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CRUISE REPORT

Ship Name: VEMA Cruise No: 33-13

Departure: 12/20/76 (Date) from Guam (Port)

Arrival: 01/18/77 (Date) at ~~Townsville, Australia~~ (Port)

Days at Sea: 29 Days Foreign Port: 3 (No. of days in arrival port)

Area of Operation: Marginal basins of the western Pacific Ocean--the east Caroline, Bismarck, Solomon, and Coral Sea basins.

Program Description: Nineteen days of systematic geophysical survey of the Coral Sea basin. Crossings of the east Caroline, Bismarck and Solomon basins en route. Main purpose was to map magnetic lineations and basement structure in an effort to understand the evolution of these marginal basins. First of two NSF-sponsored legs.

Participants: (All L-DGO unless otherwise specified)

J. K. Weissel	Chief Scientist
James Cranston	E. T.
Dennis Quick	E. T.
Nicolas Leiser	Computer Operator
Charles Gove	Heat flow
Michael Sundvik	Core describer
Van Paisley-Smith	Gravity
Herb Steeves	Airgun
Garry Karner	Geophysicist (Bureau of Mineral Resources, Australia)

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

VEMA 33-13

Cruise Report

Cruise 33, leg 13, of VEMA left Guam on December 20, 1976, and arrived in Townsville on January 18, 1977. The main purposes of this leg were to undertake a detailed, systematic geophysical survey of the Coral Sea basin and to run reconnaissance geophysical lines over parts of the east Caroline basin, Bismark basin and Solomon Sea basin en route (see track chart). This leg was the first of two designed to investigate the age, structure and history of some of the marginal basins of Melanesia.

The principal scientific results are as follows:

1. Coral Sea basin. Nineteen days were spent in this basin obtaining underway geophysical measurements. The main purpose was to map in detail the magnetic lineation pattern suggested by Falvey and, if possible, to identify the anomalies comprising the pattern. Fifteen crossings of the basin extended the previously known pattern considerably and at least one offset has been detected near 153° 25'E. Basically, the magnetic pattern strikes WNW-ESE and consists of a broad positive anomaly near the center of the basin flanked either side by one or more narrower positive anomalies. Magnetic anomaly amplitudes increase from the northwest towards the southeast and a magnetic quiet zone occurs over areas of deep crust seaward of the Queensland plateau. The magnetic anomalies also appear highly skewed and although deskewing procedures have yet to be done, the anomalies appear similar in character to the anomaly 24 to 26 sequence associated with the extinct spreading system in the Tasman basin. Crustal ages which correspond to anomalies 26 through 24 are not inconsistent with ages determined at nearby DSDP sites 210 and 287.

A remarkable pattern of migrating sediment waves was seen on all 3.5 kHz records over the base of the Louisiade archipelago rise. The crests of the waves appear to migrate upslope with time. It is interesting to note from several seismic profiles that the sedimentary layers on the flank of the Queensland plateau continue out under the uppermost turbidite layers of the Coral Sea abyssal plain. This would indicate that the plateau has not shed much sediment to the adjacent abyssal plain during more recent geologic time.

2. Bismarck basin. A single line was run over a presently active plate boundary in the Bismarck sea approximately in the direction of relative motion across the boundary as deduced from earthquake first motions. Coming in from the north, we recorded anomalies 2' through 1 where the central anomaly coincided with a sediment-free area at 3°30'S, 150°00'E. No recognizable magnetic anomalies were recorded on the south flank as the oceanic crust appears highly disrupted. (This is also the case with the Solomon basin crossing where many seamounts and seamount groups were encountered.)

3. East Caroline basin. At 3°45'N, 146°54'E we crossed a graben-like morphologic feature 15 km wide which appears to be an extinct spreading center. The track azimuth was NNW-SSE and north of the extinct boundary magnetic anomalies 11 through 9 were recorded. On the south side anomalies 9 through 12 were observed. The anomalies have large amplitudes and an approximately east-west strike is established by correlation to adjacent profiles from Bracey. The age inferred for the oceanic crust is close to the mid-Oligocene age determined from nearby DSDP site 63.

4. Other areas. En route from Guam to the Coral sea, VEMA made crossings of the Mariana trench ($>$4500 fathoms) and of the the New Britain trench ($>$4000 fathoms). On the run from the Coral Sea basin to the Australian coast the drum profiler was set at a 5-sec sweep in less than 1000 fathoms over

the Queensland plateau. The quality of the seismic records was quite high and especially good records were obtained over the fault-bounded Queensland trough which runs along the western margin of the Queensland plateau just east of the Great Barrier reef.

The following is an assessment of the performance of the scientific equipment during the course of this leg:

1. General: Magnetometer, gravimeter, PDR's, profilers, two eels, and two airguns are in working order at the end of V33-13.

21. Eels. In Guam we acquired a Lamont eel from the CONRAD which worked well until midway through the Coral Sea survey. Severe towing noise problems were then experienced intermittently for about three days. After replacing oil in the tail section with water and adding a 10 lb. lead weight 50 ft. from the nose the towing characteristics of the eel dramatically improved. The shorter Lamont eel seems to have inferior low frequency response compared to the eel acquired from CONRAD.

3. Magnetometer. Although we missed no data, considerable difficulty occurred in holding weak signals in low magnetic latitudes along near-meridional courses. Also, a peculiar type of glitch occurred in low latitudes for the first eight days and we were not able to eradicate this. The magnetometer trace would move from a smooth stable curve to an interval of instability and finally settle down some 50 counts higher or lower than before. Fortunately, this problem went away by the time we reached the Coral Sea but its origin remains unknown.

4. Computer. As the computer had broken down on the previous leg and as it was not fixed in Guam, the computer did not function normally. The technicians on board suspect that one major problem lies in the expander box of processor 1.

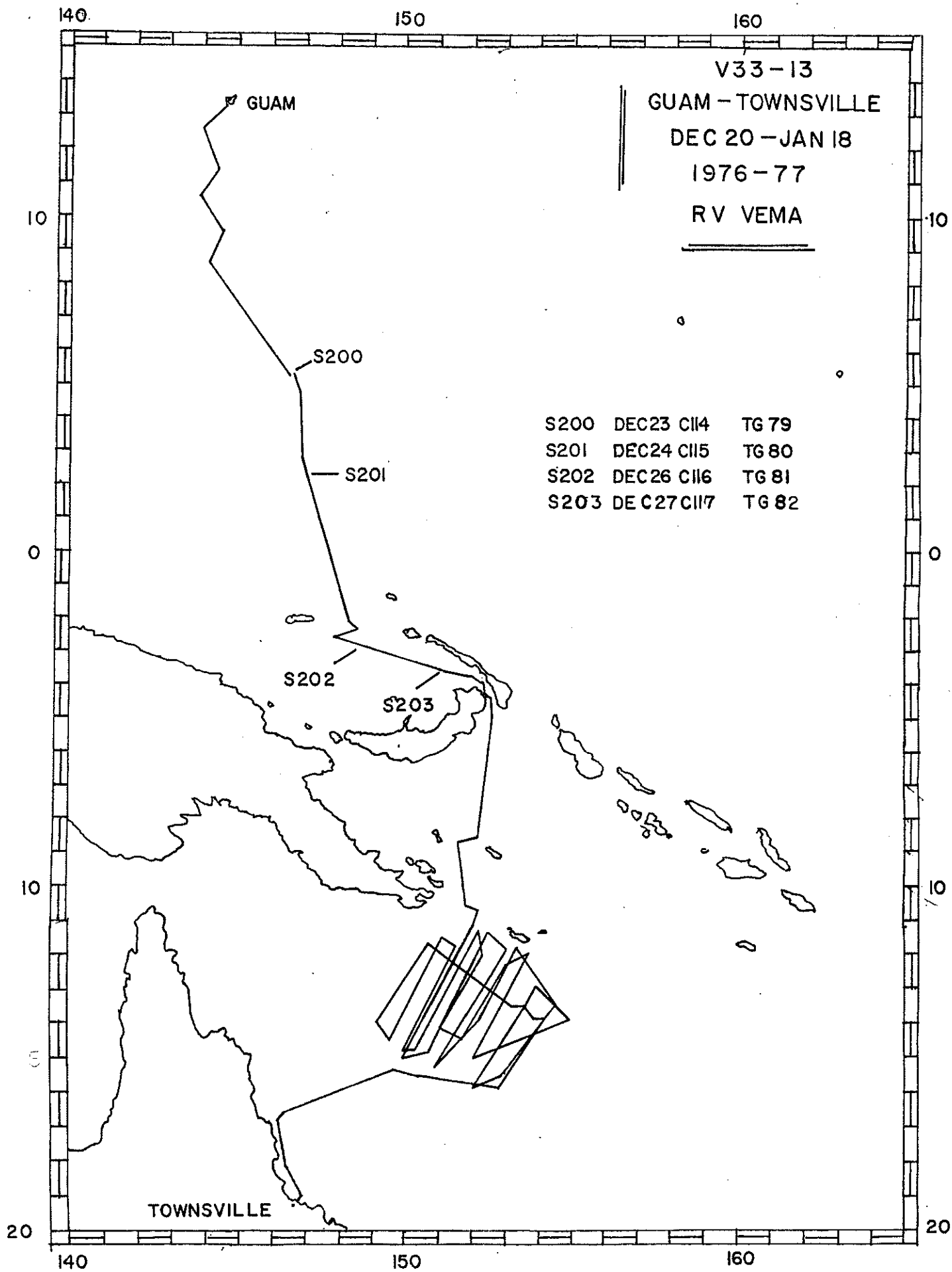
The paper tape reader and punch, the tectronix and the plotter cannot be activated. During the leg all fixes were processed from the keyboard of the decwriter. We also experienced problems in linking the plotter to processor 2. It is not known whether this is a hardware or software problem. We expect to remedy some of these problems in Townsville as Digital Equipment have an office there. We were able to run data reduction programs (except the topo storing program) without any trouble using processor 2.

5. Station gear. Only one heat flow station was successful of out of four attempts. This station was in the East Caroline basin at 5°10'N, 146°30'E and gave a value of 2.7 HFU. The cause of the problems was power failure. The lithium cells did not arrive in Guam in time and we were forced instead to use half D cells which lacked enough power to last through a station. After the fourth station it was discovered that the crane engine was broken and this took the remainder of the leg to fix.

We were happy to have Garry Karner, a geophysicist with the Australian Bureau of Mineral Resources, on board with us during VEMA 33-13. His participation was part of an agreement between L-DGO and the BMR for cooperation in shipboard studies of the marginal basins of Melanesia.

Jeffrey K. Weissel

Chief Scientist


V33-13
GUAM - TOWNSVILLE
DEC 20 - JAN 18
1976-77
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GUAM
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S202 DEC26 C116 TG 81
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