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MULTICHANNEL SEISMIC-REFLECTION DATA FROM  
THE SOUTHERN CHUKCHI SEA

by

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**Introduction**

Approximately 2568 km of 24-channel seismic-reflection data collected over the continental shelf in the southern Chukchi Sea during 1977, 1978 and 1980 by the U.S. Geological Survey (USGS) were reprocessed between 1984 and 1986 (Figure 1; Plate 1). These data come from a larger body of data collected in the Beaufort and Chukchi Seas on the USGS Research Vessel S.P. Lee and have been previously processed and released (Grantz and others, 1982; Grantz and others, 1986a, 1986b). The objective in reprocessing these data was to improve the resolution of acoustic basement of the Hope basin, a Tertiary sedimentary basin of the southern Chukchi Sea (Tolson, 1987), and to attempt to image reflections from the pre-Tertiary units which comprise acoustic basement.

**Data Collection**

Data collection methods for each of the three cruises (1977, 1978 and 1980) differed in only minor ways and these are noted below. The seismic energy source consisted of a tuned array of five air-guns with a total volume of 1326 cubic inches (1213 cubic inches in 1980) operating at a pressure of approximately 1900 psi. The recording system consisted of a 24-channel, 2400 meter long streamer with a group interval of 100m, and a GUS (Global Universal Science) model 4200 digital recording instrument. Shots were fired every 50 meters resulting in 24-fold coverage. Navigational control for the survey was provided by a Marconi integrated navigation system using transit satellites and doppler-sonar. This was augmented by Loran C (Rho-Rho) during the 1978 cruise. A Magnavox integrated navigation system using transit satellites and doppler-sonar augmented by

Loran C (Rho-Rho) was used in the 1980 cruise. A 2-millisecond sampling rate was recorded in the field and the data were later desampled to 4-milliseconds during demultiplexing. Data were recorded to eight seconds during the 1978 and 1980 cruises and on those profiles of the 1977 cruise that are included in this data set, six seconds of data were recorded.

### **Data Processing**

Both initial processing and reprocessing of the data were performed at the USGS Pacific Marine Geology Multichannel Processing Center in Menlo Park, California. The data were originally processed on the USGS Data General S-200 and S-230 computers with in-house software in the following sequence: editing-demultiplexing, velocity analysis, CDP stacking, deconvolution-filtering, and plotting. The demultiplex data were subsequently reprocessed between 1984 and 1986 on the USGS DEC 11/780 VAX computer using Digicon DISO seismic software package. The main goal in reprocessing the data was to improve imaging of deeper reflections both in the sedimentary column and in acoustic basement by enhanced stacking velocity control. The reprocessing sequence was as follows: CDP sorting, true amplitude recovery, spiking deconvolution-filtering, velocity analysis, normal moveout correction, post-NMO mute, pre-stack AGC, 24-fold CDP stacking, predictive deconvolution-filtering, finite difference migration, trace equalization, post-stack gain removal, and plotting on an electrostatic plotter. Pre-stack automatic residual statics was performed from CDP 50-250 on line 20 of cruise L8-AR-80. All seismic data were processed using the maximum record length and then displayed from 0.0-6.0 seconds at 20 traces/inch and 2.5 inches/second. Plate 1 is a trackline chart showing shotpoint navigation, and Table 1 is list of the lines and shotpoint ranges used in this report.

The data are available in the following format:

- 1) Electrostatically plotted profiles of final stacks which have been deconvolved and filtered after stacking and final migrations. Copies of the profiles may be purchased through:

National Geophysical Data Center  
NOAA/EDIS/Code D84  
325 Broadway  
Boulder, Colorado 80302

### **Conclusions**

Reprocessing of USGS seismic data from the continental margin of the southern Chukchi Sea noticeably improved the character of the basement reflections and generally improved the deeper sections of the data. In doing so, shallow reflectors were sometimes attenuated. Geologic interpretations of these reflection seismograms have been greatly facilitated by the reprocessing of the data, but these data may be augmented by the original profiles for shallow interpretations.

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**REFERENCES CITED**

- Grantz, A., D. M. Mann, and S. D. May, 1982, Tracklines of multichannel seismic-reflection data collected by the United States Geological Survey in the Beaufort and Chukchi seas in 1977 for which profiles and stack tapes are available: United States Geological Survey Open-File Report 82-0735, 1 oversize sheet.
- Grantz, A., D. M. Mann, and S. D. May, 1986, Multichannel seismic-reflection data collected in 1978 in the eastern Chukchi Sea United States Geological Survey Open-File Report 86-206, 1 oversize sheet.
- Grantz, A., D. M. Mann, and S. D. May, 1986, Multichannel seismic-reflection data collected in 1980 in the eastern Chukchi Sea United States Geological Survey Open-File Report 86-405, 1 oversize sheet.
- Tolson, R. B., 1987, Structure and stratigraphy of the Hope basin, southern Chukchi Sea, Alaska, in D.W. Scholl, ed., Geology and resource potential of the continental margin of western North America and adjacent ocean basins--Beaufort Sea to Baja California, AAPG Memoir 43, in press.

**Table 1**

Project L9AR77

<u>Line</u>	<u>DPS</u>
702	13-3352
703	15-660
704	15-918
705	15-1160
706	16-1382

Project L6AR78

<u>Line</u>	<u>DPS</u>
801	14-3137
802	14-1552
2826	4014-8334

Project L8AR80

<u>Line</u>	<u>DPS</u>
9	15-5294
10	15-4417
13	4000-7718
18	15-2109
19	15-7564
20	18-1212
21	15-2235
22	15-2373
23	15-2157
24	15-3605



FIGURE 1. AREA OF STUDY. PLATE I SHOWS DETAILED LOCATION OF TRACKLINES AND SHOTPOINTS