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CRUISE REPORT

Ship Name: VEMA Cruise No: 33-05

Departure: 18 March 1976 (Date) from Freemantle (Port)

Arrival: 16 April 1976 (Date) at Colombo (Port)

Days at Sea: 29 Days Foreign Port: 4
No. of days in arrival port

Area of Operation:

Wharton Basin, Central Indian Ocean

Program Description:

Seismic refraction
Dredging and coring
Ocean bottom hydrophone
Magnetics work W. of 90°E ridge

Participants: (All L-DGO unless otherwise specified)

1.	Carpenter, G.	C. Sci.
2.	Carmicheal, D.	OBH Tech.
3.	Quick, D.	E.T.
4.	Holland, D.	E.T.
5.	Rock, A.	Computer
6.	Sundvik, M.	Core Describer
7.	Paisley-Smith, V.	Gravity
8.	Powell, J.	Air gun
9.	Diebold, J.	Computer

General

The principal scientific objectives of V33-05 were largely concerned with dredging and seismic refraction work in the Wharton Basin in the Eastern Indian Ocean. The first week of the cruise was largely taken up in transit time to the Wharton Basin. Two short range sonobuoys (furnished by the BMR) were shot on the Caernavon Terrace on the W. continental margin of Australia on the request of the BMR. The highest velocity recorded was 5.0 km/sec. This velocity line is tangent to apparent basement as seen on the corresponding reflection profile. BMR scientists infer this basement to be high velocity (~6.2 km/sec) continental crystalline rock. The low apparent velocity of the two sonobuoys is not due to dip. Two cores were taken during the week's transit in areas of high carbonate sedimentation for N. Opdyke's continuing study of piston core paleomagnetism.

On arrival at the Wharton Basin study area, a short reconnaissance survey was conducted to locate topographically flat areas for the seismic refraction work. At 18°50'S, 103°20'E a long range sonobuoy and an OBH were deployed and a shooting line run out to about 40 miles. The long range sonobuoy produced good arrivals to about 40 seconds of "D" time but the OBH tapes yielded no usable data. (The reasons for this failure and three more subsequent to it will be gone into in some detail in a later section.) The line was partially reversed with a short range sonobuoy. The first refraction line was supposed to have been shot on "normal" oceanic crust so as to establish a reference section for the area. Reduction of the seismograms showed this to be the case. The thickness and velocity solutions were about what one would expect for a "normal" oceanic crustal section. (Programs for the reduction of refraction data have been written by J. Diebold and stored on disc. The programs apply the standard correction factors and, via the plotter, generate corrected travel time plots. Velocity-thickness solutions are then calculated by the slope-intercept method.)

Four additional refraction profiles were shot in the deepest part of the central Wharton Basin in an area that does not fit the Sclater age/depth curve. The sea floor appears to be too deep by about 1 km for a large, roughly circular region in the Wharton Basin. The refraction profiles yielded structure sections that are unusual for a deep ocean basin. Layer 2 appears to be quite thin, on the order of 600-700 m, and has a high velocity of 6.2 km/sec. Layer 3 is about 3 km thick and has a V_p in the range 6.5-6.8 km/sec. Mantle velocity appears normal (~8.0 km/sec). Excepting one line, all profiles were reversed so the calculated sections are not the result of subsurface dips. (These velocity/thickness calculations were done on board ship and are to be considered tentative.)

The second phase of the Wharton Basin work was concerned with obtaining rock samples from the walls of several very deep features. (These features resemble fracture zones and were described in Carpenter and Ewing, 1973, and Carpenter, 1974). Two of three dredges were a success (the third contained only manganese nodules) and recovered large samples of igneous rock. Due to storage space constraints at Lamont, only a representative sample of each dredge was boxed and sent to Lamont. Petrologic and velocity analyses of these rocks will be performed by Jeff Fox and Ed Schreiber.

A limited number (5) of cores were also taken in the deep central basin and produced at least one surprising result. Four of these cores showed a percentage of calcareous material considerably in excess of what would be expected in view of the depth (6000+ m). These sediments do not appear to be redeposited, but are composed of a species of small, thick-shelled foraminifera which is apparently quite resistant to solution effects.

On leaving the Wharton Basin area, the ship's track was adjusted so that a long magnetics line could be run along 81°40'E. Vema arrived in Colombo on 18 April.

Equipment Status

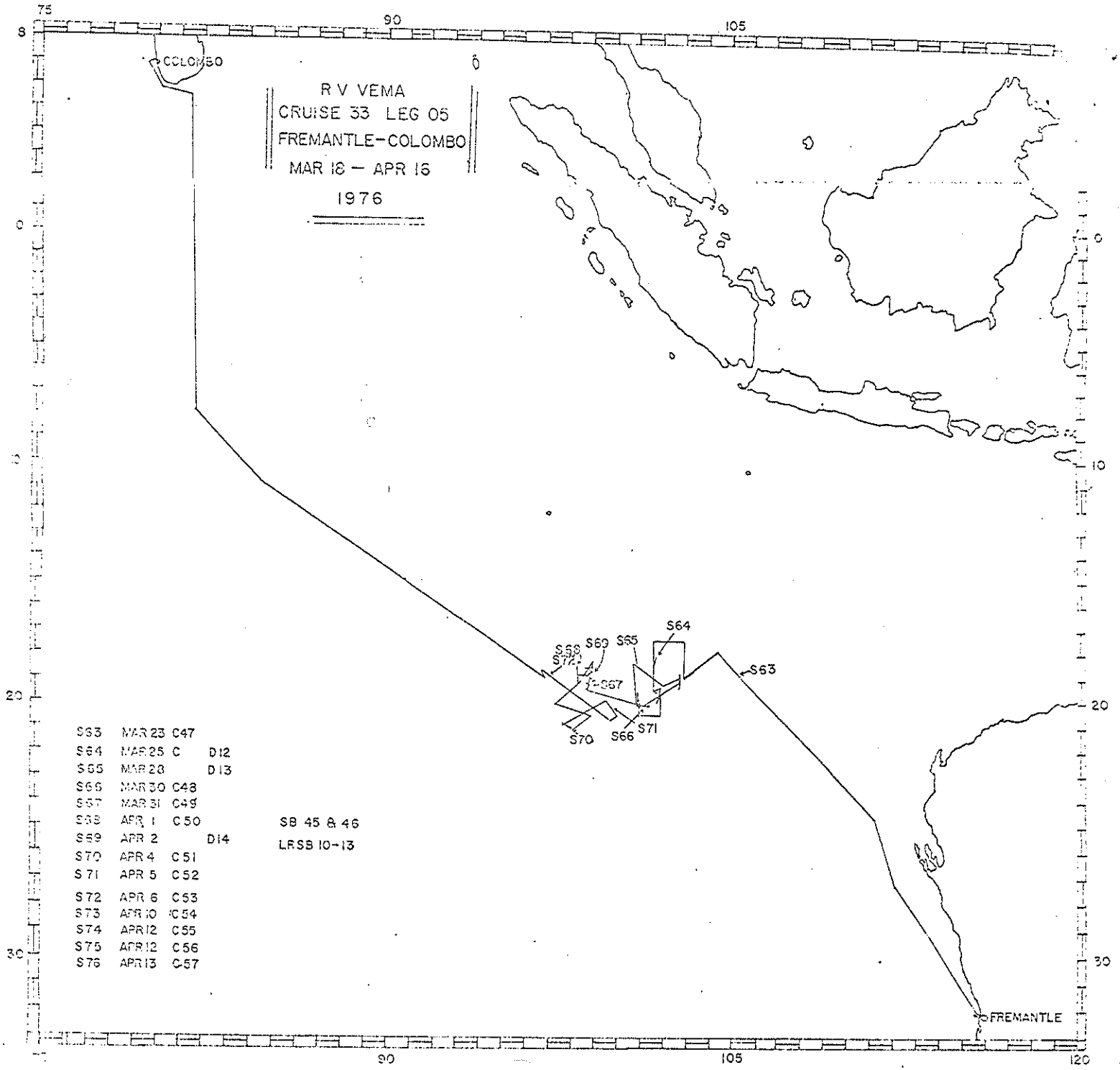
The ship's routine data collection systems were relatively free of serious problems this leg. The magnetometer has been suffering from a long standing noise problem ever since a new counter and interface network for the computer were installed nearly a year ago. In high latitudes the noise is not serious, merely a 5-10 gamma background "hash", but in equatorial regions the noise level reaches unacceptable levels. The old system has been returned to Lamont in hopes of alleviating this problem. It will be repaired and returned.

The seismic profiler and peripherals are in good order. Vema has three working eels and spares for another. A new air gun has been ordered for Djibouti.

Since it appears unlikely that a bottom photography/nephelometer program will be carried out on Vema in the near future, the hydrographic winch has been "mothballed". The core winch requires some work, but this has been arranged for.

The field testing and evaluation program for the OBH was a failure. This was the result of serious electronics problems that could not be dealt with at sea. Failure of a power supply during bench testing at the lab necessitated the purchase of a substitute supply with supposedly identical specs. On installation in the OBH the substitute power supply did not deliver the requisite voltage levels to the micro-processor circuit. This evidently caused the memory to drop several critical bits and resulted in erasure of most of the program. The failure of the OBH did not, however, seriously affect the field work. The refraction work was done with long range sonobuoys which performed well.

The ship's scientific complement is shrinking to a dangerously low level. When we departed Ceylon, the shipboard scientific party was down to five men exclusive of the arriving chief scientist. Several more are apparently getting off in Singapore.


R V VEMA
CRUISE 33 LEG 05
FREMANTLE-COLOMBO
MAR 18 – APR 16
1976
COLOMBO
FREMANTLE
S63 MAR 23 C47
S64 MAR 25 C D12
S65 MAR 28 D13
S66 MAR 30 C48
S67 MAR 31 C49
S68 APR 1 C50
S69 APR 2 D14
S70 APR 4 C51
S71 APR 5 C52
S72 APR 6 C53
S73 APR 10 C54
S74 APR 12 C55
S75 APR 12 C56
S76 APR 13 C57
SB 45 & 46
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