



Instrument Use Policies and Procedures

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This next version of this policy can be subject to approval by the OBSIC Operations Subcommittee (OBSIC-OS).

1. General Information

The Ocean Bottom Seismic Instrument Center (OBSIC) provides and operates seismic instruments to support research on the structure and tectonics of the ocean basins, their margins, and the dynamics and structure of the Earth's interior. Funded through the National Science Foundation Division of Ocean Sciences (NSF-OCE), OBSIC makes ocean bottom seismographs (OBS) available to NSF-sponsored investigators, and to investigators at other research or educational institutions with government, private, or industry funding. The OBSIC is housed at Woods Hole Oceanographic Institution (WHOI) under a 5-year cooperative agreement that commenced in 2018. OBSIC replaces the Ocean Bottom Seismograph Instrument Pool (OBSIP) that was created by NSF in 1999 and jointly operated and managed by WHOI, SIO, and LDEO until 2011, and thereafter operated by these three institutions but managed by the Incorporated Research Institutions for Seismology (IRIS). (As of January 1, 2023, IRIS has merged with UNAVCO to form the Earthscope Consortium.)

The policies and procedures described in this document define the OBSIC instrument request and funding process, provide proposal and cruise-planning information, and state the responsibilities of both principal investigator (PI) and OBSIC from the proposal preparation to data archive stages. The complexity of OBS experiments means that efficient use of OBSIC instruments requires close cooperation among all parties involved. Although significant information is provided on this website, prospective users are strongly encouraged to [contact the OBSIC Management Office](#) during the proposal development phase for more information about OBSIC procedures and instrument capabilities. This is *essential* if instrument modifications are being considered, if the OBS are to be deployed in areas deemed high risk, or if the OBS will be deployed from a non-UNOLS ship. *OBSIC treats instrument-request specifics, e.g. P.I. names, experiment location, dates, numbers and types of OBS, etc., as confidential until the experiment is either funded or recommended for funding.*

1.1 NSF Funded Projects

For NSF-funded projects, all OBS costs are supported through a cooperative agreement between NSF-OCE and OBSIC. OBS costs for experiments supported by the Marine Geology and Geophysics (MGG) Program within the Ocean Sciences Division are not included in the PI's proposed budget, but do come out of the MGG science budget and thus, *an Informational Budget* that summarizes the anticipated costs of supporting the experiment, both ashore and at sea, *must be included in the proposal*. For experiments seeking support from MGG, the required procedure for requesting and

using OBSIC instrumentation is summarized in this section and expanded upon in later sections. ***PIs submitting to NSF programs other than MGG should contact a program officer in MGG for information on how to include OBSIC costs in their proposal.***

PIs requesting OBS instrumentation will typically seek ship-time from UNOLS (University-Nationals Oceanographic Laboratory System, <https://www.unols.org>). The ship-time and OBS request processes are separate, but both requests must be included in the PI's proposal. The ship-time request (number of science days, number of days at sea, proposed ports of departure and return, preferred cruise dates) must be consistent with the OBS request.

1.1.2 Prior to Proposal Submission: Requesting OBSIC Instrumentation

- a. The PI submits an [instrument request](#) to OBSIC.
- b. OBSIC provides the PI with a 1-page Informational Budget (Appendix 1).
- c. The PI's proposal to NSF includes the Informational Budget in the "Supplementary Documentation" section of the proposal.

1.1.3 Post Award: Planning and Conducting the OBS Experiment

- a. OBSIC Management Office schedules OBS availability in consultation with the P.I. and with the research vessel provider, typically UNOLS. By default, experiments are prioritized on the basis of when they are recommended for funding.
- b. PI develops a comprehensive Cruise Plan for at-sea OBS operations (e.g. Appendix 2).
- c. OBSIC, in collaboration with the PI, develops a Science Support Plan that lays out the commitments and responsibilities of both parties (Appendix 3).
- d. OBSIC personnel participate in the experiment cruises and conduct OBS operations in conformance with the Science Support and Cruise Plans.

1.1.4 Post Experiment

- a. Upon completion of an experiment, OBSIC will provide one copy of the data set to the PI. All data collected using OBSIC instrumentation will be archived at the Earthscope Consortium Data Management Center (DMC).
- b. The PI will complete Cruise and Data Evaluation forms and return to OBSIC Management.
- c. The experiment science team acknowledges OBSIC on all publications.

2. Instrument Request Form and Informational Budget

Requests for OBSIC instruments are submitted using the online instrument request form available at the OBSIC website: [OBSIC Instrument Request](#). This form is automatically emailed to the OBSIC Management Office, which will then generate a one-page Informational Budget (pdf format) that will be sent to the PI, and which must be included with the PI's science proposal. Depending on the complexity of the experiment, it may take some time to generate an Informational Budget, *so budget requests are best made at least two weeks before a proposal deadline.*

In order to ensure an accurate Informational Budget, all relevant information should be included on the request form. Instrument types should be chosen based on the OBS specifications. Deployment times can be estimated using the information below. Risks to instruments should be understood and stated in the form. Other special circumstances (e.g., simultaneous land deployments; hazardous location) should be included. If the OBS are to be deployed/recovered using a UNOLS vessel, cruise dates and durations should be consistent with the PI's [UNOLS ship-time request](#). If a non-UNOLS vessel is to be used, then the vessel and/or its operator should be stated. Additional questions should be addressed to the [OBSIC Management Office](#).

The OBSIC Management Office will provide a one-page Informational Budget that will include a summary of instrument mobilization and demobilization costs, instrument modification costs (if any), instrument drop charges, technical and engineering support costs, and travel and shipping costs.

3. NSF Proposal

3.1 Proposal submission

The OBSIC Informational Budget must be included with the NSF science proposal submission and should be uploaded to Fastlane in the "Supplementary Documentation" section. OBSIC costs identified in the Informational Budget should not be included in the NSF science proposal budget (NSF Form 1030) submitted by the PI institution(s). However, the costs outlined in the informational budget WILL be considered as part of the overall science budget for the project, and the OBSIC-related project costs will be borne by the program that reviewed/recommended the award. **PIs submitting to NSF programs other than MGG should contact a program officer in MGG for information on how to include OBSIC costs in their proposal.**

OBSIC will provide complete engineering and technical support, both ashore and at sea, through its cooperative agreement with NSF. The PI's institutional budget(s) must, however, include all costs for non-OBSIC personnel and any other costs not specifically covered in the OBSIC Informational Budget, such as miscellaneous cruise fees, communications charges, etc.

For proposal resubmissions, a new request form should be completed and a new Informational Budget should be used.

3.2 NSF Proposal Funding

Upon acceptance of the PI's proposal, NSF will provide the PI funding for non-OBSIC related expenses. OBSIC will receive direct funding to provide instrumentation and technical support for the experiment and will begin planning for and scheduling the project in conjunction with ship operators, usually the University-National Oceanographic Laboratory System (UNOLS).

Demand-related backlogs in OBS availability and/or delays in securing a research vessel for work in remote regions might result in multi-year delays in deploying funded OBS experiments. Under those circumstances, OBSIC costs for expendables such as lithium batteries and for international shipping might be significantly greater than the estimated costs included in the funded proposal. This is of particular concern for large broadband experiments that require repeated year-long deployments. NSF may opt to provide OBSIC funding for an amount equal to that presented in the informational budget; this could require a descoping of the OBS deployment plan included in the funded proposal.

3.3 Instrument Scheduling

The OBSIC Management Office, in consultation with the PI, NSF and the ship operator (usually UNOLS), is responsible for scheduling OBSIC instruments. The OBSIC Management Office participates in UNOLS ship-scheduling meetings (typically in June or July of each year) to schedule experiments for the following calendar year. Only experiments with confirmed funding and ship time will be entered into the schedule. Scheduling priorities will be set in the following order:

- 1. Programs funded by the Ocean Sciences Division of NSF
- 2. Programs funded by other divisions of NSF

- 3. Programs funded by other US government agencies
- 4. Other funded programs

Instruments are allocated on a "first funded — first priority" basis. (USGS will have first priority for use of the 17 USGS OBS instruments at OBSIC; USGS will be the highest priority non-NSF user for other instruments at OBSIC.)

All other conditions being equal, the highest scheduling priority will go to experiments with the earliest funding dates, then to the earliest request dates. The scheduling goal is to optimize the use of the instruments, and to accommodate as many experiments as possible. Therefore, it will sometimes be necessary to negotiate with the PI the exact type and number of instruments, or to modify the time of an experiment.

The OBSIC Management Office will allocate projects based on instrument requirements and availability. Funded programs that cannot be scheduled will be placed on a waiting list for scheduling at the earliest possible date consistent with the scheduling criteria outlined above. In some cases, especially for work in remote areas, ship scheduling may drive OBS scheduling. Requests can be made for OBSIC instruments at any time of the year. Instruments will be made available to users for rapid response studies as the schedule permits.

4. Cruise Planning Information

The PI should develop and/or finalize a comprehensive Cruise Plan (e.g. Appendix 2 and [Cruise Planning Examples](#)) that outlines the specific series of steps to complete OBSIC instrument deployment and recovery. The following information should be used in planning the cruise operations.

4.1. Deployment and Recovery Times

The maximum deployment time (without recovery) will be ~12-15 months depending on sampling rate and instrument type. The maximum deployment water depth is 5,000-6,000 m, depending on OBS type.

The following estimates should be used as a guideline for planning the duration of a cruise, as well as for estimating the time required for OBS shipboard operations:

Cruise Planning Duration Guidelines

h= water depth in km

Activity	Time (hours)	h = 1 km	h = 3 km	h = 6 km
Deploy	1	1	1	1
Fall	h/1.8	0.6	1.7	3.3
Survey	0.6+0.2h	0.8	1.2	1.8
Rise	h/1.8	0.6	1.7	3.3
Recover	1	1	1	1

These times do not include the transit time between instrument sites. Active-source experiments may not require "Fall" or "Survey" times. Assumptions include a rise/sink rate of 30 m/min, and 10-min surveys at four points each at a lateral distance from the drop location of one half the water depth. The instrument locations should be surveyed directly after deployment. Multiple-deployment experiments with a fast turn-around time may require slightly more time between deployments for data recovery and instrument preparation. We strongly encourage that PI's talk to the OBSIC Management Office to discuss additional questions or concerns regarding cruise logistics.

4.2 Instrument Surveying

Seafloor instrument locations can often be determined for active-source experiments using airgun-generated water-wave arrival times, in which case the PI should provide them to OBSIC Management Office before the data are submitted to Earthscope Consortium DMC. Otherwise, instruments need to be surveyed by acoustic ranging, in which case the onboard OBSIC technical staff will determine locations and provide them to the PI.

It is preferable to do the instrument survey immediately after deployment. If the ship has a hull-mounted transducer, a minimum survey pattern is a 3/4 circle at a lateral distance of one half the water depth and at a ship speed of 5 knots. If an "over-the-side" transducer only is available, the minimum survey procedure is to range to the OBS from a few locations with good azimuthal coverage at a lateral distance from the drop point of about one half the water depth.

The azimuths of horizontal seismometer components can be measured by the PI after instrument recovery using air-gun shots or Rayleigh surface-wave data. In both cases they are not the

responsibility of OBSIC and are not included in the data headers submitted to the Earthscope Consortium DMC.

5. PI Responsibilities

The responsibilities of the PI in seagoing operations utilizing OBSIC equipment are:

1. Request sufficient ship time for all OBS operations. Although guidelines for estimating ship time are given above, it is strongly recommended that each PI consult with the OBSIC Management Office to ensure that adequate ship time for OBS operations has been requested.
2. Plan and run the cruise, which may include marine mammal permitting, foreign and NAVY clearances, port locations, schedule changes and personnel issues. Many of these issues are dealt with by the research vessel operators, but the PI should take overall responsibility for coordination and communication between OBSIC, the ship operator, the science party, and in some cases, other organizations (e.g., [PASSCAL](#), foreign ship operators). It is expected that OBS operations will normally take place from [UNOLS](#) vessels; use of a non-UNOLS vessel requires prior approval of the OBSIC Management Office and possibly certification in writing from the Captain that the vessel meets [UNOLS safety standards \(e.g. Appendix 4\)](#). A vessel inspection may be required.
3. Provide support personnel for instrument recoveries and deployments. Although OBSIC engineers and technicians handle most of the deployment/recovery responsibilities, two or three additional people per shift from the science party are needed. Prior to the cruise, OBSIC will provide a deployment/recovery check-sheet for a science party watch-stander to complete. These check-sheets should be used to record OBS deployment/recovery locations and times, station names and OBS identification numbers, and anything of importance bearing on OBS deployment/recovery. The mapping between station names (provided by the PI) and OBS identification numbers (provided by OBSIC) is critical. OBSIC requests this information from the science party even if the OBSIC technicians also record some or all of these values. Independent information sources help identify inconsistencies and mistakes. Often, the ship's officers also record station deployment/recovery locations and times, and are happy to provide these data to the science party on request. A second person from the science party is needed to assist with deck operations; in extreme conditions two deck support people may be required. If instrument locations need to be surveyed, then these personnel may also be responsible for

operating the acoustic ranging equipment. The optimal plan is to bring enough people to handle a two-person shift on a rotating schedule. This typically requires 4-6 cruise participants in addition to the PI and OBSIC personnel, although the involvement of more people is always encouraged. Certain cruise scenarios may require more or fewer personnel; we recommend contacting the OBSIC Management Office to discuss cruise logistics before proposal submission.

4. Calculate seafloor instrument locations from airgun data (if active-source experiment) and provide them to OBSIC as soon as they are available. This is often a post-cruise activity.

6. OBSIC Responsibilities

OBSIC will be responsible for all operations and equipment relevant to seagoing operations involving OBSIC instrumentation. This includes:

1. Provide ocean bottom seismic instrumentation and related equipment.
2. Provide expendables (e.g. anchors, batteries, etc.) for instrument operations.
3. Provide technical and engineering support personnel for instrument operation.
4. Transport instruments and ancillary equipment to and from ship.
5. Arrange travel of OBSIC personnel to and from ship.
6. Calculate seafloor instrument locations for passive experiments (but not the orientation of the seismometers' horizontal components).

OBSIC will provide everything needed to collect seismic data, exclusive of the PI responsibilities defined in the PI Responsibilities above. In consultation with the PI, OBSIC will develop a Science Support Plan (Appendix 3) describing in detail OBSIC's plan to support the PI's experiment.

7. PI and OBSIC Authority

The Principal Investigator has ultimate responsibility for the safety of OBSIC personnel and the return of all OBSIC instruments and equipment. The PI should consult with the senior OBSIC engineer/technician on the cruise regarding all OBS operations. If the senior OBSIC staff member (Expedition Leader) determines that conditions represent undue risks to OBSIC personnel or instrumentation, or if there is not an adequate plan for instrument recovery, he/she may terminate OBS operations.

All OBS operations are under the control of the senior OBSIC engineer/technician, the OBSIC Expedition Leader (Appendix 4). OBSIC technicians and engineers will NOT normally be available for other shipboard duties (e.g. watch standing) during non-OBS operational periods. If OBSIC personnel are needed for other operations, written approval must be obtained from the OBSIC Management Office prior to the cruise and additional costs (e.g. overtime) must be paid by the PI.

Appendix 4 of the Science Support Plan lays out guidelines for OBSIC at-sea operations.

8. Instrument Loss Risks

OBSIC has suffered instrument losses as a result of deployment in risky locations. PIs planning OBS operations in areas with unusual risks (e.g., severe weather, currents or seas; unusually shallow (<1000 m) or deep (> 5000 m) water depths; intensive bottom trawling activity; ice; foreign waters in areas of political unrest; probable volcanic activity or debris flows) should include this information in the online instrument request form, and should be prepared to work with OBSIC in identifying and mitigating these risks. The OBSIC Management Office will be able to advise on proposed high-risk instrument locations. Deployments deemed to be high risk will be flagged in the Informational Budget page that must be included in the NSF proposal.

9. Post-Cruise Information

9.1 Instrument Responses

Instrument responses for passive-source instruments are included in the SEED headers that are submitted to Earthscope Consortium DMC by OBSIC. SEGY data headers do not include instrument responses, however, and they can be obtained from OBSIC.

9.2 Data Policy

All data collected using OBSIC instrumentation or with non-OBSIC OBS operated via a sub-award from OBSIC will be archived at the Earthscope Consortium Data Management Center (DMC). To ensure accurate metadata, the PI must provide all necessary ancillary data (station names, instrument deployment and recovery locations and times, shot times if appropriate, OBS locations if available, etc.) to the OBSIC Expedition Leader prior to the end of the recovery cruise. Much of this information should be recorded in the deployment/recovery check-sheets completed by the science party.

Upon completion of a cruise, OBSIC will provide one data set to the project PI. Depending on cruise logistics and quantity of data collected, this may occur some weeks after the ship has reached port. Requests for additional copies should be made at the time the instruments are requested in order to allow for the additional costs to be budgeted.

All data will be archived in SEED format; in addition, active-source data will be archived in SEG-Y format. Data will be submitted to Earthscope Consortium within six months of the end of the last recovery cruise.

In accordance with NSF requirements, the Earthscope Consortium DMC data can be restricted to the PIs for 24 months from the date of data delivery to the PI. However, for long-term broadband experiments, data from one instrument (selected by the PI) may be made publicly available immediately. After this 24-month period, all data will be available to any interested investigator.

9.3 Evaluation Forms

Evaluation forms provide crucial feedback to the OBSIC Management Office, NSF and the OBSIC Oversight Committee. The PI is expected to complete and return the OBSIC [cruise evaluation form](#) and [data assessment form](#) after the end of a cruise. These forms are both available on the OBSIC website under [Forms](#).

9.4 Post Cruise PI Interview

OBSIC Management Office will conduct a post-cruise PI interview to assess the OBSIC performance in supporting PIs's proposed scientific objectives.

9.5 OBSIC Acknowledgement

In any publications or reports resulting from the use of OBSIC instruments, please include the following statement in the acknowledgements section:

"Data used in this research were provided by instruments from the Ocean Bottom Seismic Instrument Center (<https://obsic.who.edu>), which is funded by the U.S. National Science Foundation. OBSIC data are archived at the Earthscope Consortium Data Management Center (www.iris.edu)."

Please provide the OBSIC Management Office with copies of any publications related to your experiment or complete the [Submit a Publication](#) form on the OBSIC website.

Appendix 1: Informational Budget



This is an informational budget provided to prospective users of instruments at the Ocean Bottom Seismic Instrument Center at Woods Hole Oceanographic Institution. OBSIC will provide complete engineering and technical support for OBS operations at sea. The cost of providing this support (e.g., instrument charges, personnel support, shipping and travel) will be funded directly through the Center; these costs do not need to be included in individual NSF science proposals. NSF does, however, require PIs to provide an informational budget estimating these costs in any proposal requesting OBSIC instruments. For more information on OBSIC, see <https://obsic.who.edu>.

Project Title *Western Pacific Old Crust and Mantle Structure*
Principal Investigator(s) *John Collins*
Funding Agency *NSF-MGG*
Submission Deadline *10/1/2023*

Instruments *Short Period (active)* *Deployments*
Short Period (passive) *Deployments*
22 Long Period *1 Deployments*

Ports *Apia, Samoa to/from Apia, Samoa*

Deployment Risk

X	<i>No Additional Risk</i>
	<i>Increased Risk:</i>

<i>Proposed Date</i>	<i>5/1/2025</i>	<i>5/1/2026</i>
<i>Cruise Type</i>	<i>Deploy</i>	<i>Recover</i>
<i>Cruise Duration</i>	<i>23</i>	<i>13</i>
<i># Instruments</i>	<i>22</i>	<i>22</i>

The cruise dates and durations in the Instrument Request should be consistent with the PI's ship-time request (typically UNOLS).

<i>Baseline Facility Costs</i>							Totals
On-Shore Labor	\$73,587	\$72,005	\$0	\$0	\$0	\$0	\$145,592
At-Sea Regular Labor	\$68,923	\$43,609	\$0	\$0	\$0	\$0	\$112,532
Total Baseline Facility Costs	\$142,510	\$115,614	\$0	\$0	\$0	\$0	\$258,124
<i>Experiment Specific Costs</i>							
At-Sea Labor Uplift	\$84,854	\$42,586	\$0	\$0	\$0	\$0	\$127,440
Instrument Costs	\$143,889	\$33,078	\$0	\$0	\$0	\$0	\$176,967
Long Lead Items	\$539,725	\$0	\$0	\$0	\$0	\$0	\$539,725
Shipping	\$150,358	\$148,954	\$0	\$0	\$0	\$0	\$299,312
Travel	\$17,572	\$17,572	\$0	\$0	\$0	\$0	\$35,144
Instrument Modifications	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Experiment Specific Costs	\$936,398	\$242,190	\$0	\$0	\$0	\$0	\$1,178,588
Total:	\$1,078,908	\$357,804	\$0	\$0	\$0	\$0	\$1,436,712

Notes: Budget based on request OBSIC2023-0000XX.

Appendix 2: Cruise Planning Spreadsheet

PIs can establish and optimize cruise plan that can be a foundation for the PIs UNOLS Ship Time Request.

Site Name	WHOI OBS I.D.	Site Latitude (deg)	Site Latitude (min)	Site Latitude (heml)	Site Longitude (deg)	Site Longitude (min)	Site Longitude (heml)	Station Depth (m)	Site Latitude (decimal degrees)	Site Longitude (decimal degrees)	Site Co-Latitude (radians)	Site Longitude (radians)
Seward		60	7.1340	N	149	25.6760	W		60.11890	-149.42793	0.52152358	-2.50800943
WP-01		59	58.2730	N	149	21.1150	W		59.97122	-149.35192	0.52410114	-2.60668269
WP-02		59	49.6120	N	149	28.6640	W		59.82687	-149.47773	0.52662052	-2.60887861
WP-03		59	45.1690	N	149	22.7560	W		59.75282	-149.37927	0.52791294	-2.60716004
WD46		55	31.2	N	149	42	W	4393	55.52000	-149.70000	0.60178953	-2.61275789
WD47		54	57	N	150	27	W	3952	54.95000	-150.45000	0.61173790	-2.6284786
WD49		54	24	N	151	54	W	4090	54.40000	-151.90000	0.62133721	-2.65115513
WD53		53	46.8	N	153	25.2348	W	4656	53.78000	-153.42058	0.63215826	-2.67769426
WD58		53	54.3708	N	155	2.2536	W	4505	53.90618	-155.03756	0.62995600	-2.70591589
WD59		53	22.8156	N	155	48.441	W	4482	53.38026	-155.80735	0.63991303	-2.7193126
WNS0		67	28.544	N	155	28.244	W	1888	67.47444	-155.46888	0.66888888	-2.82888888
Distance to Following Site (nm)	Ship Speed (knots)	Time to Following Site (decimal hrs)	On_site Prep. Time (hours)	OBS Fall Time (hours)	OBS Survey Time (hours)	Time On Site (hours)	Site Departure Date and Time (local)	Arrival Time Next Site (local)	Cumulative Time to Next Station (hrs)	Cumulative Time (days)		
9	5	1.8	0.0	0.0	0.0	0	7/11/18 10:00	7/11/18 11:48	1.8	0		
10	6	1.7	0.0	0.0	0.0	0	7/11/18 11:48	7/11/18 13:30	3.5	0		
5	6	0.8	0.0	0.0	0.0	0	7/11/18 13:30	7/11/18 14:18	4.3	0		
254	10.5	24.2	0.0	0.0	0.0	0	7/11/18 14:18	7/12/18 14:30	28.5	1.2		
43	10.5	4.1	1.0	2.4	1.5	4.9	7/12/18 19:24	7/12/18 23:30	37.5	1.6		
60	10.5	5.7	1.0	2.2	1.5	4.7	7/13/18 4:12	7/13/18 9:54	47.9	2.0		
65	10.5	6.2	1.0	2.3	1.5	4.8	7/13/18 14:42	7/13/18 20:54	58.9	2.5		
58	10.5	5.5	1.0	2.6	1.5	5.1	7/14/18 2:00	7/14/18 7:30	69.5	2.9		
42	10.5	4.0	1.0	2.5	1.5	5.0	7/14/18 12:30	7/14/18 16:30	78.5	3.3		
52	10.5	5.0	1.0	2.5	1.5	5.0	7/14/18 21:30	7/15/18 2:30	88.5	3.7		
51	10.5	4.9	1.0	2.5	1.5	5.0	7/15/18 7:30	7/15/18 12:24	98.4	4.1		
54	10.5	5.1	1.0	2.6	1.5	5.1	7/15/18 17:30	7/15/18 22:36	108.6	4.5		
42	10.5	4.0	1.0	2.6	1.5	5.1	7/16/18 3:42	7/16/18 7:42	117.7	4.9		
55	10.5	5.2	1.0	2.6	1.5	5.1	7/16/18 12:48	7/16/18 18:00	128.0	5.3		
60	10.5	5.7	1.0	2.6	1.5	5.1	7/16/18 23:06	7/17/18 4:48	138.8	5.8		
45	10.5	4.3	1.0	2.6	1.5	5.1	7/17/18 9:54	7/17/18 14:12	148.2	6.2		
30	10.5	2.9	1.0	2.6	1.5	5.1	7/17/18 19:18	7/17/18 22:12	156.2	6.5		
38	10.5	3.6	1.0	2.8	1.5	5.3	7/18/18 3:30	7/18/18 7:06	165.1	6.9		
24	10.5	2.3	1.0	2.2	1.5	4.7	7/18/18 11:48	7/18/18 14:06	172.1	7.2		
32	10.5	3.0	1.0	0.7	1.5	3.2	7/18/18 17:18	7/18/18 20:18	178.3	7.4		
19	10.5	1.8	1.0	1.4	1.5	3.9	7/19/18 0:12	7/19/18 2:00	184.0	7.7		
29	10.5	2.8	1.0	0.7	1.5	3.2	7/19/18 5:12	7/19/18 8:00	190.0	7.9		
59	10.5	5.6	1.0	1.1	1.5	3.6	7/19/18 11:36	7/19/18 17:12	199.2	8.3		
85	10.5	8.1	1.0	1.2	1.5	3.7	7/19/18 20:54	7/20/18 5:00	211.0	8.8		

Appendix 3: Science Support Plan

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Appendix 4: OBSIC At-Sea Operations Guidelines

The OBSIC sea-going team involves a combination of personnel of varying experience and expertise. Some members will be permanent OBSIC staff, while others may be temporary team members from the UNOLS Technician Pool. The OBS Expedition Leader and Deck Boss are the primary interfaces with the science party.

OBSIC Expedition Leader (EL)

- Has overall responsibility for the safety of OBSIC personnel and the OBS instrumentation. The EL may terminate OBS operations if conditions or schedule represent undue risk to OBSIC personnel or instrumentation.
- Throughout the cruise, the EL coordinates with the PI, science party, and ship's crew on all aspects of OBS operations to ensure the success of the OBS component of the cruise.
- Draws up and manages the watch schedule for the OBSIC team to ensure efficient and timely OBS operations including OBS programming, debriefing, and data offload and backup.
- Assigns an experienced OBSIC team member to be the OBSIC on-deck lead or deck boss.
- Ensures that science deliverables are provided to the PI in a timely fashion during the cruise and that any deliverables not completed by the end of a cruise due to extenuating circumstances have a clear plan for being completed that is also communicated to the operations manager onshore.
- Sends regular status updates to the OBSIC Management Office.

OBSIC Deck Boss

- In coordination with the ship's Bosun and officers, develops a plan for OBS deployments and recoveries that prioritizes the safety for all personnel involved in deck operations and ensures no damage to the OBS.
- Leads OBS deployment and recovery operations. Assigns tasks, such as tag-line duties, OBS snagging, to OBSIC personnel and science party personnel as necessary. Ensures all personnel wear hard-hats, appropriate footwear, and personal floatation devices. Ensures common hand signals are understood by all before commencing operations.
- In coordinating with the Expedition Leader delegates deck leadership to other OBSIC team members as appropriate if OBS operations are being conducted 24/7.

Other OBSIC Technician(s)

All OBSIC team members support OBS assembly/disassembly, OBS programming and debriefing, deck operations, record keeping, data offloading and data backup.

The OBSIC at-sea operations safety policy adheres 100% with the UNOLS Research Vessel Safety Manual (<https://www.unols.org/document/research-vessel-safety-standards-rvss>) regardless whether the cruise is supported on a UNOLS on non-UNOLS vessel. In addition, OBSIC personnel comply with the policies described in *Maintaining an Environment of Respect Aboard Ships* (<https://www.unols.org/what-unols/maintaining-environment-respect-aboard-ships>).