

Addendum: Application for Consent to Conduct Marine Scientific Research in Japan

Date: 08 September 2008

2.1 Nature and objectives of the project:

Over the last twenty years, the North Pacific Acoustic Laboratory (NPAL) Group has conducted a series of long-range, deep-water acoustic propagation experiments in the relatively benign northeast and north central Pacific Ocean. The NPAL Group now plans to conduct a yearlong acoustic propagation experiment in the northern Philippine Sea in 2010–2011, moving to a new ocean environment and somewhat shorter ranges, preceded by a short-term Pilot Study/Engineering Test in April-May 2009. In 2010–2011, measurements of acoustic propagation and ambient noise will be combined with the deployment of an ocean acoustic tomography array to help characterize this complex and highly dynamic region. The receivers include a new, water-column-spanning Distributed Vertical Line Array (DVLA) receiver.

The goals of the 2010–2011 experiment 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.

The strategy in 2009 is to instrument a single acoustic path (Fig. 1). The experiment has three phases:

Phase 1. *R/V Melville*. Worcester (SIO), Chief Scientist. Two oceanographic moorings will be deployed. One will have a 225–325 Hz acoustic source at a depth of about 1050 m, on the sound-channel axis, and the other will be a prototype for the full DVLA receiver to be deployed in 2010–2011.

Phase 2. The second phase, lasting approximately one month, consists of two overlapping cruises:

R/V Melville. Mercer (APL-UW), Chief Scientist. Acoustic sources will be lowered from shipboard to transmit to the DVLA and to the towed Five Octave Research Array (FORA) (see below). In addition an acoustic source will be towed from the ship while transiting.

R/V Kilo Moana. Baggeroer (MIT), Chief Scientist. The FORA array will record transmissions from both the moored source, the ship-suspended sources, and the towed source.

Phase 3. *R/V Melville*. Worcester (SIO), Chief Scientist. The acoustic source and DVLA moorings will be recovered.

The 2009 objectives are:

(i) To obtain an initial look at deep-water acoustic propagation and ambient noise in the northern Philippine Sea; and

(ii) To test the equipment planned for use in 2010–2011 under actual operating conditions.

(iii) To obtain high resolution CTD measurements in the upper 500 m of the water column using a new Towed CTD Chain.

This application is for the moored component of the 2009 Pilot Study/Engineering Test, including both the mooring deployment and recovery cruises (Phases 1 and 3). The source mooring is located in Japan's Exclusive Economic Zone. The DVLA location is in international waters. In addition, CTD, underway multibeam, sub-bottom profiler, and other routine oceanographic data will be collected during the mooring deployment and recovery cruises (see Section 3.2).

