United States Department of the Interior
Geological Survey

MULTICHANNEL SEISMIC-REFLECTION PROFILES FROM VANUATU TO THE SOLOMON ISLANDS COLLECTED IN 1984

by

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In 1984, a geophysical survey (USGS cruise identifier L5-SP-84) of the central and northern parts of the New Hebrides arc was conducted by the U.S. Geological Survey aboard the R/V S. P. Lee (Plates 1, 2, and 3). This survey yielded approximately 2400 km of 24-fold multichannel seismic reflection data, 2400 km of single channel seismic reflection data, and other geophysical profile data including gravity, magnetic gradiometer, 3.5 and 12 kHz high-resolution echo-sounding, and sonobuoy refraction profiles. Gravity and echo-sounding data were collected along the transit lines from Port Vila, Vanuatu, prior to the survey, and to Honiara, Solomon Islands, after the survey. Greene et. al (1984) have summarized the scientific objectives and preliminary results of this survey. Complete descriptions of the geophysical data collection and interpretation are published in Greene and Wong (1988).

With the publication of this open-file report, the following data are being released:

1. Analog (variable area/wiggle trace) sections of the stacked, multichannel seismic reflection profiles at a horizontal scale of 1 km/in and a two-way travel-time scale of 1.5 in/sec with stacking velocities displayed across the top of the section;

2. Magnetic tapes of digital multichannel seismic reflection data, unstacked (CDP sorted) and stacked, in SEG-Y format;

3. Trackline chart (Plates 1, 2, and 3) with bathymetry and shotpoint locations.

Multichannel seismic reflection profiles

The multichannel seismic reflection data were collected along 38 lines (100 through 136, Plates 1, 2, and 3). The survey conditions were excellent, and wave-induced noise was minimal.

The source and receiver equipment and recording parameters are shown in Table 1. The seismic source consisted of a tuned, 5 airgun array totaling 1426 cubic inches, pressurized to 2000 psi, towed at a depth of 10 m. Individual gun volumes were usually 148, 194, 309, 309, and 466 cubic inches; the array was modified temporarily at times during the survey for repair. The receiver consisted of a 24 channel hydrophone streamer, with 100 meter group lengths containing 60 hydrophones in each group.

The near channel offset from the airguns was 297 m, and far channel offset 2611 m. The streamer was towed at a depth of 12 m. The data were recorded with a GUS Model HDDR-4200 recording system. During the early part of the survey (lines 100-114), the recording system experienced intermittant control problems, after which equipment problems were minimal.

The basic processing steps are shown in Table 2. Particular attention was devoted to accurate velocity estimation, through the use of standard semblance plots and constant velocity stacks. The semblance velocity analyses were performed every 2.5 km (50 CDP's) along each line, using a summation of 3 adjacent CDP gathers for each analysis.

Data availability

Analog reproductions of the stacked multichannel seismic records and shot point navigation data may be obtained from the National Geophysical Data Center (NGDC). Instructions for ordering data from these sources may be obtained by contacting:

National Geophysical Data Center
NOAA/EDIS/Code D64
325 Broadway
Boulder, Colorado 80302

The CDP sorted (unstacked) and stacked data can be obtained on SEG-Y format magnetic tapes at the requester's expense by contacting:

Data Curator
Branch of Pacific Marine Geology
345 Middlefield Rd. MS-999
Menlo Park, CA 94025

Additional copies of this report may be obtained by contacting:

Books and Open-File Reports Section
U.S. Geological Survey
P.O. Box 25425
Federal Center
Denver, Colorado 80225
Telephone: (303) 236-7476

References

Greene, H. G., A. Macfarlane, and Scientific Staff, 1984, Initial report on SOPAC II Leg 2, Vanuatu to Solomon Islands: CCOP/SOPAC Cruise Report No. 94.

Greene, H.G. and Wong, F.L., eds., 1988, Geology and Offshore Resources of Pacific Island Arcs--Vanuatu Region: Circum-PacificCouncil for Energy and Mineral Resources, Earth Science Series, Volume 8.

TABLE 1. RECORDING PARAMETERS AND EQUIPMENT USED DURING CRUISE L6-82-SP

SOURCE:	BOLT AIR GUNS
AIR GUNS IN ARRAY:	5
NET VOLUME:	1311 CU. IN.
MANIFOLD PRESSURE:	2000 PSI
GUN DEPTH:	10.5 M
SHOT INTERVAL:	50 M
STREAMER:	SEI MULTIDYNE,CHARGE COUPLED
GROUP INTERVAL:	100 M
AVERAGE DEPTH:	12.5 M
GROUP LENGTH:	100 M
PHONES/GROUP:	60
DEPTH CONTROLLERS:	SEI VARIABLE WING BIRDS
RECORDING:	GUS HDDR 4200, BINARY GAIN
SAMPLE INTERVAL:	2 MS
RECORD LENGTH:	10 S
RECORDING FILTER:	5-110 HZ
NUMBER OF CHANNELS:	24
NAVIGATION:	MAGNAVOX SYSTEM
PRIMARY:	SATELLITE

TABLE 2. PROCESSING SEQUENCE

1. DEMULTIPLEX:	
DESAMPLE:	4 MS
GAIN RECOVERY:	
REFORMAT:	PHOENIX I
2. TRACE SHOT EDIT:	
3. STATIC CORRECTIONS:	
RECORDING STATICS:	256 MS
DATUM:	SEA LEVEL
4. CDP SORT:	
5. VELOCITY ANALYSIS:	
WINDOW LENGTH:	60 MS
WINDOW INTERVAL:	4 MS
BAND PASS FILTER:	3-6-40-50 HZ
VELOCITY RANGE:	1400-4900 M/S
6. NMO CORRECTION:	
7. 24-FOLD STACK:	
8. BANDPASS FILTER:	HANNING
FILTER POINTS:	64
TIME WINDOW:	0.0 - 10.0 S
FREQUENCY:	4-8-40-50 HZ
9. AGC:	350 MS WINDOW