

**National Science Foundation  
Geosciences Directorate  
Division of Ocean Sciences  
Arlington, Virginia**

**ENVIRONMENTAL ASSESSMENT AND DETERMINATION  
PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA),  
42 U.S.C. 4321, *et seq.*  
AND EXECUTIVE ORDER 12114**

**Marine Seismic Survey in Southeast Asia, March-July 2009**

**FINDING OF NO SIGNIFICANT IMPACT**

**OCE #0408609**

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**Institutions:** Binghamton University and University of Texas

**Project Title:** Collaborative Research: Integrated Investigation of the Geodynamics of the Taiwan Orogeny [TAIGER]

This constitutes an environmental assessment (EA) by the National Science Foundation (NSF) for a marine seismic survey proposed to be conducted on board the research vessel (R/V) *Marcus G. Langseth* in Southeast Asia during March – July 2009. This EA is based, in part, on an Environmental Assessment report prepared by LGL Limited environmental research associates (LGL) on behalf of NSF, entitled, “Environmental Assessment of a Marine Geophysical Survey by the R/V *Marcus G. Langseth* in Southeast Asia, March-July 2009” (Report #TA4553-1) (Attachment 1).

The LGL report addresses potential impacts of the proposed seismic survey on marine mammals, as well as other species of concern in and near the study area, including sea turtles, fish, and invertebrates and their habitat. This document also provided information in support of the application to the National Marine Fisheries Service (NMFS) for an Incidental Harassment Authorization (IHA) submitted by the R/V *Langseth* vessel operator, Lamont-Doherty Earth Observatory L-DEO, for this cruise. NMFS posted the IHA application for the cruise in the Federal Register for public comment from December 22, 2008 through February 5, 2009. Although NSF received no direct public comments on the draft EA during (or after) the open comment period of November 14, 2008 through December 15, 2008, NMFS received comments on the IHA application. Changes to the survey design were made by L-DEO to address specific public comments and to enhance measures already identified in the draft EA to mitigate potential effects of the proposed survey on marine mammals and to satisfactorily address vessel clearance issues expressed by the Department of State. The responses to public comments and subsequent changes to the survey are provided in the report, “Supplemental Environmental Assessment of a Marine Geophysical Survey by the R/V *Marcus G. Langseth* in Southeast Asia, March-July 2009” (Report TA4553-3) (Attachment 2).

The conclusions from the LGL report (Attachment 1), and the changes identified in the supplemental report (Attachment 2), were used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the cruise. OCE has reviewed and concurs with the report findings. Accordingly, the LGL reports are incorporated into this EA by reference as if fully set forth herein.

### **Project Objectives and Context**

The proposed seismic survey will provide data integral to advancing scientific understanding of the process of large-scale mountain building, or “orogeny,” which in turn will provide information on locations and source properties of regional earthquakes. This study addresses fundamental questions about a key step in the growth of continents - arc accretion - in one of its most active examples, along the Taiwan arc-continental collision in the China and Philippine seas. Taiwan is one of only a few sites of arc-continent collision worldwide that exhibits this level of activity. The vicinity of Taiwan is particularly well-suited for this type of study, because the collision can be observed at different stages of its evolution, from incipient, to mature, and finally to post-collision. As a result of its location in an ongoing tectonic collision zone, Taiwan experiences a great number of earthquakes; most are small, but some are large and destructive. This project will provide a great deal of information about the nature of the earthquakes around Taiwan and will lead to a better assessment of earthquake hazard in the area. The information obtained from this study will help the people and government of Taiwan and the greater region to better assess the potential for future seismic events and may thus mitigate some of the loss of life and economic disruptions that would accompany major earthquakes and/or tsunamis. The information learned in this location is also expected to make significant contributions to understanding fundamental geological processes and may be applicable to other rare, but similar geologic sites.

By combining detailed 2-D studies along transects and 3-D images for the whole region, the orogen and its evolution can be characterized. The work will result in the first detailed 3-D picture of an orogen from surface to mantle. The geometry of the plate interactions, the mode of crustal deformation, and the material properties will provide a new quantitative basis for geodynamic modeling. The project will be an international collaborative effort, including support from the US, Taiwan and Japan.

### **Summary of Proposed Action and Alternatives**

The procedures to be used for the survey will be similar to those used during previous seismic surveys by L-DEO and will use conventional seismic methodology. The survey will take place from March through July 2009 in open seas and the Exclusive Economic Zones (EEZ) of Taiwan, Philippines, and Japan, in water depths ranging from <100 to >1000 m. Activities will adhere to local conservation laws and regulations of nations while in foreign waters, and known rules and boundaries of Marine Protected Areas (MPA) will be respected. In the absence of local conservation laws and regulations or MPA rules, LDEO will continue to use the mitigation measures identified in Attachments 1 and 2 and/or the IHA.

The survey will involve the R/V *Marcus G. Langseth* as the source vessel which will deploy an array of up to 36 airguns with a total discharge volume of ~6600 in<sup>3</sup>. The receiving system will consist of a hydrophone streamer and ~100 ocean bottom seismometers (OBSs). The R/V *Langseth* will deploy an 8-km long streamer for most transects requiring a streamer; however, a shorter streamer (500 m to 2 km) will be used during surveys in Taiwan (Formosa) Strait. The airgun array will not change during use of the shorter streamer. As the airgun array is towed along the survey lines, the hydrophone streamer will receive the returning acoustic signals and transfer the data to the on-board processing system. The OBSs record the returning acoustic signals internally for later analysis. The OBSs to be used for the 2009 program will be deployed and retrieved numerous times by a combination of four or five Taiwanese support vessels (see Attachment 1, page 6), as well as perhaps the R/V *Langseth*. The R/V *Langseth* will also retrieve 20 OBSs that were deployed in the study area during previous years to record earthquake activity. In addition to the operations of the airgun array, a multibeam echosounder (MBES) and a subbottom profiler (SBP) will also be operated from the R/V *Langseth* continuously throughout the cruise. The revised seismic survey will consist of ~14,515 kilometers (km) of transect lines (9% less than the original 15,902 km) within the South and East China Seas as well as the Philippine Sea (see Attachment 2, Figure 1). Take estimates (Attachment 2, Table 1) for Indo-Pacific humpback dolphins have been reduced to 0 because the revised seismic trackline is ~20 km offshore, and those of most of the other species are lower because of the reduction in the ensonified area.

One alternative to the proposed action would be to conduct the survey at an alternative time. Constraints for vessel operations and availability of equipment (including the vessel) and personnel would need to be considered for alternative cruise times. Limitations on scheduling the vessel include the additional research studies planned on the vessel for 2009 and beyond. Other national and international research activities planned within the region also would need to be considered. Given the limited weather window for the operations, and the fact that cetaceans are widespread in the survey area throughout the year, altering the timing of the proposed project, if all factors allowed, likely would result in no net benefits.

Another alternative to conducting the proposed activities would be the "No Action" alternative, i.e. do not issue an IHA and do not conduct the operations. If the planned research were not conducted, the "No Action" alternative would result in no disturbance to marine mammals of the limited potential attributable to the proposed activities, but geological data of considerable scientific value and relevance in understanding large-scale mountain building and source properties of regional earthquakes would not be acquired and the project objectives as described above would not be met. The "No Action" alternative would result in a lost opportunity to obtain important scientific data and knowledge relevant to a number of research fields and to society in general. The failure to collect and analyze these types of data represents a lost opportunity to advance knowledge of environmental processes and aspects of better understanding and prediction of earthquakes. The international collaboration, involving institutions, investigators, students, and technicians, would be lost along with the collection of new data, interpretation these data, and introduction of new results into the greater scientific

community and applicability of this data to other collisional settings. Loss of NSF support often represents a significant negative impact to the academic infrastructure.

### **Summary of environmental consequences**

The potential effects of sounds from airguns on marine species, mammals and turtles of particular concern, are described in detail in Attachment 1 (pages 46-81 and Appendices B-E) and might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and at least in theory, temporary or permanent hearing impairment, or non-auditory physical or physiological effects. It is unlikely that the project will result in any cases of temporary or especially permanent hearing impairment, or any significant nonauditory physical or physiological effects. Some behavioral disturbance is expected, if animals are in the general area during seismic operations, but this would be localized, short-term, and involve limited numbers of animals.

The proposed activity will include a mitigation program to further minimize potential impacts on marine mammals that may be present during the conduct of the research to a level of insignificance. As detailed in Attachment 1 (pages 7-16; and 59) monitoring and mitigation measures will include: ramp ups, minimum of one dedicated observer maintaining a visual watch during all daytime airgun operations, two observers for 30 minutes before and during ramp-ups during the day and at night (and when possible at other times), passive acoustic monitoring (PAM) during the day and night to complement visual monitoring (when practicable), power downs (or if necessary shut downs) when mammals or turtles are detected in or about to enter designated exclusion zones. Also, special mitigation measures will be in place for several species (as described below). The fact that the 36-airgun array, as a result of its design, directs the majority of the energy downward, and less energy laterally, will also be an inherent mitigation measure, as is the relatively wide spacing of the airgun shots during OBS operations (up to ~125 meters or 60 seconds) where each shot is in the duration of micro-seconds.

In addition to the mitigation measures identified in Attachment 1, in response to public comments additional mitigation measures have been identified for this cruise in Attachment 2. These mitigation measures include such actions as increasing the survey buffer zone to 20 km in some areas, re-routing survey tracks to deeper water depths for some tracks, and rescheduling some survey tracks to avoid sensitive humpback whale breeding times (See Attachment 2 for details). At least one regional expert Marine Mammal Observer will also participate on the cruise. In response to concerns about marine mammal species of special concern because of their low population sizes, the airgun array will be shut down immediately if there is a sighting at any distance of the North Pacific right whale, western gray whale, Indo-Pacific humpbacked dolphin, or finless porpoise (Attachment 2, page 5).

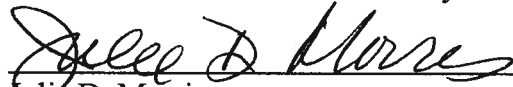
With the planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and turtle that could be encountered will be expected to be limited to short-term, localized changes in behavior and distribution near the seismic vessel. At most, effects on marine mammals may be interpreted as falling within the U.S. Marine Mammal Protection Act (MMPA) definition of "Level B Harassment" for those species managed by the National Marine Fisheries Service. No long-term or significant effects will be expected on individual marine mammals, sea turtles, or the populations to which they belong or on their habitats.

A survey at an alternative time may not be advantageous. Marine mammals and sea turtles are expected to be found throughout the proposed study area. Humpback whales are known to winter in the study area. Breeding areas will be avoided as noted in Attachments 1 and 2.

The “no action” alternative will remove the potential of the limited direct environmental consequences as described. However, it will preclude important scientific research from going forward that has distinct potential to address environmental processes/concerns.

**Conclusions**

NSF has reviewed and concurs with the conclusions of the LGL environmental assessment report (Attachment 1), and the supplemental information found in Attachment 2, that implementation of the proposed activity will not have a significant impact on the environment. An environmental impact statement will not be prepared. Consequently, implementation of the proposed activity is not a major federal action having a significant impact on the environment within the meaning of the National Environmental Policy Act (NEPA) or Executive Order 12114.



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3/27/09

Date