DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
RESIDENT REPRESENTATIVE
495 SUMMER STREET, ROOM 103
BOSTON, MA 02210-2109

(1)

IN REPLY REFER TO

SAW:saw
N00014-90-J-1817
Closeout
Ser 0926
04 October 1993

MEMORANDUM

From: ONR Resident Representative, Draper
To: Office of Chief of Naval Research
800 North Quincy Street
Arlington, VA. 22217-5660
Attn: ONR 3242
Dr. Joseph H. Kravitz

Subj: Grant N00014-90-J-1817 with Woods Hole Oceanographic Institution; Final Technical Report, request for; R&T 425j003

1. This office has been advised that the contractor submitted the required final technical report for Grant N00014-90-J-1817. For the purpose of closing out this Grant, it is requested that the certificate below be executed and returned to this office for appropriate contract completion action.

SHEILA A. WRIGHT
Procurement Technician

FIRST ENDORSEMENT on ONRRR/Draper ltr Ser 0926 dtd 04 OCT 93

From: OCNR
Attn: Dr. Randall S. Jacobson
ONR 3242
To: ONR Resident Representative, Draper
495 Summer St. Rm. 103, Boston, MA. 02210-2109

1. Returned.

2. The undersigned hereby certifies that the contractor has fulfilled the technical reporting requirements under Grant N00014-90-J-1817.

Signature Date

Copy To: DTIC

WOODS HOLE OCEANOGRAPHIC INSTITUTION
Woods Hole, Massachusetts 02543
Phone: (508) 457-2000
Fax: (508) 457-2187
Telex: 951679

Department of Geology and Geophysics

September 29, 1993

Final Report

Office of Naval Research
ONR Draper
495 Summer Street, Room 103
Boston, MA 02210-2109

Dear Sir:

In compliance with the reporting requirements of ONR Grant N00014-90-J-1817 entitled "Seismic Studies of the Geologic Structure and Physical Properties of the Seabed", PI John I. Ewing, enclosed is one copy for your files.

Sincerely yours,

John I. Ewing

JIE:pf
Enclosure

SEISMIC STUDIES OF THE GEOLOGIC STRUCTURE AND PHYSICAL PROPERTIES OF THE SEABED

JOHN I. EWING

WOODS HOLE OCEANOGRAPHIC INSTITUTION
WOODS HOLE, MA 02543
(508) 548-1400

Final Report

Long Range Scientific Objectives

To determine the physical parameters that most affect low frequency acoustic propagation in shallow water areas where elastic and acoustic waves interact intimately.

Project Objectives

To develop instrumentation, field procedures and data inversion methods for accurate measurement of shear wave speed and attenuation as functions of frequency, depth, and locations in the seabed, and to determine the effects of anisotropy and other inhomogeneities created by sedimentary processes.

Present Status and Progress During the Current Year

Based on the experience gained from two sets of experiments during the Shallow Water Acoustics ARI, we have expended a modest amount of effort in the current year modifying some of the shear wave hardware, both sources and receivers, which should improve the quality of data recorded in the future.

1. The original shear wave source was a troika sled with two airgun-powered cannons (port and starboard) mounted horizontally on the base of the sled. Alternate firing of the guns produced polarized SH energy (also P and SV) to permit separation of the P/SV and SH phases by addition and subtraction of shot pairs. One modification is the replacement of the two fixed cannons by a single cannon which can be swivelled from one side to the other to produce the alternate stress polarization. A pneumatic ram provides the swivel action, and adjustable stops permit a choice of off-horizontal inclination angles of the cannon. With this configuration we hope to avoid the exact matching of the performance of two guns, improving the spectral similarities of the port and starboard shots and thus producing better data for the addition/subtraction procedure. The ability to vary the inclination angle of the cannon may also permit the determination of the most effective direction of stress for best coupling of the sled runner to the seafloor for various sediment compositions.

2. During the last cruise of the ARI, lightweight source sleds were attached to receiver array cables (near the active section) as a means of achieving more accurate source/receiver ranges and more uniform spatial sampling. Although overall successful in most respects, these small sources produced a low ratio of SH vs SV excitation. This source design is being modified in hopes of achieving better coupling by added weight, better coupling runner design, and different cannon inclination (previously fixed at 45°).

3. A non-explosive shear source has been constructed, which is essentially a mechanical solenoid device operated either by pneumatic or hydraulic power. Controlled valving of air or fluid drives a cylindrical mass from one end of a tube to the other. The impact of the mass with alternate

ends of the tube produces the alternately-polarized stress for SH excitation. The tube lies on the seafloor and is coupled by one or more fins. Because there is no explosion in the water, this source should generate mostly SH energy, although some SV and P energy is produced by the impacts at the tube ends. Initial tests have indicated very good spectral stability for impacts similarly or alternately polarized. This source, as well as the two explosive sources, will be more thoroughly tested and compared later this year in water depths up to 200 m in the Gulf of Maine.

Publications for FY90

Berge, P.A., S. Mallick, G.J. Fryer, N. Barstow, J.A. Carter, G.H. Sutton, and J.I. Ewing, In Situ measurement of transverse isotropy in shallow-water marine sediments, Geophys. J. Int., in press, 1990.

Berge, P.A., S. Mallick, G.J. Fryer, N. Barstow, J.A. Carter, G.H. Sutton, and J.I. Ewing, Refraction measurement of shear wave anisotropy in shallow marine sediments and implications for reflection processing, Proc. Symposium on Shear Waves in Marine Sediments, NATO SACLANTCEN, submitted, 1990.

Sutton, G.H., N. Barstow, J.A. Carter, and J.I. Ewing, Experiments and analysis of data on shear wave propagation in shallow water sediments, Proc. Navy Symposium on Underwater Acoustics, Biloxi, Miss,. in press.