

Application for Consent to Conduct Marine Scientific Research
in Japan

Date: 13 October 2009

1. General Information

1.1 Project name and/or #:	PhilSea10
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1.2 Undertaking institution:	Scripps Institution of Oceanography
Name:	Rose Dufour/ Elizabeth Brenner
Address:	University of California 9602 La Jolla Shores Drive La Jolla, CA 92037 858-534-2841 shipsked@ucsd.edu
Name of Director:	Dr. Tony Haymet

1.3 Government Agency Responsible for Supervising the Project:	
Name	Dr. Ellen Livingston, 321 OA
Address	U.S. Office of Naval Research 875 North Randolph Street, Suit 1425 Arlington, VA 22203-1995

1.4 Scientist in charge of the project:	
Name:	Dr. Peter Worcester
Address:	Scripps Institution of Oceanography (0225) University of California, San Diego La Jolla, CA 92093-0225
Telephone:	(858) 534-4688
Telex:	
Telefax:	(858) 534-6251
E-mail Address:	pworcester@ucsd.edu

1.5 Scientist(s) from Japan involved in the planning of the project:	
Name(s):	None
Address:	

2. Description of Project (Attach additional pages as necessary)

2.1 Nature and objectives of the project:
The Scripps Institution of Oceanography of the University of California (UC) plans

to deploy oceanographic instruments in the Philippine Sea during spring 2010 for a one-year-long acoustic propagation experiment, referred to as PhilSea10. The 2010–2011 PhilSea10 experiment will combine measurements of acoustic propagation and ambient noise with the use of an ocean acoustic tomography array to help characterize this oceanographically complex and highly dynamic region. The tomographic array consists of six acoustic transceivers that both transmit and record low-frequency acoustic signals. It will have a radius of approximately 330 km, spanning much of the northern Philippine Sea. The tomographic measurements, when combined with satellite and other in situ measurements and with ocean models, will help characterize the structure of the rapidly varying oceanographic environment in the northern Philippine Sea, providing an eddy-resolving, 4-D sound-speed field for use in making acoustic predictions. The source transmissions will be recorded by a water-column-spanning Distributed Vertical Line Array (DVLA) acoustic receiver to study deep-water propagation. The results will be presented at international conferences and published in scientific journals. This unclassified academic effort is funded by the Office of Naval Research.

The PhilSea10 objectives are to (i) understand the impacts of fronts, eddies, and internal tides on acoustic propagation in this highly variable region, (ii) determine whether acoustic methods, together with satellite, glider and other measurements and coupled with ocean modeling, can yield estimates of the time-evolving ocean state useful for making improved acoustic predictions and for understanding the local ocean dynamics, (iii) improve our understanding of the basic physics of scattering by small-scale oceanographic variability due to internal waves and spice, and (iv) characterize the ambient noise field, particularly its variation over the year and its depth dependence.

Seven subsurface oceanographic moorings will be deployed during PhilSea10. Six of the moorings will have Webb Research Corporation (WRC) swept-frequency acoustic sources, with integrated Simple Tomographic Acoustic Receiver (STAR) controller and data acquisition systems, at a depth of 1050 m (Fig. 1). These sources transmit acoustic signals with center frequencies of approximately 250 Hz and bandwidths of approximately 100 Hz. Each WRC acoustic source includes a STAR controller and data acquisition system to provide precise timing and scheduling for the source transmissions and to record the transmissions from the other WRC sources.



Fig. 1. WRC swept-frequency acoustic source, with integrated STAR controller and data acquisition system.

The seventh mooring will be a Distributed Vertical Line Array (DVLA) acoustic receiver developed at the Scripps Institution of Oceanography. The DVLA receiver is designed to record low-frequency acoustic signals, including those transmitted by the WRC sources, other acoustic sources, and ambient noise. The DVLA receiver employs a novel approach using distributed, self-recording hydrophones (Hydrophone Modules) with timing and scheduling provided by a small number of D-STAR (DVLA-STAR) controllers, which are specially modified versions of the STAR controllers and data acquisition systems. The DVLA will be modular, made up of five 1000-m long subarrays, each of which has one D-STAR controller and roughly 30 distributed, internally-recording Hydrophone Modules. A D-STAR controller will be shackled in-line at the top of each subarray. The Hydrophone Modules will be clamped to the wire rope at the time of deployment, making the DVLA readily configurable for different experiments (Fig. 2).

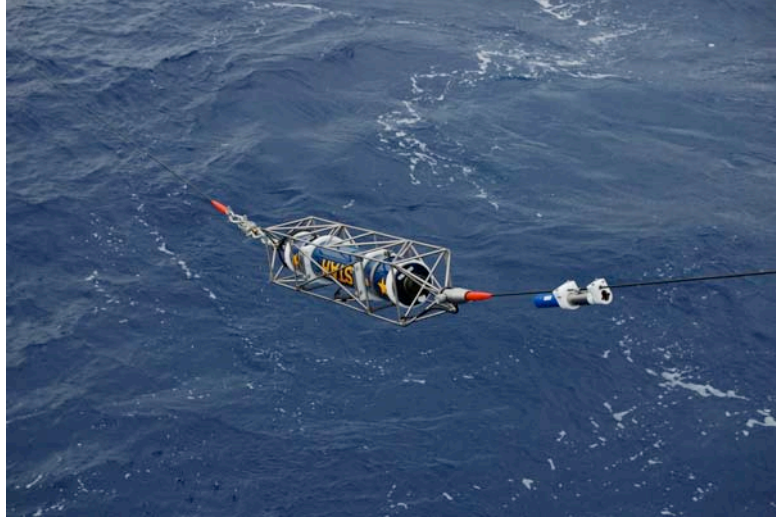


Fig. 2. D-STAR controller and Hydrophone Module being deploying in the Philippine Sea during spring 2009.

The PhilSea10 Pilot Study/Engineering Test will take place in the northern Philippine Sea (Table 1 and Figure 3). The DVLA location is in international waters. The location of WRC source mooring T1 is in Japan's Exclusive Economic Zone (EEZ). The locations of WRC source moorings T2, T3, and T6 are in international waters. The locations of WRC source moorings T4 and T5 are in the EEZ of the Philippines. The moorings will be deployed during spring 2010 and recovered approximately one year later, during spring 2011. The research vessel *R/V Revelle* will be used for the mooring deployment cruise. The *R/V Revelle* will also likely be used for the mooring recovery cruise in spring 2011, although it is possible that an alternate vessel in the University-National Oceanographic Laboratory System (UNOLS) fleet will be used instead.

Mooring	Latitude (N)	Longitude (E)	Water Depth (m)
T1	23.138	127.063	5930
T2	20.823	129.789	5933
T3	17.788	128.058	5753
T4	18.351	124.290	5780
T5	21.543	123.818	5323
T6	20.468	126.812	5585
DVLA	21.360	126.020	5530

Table 1. mooring locations and (corrected) water depths for PhilSea10, which consists of six acoustic transceivers (T1, T2, ... T6) and the DVLA receiver.

2.2 Relevant previous or future research cruises:

April-May 2009: NPAL Philippine Sea Pilot Study/Engineering Test [Japan -

State Dept. No. 2008-091]

2.3 Previously published research data relating to the project:
None

3. Methods and Means to be Used

3.1 Particulars of vessel:	
Name:	<i>R/V Roger Revelle</i>
Type:	Research Vessel
Nationality:	USA Flag
Owner:	U.S. Navy
Operator:	University of California, San Diego, Scripps Institution of Oceanography
Overall length:	84 m [275']
Maximum draught:	5.2 m [17']
Gross tonnage:	3,180 long tons
Propulsion:	Two 3000 hp Propulsion General Electric Bow Thruster: 1180 hp Azimuthing jet Type Elliot Gill Model 50T 35 Propulsors: Two 3000 hp Z-Drives Lips Type FS 2500-450/1510BO
Cruising speed:	12 knots
Maximum speed:	14 knots
Call sign:	KAOU
Method and capability of communication (including telex, frequencies):	Email, master@rv-revelle.ucsd.edu Inmarsat-B, Telephone, Indian, 011-873-336780030 Alternate, 011-873-336780020 Fax, Primary, 011-873-336780031 Alternate, 011-873-336780021 Telex, Primary, 336780033 (AnsBk=KAOU) Alternate, 336780022 (AnsBk=KAOU) Inmarsat-C, 436780010 Radio, Vessels guard standard GMDSS frequencies for calling, distress and dissemination of marine safety information. MMSI #, 367800100 SELCAL #, 71410

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Name of master:	Tom Desjardins
Number of crew:	22
Number of scientists on board:	No more than 37

3.2 Aircraft or other craft to be used in the project: None

3.3 Particulars of methods and scientific instruments		
Types of samples and data	Methods to be used	Instruments to be used
Acoustic propagation data	Section 2.1	WRC-SIO low-frequency acoustic transceivers SIO DVLA receiver Acoustic transponders
Temperature/salinity profiles	Ship-based CTD casts	Seabird CTD
Temperature, salinity, oxygen, currents, meteorological measurements	Underway measurements from continuously pumped surface seawater and on-board sensors	Thermosalinograph, acoustic doppler sonars ADCP RDI Narrowband and RDI Broadband 150 kHz
Magnetometer if available	Towed Magnetometer	Marine Magnetics SeaSpy Gradiometer
Bathymetry and sidescan	Swath mapping with multibeam system	EM120 12 kHz 150 deg swath
Sub-bottom profiles	Sub-bottom profiler	Knudsen 320 B 3.5/12 kHz
Gravity if available	Gravimeter	Gravimeter-Bell BGM-3

*Indicate type and specification of instruments (e.g. length and number of cables towed)

3.4 Indicate whether harmful substances will be used: None

3.5 Indicate whether drilling will be carried out: None

3.6 Indicate whether explosives will be used (Type and trade name, Chemical content, Depth of trade class and stowage, Size, Depth of detonation, Frequency of detonation, and Position in latitude and longitude):

3.7 Indicate whether the project involves catching, taking, or exploration of marine mammals and plants: None

N.B. When the research project involves catching, taking or exploration of marine mammals and/or plants in the exclusive economic zone of Japan, a separate approval from the Ministry of Agriculture, Forestry, and Fisheries of Japan under the Law on the Exercise of Sovereign Rights Concerning Fisheries in the Exclusive Economic Zone shall also be necessary. Applicants may submit the application form provided in Annex II through diplomatic channels. Catching and taking of marine Mammals and/or plants in the territorial Sea of Japan is generally prohibited by the Law for Regulation for Fishing Operation of Foreign Nationals and shall not be approved.

4. Installations and Equipment

Details of installations and equipment (type, specification; dates of laying, servicing, recovery; exact locations and depth):

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5. Geographical Areas

5.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude):

Oceanographic moorings will be deployed at the approximate locations:

Moorings	Latitude (N)	Longitude (E)	Water Depth (m)
Acoustic Transceiver T1	23.138°	127.063°	5930
Acoustic Transceiver T2	20.823°	129.789°	5933
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CTD, underway multibeam, and sub-bottom profiler data will be collected along the lines between the moorings.

5.2 Attach chart(s) at an appropriate scale showing the geographical areas of the intended work and, as far as practicable, the positions of intended stations, the tracks of survey lines, and the locations of installations and equipment.

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Table 1. Approximate mooring locations and (corrected) water depths for PhilSea10, which consists of six acoustic transceivers (T1, T2, ... T6) and the DVLA receiver.

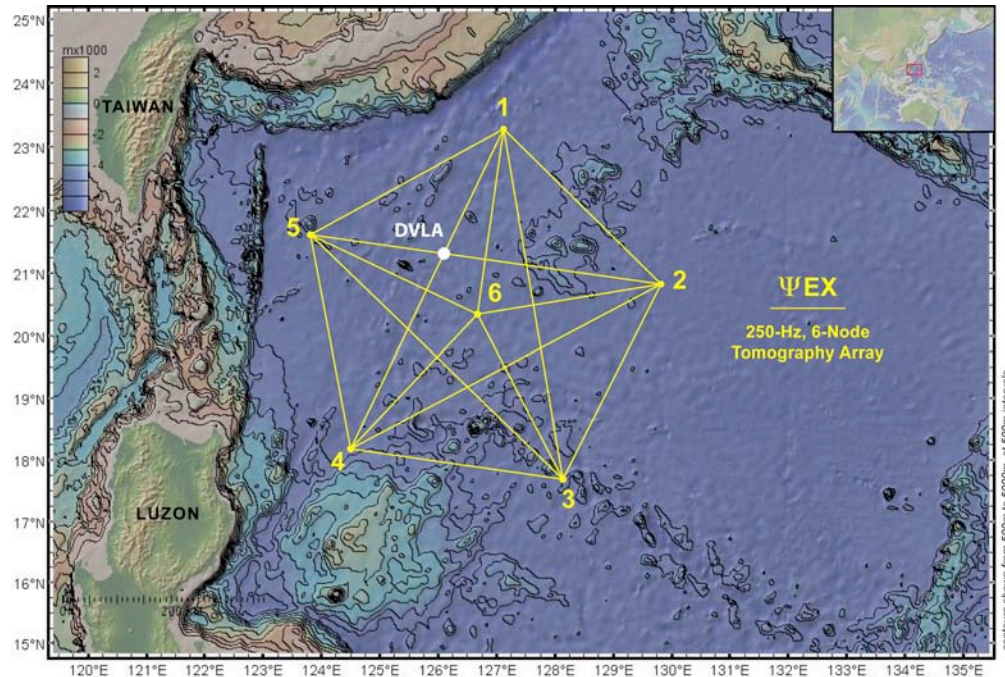


Figure 3. Plan view of the PhilSea10 mooring geometry, consisting of six acoustic transceivers (T1, T2, ... T6) and the DVLA receiver located at the intersection of the T1-T4 and T2-T5 paths.

The subsurface floats supporting the DVLA mooring and the transceiver moorings will be approximately 150 m below the ocean surface (Fig. 4). The moorings are connected to anchors on the seafloor using two parallel acoustic releases. The moorings are recovered by sending a coded acoustic command to the releases, instructing them to let go of the anchor, so that the mooring can rise to the surface.



Fig. 4. Subsurface float used to support the DVLA mooring.

The motion of the DVLA and source moorings due to ocean currents will be measured using long-baseline acoustic navigation systems. Four acoustic transponders will be deployed around the DVLA, approximately 3500 m from the mooring and 3 m above the seafloor. Three acoustic transponders will be deployed around each WRC source mooring, again approximately 3500 m from the mooring and 3 m above the seafloor. All equipment, except for the mooring and transponder anchors, will be recovered at the completion of the experiment.

6. Dates

6.1 Expected dates of first entry into and final departure from the research area of the research vessel:

This request is for mooring deployment and recovery cruises. The mooring deployment cruise is scheduled for 04 April –7 May 2010. The mooring recovery cruise is planned for April-May 2011.
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6.2 Indicated if multiple entry is expected:
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Two cruises, 2010 & 2011. We are requesting that the clearance be granted for the entire project through the 2011 recovery.

7. Port Calls

7.1 Dates and names of intended ports of call:

None in the Japan

All port calls in Kao-hsiung, Taiwan

N.B. A separate request should be submitted by Note Verbales for intended port calls by public vessels.

7.2 Name/Address/Telephone of shipping agent (if available):

Mr. H.M. Chao

Jardine Shipping Services

5F, No.21 Chung HWA 3rd Road

Kao-hsiung, Taiwan

Ph# 886-7-281-2804

Fax # 886-7-201-5492

Cell # 886-929-639-939

Email: hm.chao@jm.com.tw or operation.kao@jm.com.tw

8. Participation

8.1 Extent to which Japanese scientists or officials will be enabled to participate or to be represented in the research project:

Participation by Japanese colleagues encouraged. Two bunks will be held for possible Japanese participation. Dr. Worcester has invited a graduate student from Graduate School of Engineering, Hiroshima University to participate on the cruise.

8.2 Proposed dates and ports for embarkation / disembarkation:

Embarkation: *Currently the departure date from Kao-hsiung is 7 April.*

Disembarkation: *Currently the arrival date into Kao-hsiung is 29 April.*

9. Access to data, samples and research results

9.1 Expected dates of submission to the Ministry of Foreign Affairs of Japan of preliminary reports and data which should include the expected dates of submission of the final results:

No more than 30 days from the end date of the cruise.

9.2 Proposed means for access by Japanese scientists or officials to samples:

CD or DVD provided, with further access to the data via internet download or CD/DVD on request.

9.3 Proposed means to provide Japan with assessment of data, samples and research results or provide assistance in their assessment or interpretation:

Participation in international data analysis workshops and science symposia during the analysis phase of the project.

9.4 Proposed means of making results internationally available:

Publication in scientific journals and reports.

(Revised August 27, 2003)

