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DRAFT ENVIRONMENTAL ANALYSIS PURSUANT TO EXECUTIVE ORDER 12114

Marine Geophysical Survey by the R/V *Melville* in the Pacific Ocean off Central and South America, October–November 2010

OCE# 0851056
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Project Title: ^{230}Th dynamics in the Eastern Equatorial Pacific Ocean: testing the ^{230}Th - normalization method to estimate sediment fluxes

This constitutes a draft environmental analysis prepared by the National Science Foundation (NSF) for a marine seismic survey proposed to be conducted in October - November 2010 on board the research vessel (R/V) *Melville* in the Pacific Ocean off Central and South America. This analysis 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 *Melville* in the Pacific Ocean off Central and South America, October–November 2010" (Report #TA4902-1) (Attachment 1). The conclusions from the LGL report 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's findings. Accordingly, the LGL report is incorporated into this analysis by reference as if fully set forth herein.

Project Objectives and Context

The purpose of the survey would be to study sedimentation processes in the equatorial tropical Pacific through acquisition of sediment, water-column, and geophysical data. Knowledge of sedimentary fluxes is crucial to understanding the role of the ocean relative to historical climate conditions and understanding impacts of large-scale anthropogenic releases of greenhouse gases. Sediment transport and deposition is influenced by drivers such as wind, temperature, biological productivity, and upwelling. Through this study, scientists would evaluate the presence of ^{230}Thorium (^{230}Th), which is a constant-flux proxy used in sediment deposition models that are used to identify past climate conditions. A proxy is needed since there are no direct data for processes that occurred on time scales longer than the record of scientific observations (for the oceans, 50-100 years). Results from the survey would also resolve disagreements in the scientific community about the applicability of the use of ^{230}Th as a proxy in sediment deposition models in the equatorial tropical Pacific.

The Panama Basin would be a good test area for this study because there are defined potential sediment sources, and well understood water paths to study sediment movement and ^{230}Th fractionation. Additional measurements on already existing sediment cores would complement the collection and analysis of new sediment, water column, and geophysical data.

The project would support scientists, technicians, graduate and undergraduate students, and others. The research and results from this project would be used by the Principal Investigators to teach advanced graduate classes.

Summary of Proposed Action and Alternatives

The procedures to be used for the survey would be similar to those used during previous seismic surveys and would involve conventional seismic methodology. The proposed survey would take place from October through November 2010 within international waters and the Exclusive Economic Zones (EEZs) of Costa Rica, Panama, Colombia, and Ecuador (See Attachment 1, Figure 1). The seismic survey would consist of approximately 5475 km of transect lines (including turns) in water depths ranging from approximately 1000 meters to 4800 meters. The survey would involve the R/V *Melville* as the source vessel which would deploy a pair of low-energy Sercel Generator-Injector (GI) airguns as an energy source (each with a discharge volume of 45 in^3), plus either of two towed hydrophone streamers, one 725 meters long with 40 channels, and the other 350 meters long with 16 channels. As the airgun array is towed along the survey lines, the hydrophone streamer would receive the returning acoustic signals and transfer the data to the on-board processing system. The GI airguns would be operated on a small grid (see Attachment 1, Figure 1, inset) for approximately 45 hours at each of four sites (see Attachment 1, Figure 1, depicted black boxes), where the 40-channel streamer would be used. During transit to the first site, transits between the sites, and after the last site (see Attachment 1, Figure 1, depicted red seismic line), the 12-channel streamer would be used. In addition to the GI airguns, a multibeam echosounder (MBES) and a sub-bottom profiler (SBP) would be used throughout the cruise except while at water/core stations to help verify seafloor conditions at possible coring sites and to collect additional seafloor bathymetric data. Seismic operations would be carried out for approximately 15 days, water and core samples would be collected for approximately 10 days, and approximately 2 days would be transit. Some minor deviation from proposed cruise dates may be required, depending on logistics, weather conditions, and the need to repeat some lines if data quality were substandard.

One alternative to the proposed action would be to issue an IHA at an alternative time and conduct the survey at that 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 2010 and beyond. Other research activities planned within the region also would need to be considered.

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 attributable to the proposed activities, but paleo-oceangraphic data of considerable scientific value and relevance increasing our understanding of sediment deposition and climate change

processes 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 collaboration, involving investigators, students, and technicians, would be lost along with the collection of new data, interpretation of these data, and introduction of new results into the greater scientific community and applicability of this data to other similar 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 44-77 and Appendices A-D) 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 would 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 would 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 7-12; and 58) monitoring and mitigation measures would include: ramp ups, minimum of one dedicated observer maintaining a visual watch during all daytime airgun operations, two observers for 30 min before and during ramp ups during the day and at night (and when possible at other times), and shut downs when mammals or turtles are detected in or about to enter designated exclusion zones. The fact that the GI airgun, as a result of its design, directs the majority of the energy downward, and less energy laterally, would also be an inherent mitigation measure.

With the planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and turtle that could be encountered would 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 would 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 would result in few net benefits. As described in Attachment 1, marine mammals and sea turtles are expected to be found throughout the equatorial tropical Pacific and throughout the time period during which the project may occur. A number of marine mammal species are year-round residents in the survey areas, so altering the timing of the proposed project likely would result in no net benefits for those species (see Attachment 1, Section III). The proposed survey is scheduled near the start of the peak nesting periods for the three sea turtles that nest in the area, so few hatchlings would be encountered at sea.

The “no action” alternative would remove the potential for disturbance to marine mammals or sea turtles attributable to the proposed activities as described. It would however preclude important scientific research from going forward that has distinct potential to address geological and climate processes of concern.

Conclusions

NSF has reviewed and concurs with the conclusions of the LGL Environmental Assessment (Attachment 1) that implementation of the proposed activity would not have a significant impact on the environment.