Appendix 3: Science Support Plan

OBSIC Science Support Plan

OBSIC Identifier:	24014.07
PI:	
Project:	Hawaii-Emperor Seamount Chain Seismic Experiment, Leg 2
Location:	Hawaii-Emperor Seamount Chain
At Sea Dates:	04/19/2019 – 06/01/2019
Port Stops:	Honolulu, HI to Kodiak, AK
OBS Providers:	WHOI (7), GEOMAR (25)
Vessel:	R/V Marcus G. Langseth
Funding Agency:	NSF-OCE-MGG
UNOLS Cruise #:	MGL19-02

Nota Bene
This cruise will support Leg 2 of the Hawaii-Emperor Seamount experiment, including deployment, recovery, and data delivery.

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Document Change History

Version	Author	Description	Date
1.0		Draft	2019-02-25
1.1		Draft	2019-03-12
2.0		Final	2019-03-15

Distribution

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1	OBSIC ( )	
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6	NAVY ( )	

1. Cruise Overview

Ocean-Bottom Seismographs (OBS) will be used to acquire two 2-D active-source refraction profiles along and across the Hawaiian-Emperor seamount chain. Thirty-two (32) OBS will be deployed along each line. The shooting ship will be the R/V Marcus G. Langseth. In addition to acquiring refraction data, the Langseth will deploy its 15 km streamer to collect ~1300 km of MultiChannel Seismic (MCS) reflection lines. This is the second leg of a two-leg cruise. (Leg 1 took place in September/October 2019.)

2. Outstanding Issues

There are no outstanding issues

3. OBSIC Schedule

Activity	Date
Ship 7 WHOI short-period OBS plus laboratory van from Woods Hole to Honolulu, HI	25/03/2019
Fly to Honolulu, HI	04/15/2019
Mobilize OBS in Honolulu	04/16/2019 – 04/18/2019
Deploy 7 OBS, shoot, recover OBS during cruise. Repeat once.	04/19/2019 – 06/01/2019
Return home from Kodiak, AK	06/03/2019
WHOI Lab Van and OBS shipped home from a Pacific Northwest port.	07/03/2019

OBSIC Information

PIs are expected to understand and plan their experiment according to the OBSIC Instrument Use Policies and Procedures that have been approved by the OBSIC Oversight Committee. The instrument use policy contains detailed planning information and is available on the OBSIC website:

http://www.obsic.org/experiment-planning/obsip-instrument-use-policies-and-procedures/

This experiment will be serviced by WHOI and GEOMAR. The following table summarizes the instruments to be provided:

Table 1 - Instrumentation Summary

Quantity	OBS Type	Provider	Sample Rate	Max. Deployable Depth
15	SPOBS (WHOI D2)	WHOI	200 Hz	5000 m
17	LOBSTER	GEOMAR	250 Hz	6000 m
8	Ultradeep LOBSTER	GEOMAR	250 Hz	8000 m
32	<<Total			

3.1. Instrument Modifications

None.

3.2. Pre-Cruise

OBSIC will perform functional testing all instruments prior to shipping. This testing verifies instrument operation.

3.3. Mobilization

3.3.1. Shipping

The 7 WHOI OBS to be used on the Shillington experiment will be shipped to the Honolulu port for mobilization aboard the R/V Langseth.

3.3.2. Port Call

The port stops are Honolulu and Kodiak. Mobilization for the cruise aboard the Langseth will be according to the schedule stated in Section 3. OBSIC personnel will use this time to configure OBS instrumentation in preparation for the cruise.

3.4. Cruise

3.4.1. Technical Support

OBSIC will provide technical support in port and at sea to load, prepare, deploy, recover and unload OBS's. Assistance to OBSIC personnel by the science team is generally encouraged for both instrument preparation and deck operations, although the specific inclusion of the science team is up to OBSIC personnel.

OBSIC personnel will provide support for 24-hour vessel operations (12 hours per tech). Some groups operate in shifts while some groups work on and off as needed to cover the required operations.

OBSIC technical support at sea will be provided by XXXX. OBSIC technician XXXX will provide port-side support in Honolulu only; he will not sail.

3.4.2. Instrument Configuration

The OBSIC OBS will be configured as follows:

Table 2 – WHOI OBS Configuration

Instrument	Short-period OBS
OBS Provider	WHOI
Sensors	Ground Motion: Geospace GS-11D 3-component 4.5 Hz geophone; Hydrophone (High Tech HTI-90-U)
Sample Rate	200 samples per second
FIR Filter	Linear Phase
Max. Deployable Depth	~5000 m
Endurance	2 months
Modifications	None
Quantity	7

Table 3 – GEOMAR OBS Configuration

Instrument	Short-period OBS
OBS Provider	GEOMAR
Sensors	Ground Motion: Input/Output SM-6 3-component 4.5 Hz geophone; Hydrophone: High Tech HTI-90-U or HTI-4-PCA/ULF
Max. Sample Rate	250 samples per second
Max. Deployable Depth	6000 m (LOBSTER); 8,000 m (Ultradeep LOBSTER)
Endurance	
Quantity	25 total (17 LOBSTER; 8 Ultradeep LOBSTER)

3.5. Demobilization

3.5.1. Port Call

This cruise terminates in Kodiak, AK. OBSIC personnel will use this time to complete decommissioning of OBS instrumentation.

3.5.2. Return Shipping

The Marcus Langseth is scheduled to return to Astoria, OR on July 1. The WHOI laboratory van and OBS will remain on the Langseth until then. At that time, the van and OBS will be shipped back to WHOI.

3.6. Post-Instrument Recovery

OBSIC will make every effort to provide the PI with clock-corrected SEG-Y data during the cruise. The PI is responsible for specifying the time slices that make up the SEG-Y files by providing personnel with appropriately formatted shot tables. OBSIC uses a variant of the SEG-Y Rev 1 format. OBSIC also has a standard shot-table format. Both of these formats are available from OBSIC on request.

Post-cruise, OBSIC will format the data in preparation for archiving at the IRIS Data Management Center (DMC). OBSIC will perform a quality check of the data to ensure that the number of stations and channels is correct and will validate the metadata. The complete, continuous data set will be archived in SEED format, while the shot data will be archived as “Assembled Data” in SEG-Y format. The data will then be officially released to the P.I.s for download. The data will be restricted for two years after archival at the IRIS DMC. The FDSN network code assigned to this experiment is: ZU:2018-2019. The assembled data set number assigned to this experiment is: 18-015. The PI is responsible for choosing station names. To conform to the SEED standard, station names cannot exceed 5 alphanumeric characters.

4. PI Information

4.1. Cruise Plan

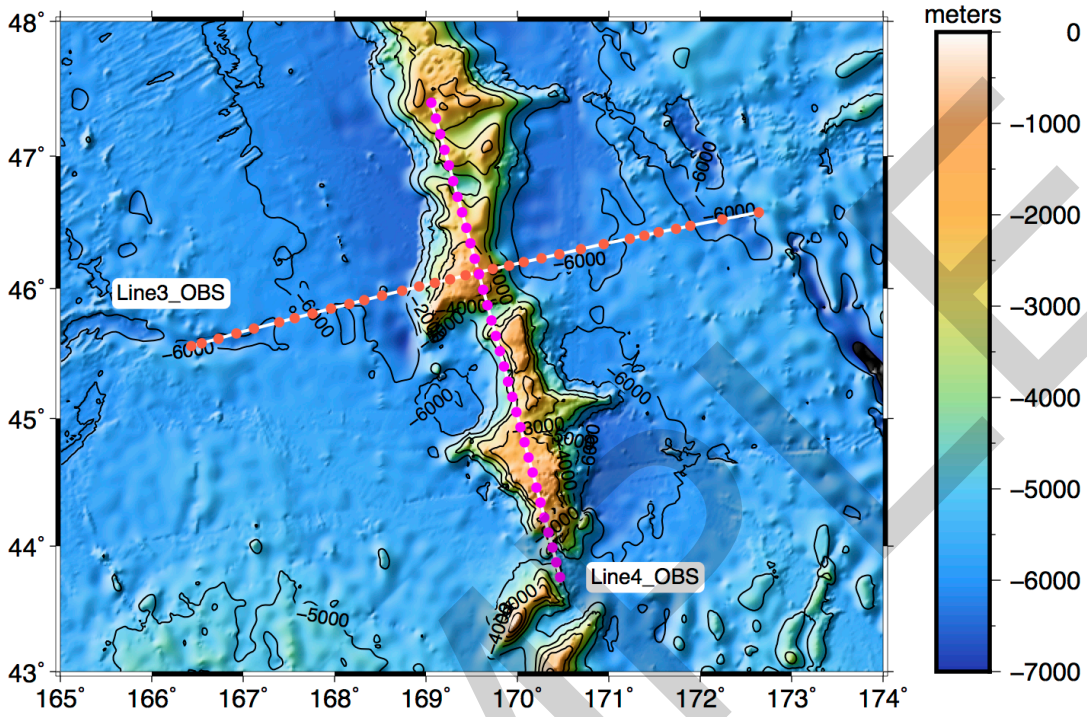
The scientific objectives of the planned data acquisition and analysis of this project are to examine controls on magmatic addition along the Hawaiian-Emperor seamount chain, provide fundamental constraints on rheological properties of oceanic lithosphere, address the origin of the hotspot swell, and assess implications for earthquakes and tsunamis from plate deformation in response to flexure. The plan is to acquire coincident 2D, deep-penetration seismic reflection data as well as wide-angle reflection/refraction data using ocean bottom seismometers spaced at 15 km along four 500-km-long transects across the Hawaiian-Emperor seamount chain during two cruises. The first cruise focused on the Hawaiian Islands and took place in September-October 2018. The second cruise is focused on the Emperor seamount chain and is the focus of this document. The locations of these transects will encompass wide variations in the timing of magma emplacement and volume flux, the age of the lithosphere at the time of loading and the presence/absence of a topographic swell. The transects are sufficiently long to capture the flexural response of the lithosphere to volcano loading out to the flexural bulge. The processed seismic reflection profiles and velocity models created from wide-angle seismic data will constrain the volume and distribution of magmatic addition to the crust as well as faulting within the volcanic edifice and within the loaded oceanic plate. New seismic constraints will be combined with gravity, magnetic, bathymetric and geochemical data and used as the basis for flexural analysis and numerical modeling to gain fundamental new insights into crust and lithosphere dynamics.

Table 4. Nominal OBS deployment locations and depths. Planned positions of OBSIC instruments are limited to water depths <~5000 m and are indicated below with station names US-#. Planned positions of GEOMAR LOBSTER and ultradeep LOBSTER instruments indicated with G-# and GD-#, respectively. Final positions, as well as the disposition of OBSIC and German OBS will be determined based on multibeam bathymetry data acquired during the cruise.

Line	Station	Lat.	Lon.	Elev. (m)	Line	Station	Lat.	Lon.	Elev. (m)
Line3_OBS	G-15	45.5600	166.4314	-6060	Line4_OBS	XX	47.4	169.059	-2529
Line3_OBS	G-14	45.5812	166.5465	-6043	Line4_OBS	XX	47.2827	169.108	-2758
Line3_OBS	GD-10	45.6162	166.7306	-6114	Line4_OBS	XX	47.1653	169.156	-3107
Line3_OBS	G-13	45.6577	166.9261	-5898	Line4_OBS	XX	47.0479	169.204	-2498
Line3_OBS	G-12	45.6929	167.1184	-5957	Line4_OBS	XX	46.9305	169.252	-3188
Line3_OBS	G-11	45.742	167.3948	-5960	Line4_OBS	XX	46.813	169.299	-4163
Line3_OBS	G-10	45.7744	167.5642	-5968	Line4_OBS	XX	46.6956	169.346	-3246
Line3_OBS	G-09	45.8088	167.7582	-5980	Line4_OBS	XX	46.5781	169.394	-2268
Line3_OBS	G-08	45.8464	167.9626	-6003	Line4_OBS	XX	46.4606	169.441	-2183
Line3_OBS	G-07	45.8815	168.1615	-6001	Line4_OBS	XX	46.3431	169.487	-1999
Line3_OBS	GD-09	45.9118	168.327	-6224	Line4_OBS	XX	46.2256	169.534	-1390
Line3_OBS	GD-08	45.9463	168.5212	-6236	Line4_OBS	XX	46.108	169.58	-1475
Line3_OBS	GD-07	45.9829	168.7406	-6293	Line4_OBS	XX	45.9904	169.626	-1811
Line3_OBS	US-01	46.016	168.925	-5422	Line4_OBS	XX	45.8729	169.672	-3742
Line3_OBS	US-02	46.0434	169.0988	-3524	Line4_OBS	XX	45.7553	169.718	-4080
Line3_OBS	US-03	46.0704	169.2632	-1561	Line4_OBS	XX	45.6376	169.764	-2631
Line3_OBS	US-04	46.1002	169.4335	-1318	Line4_OBS	XX	45.52	169.809	-3750
Line3_OBS	US-05	46.1232	169.5712	-1415	Line4_OBS	XX	45.4023	169.854	-4256
Line3_OBS	US-06	46.1484	169.7306	-2118	Line4_OBS	XX	45.2846	169.899	-4021
Line3_OBS	US-07	46.1745	169.9088	-5054	Line4_OBS	XX	45.1669	169.944	-3860
Line3_OBS	GD-01	46.2014	170.0702	-6221	Line4_OBS	XX	45.0492	169.989	-2566
Line3_OBS	GD-02	46.2309	170.2641	-6264	Line4_OBS	XX	44.9315	170.033	-1986
Line3_OBS	GD-33	46.2608	170.4581	-6248	Line4_OBS	XX	44.8138	170.078	-1871
Line3_OBS	GD-04	46.3002	170.6965	-6217	Line4_OBS	XX	44.696	170.122	-1662
Line3_OBS	GD-05	46.3391	170.9441	-6042	Line4_OBS	XX	44.5782	170.166	-1198
Line3_OBS	G-01	46.3794	171.2317	-5952	Line4_OBS	XX	44.4604	170.209	-1205
Line3_OBS	G-02	46.4025	171.3909	-5888	Line4_OBS	XX	44.3426	170.253	-1684
Line3_OBS	G-03	46.4281	171.5444	-5975	Line4_OBS	XX	44.2248	170.296	-1995
Line3_OBS	G-04	46.4531	171.7365	-5771	Line4_OBS	XX	44.1069	170.34	-2713
Line3_OBS	G-05	46.4765	171.8931	-5932	Line4_OBS	XX	43.989	170.383	-3855
Line3_OBS	GD-06	46.5242	172.2416	-6325	Line4_OBS	XX	43.8712	170.426	-5125
Line3_OBS	G-06	46.5787	172.6413	-5926	Line4_OBS	XX	43.7533	170.468	-4469

4.2. Cruise Map

The OBS will be deployed and recovered in two transects along and across the Hawaiian-Emperor seamount chain.



Map showing the location of Leg 2 of the Hawaii-Emperor Seamount Chain experiment. Deployed OBS are indicated by red and magenta colored triangles.

4.3. Known Instrument Risks

Many of the proposed OBS sites are in water depths >~ 5,900 m. These sites will be occupied by the GEOMAR OBS, which are capable of operating at depths of up to 7,300 m. The OBSIC OBS will be deployed at depths <~5,000m.

4.4. Other Science

OBS operations constitute only a portion of the anticipated 2019 fieldwork. 2-D seismic reflection will be acquired along a series of profiles with the 15-km streamer of the Langseth. Multibeam bathymetry, gravity, and magnetics data will also be collected.

5. Vessel Information

All operations will be performed on the R/V Langseth, operated by UNOLS. The PI is responsible for coordinating all vessel logistics.

6. Contacts

Role	Person	Phone	email
OBSIC			
PI			
Vessel Op			
NSF			

7. Cruise/Experiment Photo Request

The OBSIC Management Office would like to make a request for 25 (or more) high quality photos from the field portion of your experiment. Experiment photos are invaluable for promoting OBSIC activities through reports, educational materials, presentations, and the OBSIC website. In the month prior to your cruise(s) we will send instructions that can be handed over to one or more cruise participants to complete. Included in the instructions will be a one-pager that describes the photo request and explains the additional metadata needed, a pre-formatted Excel spreadsheet for recording the photo metadata, and a photo release form to collect signatures. We also welcome video footage, blogs/written documentation, preliminary figures, and other materials in addition to the photos.

8. Feedback

Evaluation forms provide crucial feedback to OBSIC, NSF, and the OBSIC Oversight Committee. The P.I. is expected to complete and return OBSIC evaluation forms. Two evaluation forms are available on the OBSIC website, a cruise evaluation, which should be completed at the conclusion of a cruise, and a data evaluation form, which should be completed after the P.I. has evaluated the OBS data.

The evaluations forms are available on the OBSIC website at:

http://www.obsic.org/experiment-planning/cruise-evaluation-form/
http://www.obsic.org/experiment-planning/data-assessment-form/

9. Acknowledgement

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

"*The data used in this research were acquired using instruments from the Ocean Bottom Seismometer Instrument Center (https://obsic.whoi.edu), which is funded by the U.S. National Science Foundation. OBSIC data are archived at the IRIS Data Management Center (www.iris.edu).*"

Please provide the OBSIC Management Office with copies of any publications related to your experiment.