UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNDERWAY SEISMIC DATA COLLECTED ON U.S.G.S. CRUISE S6-77, SOUTHEASTERN BERING SEA

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This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards.

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INTRODUCTION

The seismic reflection data included in this report were collected on U.S.G.S. cruise S6-77 aboard the R/V SEA SOUNDER in the southeastern Bering Sea. Gravity and magnetic data were collected but have not been reduced; consequently, they will be reported on at a later date.

The data are open-filed for the convenience of others working in the Bering Sea. Several projects are currently underway using these data and, in order to avoid duplication of efforts, we ask that potential users check with us before any major project is undertaken.

Microfilm copies (2 rolls each) of 3.5 kHz, 0.4 to 1.5 kHz Uniboom and 160 kj sparker (63 to 125 Hz) data as well as navigation data are available, for the cost of reproduction, from Mr. Tom Chase, Marine Technical Data Center, Pacific-Arctic Branch of Marine Geology, 345 Middlefield Road, Menlo Park, California 94025 or National Oceanic and Atmospheric Agency (NOAA), National Geophysical and Solar-Terrestrial Data Center, Boulder, Colorado 80302.

Cruise S6-77 departed Dutch Harbor, Alaska on 5 August 1977, returned for a port stop on 20 August, departed on 24 August and terminated in Kodiak, Alaska on 10 September. The total trackline distance covered is 8,900 km. The 160 kj sparker and 3.5 kHz systems were run almost continuously. However, very little 2.5 kHz Uniboom data were taken because either we were in water too deep for Uniboom operations or the sea-state precluded any useful quality data.

The tracklines (Plate 1) complement work completed on U.S.G.S. cruise S4-76 (Gardner and Vallier, 1977). Line spacing is approximately 50 km in the general survey area although several small regions have very closely spaced lines.

Table 1 summarizes the number of line kilometers of geophysical data collected on cruise S6-77.

Table 1. Line kilometers of geophysical data collected on cruise S6-77.

DATA TYPE	DOMINANT FREQUENCY	LINE KILOMETERS
12 kHz*	12 kHz	6,860
3.5 kHz	3.5 kHz	8,567
Uniboom	0.4-2.5 kHz	168
Minisparker*	800 Hz	58
Sparker	63-125 Hz	7,234
Gravity*		8,810
Magnetics*		8,726

* Data not included in this report

NAVIGATION

The R/V SEA SOUNDER is equipped with a Magnavox Integrated Satellite and Loran C system. It is coupled to a single-axis doppler speed log and gyro. Table 2 gives the results of a test of the precision of the navigation system performed during cruise S4-76 (Gardner and Vallier, 1977).

Table 2. Precision of R/V SEA SOUNDER navigation system.

long-course offset	$\pm$ 0.0789 km
cross-course offset	$\pm$ 0.0891 km
radial offset	$\pm$ 0.1341 km

Data based on 25 updated satellite fixes

SEISMIC EQUIPMENT

The 12 kHz system consists of a single hull-mounted transducer using a Raytheon PTR # 105B with 2 kilowatts maximum power output. The system is coupled to a Raytheon PDD # 200 which digitizes bathymetry and provides the data to the navigation tape. The analog data were recorded on an EPC 4100 recorder.

The 3.5 kHz system consists of a hull-mounted 12-transducer array (Raytheon TR 109) using a Raytheon PTR # 105B with a 2 kilowatt maximum power output coupled to a Raytheon CESP II autocorrelator and an EPC 4100 recorder.

The E.G. & G Uniboom system uses four hull-mounted plates with E.G. & G. Model 234 energy sources. The hydrophones array is a standard E.G. & G. high-resolution streamer coupled to a pre-amplifier and then into Khron-Hite filters. Filters were set to allow band pass at 400 to 1500 Hz. The data were recorded on an RPC 4100 recorder.

The sparker system uses four banks of 40 kilojoules (Kj) each for a maximum energy of 160 kj. The hydrophone used is a two-channel array towed approximately 200 m aft of the ship. This is coupled to a Geospace 190 amplifier filter for signal processing. The system was fired on a 6-second cycle and the full 6-second record was recorded on a Raytheon Model 1900 graphic recorder. In addition, a time-delay start-stop mode was used to record an expanded section on a 3-second record using an EPC 4100 recorder. The cruise started with all banks firing for an energy level of 160 kj, but throughout the cruise capacitors exploded. Because we had no spare capacitors, each failure reduced our energy by approximately 4 kj. By the end of the cruise we were reduced to approximately 120 kj.

DATA

The quality of the 3.5 kHz, 12 kHz, and sparker data is excellent. The few kilometers of Uniboom and Minisparker data were of very poor quality and are essentially useless for interpretation. Factors which affect the quality of

the seismic data can be grouped in two broad categories: (1) the types of seismic systems used and their environments, and (2) the surface and subsurface geology. The environment of the seismic system includes the sea-state at the time of recording, ambient acoustic interference generated by the vessel, depth of water, and the watchstander overseeing the system. The first two factors affect the high-resolution systems (12 and 3.5 kHz, Uniboom and Minisparker) much more than the low-resolution system (sparker). Sea-state conditions during which most data were collected ranged between calm and Force 8, but were typically between Forces 2 and 5. Rough sea-states result in decoupling of hydrophones and/or transducers from the water column, thus seriously reducing the quality of high-resolution records. Ambient acoustic interference generated by the vessel added further to the noise level on all data. The depth of water affects the high- and low-resolution systems in opposite ways. Shallow water depths influence the sparker-system by producing a first harmonic (multiple) that on many records obliterates the signals beneath it. As the water depth increases, the interference by the first harmonic is at deeper levels on the records, thus allowing more geologic information to be recorded. Reverberations create a "ringing" at each reflector that also tends to mask out some information. The Uniboom and minisparker high-resolution systems did not perform well because we were operating in water deeper than 1,000 m or because of deteriorating sea-states.

ACKNOWLEDGMENT

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REFERENCES

Gardner, J. V. and Vallier, T. L., 1977, Underway geophysical data collected on U.S.G.S. cruise S4-76, southern Bering shelf: U.S. Geol. Survey Open-file Rept. 77-524, 5 p.