and MISO facility operations.**

MISO TowCam & Imaging Systems Cruises - 2002-2017



Since completion of their construction in mid-2002, the WHOI *TowCam* systems and the imaging capabilities within MISO (e.g., digital still and HD video cameras, strobes, LED lights, & control systems) **have been used successfully on 63 research cruises**. The WHOI *TowCams* have been used for seafloor mapping and imaging that span the fields of marine geology, petrology, volcanology, biology, hydrothermal vent mapping, and climate change/deep-sea coral mapping, as well as for education and outreach.

The current *TowCam* systems have been used in a wide range of geographic and tectonic environments and have collected over **400 samples of volcanic glass, >300 multicore cores, and recorded >~1 million deep-sea photographs** since being placed in service. Data from *TowCam* have been provided to the MGDS data archive (http://www.marine-geo.org/index.php) along with relevant navigation, CTD and associated sample information.

MISO Supported Cruises (15) – 2016-2018

2016

Feb. – RV Thompson – UW Chief Sci. training cruise – MC800 multicoring with MISO imaging/data

Mar. – RV Sikuliaq – Science Verification Cruise – MC800 multicoring with MISO imaging/data

Mar. – RV Atlantis –AT33-07- M. Kurz – TowCam & MISO cameras on Alvin – down and forward-looking

May – RV Savannah – M. Taillifert – MC800 and miniTowCam

June – RV Armstrong - Science Verification Cruise – TowCam

Aug. – RV Atlantis – NDSF Early Career Training Cruise MC400 w/MISO camera/data system

MISO cameras on Alvin – down and forward-looking

Sept. - RV Sikuliaq – L. Juranek/M. Goni – Chuckchi Sea MC400 w/MISO camera data system

Nov. - RV Atlantis –AT37-05- T. Gregg – TowCam & MISO cameras on Alvin – down and forward-looking

2017

Mar. − RV Oceanus − A. Dekas − MC800 with MISO imaging/data

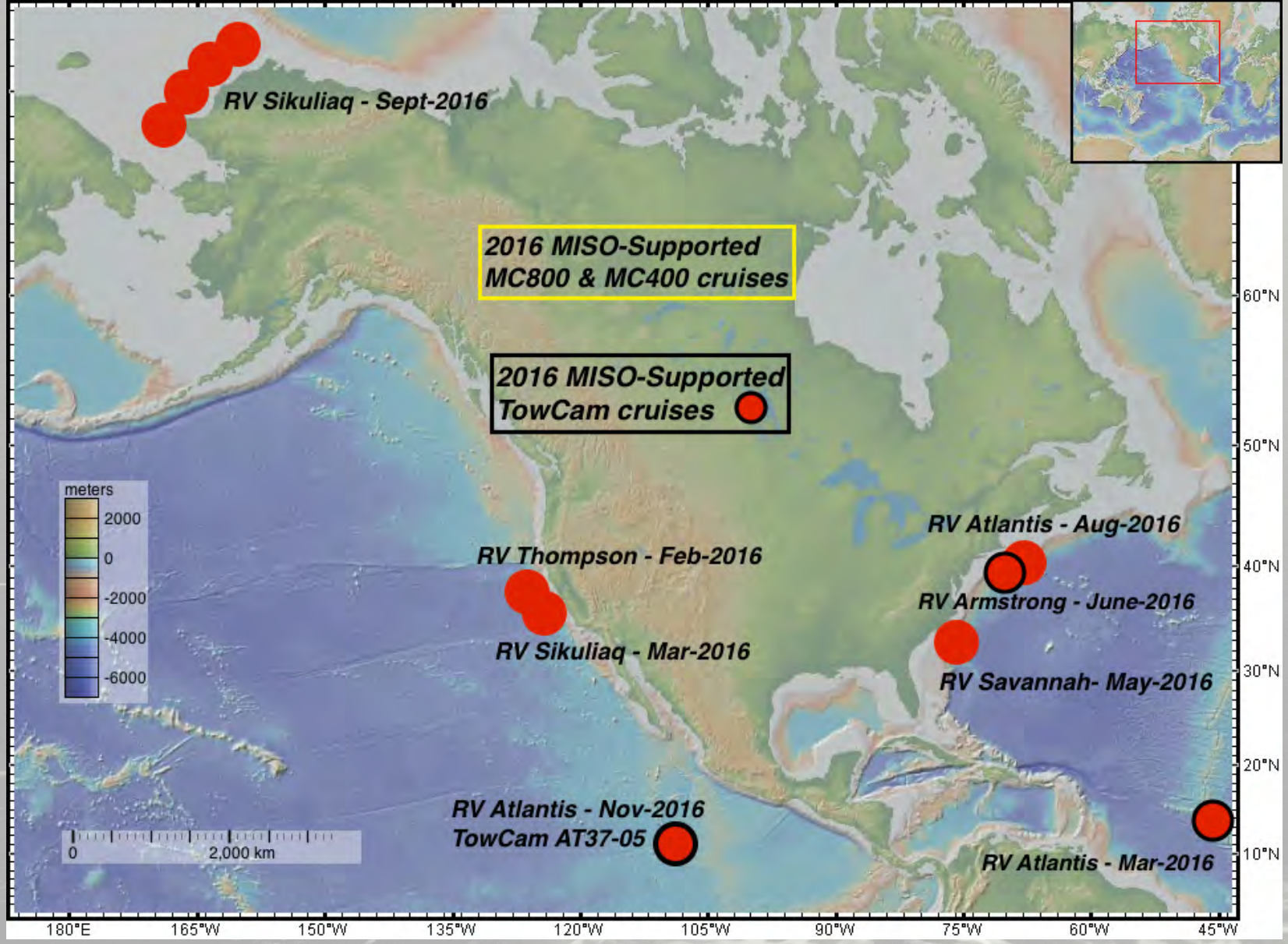
July − RV H. Hanssen − G. Panieri - U. Tromso − CAGE multicorer with MISO imaging/data

2018

July - GO SARS − R. Pedersen - U. Bergen − MISO imaging systems on AEGIR6000 ROV

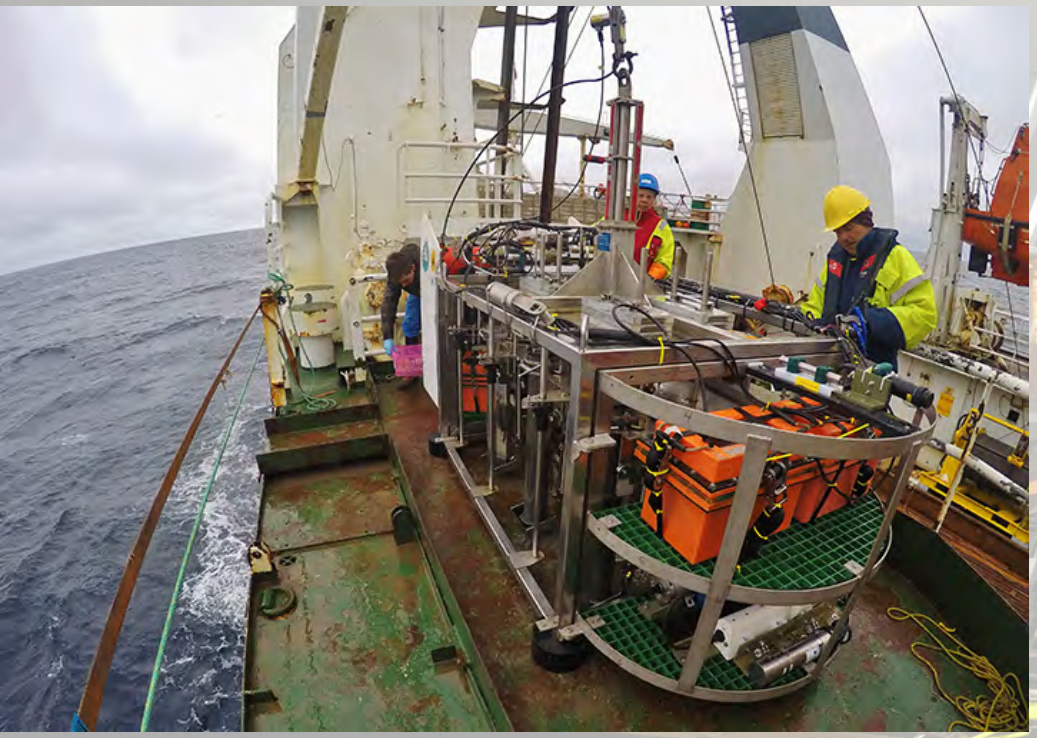
Sept.− RV Atlantis − S. Lang − U. S. Carolina - MISO imaging system on Jason ROV

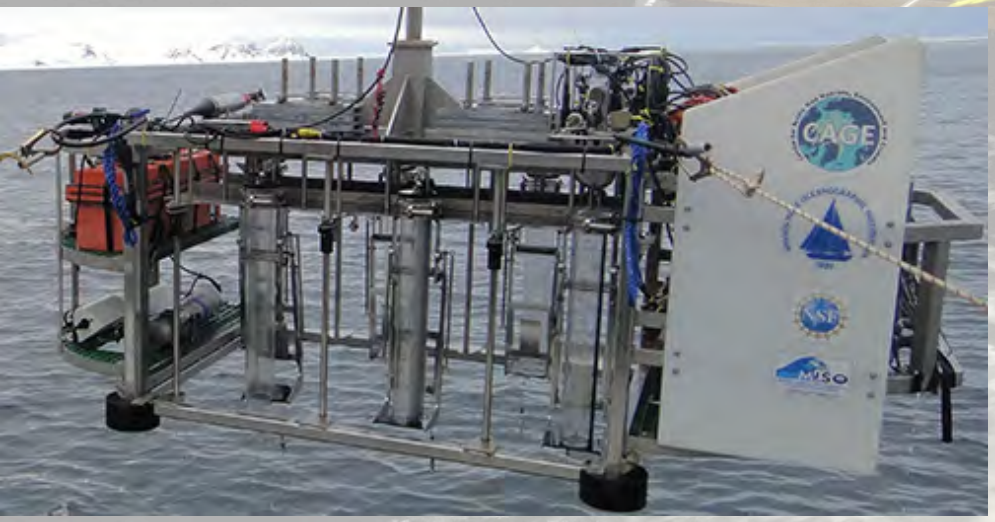
Oct-Dec. RV Atlantis − 3 PIs - MISO imaging system on Alvin

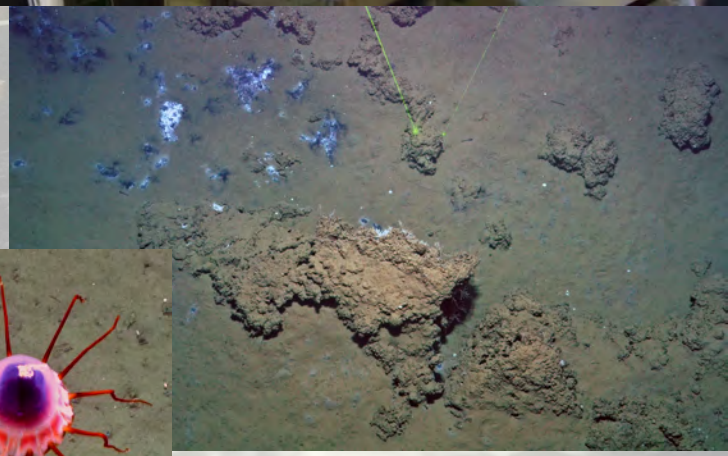


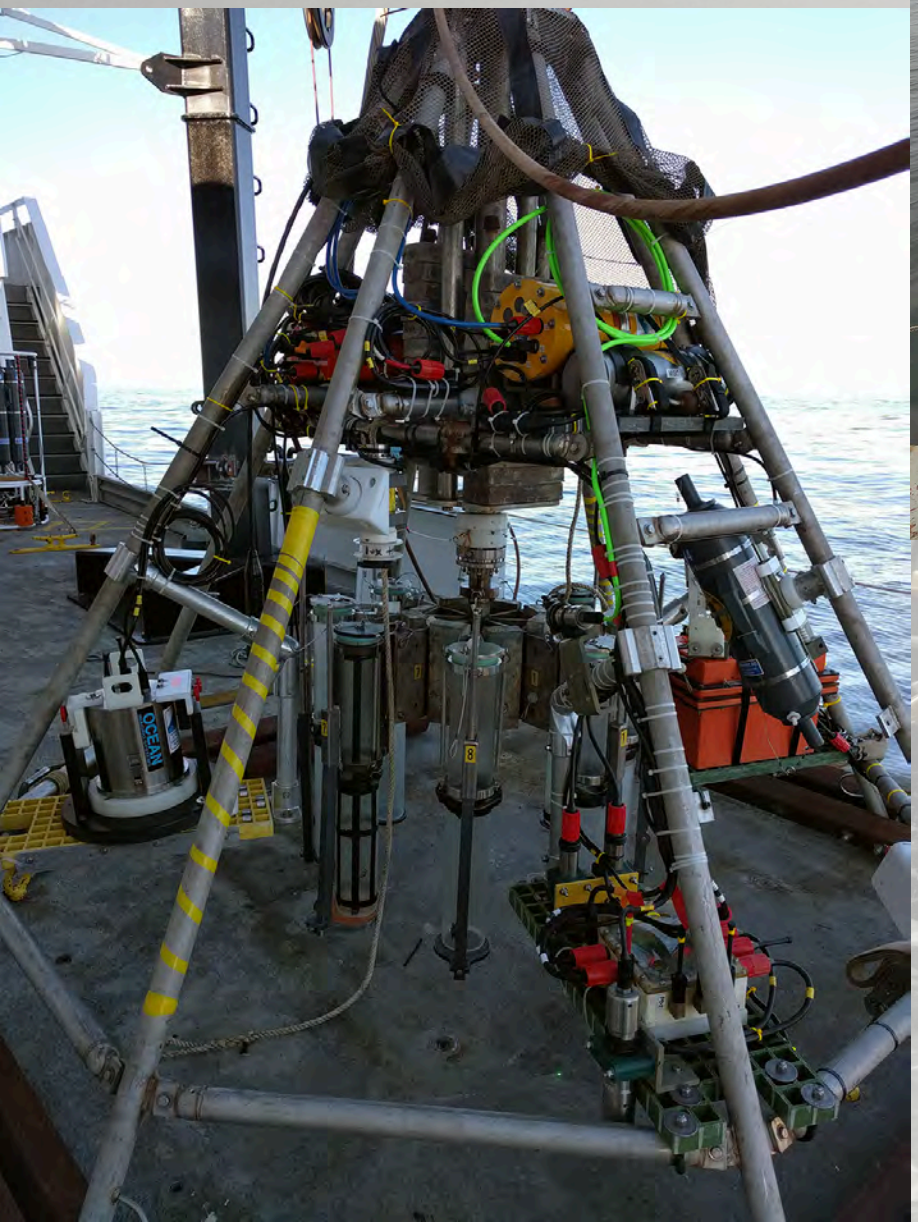
Excellent collaboration & communication with participating operators and programs – U.Alaska-F, U. Washington, Skidaway, NSF, OSU, WHOI, SIO, UNOLS

CAGE Multicorer with MISO Camera and Data Systems- U. Tromsø

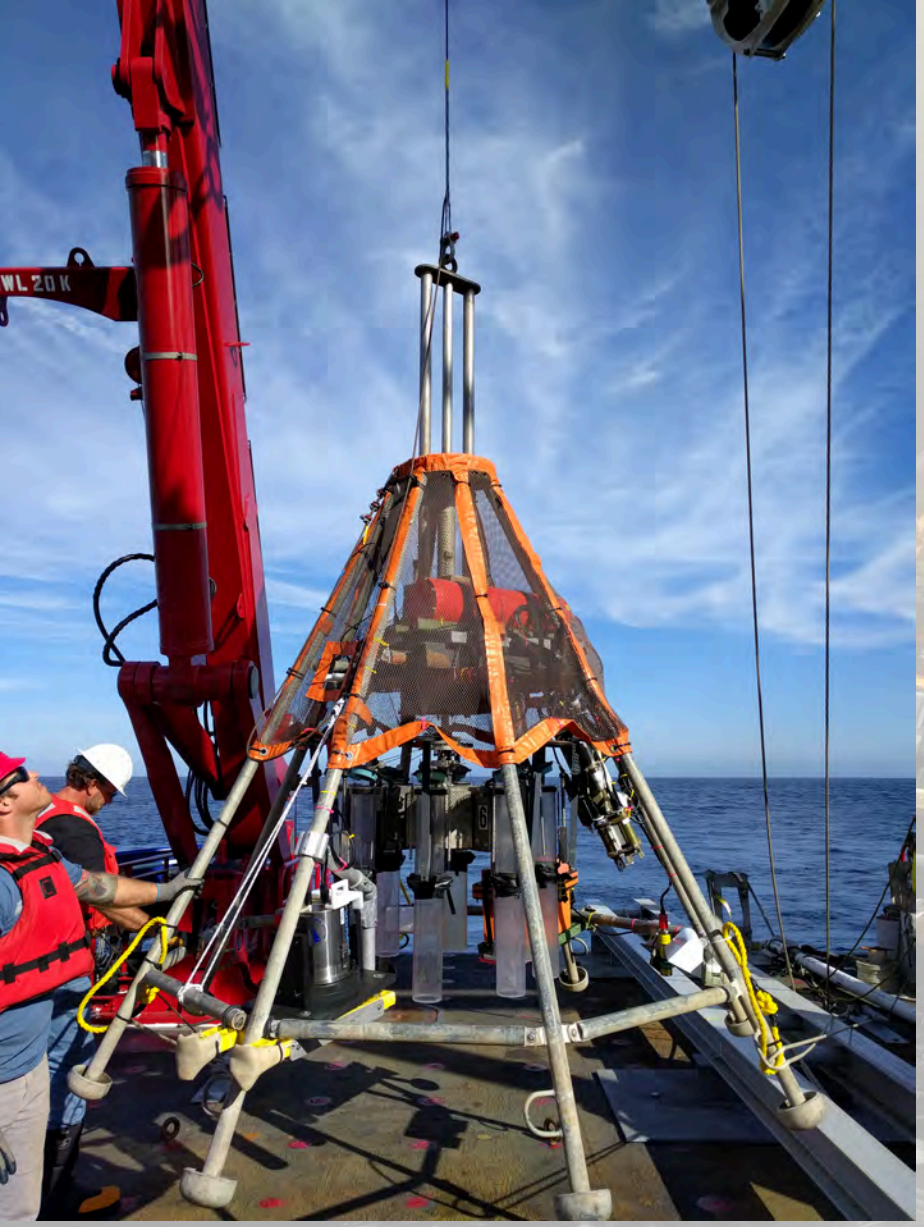






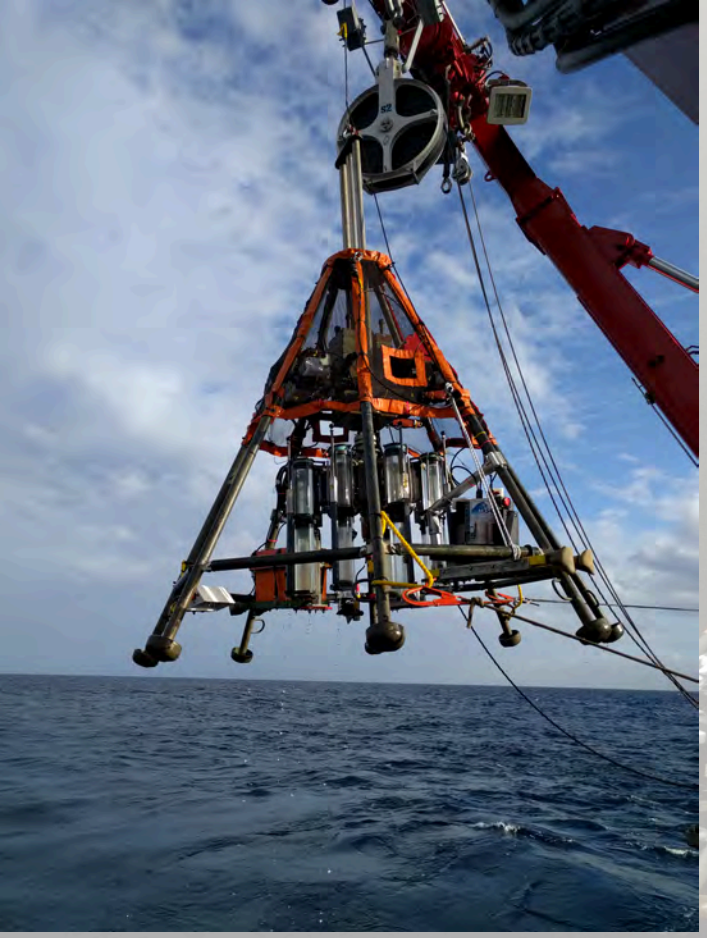


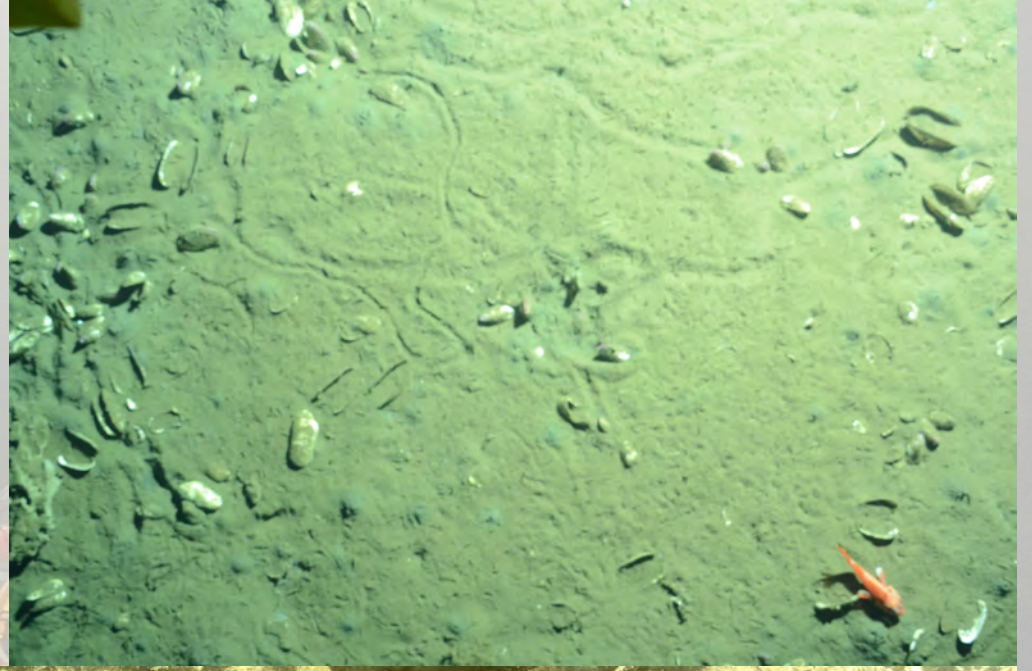
MISO imaging and data systems with anti-pretrip collar



Mar. – RV Sikuliaq – Science Verification Cruise – coring - MC800 rigged with MISO 16- MP camera & strobe and depth/altimeter system and SBE25plus CTD with SBE43 O2 sensor – supported by M. Swartz - WHOI

Feb. – RV Thompson – UW Chief Sci. training cruise- MISO OIS 16 MP camera image of coring site – pre-impact - ~75 cm across image





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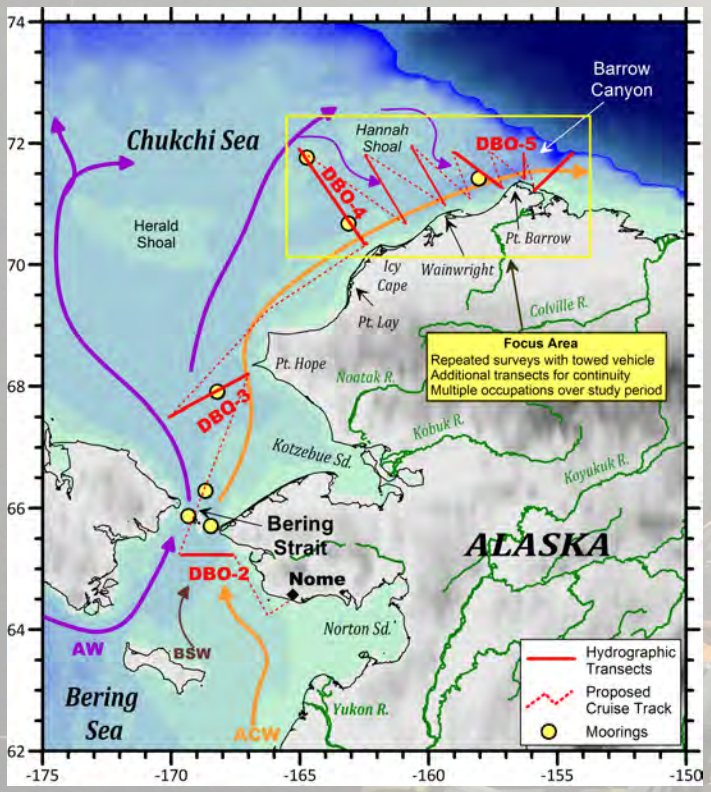
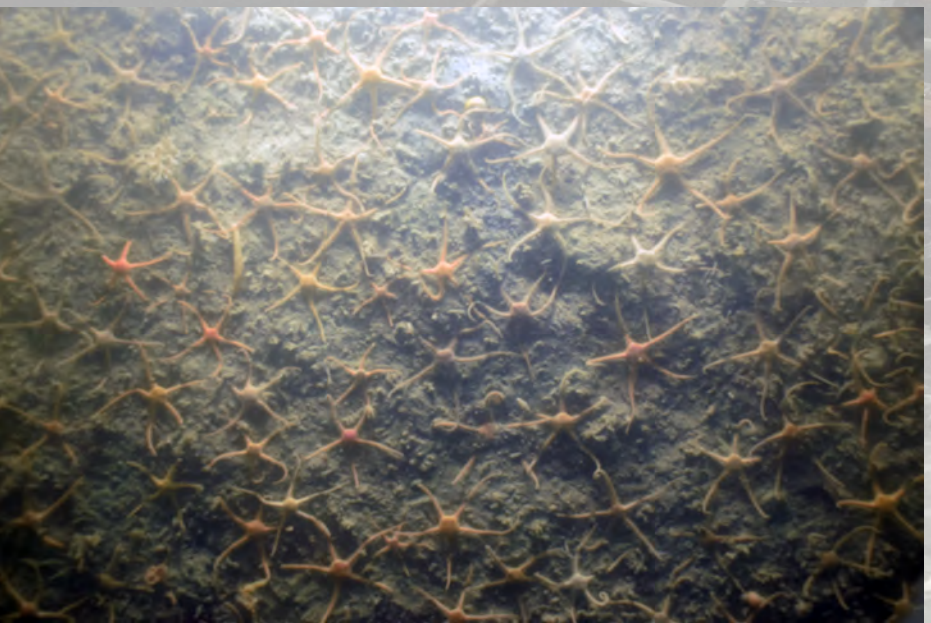
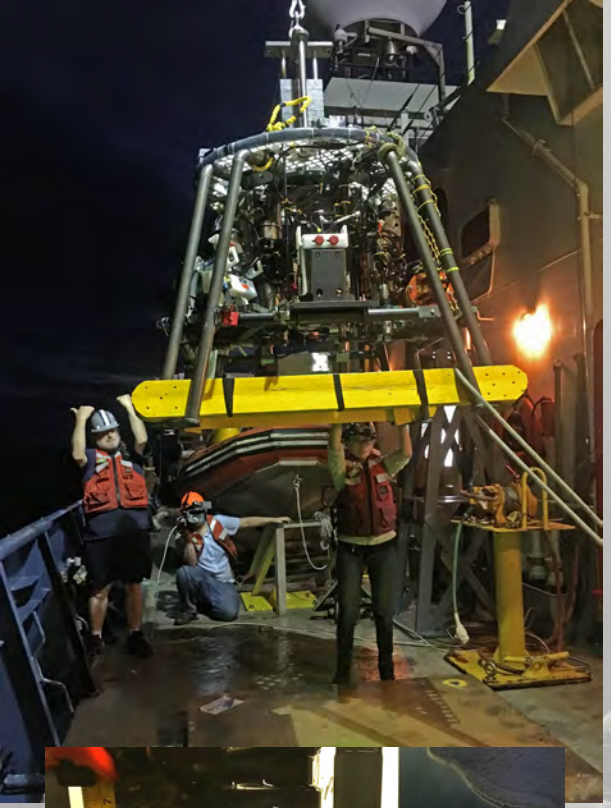
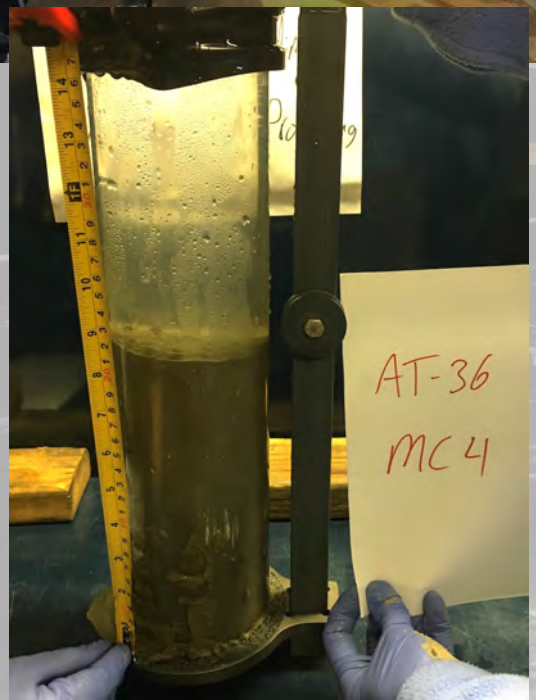




Sept. - RV Sikuliaq - L. Juranek/M. Goni (OSU) Chuckchi Sea
MC400 w/MISO camera/data system
Supported by Marshall Swartz





Aug. – RV Atlantis – NDSF Early Career Training Cruise MC400 w/MISO camera/data system & MISO cameras on Alvin – down and forward-looking
Supported by Dan Fornari


OCEAN INSTRUMENT

WHOI-SSSG/MISO Pre-Trip Prevention Collar for MC-800

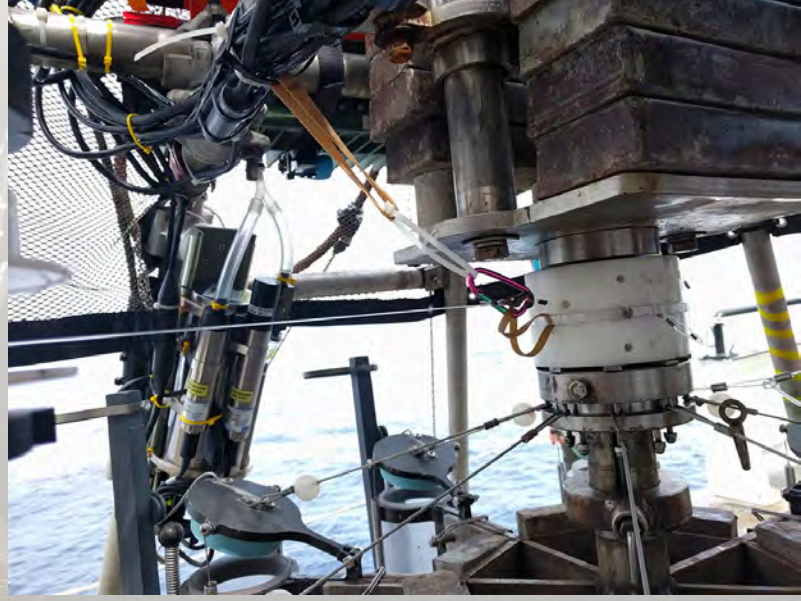
Pre-Trip Prevention Collar Testing at WHOI Core Lab

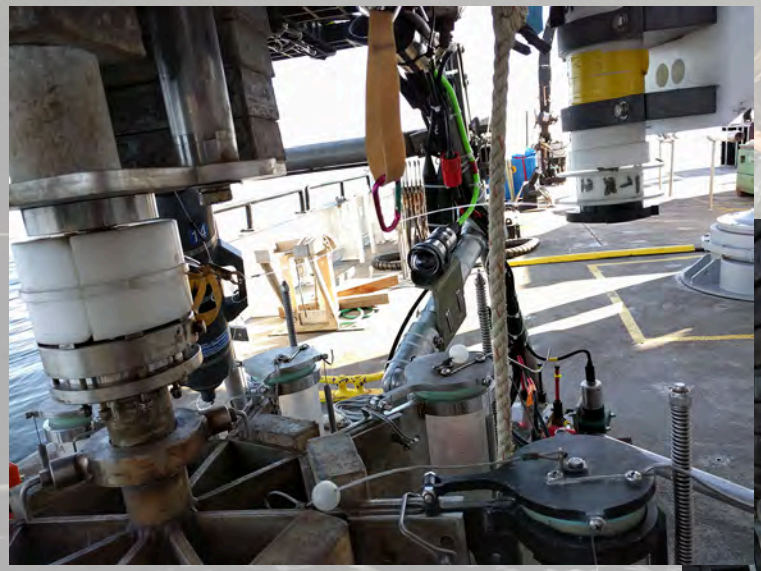
Pre-Trip Prevention Collar 1st Use - A. Dekas Stanford U. On RV Oceanus April 2017 – offshore Monterery, CA Multicoring on 0.680 coax cable

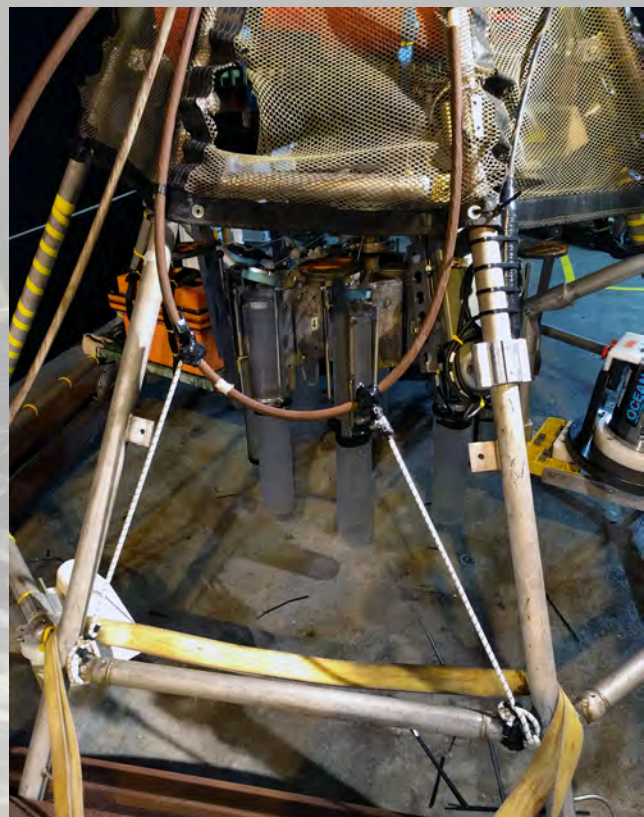
Thanks to: Marshall Swartz, Cliff Pontbriand, Ellen Roosen, Jim Broda, Chris Moser Croy Carlin, Paul Walczak OSU Coring Facility − Mitch Lyle, Master and crew of RV Oceanus, Jim Holik − NSF-OCE-OI, Anne Dekas and Stanford U. Science Party

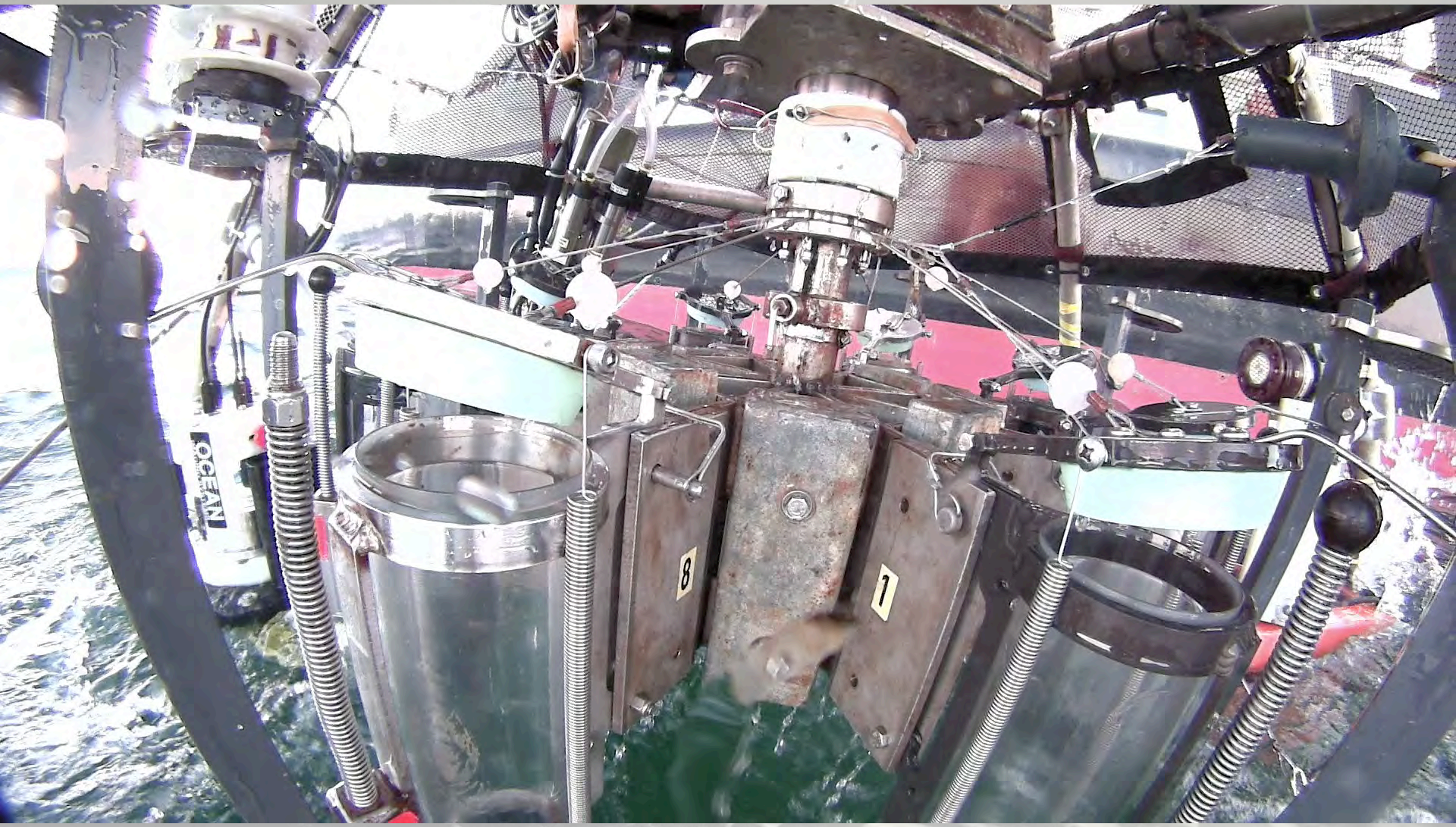
Motivation:

- Developing a reliable method to avoid pre-tripping the MC800 multicorer because of ship heave during launch and surging of the corer and spyder during lowering.
- Avoiding pre-tripping saves ship time, improves sample collection and reduces breakage of the core tubes and spyder.
- Inclusion of MISO imaging and data systems when MC800 is used on conducting cables greatly improves both operations and quality and quantity of core data.





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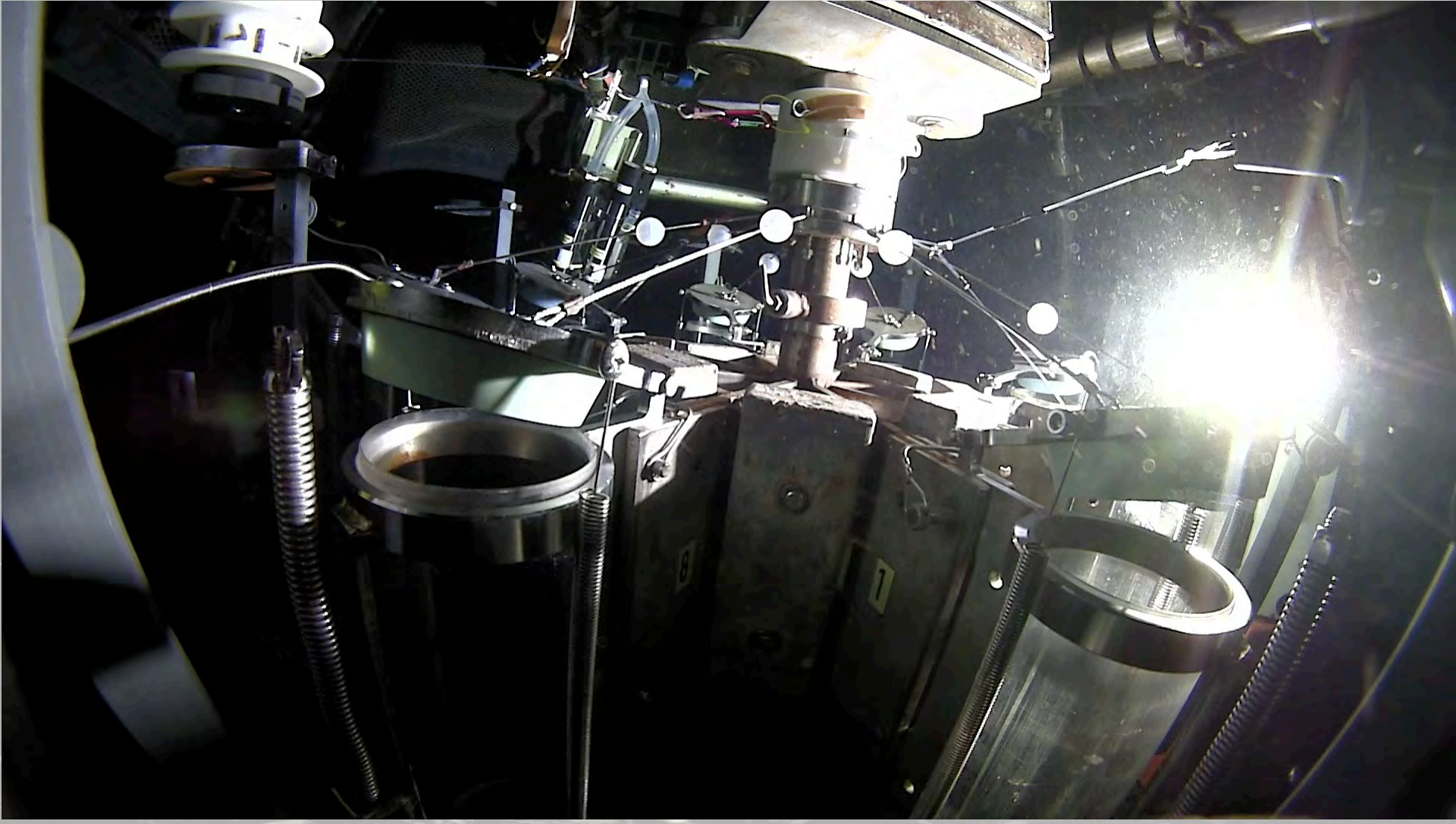
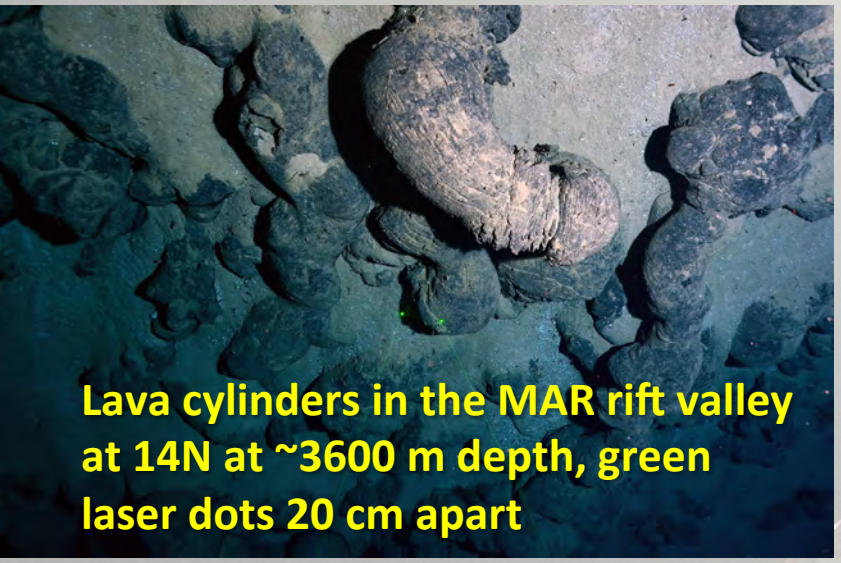
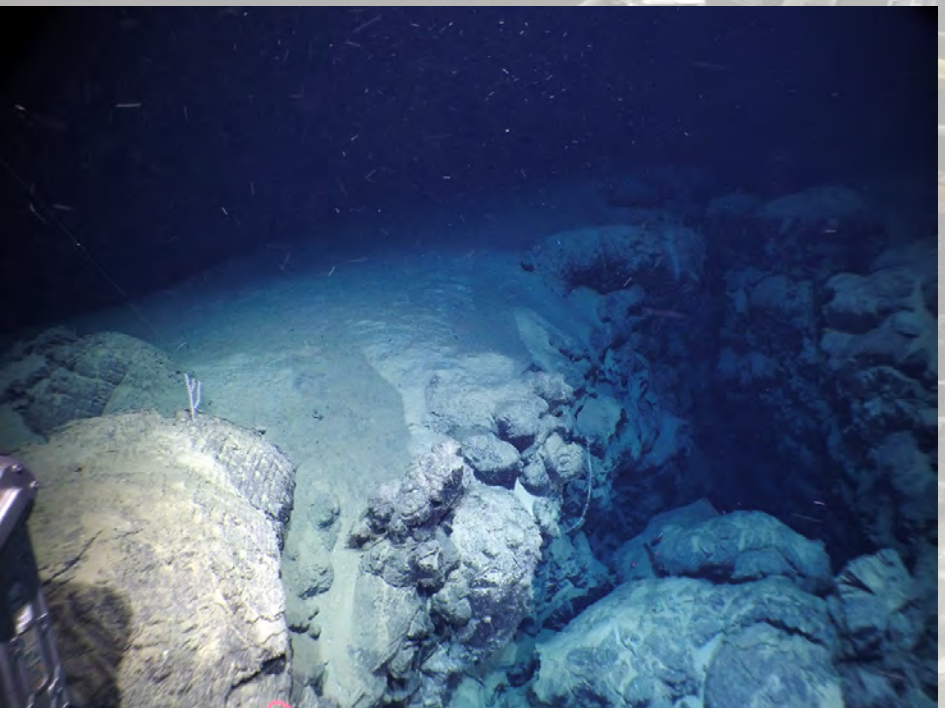


I-Collar I-Coring I-Pullout

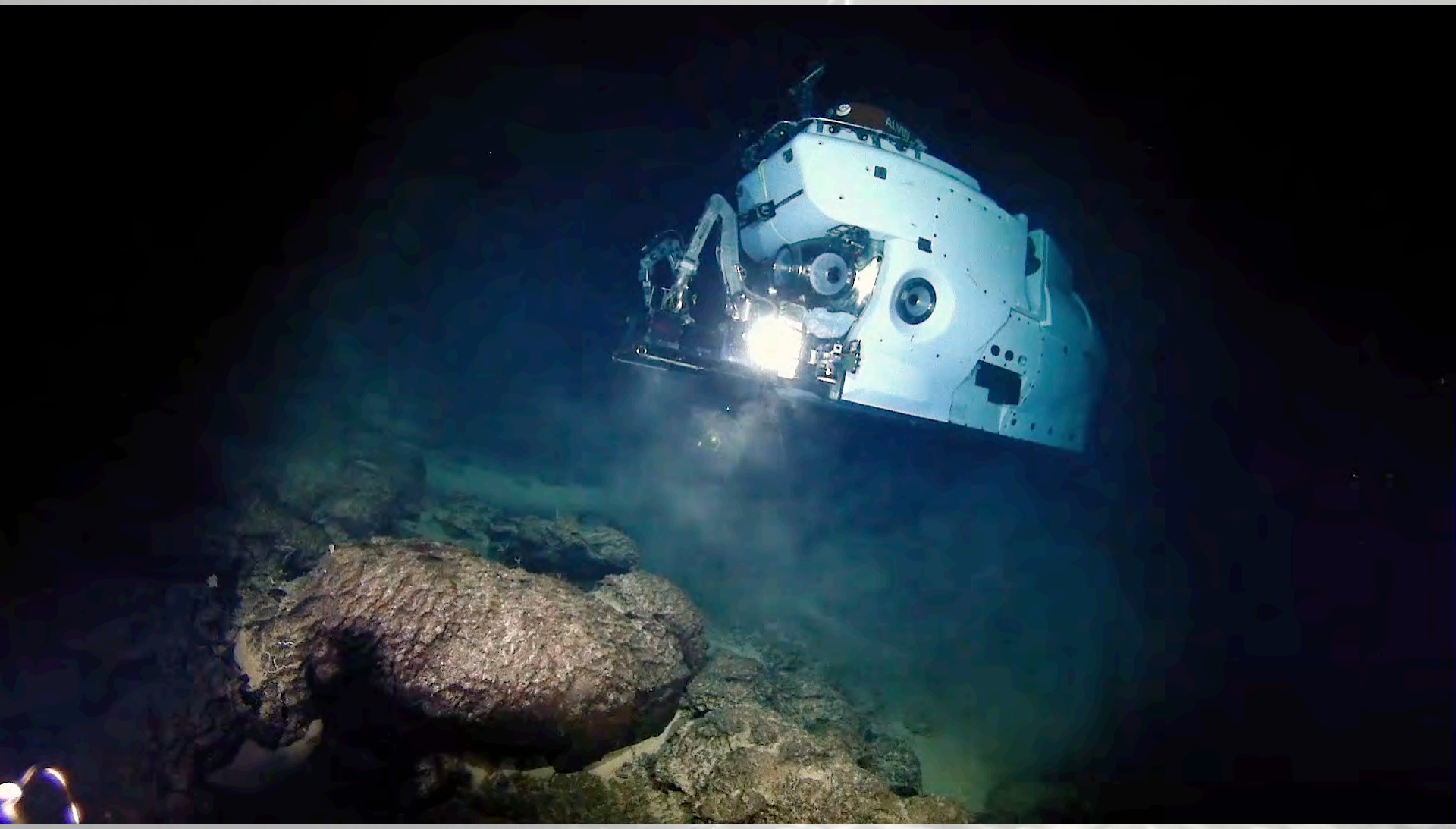


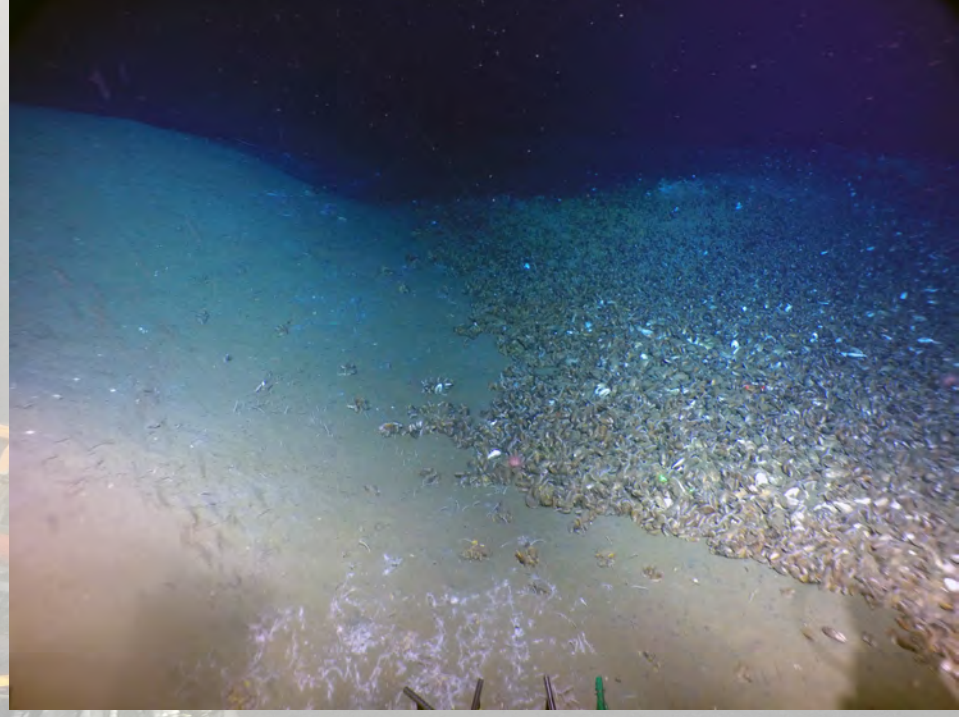
Lava cylinders in the MAR rift valley at 14N at ~3600 m depth, green laser dots 20 cm apart

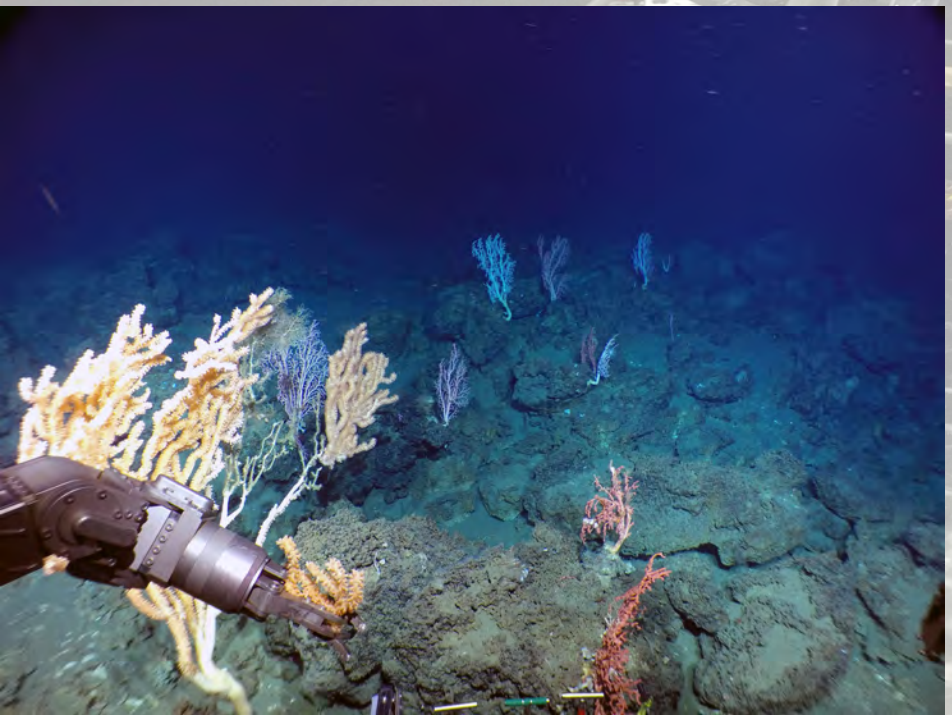
Mar. – RV Atlantis –AT33-07 & AT42-02 M. Kurz – MISO cameras on Alvin – down & forward-looking



Alvin imaged by WHOI-SSSG/MISO HD video system on lander Matthew Smt. 2016 – 8°20’N west of EPR axis

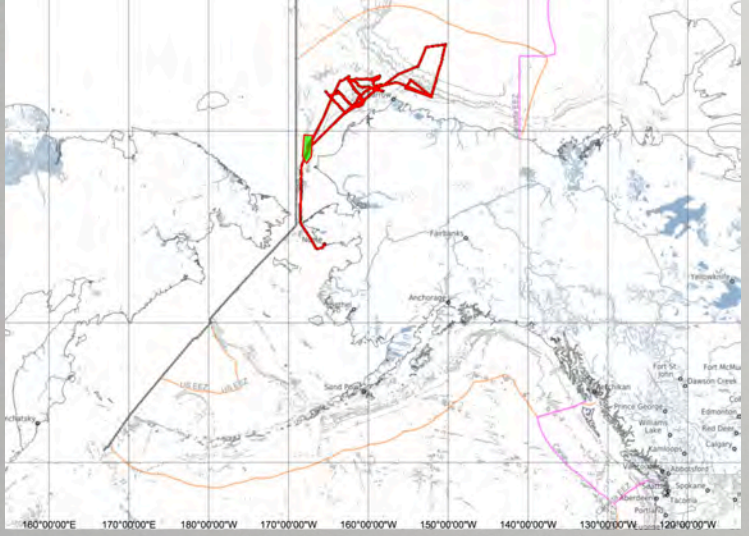






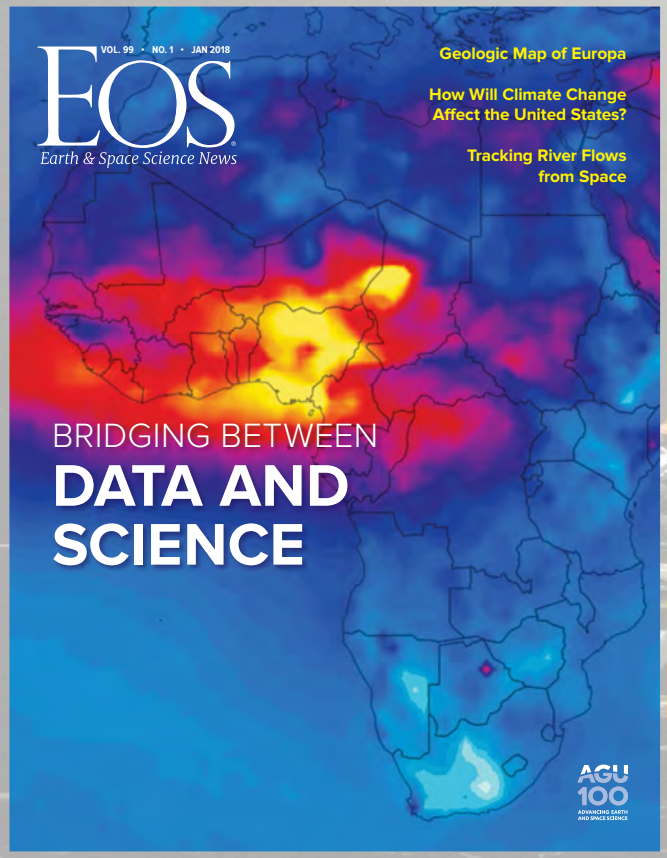
Aug. – RV Atlantis – NDSF Early Career Training Cruise

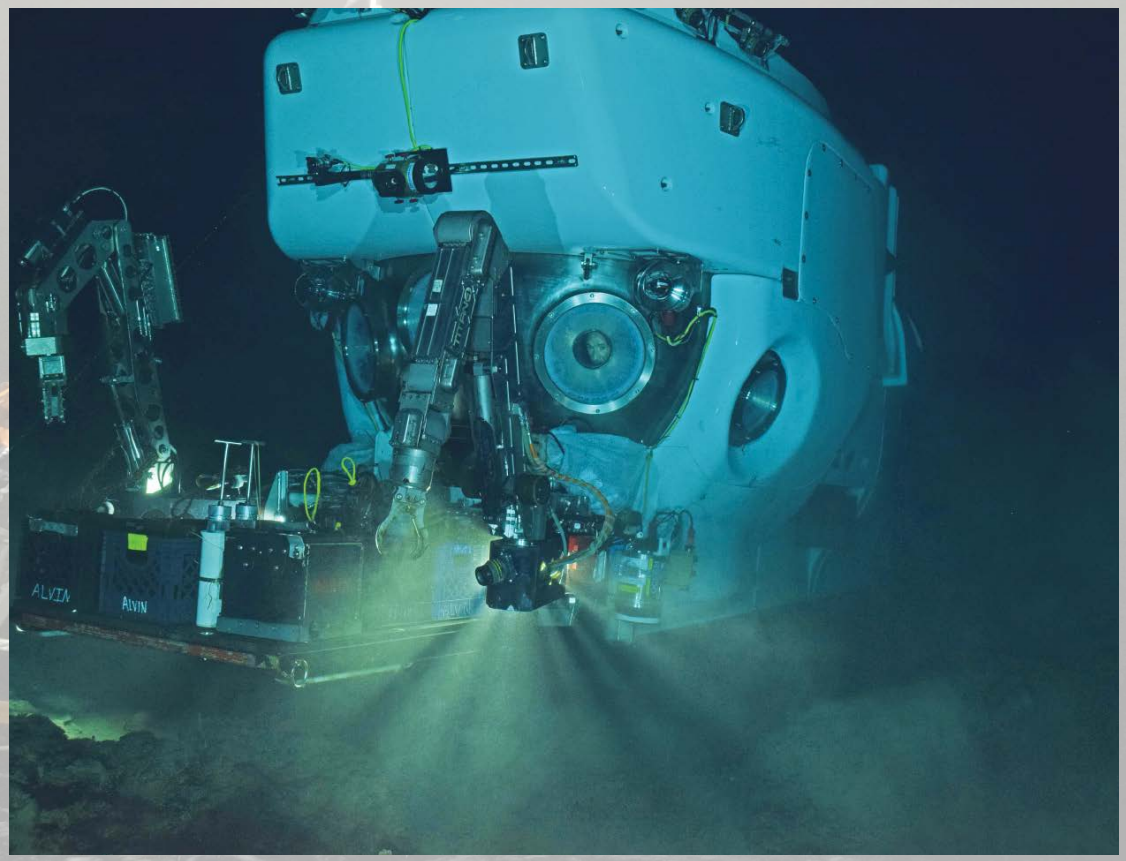
Examples of MISO GoPro camera on Alvin
Supported by Dan Fornari and Adam Soule



Sept. - RV Sikuliaq – L. Juranek/M. Goni (OSU)
Chuckchi Sea - MC400 w/MISO camera/data system

Postcards from the Field





Hello!

That's me looking out DSV *Alvin*'s viewport on Dive 4850 near the summit of Matthew seamount, in the northeastern Pacific, in November 2016. I'm at a depth of approximately 2,650 meters, studying seafloor volcanic processes and magmatism as part of a National Science Foundation–Division of Ocean Sciences funded research cruise with collaborators from numerous U.S. institutions and co-principal investigators Trish Gregg (University of Illinois at Urbana-Champaign) and Mike Perfit (University of Florida, Gainesville). Possibly the deepest selfie ever taken!

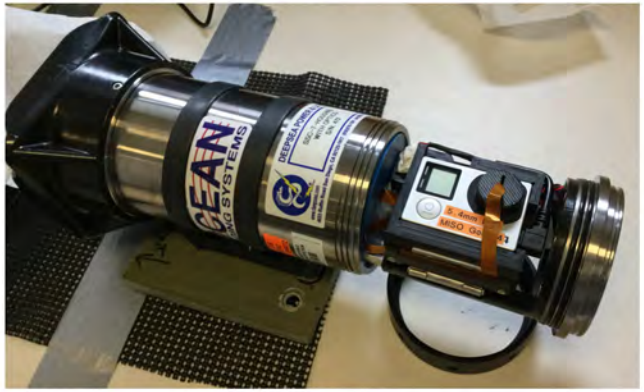
—Daniel Fornari, Woods Hole Oceanographic Institution, Woods Hole, Mass.

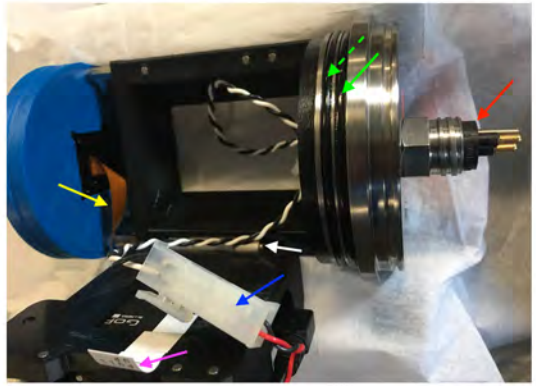
View more postcards at
http://americangeophysicalunion.tumblr.com/tagged/postcards-from-the-field.

12 MP DEEP-SEA CAMERA - 6000 M RATED

OCEAN IMAGING SYSTEMS & WHOI-SSSG/MISO

Eli Perrone Dan Fornari





OCEAN IMAGING SYSTEMS

12 MP DEEP-SEA CAMERA - 6000 M RATED

OCEAN IMAGING SYSTEMS & WHOI-SSSG/MISO

Eli Perrone Dan Fornari

MISO Multidisciplinary Instrumentation in Support of Oceanography

WOODS HOLE OCEANOGRAPHIC INSTITUTION 1930