SERVICING AND DEPLOYMENT OF DATA BUOYS IN BAY OF BENGAL

CRUISE REPORT

ORV SAGAR KANYA SK - 135
(SECOND LEG)

JUNE 3 TO JUNE 13, 1998

CHENNAI to CHENNAI

NATIONAL DATA BUOY PROGRAMME
NATIONAL INSTITUTE OF OCEAN TECHNOLOGY
CHENNAI
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1. CRUISE SUMMARY

The Sagar Kanya cruise 135 (second leg) was conducted to service existing data buoys and to deploy new data buoys in Bay of Bengal. Further to carry out Hydrosweep survey on a grid of 4 x 10 miles off Chennai. Ship sailed off from Chennai on 3rd June 98 and returned back on 13th June 98 after cruising distance of 1473 nautical miles. During this cruise servicing of two deep water data buoys (DS5 & DS3) were accomplished using a Gemini craft. A data buoy of Seawatch type (SW7) was deployed within Vizag port at Lat 17° 41.34’N  Long 83° 19.43’E in the presence of Vizag port officials. A data buoy of Wavescan type was deployed at Lat 17° 59.6’N  Long 88° 04.94’S (DS4 new location) in deep waters of Bay of Bengal. The data buoy at DS4 (old station) which got damaged had been inspected. As the data buoy could not be retrieved due to bad weather conditions prevailed in that region. This buoy had been provided with a marker flag indicating that the property belongs to Department of Ocean Development, Government of India.
2. LIST OF PARTICIPANTS

National Institute Of Ocean Technology, Chennai.

1. Mr. R. Venkatesan Chief Scientist
2. Mr. T. Sudhakar
3. Mr. V. Gowthaman
4. Mr. D. Sivakumar
5. Mr. Inge Saetereng M/s. Oceanor, Norway
6. Mr. Torger Johnsen M/s. Oceanor, Norway
7. Mr. K. Bharathan Scientific Hand M/s Tradex India Chennai
8. Mr. K. Nasim Basha Scientific Hand M/s Tradex India Chennai

NORINCO
9. Mr. K.M. Jaikrishnan
10. Mr. Kantak Mangirish
11. Mr. P. Bhooopathy
12. Mr. Jagadish Negali
13. Mr. K. Madhusudan.

Ship’s Compliment
1. Capt. R.M. Verma Master
2. Mr. A.S. Kundargi Chief Officer
3. Mr. P.S. Madhavan 2 Officer
4. Mr. U. Gurayya AKWO
5. Mr. V.K. John Gudala Jr. Off
6. Mr. G.R. Kamat Radio Officer
7. Dr. A.K. Malar Mani Medical Officer
8. Mr. R.G.S. D’Silva Purser Officer
9. Mr. Vinay Kumar Chief Engineer Officer
10. Mr. A.K. Neigi 2 EO
11. Mr. A.K. Tejan 4 EO
12. Mr. D.K. Moitra A4 EO
13. Mr. J.C. Sharma Electrical Officer
14. Mr. P.S. Dhillon Electrical Officer
15. Mr. M.F. Rodrigues Catering Officer
16. Mr. N.V. Moorty Deck Sarang

NIOT team at shore station, Chennai.

Mr. K. Premkumar Programme Director, NDBP
Dr. Y. R. Rao
Mr. K. Santanam
Mr. M. Ravichandran
Mr. R. Vaithiyathan
3. OBJECTIVES OF THE CRUISE

The main objectives of this cruise are:

- Servicing of two deep water data buoys (DS3 & DS5).
- Deployment of one shallow water data buoy off Vizag (SW7)
- Deployment of one deep water data buoy (DS4 new station)
- Retrieval of damaged buoy at DS4 (old station)
- Hydrosweep survey off Chennai

4. CRUISE SCHEDULE

<table>
<thead>
<tr>
<th>DAY</th>
<th>TIME (HRS)</th>
<th>EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 June 98</td>
<td>16.00</td>
<td>Boarding of participants</td>
</tr>
<tr>
<td>3 June 98</td>
<td>15.30</td>
<td>Departure from Chennai</td>
</tr>
<tr>
<td>5 June 98</td>
<td>05:30 to 12:00</td>
<td>Servicing of data buoy DS 5</td>
</tr>
<tr>
<td>6 June 98</td>
<td>09:30</td>
<td>Deployment of data buoy SW 7</td>
</tr>
<tr>
<td>7 June 98</td>
<td>13:30 to 14:58</td>
<td>Deployment of data buoy DS 4 (New) location</td>
</tr>
<tr>
<td>8 June 98</td>
<td>05:30</td>
<td>Arrival at data buoy DS4 (old) location;</td>
</tr>
<tr>
<td>8 June 98</td>
<td>09:30</td>
<td>Due to adverse weather condition buoy can not be taken on board the ship. The buoy central cylinder is closed and is marked. Retrieval operation is abandoned on the advise of The Master.</td>
</tr>
<tr>
<td>10 June 98</td>
<td>14:00</td>
<td>Arrival at data buoy location DS3. Bad weather and rain prevailed. Not-advisable to service buoy and lower Gemini craft. Decided to wait until 11th for a fair weather</td>
</tr>
<tr>
<td>11 June 98</td>
<td>05:30 to 12:20</td>
<td>Servicing of data buoy at DS 3 location</td>
</tr>
<tr>
<td>13 June 98</td>
<td>20:00</td>
<td>Arrival at Chennai port.</td>
</tr>
</tbody>
</table>

5 HYDROSWEEP SURVEY OFF CHENNAI

On 3rd June 98 the Hydrosweep survey was carried out on a grid of 4 x 10 miles off Chennai. Survey area is: Lat 13° 18' N Long 80° 30' E to Lat 13° 22' N Long 80° 40' E as shown in the Fig 2. As the GPS was not tracking, there was no input of GPS data to INS system. Also link could not be established between INS system to Hydrosweep system. So position was manually marked for every 15 minutes on the hard copy.
Date of survey: 3rd June 98

<table>
<thead>
<tr>
<th>Line no</th>
<th>Time GMT</th>
<th>Latitude N</th>
<th>Longitude E</th>
<th>Time GMT</th>
<th>Latitude N</th>
<th>Longitude E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1</td>
<td>13:25</td>
<td>13° 18'</td>
<td>80° 30'</td>
<td>14:30</td>
<td>13° 18'</td>
<td>80° 40'</td>
</tr>
<tr>
<td>Line 2</td>
<td>14:40</td>
<td>13° 19'</td>
<td>80° 40'</td>
<td>15:44</td>
<td>13° 19'</td>
<td>80° 30'</td>
</tr>
<tr>
<td>Line 3</td>
<td>16:03</td>
<td>13° 20'</td>
<td>80° 29.9'</td>
<td>17:10</td>
<td>13° 20'</td>
<td>80° 40'</td>
</tr>
<tr>
<td>Line 4</td>
<td>17:25</td>
<td>13° 21'</td>
<td>80° 40'</td>
<td>18:35</td>
<td>13° 21'</td>
<td>80° 30'</td>
</tr>
<tr>
<td>Line 5</td>
<td>18:45</td>
<td>13° 22'</td>
<td>80° 30'</td>
<td>19:55</td>
<td>13° 22'</td>
<td>80° 40'</td>
</tr>
</tbody>
</table>

6. PREPARATIONS OF DATA BUOY

The preliminary testing of buoys was carried out at NIOT Chennai. Sensors were tested for the correct functionality. Delicate sensors like MRU were removed from the buoy and safely transported to the ship. All the exposed metal parts of the buoy and sensor assembly were painted with anti fouling paint and metallic parts of the buoy were fitted with sacrificial anodes against corrosion.

6.1 Setting up of Field Station

A field station was set up on board the ship in multipurpose wet lab on the starboard side of the main deck, to communicate with the buoy while testing the assembly and to receive initial set of data from the moored buoy after the deployment at the location. This field station comprises of a modem with power module, a PC with necessary software and an Inmarsat antenna fitted on the balcony deck. Buoy software and data transmission from the buoy to shore station at Chennai was also established.

6.2 Buoy Configuration

Wavescan buoy

The Wavescan buoy has a discus shaped hull and a keel with a counter weight mounted under the hull to prevent capsizing of the buoy. The Wavescan buoy has a diameter of 2.76 metres and a total height of 6.15 metres weighing 994 kg, when assembled with its mast and keel. The central cylinder of the buoy contains all electronics modules, power package and the wave sensor (MRU 6). The buoy is equipped with a mast to support the meteorological sensors and INMARSAT and GPS antenna. Four solar panels are mounted on top of the buoy to charge the lead acid batteries.
Seawatch buoy

The Seawatch buoy is a vertically stabilized buoy, mounted on a transparent framework surrounding the central buoyancy. Seawatch buoy has a diameter of 1.75m and a total height of 8.2 metres weighing 604 Kg. For wave measurements this buoy uses vector output from MRU-6 sensor. The buoy is equipped with meteorological and oceanographic sensors to measure wind speed and direction, air and water temperature, air pressure, wave parameters, currents, and conductivity. The buoyant body is a divenycell coated with PVC and on the upper body 6 solar panels are mounted. These solar panels charge lead acid batteries. The buoy is also equipped with two lithium batteries as back up power source. It has a Global Positioning System fitted inside the INMARSAT-C transceiver and a beacon light to mark its position during night time.

The communication with the above mentioned buoys is a two way link based on INMARSAT-C satellite system.

Sensors

The details of sensors mounted on the buoys deployed are shown in the table below.

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>RANGE</th>
<th>ACCURACY</th>
<th>MODEL/MAKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave height and direction</td>
<td>± 20 m, 0 - 360°</td>
<td>± 10 cm, ± 5°</td>
<td>MRU-6/ SEATEX</td>
</tr>
<tr>
<td>Wind Speed and direction</td>
<td>0-60 m/s, 0- 360°</td>
<td>1.5% FS, ± 3.6°</td>
<td>1453S2/ Lambrecht</td>
</tr>
<tr>
<td>Air Pressure</td>
<td>800-1100 hPa</td>
<td>± 0.1 hPa</td>
<td>PTB - 200 A/ Vaisala</td>
</tr>
<tr>
<td>Air Temperature</td>
<td>10 - 50°C</td>
<td>± 0.1° C</td>
<td>Omega Eng. ON-905-5036</td>
</tr>
<tr>
<td>Current Speed</td>
<td>0 - 300, cm/s</td>
<td>± 5 mm/s</td>
<td>NE Sensortec UCM-60</td>
</tr>
<tr>
<td>Current direction</td>
<td>0 - 360°</td>
<td>± 2°</td>
<td>NE Sensortec UCM-60</td>
</tr>
<tr>
<td>Water temperature</td>
<td>-5°C to 45°C</td>
<td>± 0.1°C</td>
<td>NE Sensortec UCM-60</td>
</tr>
<tr>
<td>Conductivity</td>
<td>2- 77 m mho/cm</td>
<td>± 0.06 mmho/cm</td>
<td>NE Sensortec UCM-60</td>
</tr>
</tbody>
</table>

7. DATA BUOY SERVICING AND DEPLOYMENT

7.1 Servicing of Wavescan buoy DS5 (Off Machilipatnam)

The Wavescan buoy deployed on 4th September 97 had to be replaced by a new buoy for routine maintenance. This buoy had been transmitting data to shore station at three hours interval. This new buoy was assembled and tested on board prior to its deployment. On 5th June early morning, the weather was favourable. Wind speed was about 10 knots and wind direction was southerly. When we approached the moored buoy we could observe radar signals from Aluminium mast at a distance of 4.7 miles away. As it is not possible to connect the buoy directly from ship. Gemini craft was used. Then Gemini craft was lowered in the leeward side of ship. After three attempts, ship could connect the buoy to
winch line. The buoy was lifted on board the ship and a surface float assembly was attached to mooring system and was dropped into water. Later new buoy was lowered from ship and was towed by the Gemini craft to mooring location. An arrangement is made such that Wavescan buoy can be connected to mooring and surface float can be disconnected from the mooring system. After confirming the position of the buoy and its transmission, the ship sailed for next station SW7. The mooring configuration is shown in Fig. 3.

It is observed that after 275 days, no barnacle growth was observed and scattered growth of shells were seen on the buoy hull, keel and current meter. However shell growth inside conductivity cell had affected conductivity data. The zinc anodes fitted on to the buoy hull and keel had been dissolved. Pitting or crevice corrosion was not seen on any metallic part immersed in water. The five surface retrieval floats had been lost at sea.

In this method of replacing the buoy, during handling the mooring system, the ship gets drifted away easily by wind due to huge ship structure. This leads to sudden increase in tension on the mooring system and handling the buoy becomes unsafe and risky.

7.2 Deployment of Seawatch buoy SW 7 (Off Vizag)

The SEA WATCH buoy and mooring assembly was kept ready on board. The sensors on the buoy had been tested. The buoy and mooring assembly was lifted with mid-ship ATLAS crane and NMF crane of the ship The SEAWATCH buoy off Vizag was deployed on 6th June 98 at the location Lat 17° 41.3’N ; Long 83° 19.43’E at 18 metres depth. The deployment was witnessed by the Deputy Port Conservator along with Port officials and press personnel from Tug ‘Swatantra’ The mooring configuration used in this location are shown in Fig.4.

7.3 Deployment of Wavescan buoy DS 4 (New station)

The Wavescan retrieved from DS5 was cleaned and serviced and all sensors are tested on board the ship. On 7th June, the WAVESCAN buoy was deployed at the location Lat 17° 59.6’N Long 88° 04.94’S (DS4 new) at 2200 m depth. The anchor last method was adopted for the deployment of mooring system. The mooring configuration is shown in Fig.5.

7.4 Retrieval of Wavescan buoy DS 4 (Old station)

The Wavescan data buoy deployed off Paradip at location Lat 19° 00’N Long 88° 60’ E stopped transmission of data to shore station from 15.3.98. Upon reaching the site it is observed that Wavescan buoy did not have upper mast and sensors attached to antenna carrier arm and solar panels. The central cylinder was empty and was filled with water. We could see entanglement of fishing net onto the mooring system. Also a whale was seen in the vicinity of the buoy. Sea was rough and strong wind and currents were observed. The Gemini Craft was lowered to connect data buoy to winch line of the ship.
In the first attempt due to strong wind and heavy currents the retrieval line from the ship got snapped. There was a small mishap in which one of the boat person got injured in the leg. In the second attempt the ship got drifted away and retrieval line passed between propellers which was cut away. As the wind speed was increasing and sea was getting more and more rough, the Master had recommended to abandon the operation as it was unsafe to continue the work. We waited for one hour expecting some change in the weather. We had marked the buoy with a flag and a radar reflector and the central cylinder was covered with a wooden lid.

7.5 Servicing of Wavescan buoy DS3

After sailing a distance of 390 miles ship reached buoy site at DS 3 on 10th June 98 at 14:30 hrs. As the sea was rough and the buoy could not be located easily The wind speed was approximately 30 knots. It was not safe to lower the Gemini craft. After a while buoy could be located and found in position The ship moved 10 nautical miles away from buoy position and decided to wait for fair weather condition.

On 11th June at 05 30 hrs the weather had improved and replacement work of existing buoy was initiated. The procedure adopted at DS5 was followed and new buoy was moored successfully. The mooring configuration is shown in Fig 6. The disconnecting operation of WAVESCAN buoy was a tough job. As the ship got drifted by wind, high tension was observed during handling. For all these operation ship should respond quickly for proper maneuvering. When the mooring line is on board and there is risk of rope chaffing the ship or cutting the propellers and may lead to personal injury on board the ship.

The retrieved buoy had scattered shell growth and conductivity cell was covered with shells. The five retrieval surface floats attached to the buoy had been lost.

8. PERFORMANCE OF EQUIPMENT ON BOARD SAGAR KANYA

The following equipment were used during the cruise and their performance is indicated below.
1. Hydrosweep system: During the Hydrosweep survey, GPS was not tracking and there was no link from INS to Hydrosweep system.
2. Deep sea Winch: Deep sea winch used extensively for mooring operations. Performance was satisfactory. Tension meter is not showing correct reading. Like other deck machineries deep sea winch operation should be done by SCI personnel which was earlier practice. Aluminium drum attachment for deep sea winch should be tested for its rated capacity.
3. Deck equipment: Atlas cranes, Jib-boom, NMF crane etc. worked satisfactorily. Hydraulic oil leakage from these cranes should be rectified.
9. RECOMMENDATIONS

1. A Weather station should be working in all cruises. This will be a useful data for the scientific purpose and navigation.
2. Aluminium drum for deep sea winch should be tested for its rated capacity.
3. Tension meter for deep sea winch should be repaired

10. ACKNOWLEDGEMENT

We thank the Department of Ocean Development, New Delhi for providing ship time on ORV Sagar Kanya. We express our thanks to Dr. Pandey Director, Antarctic Study Centre and Dr. M. Sudhakar, Programme Manager, Sagar Kanya Ship Cell., for coordinating the cruise. Our sincere thanks to Capt. R.M. Verma, the officers and crew of ORV Sagar Kanya for their cooperation throughout the cruise and their sincere effort in helping us to complete task even in unfavourable weather conditions. We thank M/s Tradex for having provided Mr. Bharathan and Mr. Basha who had handled Gemini Craft skillfully. We greatly acknowledge the timely help of Coast Guard (Eastern region) by providing the Gemini craft and Out-Board Motor with out which data buoys could not have been retrieved and redeployed at deep water stations. We are also thankful to NORINCO staff for their cooperation during deck operations.

We express our sincere thanks to Prof. M. Ravindran Executive Director NIOT and Mr K Premkumar Programme Director for entrusting this task. We are also thankful to all NDBP colleagues at NIOT for helping us at various stages for the successful completion of the cruise.
Fig 2. Map of Hydrosweep survey area
Fig-3 Mooring Configuration for Data Buoy at- DS-5
Fig. 4 Mooring Configuration for Data Buoy at SW-7
Fig-5  Mooring Configuration For Data Buoy At- DS4
Fig-6  Mooring Configuration for Data Buoy at- DS-3
Retrieval of Buoy using Gemini Craft
Detachment of Wavescan Buoy from Deep Sea Mooring and connecting a surface float assembly to Mooring System
Surface Float Assembly in Sea
Deployment of New Data Buoy and connecting new Wavescan Buoy to mooring System
Deployment of Data Buoy at Vizag port SW7
Deployed Data Buoy (SW 7) being witnessed by Vizag Port officials.