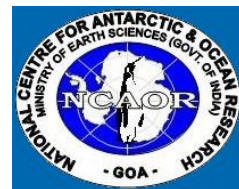
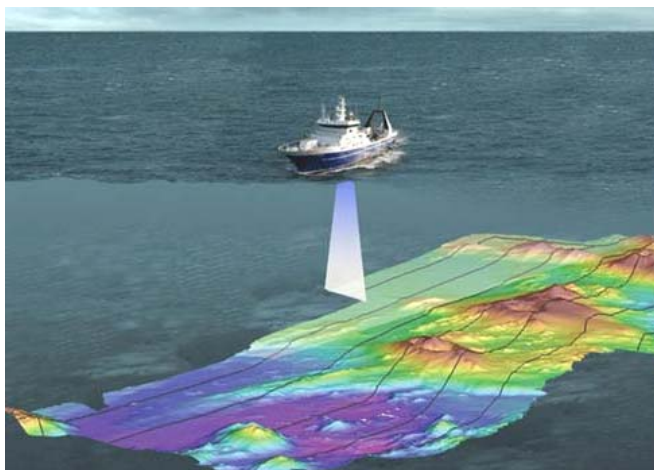


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# CRUISE REPORT

## O.R.V. SAGAR KANYA CRUISE – 262

(August 25<sup>th</sup>, 2009 to September 15<sup>th</sup>, 2009)



**NATIONAL CENTRE FOR ANTARCTIC AND OCEAN RESEARCH  
(MINISTRY OF EARTH SCIENCES),  
HEADLAND SADA, GOA 403 804.**

## CONTENTS

<b>1.</b>	<b>Preview</b>	<b>01</b>
<b>2.</b>	<b>Introduction</b>	<b>03</b>
<b>3.</b>	<b>Objectives</b>	<b>04</b>
<b>4.</b>	<b>Participants</b>	<b>04</b>
<b>5.</b>	<b>Cruise Itinerary</b>	<b>04</b>
<b>6.</b>	<b>Equipment Used/ Operated</b>	<b>05</b>
<b>7.</b>	<b>Parameter Measured</b>	<b>05</b>
<b>8.</b>	<b>Data Statistics</b>	<b>06</b>
<b>9.</b>	<b>Preliminary Results</b>	<b>07</b>
<b>10.</b>	<b>Performance of the Equipments &amp; Ship</b>	<b>08</b>
<b>11.</b>	<b>Recommendations</b>	<b>10</b>
<b>12.</b>	<b>Acknowledgements</b>	<b>11</b>
	<b>Annexure – I (Figures)</b>	<b>12</b>
	<b>Annexure – II (Tables)</b>	<b>15</b>

## 1. Preview

Scientist boarded O.R.V. Sagar Kanya on 21<sup>st</sup> August 2009 in Chennai port after completing embarkation formalities. Due to catering union strike onboard, sailing was delayed till 25<sup>th</sup> August 2009. Pilot arrived onboard on 25<sup>th</sup> August 2009 at 0800 hrs and vessel sailed at 0930 hrs. The main objective of the cruise was to collect bathymetric data using multibeam system and other physical parameters. Underway equipments onboard like Seabeam 3012, Sub Bottom Profiler, Acoustic Doppler Current Profiler (ADCP), Thermo-salinograph, Automatic Weather Station (AWS), Single beam Echosounder were switched on for acquisition of data after crossing 500 m depth contour. Also Seabeam CTD, Sound Velocity Profiler (SVP), Sea Surface Temperature with bucket thermometer and Sea Surface Salinity using Autosal are measured in one degree interval.

Onward ship track was along 13°N latitude from Chennai to survey block area near to west of Andaman region. Without loosing ship time Seabird CTD operated in one degree interval in top 1000 m. On 28<sup>th</sup> August 2009, vessel arrived survey area. The beginning co-ordinates of first survey line (line-01) was from 13°30'N, 90°01.2'E to 11°15'N, 89°36.6'E and the co-ordinate of the fourteen survey line (line-14) was from 13°30'N, 89°22.2'E to 11°15'N, 88°57.6'E. In total fourteen survey lines are completed. Each survey line was 135 nautical mile and line spacing was 3 nautical mile interval to get at least 25% overlapping. Survey line-15 and line-16 each of 60 nautical mile and 30 nautical mile completed during returned journey. Apart from multibeam survey, SVP operated in survey block to provide sound velocity profile to Seabeam 3012. There are some possibilities of data gaps in survey block north of 13°N due to shallow depth and less swath for which five horizontal survey lines are completed with line spacing of 2 nautical mile interval. Each horizontal survey line was ~35 nautical mile to ~40 nautical mile. Bathymetric data was missing due to multibeam error from survey line-01 to survey line-02. Three

survey lines repeated each of 60 nautical mile due to data gaps. In total 1,980 nautical mile surveys conducted covering area ~19,000 Square Kilometer. To keep the arrival scheduled at Chennai port on 15<sup>th</sup> September 2009, the ship started its return journey along 12°N latitude on 12<sup>th</sup> September 2009. Seabird CTD operated in one degree interval in top 1000 m in quick manner.

The sea condition was very rough with heavy winds throughout the survey period. The time spend during SK-262 cruise includes various types of data collection, rectifying Seabeam 3012 system during surveys period due to instrumental execution error as well as DTM plotting errors on NaviPack online system. Initially surface sound velocity sensor was not detected by the Seabeam 3012 system hence data was not recorded in few nautical miles of surveys which was later rectified. In future to conduct multibeam surveys geophysical scientist are highly required to do proper surveys. The multibeam bathymetric data collected during SK-262 cruise was the additional contribution to the Exclusive Economic Zone (EEZ) project for compiling the total bathymetric chart of entire EEZ of India. The bathymetric data, underway and other physical parameters collected during SK-262 cruise was satisfactory. This cruise forms a part of the Ministry of Earth Sciences programme.

## 2. Introduction

India, with a coastline of about 6000 km, has an area of about  $2 \times 10^6$  Square Kilometer under its Exclusive Economic Zone (EEZ). The EEZ extends to 200 nautical miles (2 million Square Kilometer) offshore from the coastline where the coastal state has the rights for exploration and exploitation of the living and non-living resources and protection of the environment. The study of the seafloor morphology is essential and would not only provide information for academic purposes but also for navigation and engineering. The main output of the program will be the comprehensive bathymetric map of the EEZ of India.

Keeping the above views various bathymetric surveys are conducted in Indian territories. The present SK-262 cruise also form a part of the above programme. Scientist boarded O.R.V. Sagar kanya on 21<sup>st</sup> August 2009 after completing all the embarkation formalities. The vessel sailed from Chennai on 25<sup>th</sup> August 2009 at 0930 hrs due to catering strike. The bathymetric multibeam survey block area selected near to west of Andaman region. Understanding the importance of ship time attempt was made to collect various parameters. Underway equipments were switch on crossing 500 m depth contour for data collection. Seabeam 3012 was used for bathymetric survey in deep water Bay of Bengal region. Sea was very rough throughout the survey period. The survey block was selected in continuation with early cruise onboard R.V. Akademik Boris Petrov (ABP-019). Working of Seabeam 3012 system was satisfactory although there was system hanging and DTM plotting problem. The objectives of this cruise and the performance of the equipment are given below. This cruise form part of the EEZ programme.

### 3. Objectives

- Multibeam bathymetric survey.
- Underway data collection along ship track.
- CTD operation during onward and returned ship track.

### 4. Participants

#### Scientific component

- |    |   |       |
|----|---|-------|
| 1. | Dr. S. M. Pednekar, <b>Chief Scientist,</b> | NCAOR |
| 2. | Dr. M. V. Ramesh, Deputy Chief Scientist    | NCAOR |
| 3. | Mr. Vijay G. Parmar, Shipboard Assistance   | NCAOR |

#### Non-Scientific component

- |    |                             |         |
|----|-----------------------------|---------|
| 1. | Mr. K. Madhusudan,          | NORINCO |
| 2. | Mr. A.C. Luis,              | NORINCO |
| 3. | Mr. Narayanan Dhanasekaran, | NORINCO |
| 4. | Mr. P. Paul Raigon,         | NORINCO |

### 5. Cruise Itinerary

Embarkation onboard at Chennai on August 21<sup>st</sup>, 2009

Departure : August 25<sup>th</sup>, 2009

Arrival : September 15<sup>th</sup>, 2009

Disembarkation from vessel at Chennai on September 16<sup>th</sup>, 2009

## **6. Equipment Used/Operated**

1. Seabeam – 3012 multibeam
2. Atlas Echo Sounder single beam
3. Sub Bottom Profiler
4. CTD winch
5. Seabird CTD
6. Seabird CTD with Rosette
7. ADCP
8. Thermo-Salinograph
9. AWS
10. Bucket thermometer
11. Autosal

## **7. Parameter Measured**

1. Depth using multibeam eco-sounder
2. Depth using single beam eco-sounder
3. Sub Bottom profile
4. Sound Velocity profile
5. Temperature profile
6. Salinity profile
7. Sea surface temperature
8. Sea surface salinity using Autosal
9. Surface currents using ADCP
10. Meteorological parameters using AWS
11. Surface water samples

## 8. Data Statistics

**Multibeam Survey using Seabeam 3012:** On 28<sup>th</sup> August 2009, vessel arrived survey block area near to west of Andaman region. The details survey track lines are shown in **Figure 1a** and with more resolution survey lines are shown in **Figure 1b**. The beginning co-ordinates of the first survey line (line-01) was 13°30'N, 90°01.2'E and the co-ordinate of the end of the survey line was 11°15'N, 89°36.6'E. The co-ordinate of the fourteen survey line (line-14) was from 13°30'N, 89°22.2'E to 11°15'N, 88°57.6'E. The co-ordinates of each survey lines are given in **Table 1**. In total sixteen survey lines are completed out of which survey line-1 to survey line-14 each was 135 nautical mile with line spacing of 3 nautical mile. Survey line-15 and line-16 each of 60 nautical mile and 30 nautical mile completed during returned journey. Sound velocity Profiler (SVP) operated in survey block area to provide sound velocity profile to Seabeam 3012. The locations of the SVP operations are given in **Table 2**. In total 1,980 nautical mile of surveys completed covering survey block area of ~19,000 Square Kilometer. The DTM of the survey area obtained using raw bathymetric multibeam data is shown in **Figure 2**. There are some possibilities of data gaps in survey block north of 13°N due to shallow depth and less swath. Five horizontal survey lines are completed each of ~35 to ~40 nautical mile with line spacing of 2 nautical mile. Also found missing data from of survey line-01 and survey line-02 for which three survey lines each of 60 nautical mile are repeated from line-01 and line-02 due to data gaps (please refer Figure 1b). The raw bathymetric data collected during SK-262 cruise will be processed by expert multibeam group at NCAOR laboratory to obtain final map of the survey region.

**Atlas Sub Bottom Profiler:** To understand the characteristics of the bottom, underway sub Bottom profiler operated along the ship track and survey area.



**Physical Parameters:** The ocean dynamics in the Bay of Bengal would be understood using temperature and salinity profiles along 13°N and 12°N latitude. Seabird CTD operated in one degree interval in top 1000 m without loosing ship time (**Table 3**). The raw data will be processed in laboratory to understand the ocean circulation in the Bay of Bengal. Other parameters such as underway surface temperature, surface salinity, and surface currents would be supporting the study.

## **9. Preliminary Results**

Bathymetric raw data have been collected using Seabeam 3012 multibeam system onboard ORV Sagar kanya. The total of survey lines including extra lines are 2,360 nautical mile. The total survey area covered during SK-262 cruise was ~19,000 Square Kilometers. The raw multibeam data collected will be processed by the multibeam expert at NCAOR laboratory to produce the final map of the survey region. DTM plot of raw data shows Small River like morphological features.

## 10. Performance of the Equipments & Ship

Seabeam - 3012 operation: Unix work station for Seabeam 3012 system was not booting initial stage for switching on traducer and receiver. We tried to rectify the problem to execute the Hydrostar online software. Executing Hydrostar online software not displaying the various windows required on monitor at a time. The various windows are displayed manually on monitor to monitor swath as well other parameters of the Seabeam 3012 multibeam system. Initially surface sound velocity sensor was not detected by the online Hydrostar for which surface sound velocity data was not recorded in the output files. DTM on NavPack online was not displaying online survey line map. During bathymetric survey the Hydrostar online system hanging frequently and needs to restart the system. This caused missing swath bathymetric data and to repeat survey. Overall working of Seabeam 3012 multibeam system was satisfactory.

Atlas Single Beam echo sounder operation: Single beam echo-sounder operated continuously from Chennai along the ship track except few data gaps. The system performance is fine.

Atlas Sub Bottom Profiler: Sub Bottom Profiler was switch on after crossing 500 m contour. The performance of the equipments throughout the ship track was very good. The acquisition of underway data along the ship track provided the information on morphological features and characteristics of sediments.

Sound Velocity Profiler (SVP) operation: Initially SVP could not record data due to discharged of battery after operation. Replacing the battery SVP operated and data was recorded for two operations. Same problem occurred for fourth operations and data was not recorded. Overall performance of the SVP was not good for which sound velocity using CTD was calculated. SVP required servicing from the manufacturer.

CTD winch operation: Initially winch was operational but during one station hydraulic pipe got damaged. This was replaced and made winch operational satisfactory.

SeaBird CTD operation: Sea-Bird CTD was operated in one degree interval along onward and returned ship track upto 1000 m water depth. The data was collected during downcast and upcast was satisfactory in all the CTD stations.

Seabird CTD with Rosette: Seabird CTD tested for auto fired module using 24 bottles. Initially the bottle could not be closed because of setting made in the programmed. This was later tested satisfactory closing of the niskin bottles in different depth.

ADCP operation: ADCP was switch on crossing 500 m depth contour. It was functional during cruise period and current measured satisfactory.

AUTOSAL operation: The salinity from the conductivity sensor of onboard Sea-Bird CTD was calibrated with water samples collected at selected standard water depth and salinity estimated with the help of onboard Autosal. Few samples was used to calibrate the salinity obtained using CTD with Autosal. Autosal was working satisfactory.

Thermo-salinograph operation: Initially Thermo-salinograph pump was not working properly which was made functional and satisfactory. Water pump of Thermo-salinograph required servicing.

Automatic Weather Station operation: Automatic Weather Station does not work properly due to sensors problems. Some of the sensors required replacement and more over the existing system is land based AWS station

and not marine based. The present AWS station does not have direct input for GPS recording.

In general, the shipboard machinery and equipments onboard worked satisfactorily with less effort. The performance of the ship was good as far as scientific operations are concerned however there are some recommendations made if useful to make it more better-quality.

## **11. Recommendations**

- Marine based Automatic Weather Station required. The present AWS does not have GPS input and some sensors are not working.
- Proper fumigation is required to get rid of bed bugs in scientific cabins and cockroaches in scientific cabins, mess room and kitchen etc.
- Found expired preservative food on dining table. Catering staff should check the expiry dates before providing preservative food to the Scientists and Officers.
- Fungus infected vegetable made from cauliflower served which was required to be disposed off. When inspected vegetable cold storage room found many vegetables infected by fungus together with good vegetables. It is required to clean cold storage room periodically removing spoiled and fungus infected vegetables to protect good ones.
- Master of the vessel should act immediate on any complain given by the chief scientist either in scientific or non scientific issue rather than neglecting it.

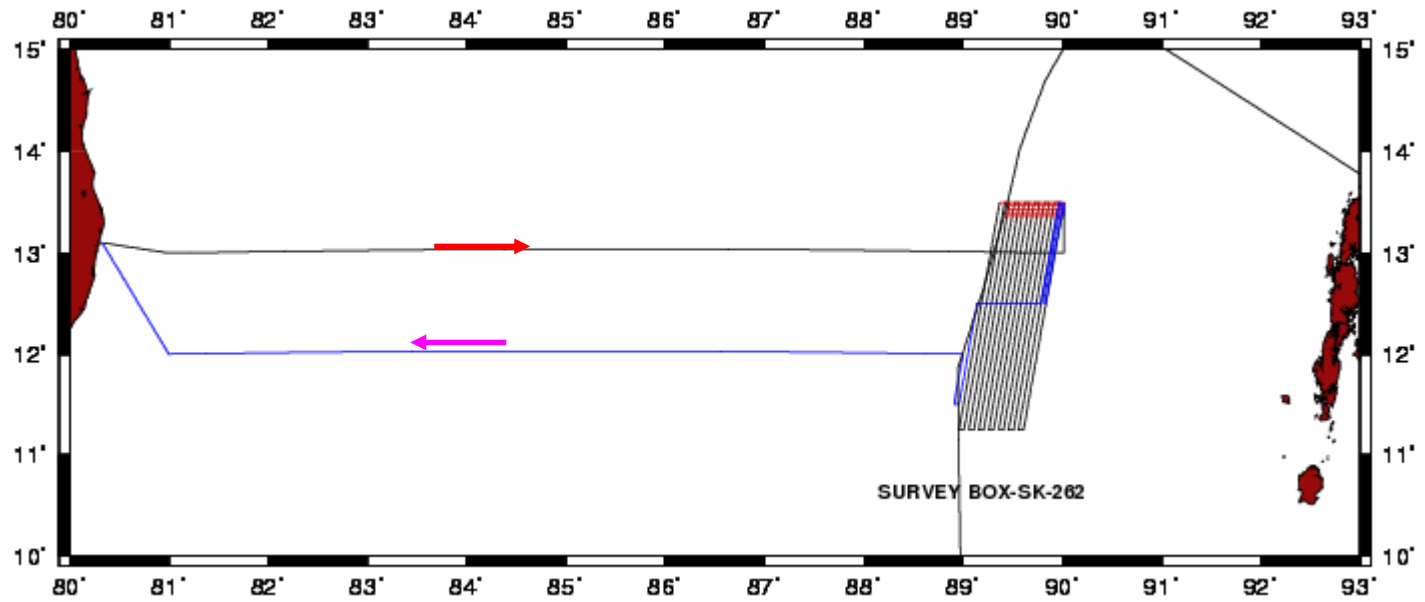
## **12. Acknowledgements**

Master, Chief Engineer, Chief Officer, all the other officers as well as the entire shipboard personnel from deck, engine and catering departments co operated very well to make this cruise a great success. The chief scientist and the entire team record their appreciation for this co operation.

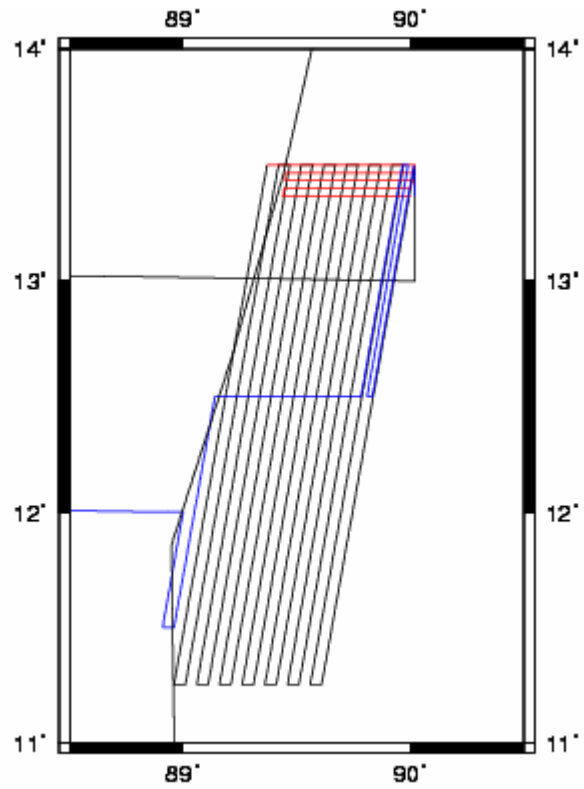
Similarly, the NORINCO Engineers extends their technical support whenever required.

The constant encouragement by the Director, NCAOR, and the excellent logistical support extended by ship cell and team is greatly acknowledged.

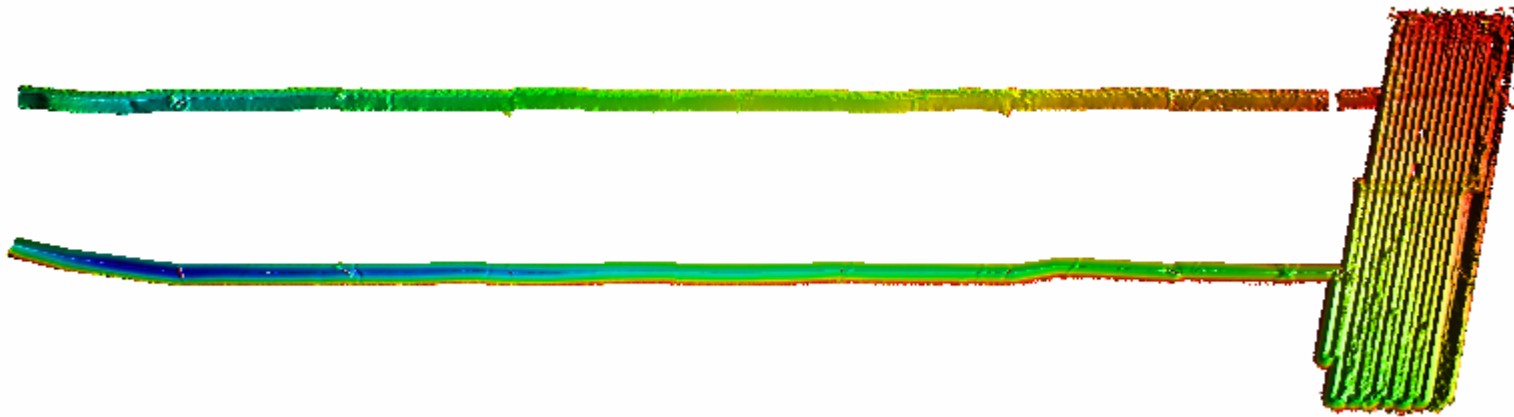
## Annexure – I



*Fig. 1a. Shows ship track during SK-262.*



*Fig. 1b. Shows the zoom up of survey lines west of Andaman region.*



*Fig. 2. DTM map of multibeam swath bathymetry (raw data) along ship track during SK-262.*



## Annexure – II

**Table 1: Detail co-ordinates of each survey lines**

*Below are given north-south survey tracks co-ordinates.*

TRACK-1:	90°01.2'E	13°30.0'N	(N-S)
	89°36.6'E	11°15.0'N	
TRACK-2:	89°58.2'E	13°30.0'N	(S-N)
	89°33.6'E	11°15.0'N	
TRACK-3:	89°55.2'E	13°30.0'N	(N-S)
	89°30.6'E	11°15.0'N	
TRACK-4:	89°52.2'E	13°30.0'N	(S-N)
	89°27.6'E	11°15.0'N	
TRACK-5:	89°49.2'E	13°30.0'N	(N-S)
	89°24.6'E	11°15.0'N	
TRACK-6:	89°46.2'E	13°30.0'N	(S-N)
	89°21.6'E	11°15.0'N	
TRACK-7:	89°43.2'E	13°30.0'N	(N-S)
	89°18.6'E	11°15.0'N	
TRACK-8:	89°40.2'E	13°30.0'N	(S-N)
	89°15.6'E	11°15.0'N	
TRACK-9:	89°37.2'E	13°30.0'N	(N-S)
	89°12.6'E	11°15.0'N	
TRACK-10:	89°34.2'E	13°30.0'N	(S-N)
	89°09.6'E	11°15.0'N	
TRACK-11:	89°31.2'E	13°30.0'N	(N-S)
	89°06.6'E	11°15.0'N	
TRACK-12:	89°28.2'E	13°30.0'N	(S-N)
	89°03.6'E	11°15.0'N	
TRACK-13:	89°25.2'E	13°30.0'N	(N-S)
	89°00.6'E	11°15.0'N	
TRACK-14:	89°22.2'E	13°30.0'N	(S-N)
	88°57.6'E	11°15.0'N	
TRACK-15:	89°08.4'E	12°30.0'N	(N-S)
	88°57.6'E	11°30.0'N	
TRACK-16:	89°00.0'E	12°00.0'N	(S-N)
	88°54.6'E	11°30.0'N	

*Below are given east-west survey tracks co-ordinates.*

TRACK-1:	89°22.2'E	13°30.0'N	(E-W)
	90°01.2'E	13°30.0'N	
TRACK-2:	90°00.6'E	13°28.0'N	(W-E)
	89°27.0'E	13°28.0'N	
TRACK-3:	89°27.0'E	13°26.0'N	(E-W)
	90°00.5'E	13°26.0'N	
TRACK-4:	89°26.8'E	13°24.0'N	(W-E)
	90°00.0'E	13°24.0'N	
TRACK-5:	89°26.4'E	13°22.0'N	(E-W)
	90°01.2'E	13°22.0'N	

*Below are given repeat north-south survey tracks co-ordinates.*

TRACK-1:	90°01.2'E	13°22.0'N	(S-N)
	90°01.0'E	13°30.0'N	
TRACK-2:	90°01.0'E	13°30.0'N	(N-S)
	89°50.0'E	12°30.0'N	
TRACK-3:	89°59.5'E	13°30.0'N	(S-N)
	89°48.6'E	12°30.0'N	
TRACK-4:	89°58.0'E	13°30.0'N	(N-S)
	89°47.0'E	12°30.0'N	
TRACK-5:	89°47.0'E	12°30.0'N	(E-W)
	89°08.4'E	12°30.0'N	

**Table 2: SVP Operations in Survey Block**

<b>SVP stations</b>					
<b>Sr. No.</b>	<b>Date</b>	<b>Time</b>	<b>Latitude (N)</b>	<b>Longitude (E)</b>	<b>Profile Depth</b>
1	28/08/09	0400	13 30	90 01 00	1000
2	29/08/09	0630	12 00	89 45 80	1000
3	05/09/09	0900	11 15	89 12 30	1000
4	09/09/09	2030	13 30	89 22 00	1000

**Table 3: CTD Operations during onward and return journey**

<b>CTD stations</b>					
<b>Sr. No.</b>	<b>Date</b>	<b>Time</b>	<b>Latitude (N)</b>	<b>Longitude (E)</b>	<b>Profile Depth</b>
1	25/08/09	0900	13 00	81 00	1000
2	26/08/09	1300	13 00	82 00	1000
3	26/08/09	1945	13 00	83 00	1000
4	26/08/09	1300	13 00	84 00	1000
5	26/08/09	2030	13 00	85 00	1000
6	27/08/09	0730	13 00	86 00	1000
7	27/08/09	1600	13 00	87 00	1000
8	27/08/09	2000	13 00	88 00	1000
9	28/08/09	1400	13 00	89 00	1000
10	28/08/09	1030	13 00	90 00	1000
11	29/08/09	0630	12 00	89 45	1000
12	05/09/09	0900	11 15	89 12	1000
13	09/09/09	2030	13 30	89 22	1000
14	12/09/09	1200	12 00	89 00	1000
15	12/09/09	2000	12 00	88 00	1000
16	13/09/09	0400	12 00	87 00	1000
17	13/09/09	1100	12 00	86 00	1000
18	13/09/09	1800	12 00	85 00	1000
19	14/09/09	0100	12 00	84 00	1000
20	14/09/09	0750	12 00	83 00	1000
21	14/09/09	1630	12 00	82 00	1000
22	14/09/09	2300	12 10	81 00	1000