REPORT

OF

SIXTEENTH OCEANOGRAPHIC CRUISE

OF

ORV SAGAR KANYA

(6 June to 23 July, 1984)
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FIG 1 - CRUISE TRACK

ANNEXURE & SUMMARY OF OBSERVATIONS
International

Port of embarkation: Marmaga 2.6.85
Port of call at Port Louis, Mauritius: 27.6.85 to 28.6.85
Port of disembarkation: Marmaga: 23.7.85
1. Shri B. Megender Nath  
2. Shri N. B. C. Reddy  
3. Dr. J N Pattnaik  
4. Shri M. Sudhakar  
5. Dr. Pratima Jadhavari  
6. Shri A. V. Madhukar  
7. Shri B. Chakraborty  
8. Shri A. K. Chaubey  
9. Shri A. S. Muralinath  
10. Shri P. G. Mislunukar  
11. Shri G. Parthibah  
12. Shri V. S. Rajaraman  
13. Shri P. Ganesan  
14. Shri S. S. Gaonkar  
15. Shri T. Sudhakar  
16. Shri K. L. Naik  
17. Shri M. Suresh Raj  
18. Dr. C. Subramanyam  
19. Shri R. K. Drolia  
20. Shri A. Sundar  
21. Dr. H. Banerjee  
22. Shri S. Dasgupta  
23. Shri S. Mukhopadhyay  
24. Dr. K. Dilli  
25. Shri L. Krishnamurthy  
26. Dr. A. K. Shukla  
27. Shri S. P. Saxena  
28. Shri S. P. Sharma  
29. Shri P. Nandakumar

.. Chief Scientist

.. Geological Oceanography Division

.. N. G. A. T. Hyderabad

.. Jadavpur University Calcutta

.. PRL, Ahmedabad

.. Indian Meteorological Department
1. J. F. Ancao
   - Captain
2. Anup Banerjee
   - Chief Officer
3. Babey
   - Second Officer
4. A. K. Mehta
   - Third Officer
5. J. E. Coutinho
   - Fourth Officer
6. K. B. Bras
   - Chief Engineer
7. S. S. Singh
   - Second Engineer
8. R. K. Taiwar
   - Third Engineer
9. R. C. Mouli
   - Fourth Engineer
10. P. P. D'Souza
    - Chief Radio Officer
11. K. B. Das
    - Radio Officer
12. Dr. S. K. Roy
    - Medical Officer
The sixteenth cruise of RV SAGAR KULESH started from
Karimgar on 6th June, 1985 and carried out surveys for 45
days with a port call at Port Louis, Mauritius for 2 days
and returned to Karimgar on 23rd July, 1985. The main
objectives of the cruise were (i) to study the various under
pheneomena of monsoon (ii) exploration for hydrothermal
deposits in the inverted 'Y' junction (iii) surveys for
polymetallic nodules.

In all, 18 lines of magnetics, gravity and bathymetry and 3
stations for coring, beam trawling and dredging operations were
covered.

INTRODUCTION

This cruise was initially for full 65 days all the inverted
'Y' junction are for conducting geophysical and geological
surveys for exploration of hydrothermal deposits and study of
the pattern of spreading in relation to mineralization in the
full equipment was not available it was cut short to 4 days
and remaining part was planned for the ongoing survey programme
for polymetallic nodules. As the cruise was planned for June - July
Ind was interested to collect the meteorological data during the
onset of monsoon in the N. Arabian Sea, Somali Basin.

In the process of collecting the data for the above purposes
the vessel has crossed C. R. ridge, Somali Basin, Arabian Basin,
Chinn Ridge, Error Seamount, Madagascar Basin, Inverted 'Y'
Junction and Central Indian Ocean Basin.
... Sediment Core Operations were carried out, two of which three were successful. Of them one is in the graben and two in the GLO. The graben cores had associated mounds on top.

Dredging was carried out at the Triple Junction, after the identification of the rift valley the chain leg dredge was operated at four places among which one operation was successful. It brought pillow lava basalts with hydrothermal encrustations and volcanic glass coatings. core was also carried out in shallow areas for recovering cobble rich nodules at two locations.

Sediment grab samples were operated in six locations in the Central Indian Ocean.

Heatflow equipment brought by RMK scientists was operated once in Somali Basin and once in Madagascar Basin. They were unsuccessful the problem being the water entering the probe.

The status of equipment at the end of the cruise is given alongwith the recommendations.

After the first phase of the cruise Sagar Kanya has touched Mauritius for first time since she was acquired by India. On her maiden visit, the High Commissioner of India at Mauritius Shri Pram Singh and other officials from the same office have visited the ship.
POSITION FIXING

In this cruise position fixing...a done by RX 1107 Satellite receives integrated with INS, RX 1107 system as well as Satellite Navigation with Integrated Navigation System.

RX 1107 Satellite receiver tracks the Satellites and when are acquired it receives the data doppler counts on two different frequencies i.e. 150 Hz & 400 Hz. These doppler counts are stored in the memory and calculations are done as per the present programme and the position is displayed on the terminal screen.

Satellite data doppler count data sent simultaneously to INS and as per the preset programme and the position is displayed on the terminal screen.

Satellite data doppler count data sent simultaneously to INS and as per the preset programme Integrated Navigation System compares the phase differences between the data of both the frequencies and displays the accurate satellite fix position, updated or not depending upon criteria like elevation etc. Between two satellite fixes position is obtained by dead reckoning.
Bathymetric survey was carried on a Honeywell Mid-\nmediumbeam echosounder with 12 kHz frequency throughout \nthe cruise and in nearshore shallow water echosounder was \nused. Based on the depth data, after corrections bathymetric \nprofiles along the cruise track were plotted. Bathymetric \nsurvey started from Madagasca via Somalia Basin where it \ncrossed a seamount (15°20' N and 70°01' E) in which water \ndepth changes from 3739 mts to 1987 mts, then it crossed latter \nseamount (10°18' N and 58°51' E) where water depth changes from \n4500 mts to 340 mts followed by by chain Ridge (5°43' N and \n56°31' E) in where the depth ranges from 415 mts to 7750 mts and \npasses near by Seychelles Group of Islands (3°04' S and 51°45' E) \nat 6190 mts water depth.

From seamount was operated and reached Mauritius. From \nMauritius it crossed triple junction (Central Indian Ridge) \nwhere detailed bathymetric survey was carried for three lines in \nwhich a rift valley was identified and there depositing was carried \nout for hydrothermal sulfides. The topographic arrangement in \ntriple junction is rough where water depth ranges from 1794 mts. \nto 5493 mts with an average depth around 2900 mts.

In Central Indian Ocean topography is not very rough where water depth ranges from 4100 mts to 5500 mts with an \naverage depth around 5500 mts.

Variable sediment penetration is noticed from few metres to 100 mts.
Magnetics

The total intensity of Earth's magnetic field data was collected along the tracks shown in Figure 1 using a 3.801/3 marine proton precession magnetometer. The sensor was towed by a suitable low noise cable to a distance of about 350 meters behind the ship in order to avoid the magnetic effect due to the ship. The data were recorded on graphic recorder as well as on magnetic tape.

Approximately 10,100 km magnetic data were collected along the tracks from Hornaguao to Port Louis & back with three parallel profiles perpendicular to Central Indian Ridge at the interval of 20 km. of length 350 km each.

The total earth's magnetic field values decreased along the track from Hornaguao to Port Louis and a gradual increase from Port Louis to Hornaguao was observed. A high magnetic anomaly at the ridge axis is observed with alternate low & high on either side of ridge axis. This may be due to normal & reversed magnetization. The data is under processing to find out the seafloor spreading rate & other parameters across the ridge.

Gravity

The relative variation of Earth's gravity field data were also collected along part of the shown track using Kees-30 Boodenseewerk gravimeter. Due to failure of gravity meter the data could not be collected all along the tracks. A total of 11,261 km Earth's gravity field data were collected during the cruise.

The free air gravity anomaly reflects an integration of topography to some extent. But across the Central Indian Ridge it follows the topography. The Bouguer anomaly shows minimum at the ridge axis. This may be the fact that material under the crest is less dense than under the flanks.
Dredging has been carried out by chain bag dredge and box dredge in all 8 stations with depths ranging from 3318 to 5176 m from different areas. At station No. 167 chain bag dredging was done in the rift valley of the inverted Y junction (triangle junction) of the Mid Indian Ocean Ridge (d=3318 m) where the recovery was full consisting of volcanic rocks with encrustations. At station nos. 168, 169 & 170 no sample could be recovered. At st. No. 171 in the C10 Basin a box dredge was tried and found nodules as well as encrustations. Again a chain bag dredge was tried in a seamount towards upslope to recover slabs and pavements. Box dredge was tried at st. No. 173 & 174 but could recover encrustations only at the earlier station and nothing was found in the latter.

A gravity box core of 6 m length was operated at 3 stations from different areas. First stn. No. 164 was operated in the Somali Basin and collected a core of length 4.9 m. The sediment is mainly a calcareous ooze and the depth at which it is collected was 4832 m. At st. nos. 166 & 175 no sample was recovered. The core liner was found bent partially at station nos. 164 & 165. At st. no. 178 and 133, 3 m and 2.2 m cores of length 3.75 & 4.6 m, respectively, were recovered. The sediment is pelagic clay and nodules were found buried upto 14 in these cores. No core could be recovered at st. no. 184 even after trying twice.
3. **BOOMERANG GRABS**

Boomerang grabs were operated at 6 stations with five free fall grabs without cameras and two with cameras. In all 30 freefall grabs and twelve photogrammers were operated, such that at each station only two cameras were operated, one black and white and the other colour. At stations 172 and 182 the distribution of nodules was found to be uniform with an average of 3 kg/m² whereas at st. no. 177, nodules were irregularly distributed ranging from nil to 23.13 kg/m². Abundance was found to be very high at st. no. 179 with an average of 10 kg/m², whereas it was found to be low at station no. 181.

4. **PHOTO SLEDGE**

Photosledge was operated at a single station (no. 183). Camera fixed to the sledge is of Model 277 of Denthos.

The sledge was operated manually with triggering weights attached as there was no programming facility for this model. In all 10 snaps were shot manually hauling up and lowering the sledge continuously. But no photo could be obtained due to the damaged condition of the cable, and triggering weights were also lost.
Meteorology:

It was proposed to collect and observe the sea conditions over Arabian Sea & Indian Ocean during the advance of SW monsoon over India.

The data consists of 8 surface observations & two upper air soundings per day during onward phase upto Mauritius. During return phase, only one upper air sounding per day and 8 surface observations / day.

Total no. of surface observations were 370 and upper air soundings were 51 during the entire cruise.

Due to the 'Interphase' problem of the 'Data Logger' with Navigation Computer / SRS Computer the print out of Meteorological data could not obtained.
LOSS REPORT

In this cruise the losses at sea are as follows:

1) During the sta. 161 a photoboomerang did not surface. A thorough search was made for extra two hours.

2) Along with the above freefall grab, an underwater photoboomerang camera and a radiomarker was also lost.

3) During the Photoelodge operation at sta. 165 two triggering weights were lost which seems to have cut off during operations.

4) At 3 station the box core liners were bent during operations. This attributed to the compact clays observed in these areas.
### SUMMARY OF OBSERVATIONS

1. Lathemetry - 14,014 km
2. Magnetics - 10,055.5 km
3. Gravity - 11,261.5 km
4. Boomerang grabs - 30 operations
5. Photo boomerang grab - 12
6. Dredge - 8
7. Box corer - 6
8. Upper Air soundings - 51 observations
9. Surface observations - 370
10. Photo sledge - 1 stn
11. Heat flow - 2 stn