Oregon State University
MARine Sediment SAMpling Group (MARSSAM)

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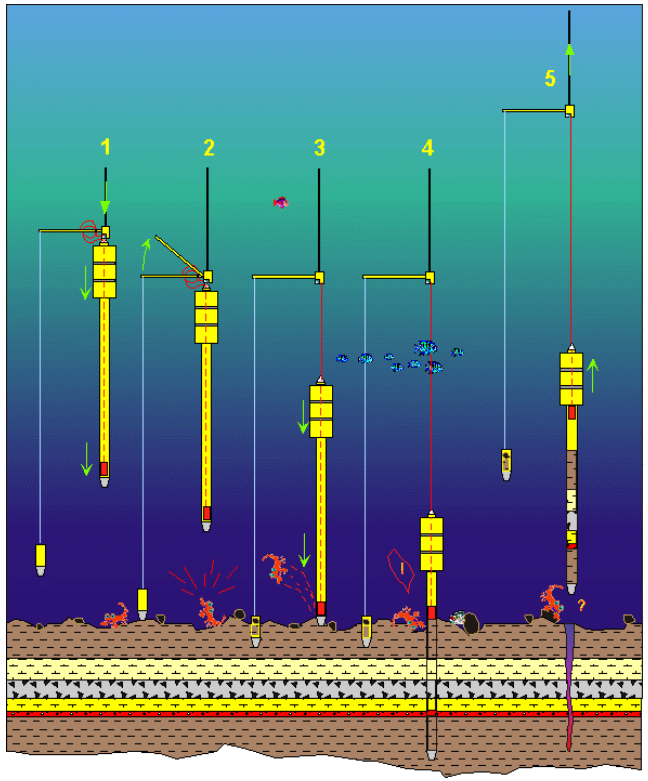
What is a sediment core?

Ideally: sediment cores are minimally disturbed samples of the seafloor, extending from the sediment-water interface down several centimeters to decameters.

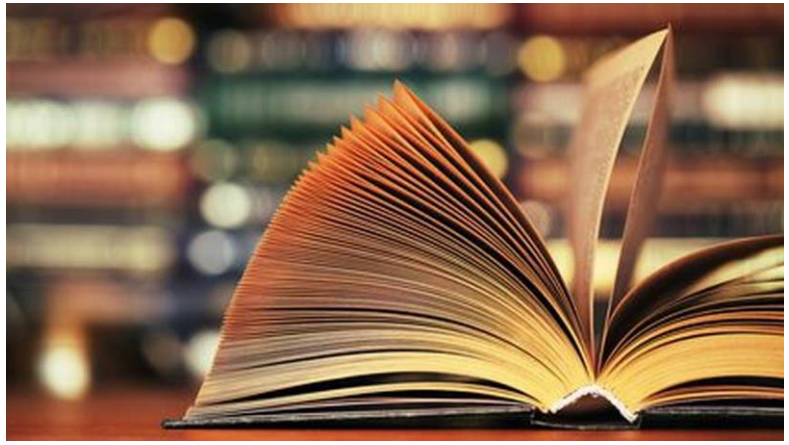


The reality can be more complicated.

Depending on operational parameters, ranging from science needs and coring device, to vessel capabilities and sea states, obtaining high-quality samples can be challenging. Distinguishing between high-quality and disturbed recovery is critical for science.

What science needs cores?

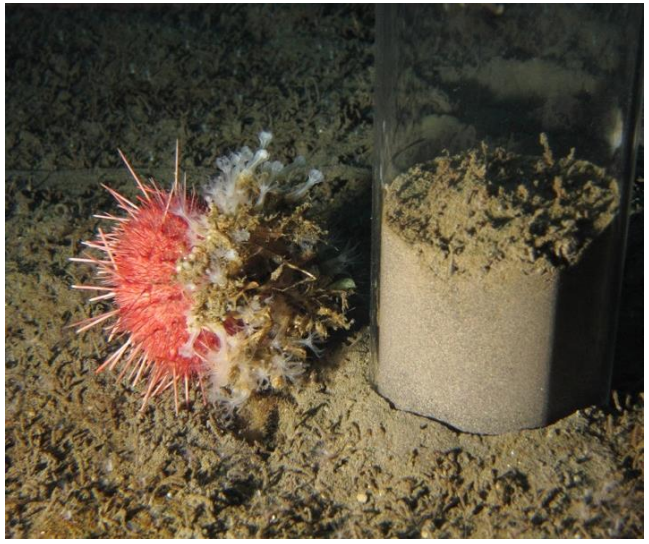
Marine sediments record Earth's story!



Large scale changes in the climate system, natural disasters like earthquakes and hurricanes, changes in marine ecology and nutrient cycling in the ocean, and *many other processes* leave a signature in marine muds.

Marine sediments host abundant life!

From the surface to kilometers deep in the mud, the seafloor hosts a startling abundance of life. These organisms are of direct and indirect economic importance to fisheries, are a major control on global biogeochemical cycles, and possess a range of novel biological adaptations to their environment of interest to science.



Sea Change 2015-2025

CONTRIBUTORS:

Committee on Guidance for NSF on National Ocean Science Research Priorities

Decadal Survey of Ocean Sciences

Ocean Studies Board

Division on Earth and Life Studies

National Research Council

Sea Change “Priority Science Questions” (8)

1. What are the rates, mechanisms, impacts, and geographic variability of sea level change?
2. How are the coastal and estuarine ocean and their ecosystems influenced by the global hydrologic cycle, land use, and upwelling from the deep ocean?
3. How have ocean biogeochemical and physical processes contributed to today’s climate and its variability, and how will this system change over the next century?
4. What is the role of biodiversity in the resilience of marine ecosystems and how will it be affected by natural and anthropogenic changes?

Sea Change “Priority Science Questions” (8)

5. How different will marine food webs be at midcentury? In the next 100 years?
6. What are the processes that control the formation and evolution of ocean basins?
7. How can risk be better characterized and the ability to forecast geohazards like mega-earthquakes, tsunamis, undersea landslides, and volcanic eruptions be improved?
8. What is the geophysical, chemical, and biological character of the subseafloor environment and how does it affect global elemental cycles and understanding of the origin and evolution of life?

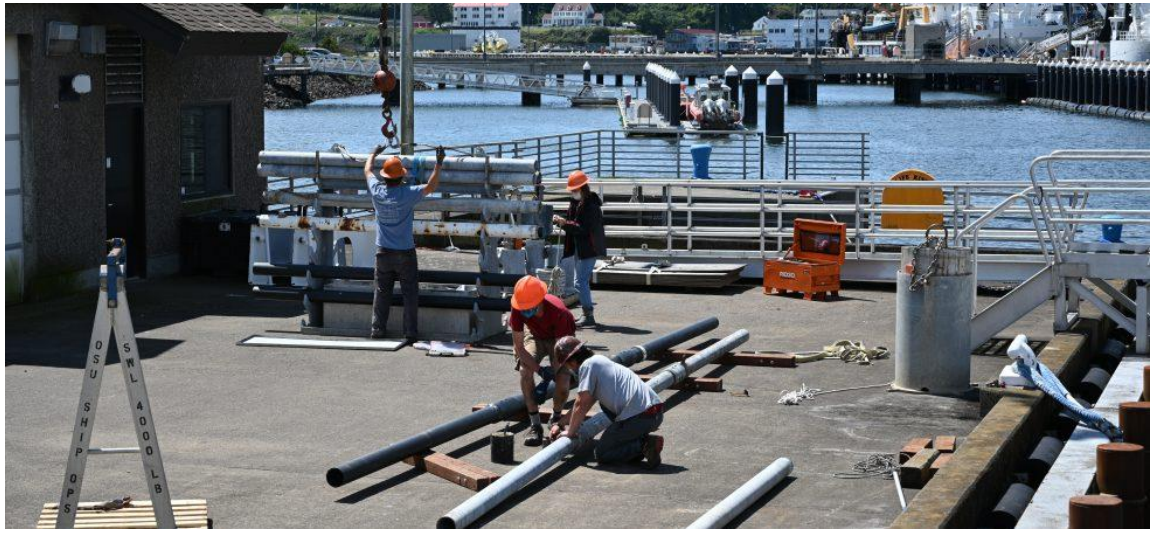
What is MARSSAM?

Prior to 1992 National Science Foundation (NSF) ***investigators responsible on an individual basis*** for requesting all funding necessary for sediment coring

However, all sediment cores collected with NSF funding become available to the broad scientific community after brief moratorium

At 1992 Future of Marine Geoscience meeting, it was decided that ***a central facility should exist*** to support coring for all NSF-supported PIs

Now a 28-year-old national facility based at Oregon State University



The MARSSAM mandate:

Maintain, repair, and design new coring equipment suitable for U.S. scientific research platforms (University-National Oceanographic Laboratory System or UNOLS vessels)

Provide expert advice to PIs seeking marine geology samples for a wide variety of research goals

Provide logistical support: shipping and staging gear, and returning and archiving samples at NSF repository of PI's choosing

Provide archival materials, multi-sensor track for shipboard logging of sediment physical properties, and training in the operation of that instrument as well as interpretation of physical properties and sub-bottom profile data

Provide shipboard support for shipboard sampling operations, most importantly complex jumbo piston coring systems

Who are MARSSAM?

Dean of CEOAS
Dr. Roberta Marinelli

Facility Management and Scientific Direction:
Lead Principle Investigator Maureen Walczak
Co-Principle Investigator Mitch Lyle
Co-Principle Investigator Chris Goldfinger

Operational Direction:
Lead Coring Technician Paul Walczak

MARSSAM Technical Pool:
Coring Technician Chris Fanshier
Coring Technician Dale Hubbard
Coring Technician Ben Freiberg

MARSSAM Advisorial Committee:
Prof. Emeritus Nick Pisias
Distinguished Prof. Alan Mix
Associate Prof. Joe Stoner
Coring Technician (Ret) Chris Moser
Coring Technician (Ret) Pete Kalk

NSF Program Managers
NSF Principle Investigators
UNOLS Operators

Ship Captain and Crew
Shipboard Science Party
NSF Repositories

We also sail special guest stars from the UNOLS Tech Pool!
e.g. **Drew Cole**

The MARSSAM Inventory:

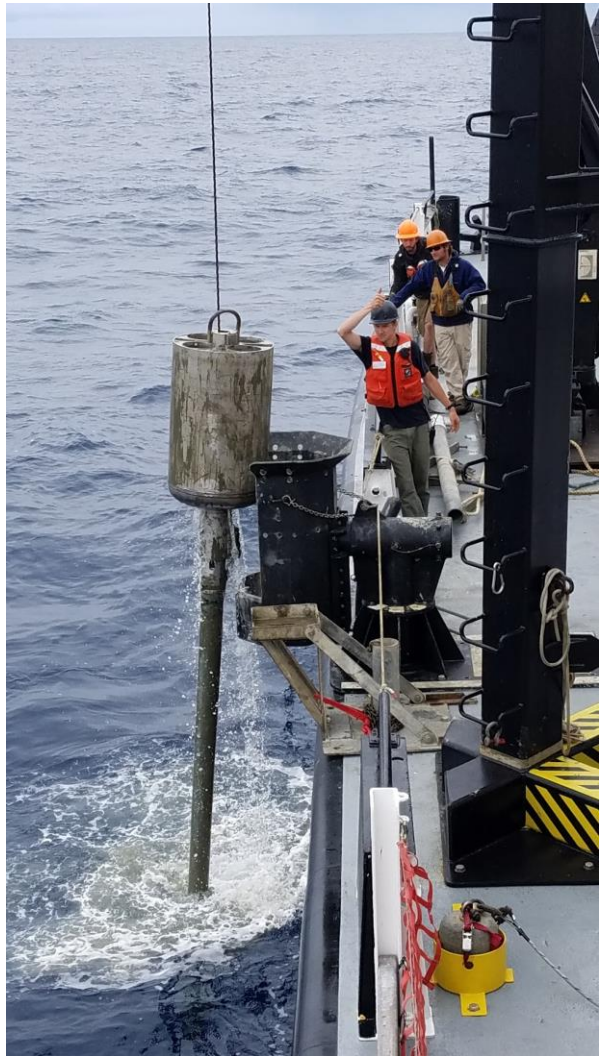
Equipment Type	Manufacturer	Number
Grab Sampler	Shipek, Van Veen	6
Corer, Multi (slocorer)		1
Corer, Multi (MC-400, stainless)	Ocean Instruments	1
Corer, Multi (MC-800)	Ocean Instruments	3
Corer, Box (0.25 m2)	Ocean Instruments	2
Corer, Box (0.2 m2)	Ocean Instruments	1
Corer, Kasten (small)	OSU	2
Corer, Kasten (large)	OSU	2
Corer, Gravity (2" barrel)	Benthos	3
Corer, Gravity (4" barrel)	OSU	3
Corer, Piston (2.5")*	OSU	2
Corer, Piston (4")*	OSU	3
Corer, Rock	OSU	1
Dredge, Rock	OSU	2
Knuckle Crane	Hiab	3
Shipping Flat Rack		3
Seagoing Refrigerated Vans	Carrier	3
Phys Props Multi-sensor Track **	Geotek	2

* All piston coring systems include trigger arm, trigger corer, and multiple barrels and couplers.
** Only one system is seagoing

Depending on the experience of your res techs and/or the science party ***you may be able to borrow MARSSAM coring equipment without sailing a technician.***

However, you ***can always request MARSSAM shipboard support*** with coring for NSF/UNOLS Science.

2019-2020 Shipboard Activities:



7 major coring activities in 2019 (*164 NSF days aboard UNOLS fleet*):

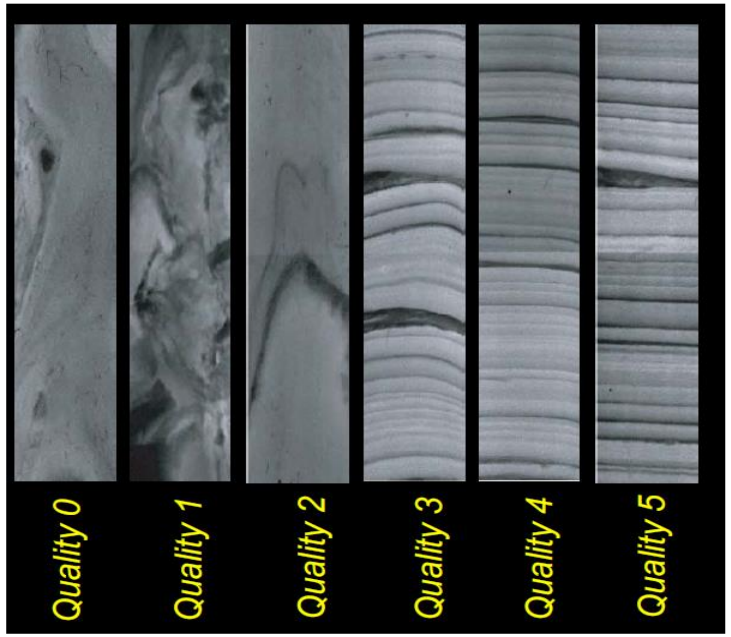
- R/V Revelle – PI Solomon : *piston + gravity coring*
- R/V Oceanus – PI Reimers (x3) : *slow coring*
- R/V Oceanus – PI Abdulla : *multi + gravity coring*
- R/V Oceanus – PI Rathburn : *multi + gravity coring*
- R/V Armstrong – PI Keigwin : *piston coring (WHOI 'long core lite' system)*
- R/V Thompson – PI Slowey : *piston, gravity, and multi-coring*
- R/V Atlantis – PI Kelley : *gravity coring*

4 major coring activities in 2020 (ongoing):

- R/V Oceanus – PI Walczak : *piston + gravity coring*
- R/V Kilo Moana – PI Haley : *multi coring*
- R/V Sikuliaq – PI Abdulla : *multi + gravity coring*
- R/V Sally Ride – PI Berelson : *multi coring*

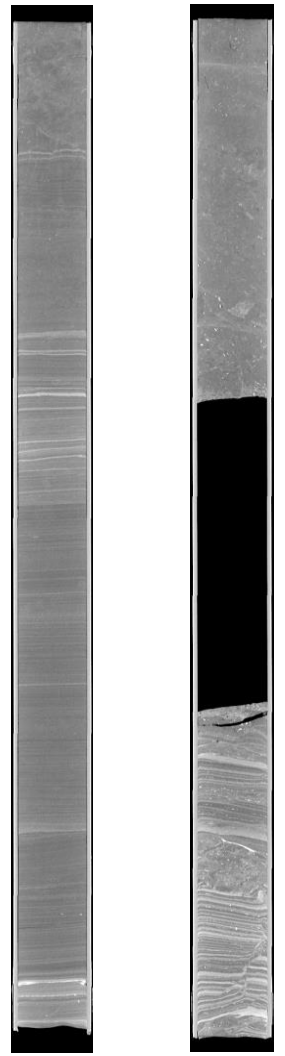
2019-2020 Equipment Updates:

Have begun instrumenting corers to record tilt and acceleration data during the coring process. Goal is to improve quality of sediment recovery and decrease coring deformation.



Bourillet et al., 2009

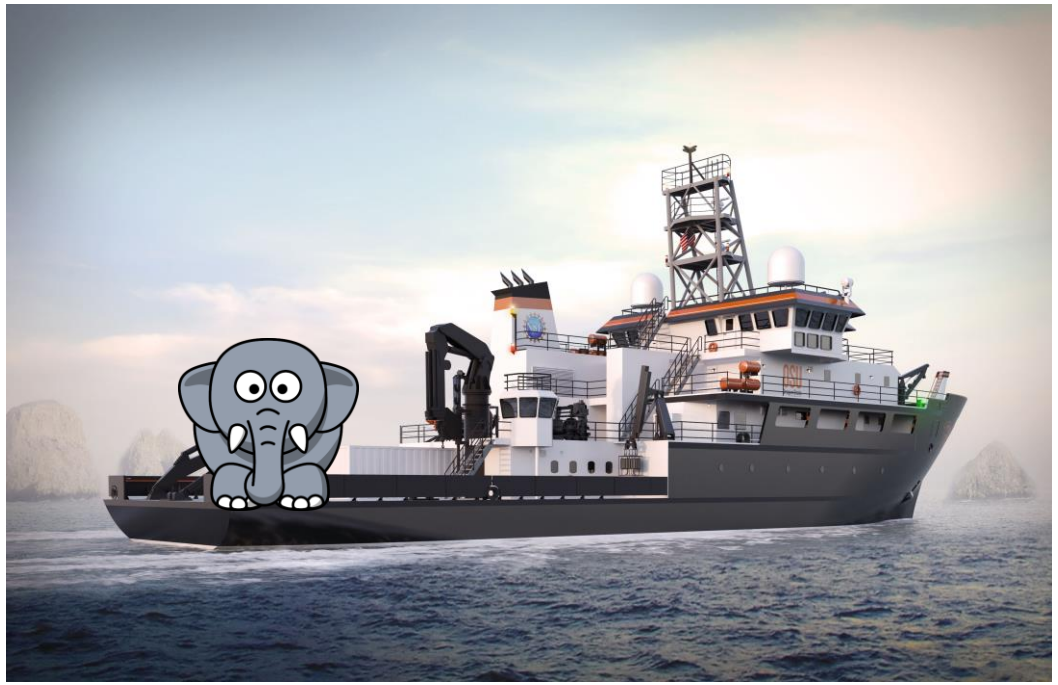
Conducted first side-by-side tests of galvanized vs. ceramic-coated core barrels. Ceramic coated barrels easier to handle and modestly improve pullout tensions, but seem to produce deformation and pull-apart gaps in recovery. Changing piston retraction speed may allow us to optimize recovery.



CT scans of galvanized barrel core section (L) vs. ceramic barrel core section (R)

2019-2020
Future of UNOLS Coring:

Finalized specifications for the Regional Class Research Vessel Piston Core Deployment and Recovery System (PCDRM)



nasa.gov

Contributed to the Process and Requirements List for supporting collection of jumbo piston cores from the new Antarctic Research Vessel

How to request MARSSAM:

Major Ancillary Facilities (that require coordination of schedules with ship schedule)			
Aircraft			
☐ Helicopter Ops (USCG)	☐ Twin Otter	☐ Unmanned Aerial Systems (UAS)	
Autonomous Underwater Vehicle (AUV)			
☐ Other AUV	☐ Sentry		
Coring Facility			
☐ Jumbo Piston Coring	☐ Large Gravity Core	☐ MC800 multicorer w/ MISO camera/telemetry	☑ OSU Coring Facility (MARSSAM)
☐ Other Large Coring Facility	☐ WHOI Long Core		
Human Occupied Vehicle (HOV)			
☐ Alvin	☐ Clelia (HBOI)	☐ JSL I & II (HBOI)	☐ Other HOV
Other Facility			
☐ MISO Facility - deep-sea imaging	☐ Other Facility	☐ Potential Fields Pool Equipment	
Remotely Operated Vehicle (ROV)			
☐ Jason	☐ Other ROV		
Seismic Facility			
☐ Ocean Bottom Seismograph Instrument Center (OBSIC)	☐ Ocean Bottom Seismograph Instrument Pool (OBSIP)	☐ Ocean-Bottom Seismometer Program (UTIG)	☐ Other Seismic/OBS Facility
☐ PASSCAL	☐ Portable MCS group	☐ Portable MCS/SCS group	☐ U.S. Geological Survey Ocean Bottom Seismometer Facility (USGS at WHOI)
Towed Underwater Vehicle			
☐ ARGO II	☐ Hawaii MR1 (HMRG)	☐ IMI12 (HMRG)	☐ IMI120 (HMRG - formerly DSL 120A)
☐ IMI30 (HMRG)	☐ Other Towed Underwater Vehicle	☐ Towfish	
UNOLS Van Pool			
☐ AUV Lab Van #1	☐ Clean Lab Van	☐ Cold Lab Van	☐ General Purpose Lab Van
☐ Radioisotope Lab Van	☐ Wet Lab Van		
UNOLS Winch Pool			
☐ Mooring Spooler	☐ Portable Winch	☐ Turn Table	

Explain Major Ancillary Facilities Requirements and list description and provider for "other" systems.

Principle Investigators should request the MARSSAM facility when submitting their UNOLS Ship Time Request.

Any request for coring will be followed up by our facility.

WE LOVE TO KNOW WHAT'S COMING DOWN THE PIPELINE! Please encourage your PI's to talk to us often and early, we can often provide useful advice even at the proposal preparation stage.

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"What could possibly go wrong?"

Maureen Walczak
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[What's a Core For?](https://tinyurl.com/yxpnqg86)

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