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CRUISE REPORT

Ship Name: VEMA

Cruise No: 33-14

Departure: 1/21/77 from Townsville, Australia
Date Port

Arrival: 2/18/77 at Suva, Fiji Islands
Date Port

Days at Sea: 28 Days Foreign Port: 4
No. days in arrival port

Area of Operation: Southwest Pacific Ocean: Coral Sea basin, New Hebrides basin, South Fiji basin.

Program Description: Systematic magnetic/bathymetric/seismic/gravity surveys of various marginal basins of the southwest Pacific designed to investigate the age structure and tectonic history of some of the marginal basins in Melanesia.

Participants: (All L-DGO unless otherwise specified)

A. B. Watts	Chief Scientist
Nicolas Leiser	Computer
Van Paisley-Smith	Gravity
Herbert Steeves	Airgun
Michael Sundvik	Core Describer
Dennis Quick	E. T.
James Cranston	E. T.
Charles Gove	Heat Flow
Derk Jongsma	Scientist (Bureau of Mineral Resources Australia)
A. Lapouille	Scientist (O.R.S.T.O.M., Noumea, New Caledonia)
A. J. Chandra	E. T. (Mineral Resources Division, Suva, Fiji Islands).
Alan James	Scientist (University of Sydney, Australia)

All inquiries regarding cruise should be made to the chief scientist.

VEMA 33-14

Cruise Report

Cruise 33, leg 14, of R/V VEMA left Townsville on January 21, 1977 and arrived in Suva on February 18, 1977. The main purpose of the leg was to undertake geophysical surveys of the Coral Sea, New Hebrides and South Fiji basins (see attached track chart). This leg was the second of two designed to investigate the age structure and tectonic history of some of the marginal basins in Melanesia.

The principal scientific results of the leg were as follows:

(a) Coral Sea basin: The main purpose of the survey in this basin was to extend the magnetic lineations mapped during V33-13 into the southeast part of the basin. Three geophysical profiles of the basin were obtained. Magnetic anomaly data along these profiles confirm the presence of NW-SE trending magnetic lineations in the southeast part of the basin. The magnetic anomalies consist of a broad positive anomaly in the center of the basin flanked by two short-wavelength positive anomalies. The broad positive anomaly correlates on one of the profiles with relatively shallow acoustic basement which may represent an extinct spreading center. The magnetic anomalies in the basin are highly "skewed" and appear to represent anomalies 24 through 26.

(b) New Hebrides basin: The objective in this basin was to determine whether magnetic lineations could be mapped in the basin. The ship's tracks were oriented approximately N-S normal to the morphologic trends in the basin and complimented other magnetic data in the basin, particularly those obtained by O.R.S.T.O.M. (Noumea, New Caledonia). The main results were to tentatively establish (1) E-W lineations in the west part of the basin, between the D'Entrecasteaux Fracture Zone and the Rennell Island

ridge, (2) ENE-WSW lineations in the southeast part of the basin, between the Loyalty Islands and the New Hebrides trench. The magnetic lineations in both parts of the basin occur in regions of relatively smooth and deep sea-floor (about 4.5 km). The overall topographic trends in the basin are NE-SW and E-W but the structure of the basin is complicated by a number of E-W trending fracture zones. The most prominent of these is the D'Entrecasteaux Fracture Zone which is infilled by at least 2 km of sediment. The well lineated anomalies in the southeast part of the basin may represent anomalies 18 through 21. Thus the age of this part of the basin may be Eocene, in general agreement with ages inferred from DSDP site 286 and the global empirical age/depth curve. Three sonobuoy profiles were obtained in the basin in the region of the magnetic lineations.

(c) South Fiji basin: The objective in this basin was to determine better the pattern of magnetic lineations mapped during V32-15. The main results of the survey were to (1) extend the N-S lineations mapped earlier to the northeast, as far as latitude 23°S and (2) establish NW-SE lineations in the southeast part of the basin between 26° and 28°S . The presence of NW-SE lineations supports the suggestion that the South Fiji basin formed at three spreading centers during the Oligocene. The NW-SE lineations were generated at a NW-SE trending spreading center, mapped on an earlier bathymetry map of the basin. Only the eastern limb of this spreading system is now preserved. The western limb is missing, probably due to subduction along the region of complicated ridges and troughs between New Zealand and New Caledonia.

(d) Other areas: Enroute between the Coral Sea, New Hebrides and South Fiji basins the southern extension of the Rennell trough, the Mellish Fracture Zone, the Norfolk ridge and the Three Kings Rise were crossed.

Three successful rock dredges were obtained between the Norfolk ridge and the crest of the Three Kings Rise. Two of the dredges on the flanks of the Three Kings Rise consisted of pyroclastic (volcanic) rocks. Predominant rock types included weathered lava, carbonaceous materials, obsidian and volcanic glass. These rocks can be expected to provide useful new information on the origin of the Three Kings Rise and its tectonic relation to the South Fiji basin.

The following is a brief summary of the status of some of the geophysical and geological equipment used during this leg:

(a) Computer: The computer was serviced in Townsville by two DEC engineers who succeeded in getting CPU 1 and the expander box working. It was therefore possible during the leg to use the plotter. They tried unsuccessfully to get the tectronix scope or the dectape drives working. Each of the disk drives were checked and they are in working order. CPU 2 was not serviced but is believed to be in working condition although it has not been used for several months. At the end of the leg the following devices were operational; CPU 1, plotter, disk drives and decwriter 1. The following were not operational: PDM 70, A/D converter, Tectronix scope and Dectape drives. With this configuration it is possible to process satellite fixes, carry out FIXPIT's and plot geophysical data manually entered into the machine.

(b) Seismic: At the end of the leg two Lamont eels and the Aquatronics eel are in good working condition. The Aquatronics eel was used for a short period during the leg (towed at a speed of 7 knots) while one of the Lamont eels was being repaired. Two Lamont air guns are in good working condition. Failure of a gear box in profiler B was reported to Bill Robinson during the leg.

(c) Gravity: About three days from Townsville off-leveling problems were encountered with the stable platform. The fault was isolated to the pitch gyro which was showing signs of "oscillating". This gyro was installed only a month earlier and is presumed now to be faulty. Unfortunately, replacing this gyro with the spare (which had previously been in operation for nearly a year) did not improve the off-leveling. The system was finally shut down ten days out of Townsville. A new gyro was sent from the manufacturer to meet the ship at Suva.

(d) Magnetics: Apart from occasional "glitches" in the record the magnetometer worked well during the leg.

(e) Heat flow: No successful heat flow measurements were obtained during the leg. A number of problems were encountered, particularly with malfunctioning of the recorder. A detailed report of these problems will be submitted separately to Marc Langseth.

(f) Rock dredges: Three rock dredges were in operational condition at the end of the leg. There is only one pebble dredge on board and this is in poor condition.

Anthony B. Watts

Chief Scientist

