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CRUISE REPORT

Ship Name: R/V VEMA Cruise No: 3616

Departure: Sept. 12, 1980 (Date) from Singapore (Port)

Arrival: Oct. 9, 1980 (Date) at Colombo (Port)

Days at Sea: 27
(Count day of departure but not day of arrival in port)

Days Foreign Port: 3
(number of days in arrival port before next leg)

Area of Operation: North Central Indian Ocean

Program Description: Shipboard Study of intraplate deformation in the N.E. Indian Ocean featuring: a) geophysical survey of the extent of the deformation; b) slow-speed seismic reflection surveys at five sites, and c) T-grad and Pogo heat flow surveys.

Program supported by what contract: OCE 79-25070

Participants: (All L-DGO unless otherwise specified)

Name	Title
Jeffrey K. Weissel	Chief Scientist
David Roach	Heat Flow tech.
Carol A. Geller	Graduate Assistant
Ralph Roessler	E.T.
Kevin Little	E.T.
Ed Christian	E.T.
H.R. Smith	Mech. Tech.
Patrick Williams	Sci. Crew
W.J. Robinson	Computer Operator
M. Boleikinaualu	Core Bosun

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

V3616

CRUISE REPORT

Leg 16 of VEMA Cruise 36 left Singapore on Sept. 12th, 1980 and arrived in Colombo on Oct. 9th, 1980 after sailing approximately 4,600 n.m. (see attached figure). The original scientific objectives of this leg were as follows:

a) To examine (by reconnaissance MG & G) the areal extent of the Indo-Australian plate affected by intraplate deformation.

b) To conduct a pilot study of the relation between heat flow and intraplate deformation in the northern Indian Ocean.

c) To raise several piston cores for a study of the onset age of the deformation.

d) To conduct slow-speed seismic reflection surveys of small areas to determine the nature and dip of faults associated with the intraplate deformation.

Scientific Summary

Despite some problems with the underway geophysical gear, these objectives were largely met. The major scientific results are:

a) Intraplate deformation (at least in the form of faulting) is present east of the Ninetyeast Ridge in the northwest Wharton basin.

b) Most of the faults examined during 5 slow-speed surveys are reverse in a sense, with dips ranging upwards from ~50°.

c) The intraplate deformation is associated with abnormally high heat flow, lending credence to the view that frictional heat generated during faulting is a factor. The excess heat flow found in one survey area (6°50'S, 80°45'E) amounts to 0.5 HFU.

d) Further evidence of long wavelength deformation of the oceanic lithosphere was observed on two long N-S geophysical profiles.

Equipment Report

The underway geophysical gear aboard VEMA can best be described as "fragile." However, numerous problems can be laid to a lack of adequate preventive maintenance. For example, the horrendous noise initially encountered on the 12 kHz PDR receiver was largely removed by cleaning contacts, plugs etc. Brief comments on the scientific equipment appear below:-

a) Seismic System: For normal seismic reconnaissance (towing speed ~220 r.p.m.) we used two 465 cu. in. airguns firing every 12 sec at ~1300 psi. The 78 feet length of towing assembly results in significant energy loss upwards at such high towing speeds. This drawback, however, can be easily overcome by longer towing lengths. The Price compressor developed a serious oil pressure problem midway through the leg. This was fixed by replacing the bearings and for about 7 days total we used the L-DGO 20 cu. in. gun as the seismic sound source. Only one good single-channel L-DGO eel was aboard and although this gave superb records when working, repeated breaks in the pre-amp section occurred during the leg. The L-DGO drum profilers were used during the reconnaissance surveys and additionally, an EDO-WESTERN 550B graphics recorder was used during the slow-speed reflection surveys. Profiler drum 'B' has a serious drive mechanism problem and gave inferior records throughout the leg.

b) Magnetometer: Worked well for entire leg, even on close to N-S track azimuths in the equatorial Indian Ocean.

c) Gravimeter: Other than blowing a gyro on bringing the system up out of Singapore, the gravity system worked well. However, we feared that the cross-coupling computer was not working, and this was found to be the case during the following leg.

d) 3.5 kHz PDR system: Worked well during the leg.

e) HP Computer System: The system only worked as a data reduction and display system, the data acquisition end did not work during the leg. The reason for this is the lack of a critical Op-amp for the AMS data logger. It seems that some problems for the computer system can be traced to the dirty environment on board ship. For example, failure to boot the system from disc during the first week of the leg was largely due to dirty contacts (and a bad board). Again, preventive maintenance could improve matters.

f) Magnavox satellite navigator: This piece of equipment behaves in a mysterious way. Although 14-16 fixes per day were received and processed, the Magnavox would unaccountably drop apparently good fixes. This behaviour appeared to worsen during the last few days of the leg.

g) Core winch and cable: Worked well during all stations.

h) Heat flow program: After a disasterous first two stations where we managed only two numbers total in addition to breaking one multi-penetration (POGO) spear and bending another, we switched to piston core-TGrad operations for the next five stations. We obtained 10 good hits with the Pogo system along a profile at the southern (distal) end of the Bengal Fan. Probably our penetration problems further north can be attributed to mica and sand in the turbidites. Conductivity was measured on all the piston core-TGrad stations.

Personnel Report

Most of the scientific achievements made during this leg can be attributed to two hard-working people, Hector Smith and Ralph Roessler. The cooperation of the Captain, the officers and ship's crew and the scientific crew with the chief scientist was excellent.

Jeffrey K. Weissel
Chief Scientist V3616

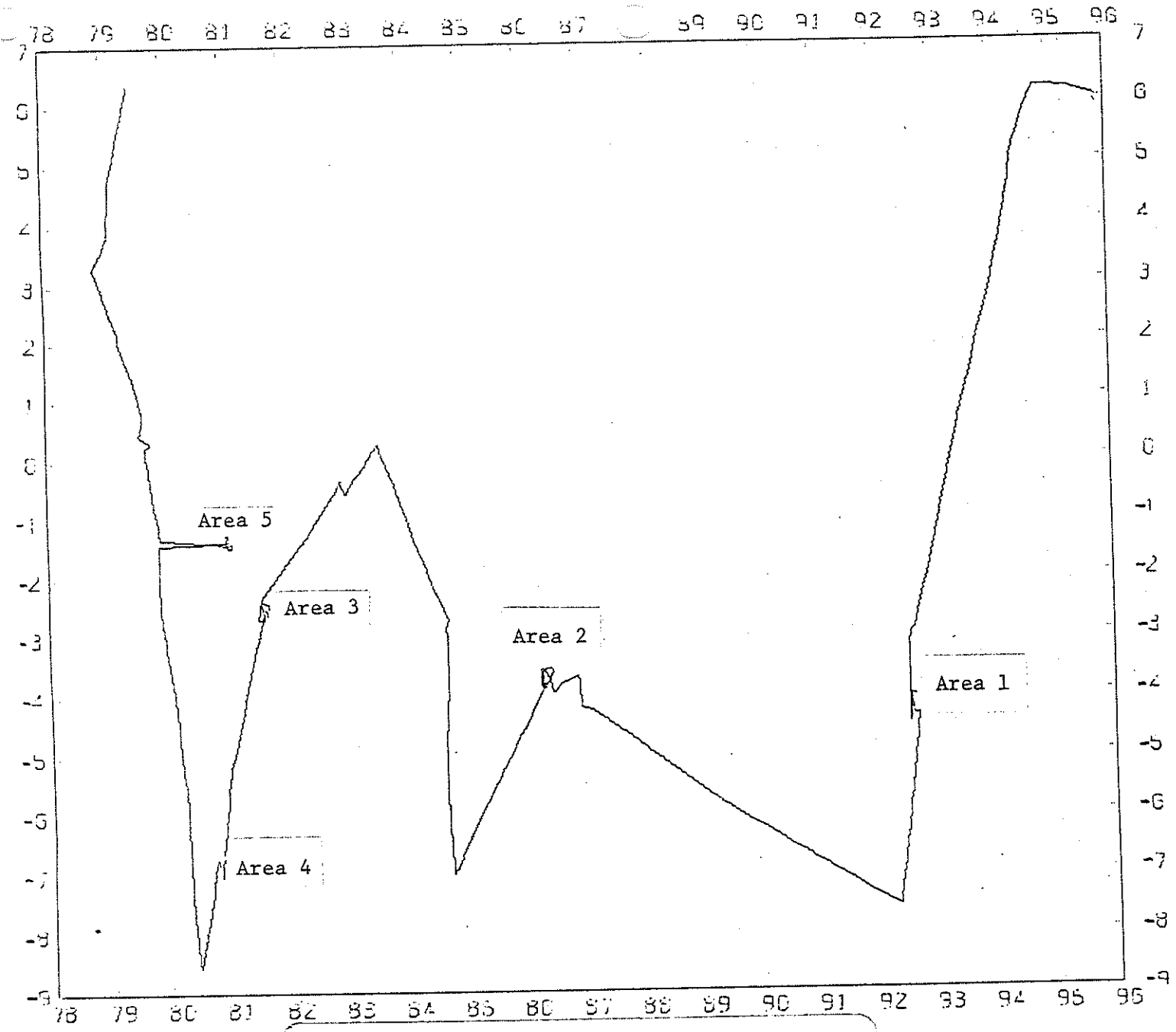

Figure shows track of V3616. Numbered areas refer to sites where pilot heat flow studies and special slow-speed seismic reflection surveys were carried out.