

CRUISE REPORT

ORV SAGAR KANYA SK-230

December 2006

DEPLOYMENT OF TSUNAMI BUOYS IN BAY OF BENGAL



**NATIONAL DATA BUOY PROGRAMME
NATIONAL INSTITUTE OF OCEAN TECHNOLOGY
CHENNAI**

ORV SAGAR KANYA CRUISE REPORT SK-230

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1. CRUISE SUMMARY

The Sagar Kanya cruise SK-230 was performed to establish Deep Ocean Tsunami Detection system around Andaman region off Bay of Bengal. Deployment of new Tsunami buoys in identified locations and to service the old tsunami buoys have been carried out. A non-transmitting data buoy at DS3 location has also been retrieved.

2. OBJECTIVES OF THE CRUISE

The main objectives of the cruise are:

- Deployment of one new Tsunami buoy system at TB8 location
- Servicing of three Tsunami buoys at TB5, TB4 and TB6 locations.
- Retrieval of data buoy at DS3 location

3. LIST OF PARTICIPANTS

Participants List: First Leg (Chennai to Portblair)

Period: 6-12 Dec. 2006

Mr. K.Premkumar, Chief Scientist
Mr. Tata Sudhakar
Mr. P.SelvaKumar
Mr. M.Arul Muthiah
Mr. P. Ramesh
Mr. J.A Irudayaraj
Mr. M.A Prabhakar
Mr. Solaiappan Alwar

Mr. Calore Daniele, Envirtech
Mr. Adami Mario, Envirtech
Mr. Nagraj Kanniah, Engr.Sofftel
Mr. D.Rajan, Engr. Sofftel
Mr. R.D. Yashawi, Engr. Sofftel

Participants List : Second Leg:(Portblair to Chennai)

Period : 13-21st Dec. 2006

Mr. K.Premkumar ; Chief Scientist
Mr. P.SelvaKumar
Mr. M. Saravanan
Mr. M.Arul Muthiah
Mr. P. Ramesh
Mr. M.A Prabhakar
Mr. Soliappan Alwar
Mr. J.A Irudayaraj

Mr. Stig Lyng, Engr Fugro Oceanor

4. DIARY OF EVENTS

Date	Activities	Remarks
5.12.06	Ship arrived Chennai harbour. Master of Sagar Kanya was briefed about the cruise activities about 1900 hrs by Chief Scientist and handed over him the cruise track plan.	It has been noted that the CTD winch is the only equipment currently available for controlled lowering of the BPR with the support of LARS crane. For buoy deployments the two Atlas crane have been considered adequate.
6.12.06	Six trucks with cruise materials arrived at 0415 hrs before the Chennai harbour gate. The ship agent could get necessary Port and custom clearance in the late evening and the materials could reach the ship around 2130 hrs. The materials loaded to the ship uptill 2400 hrs.	
7.12.06	The ship left Chennai harbour around 0700 hrs.	There was a LSA drill onboard and all participants of the cruise were present for it. The participants have been informed about the EVAC system onboard and cautioned of any inadvertent misuse of it. The team onboard analyzed the handling and rigging arrangements for the BPR and it was found that the CTD winch and LARS crane need to be used in tandem at first instance to lower the BPR and then when the BPR is sea borne the load need to be smoothly transferred to CTD winch for the latter to carry out the controlled lowering. The first Envirtech surface system and the BPR was put on dry test. The data communication was confirmed by the NIOT shore station.
8.12.06	Deployment of Tsunami buoy location at TB8 (Lat.12° 30' N Long. 085° 30' E)	Detailed report separately covered in this report.
9.12.06	Ship left from TB8 location to next station TB5	Detailed report separately covered in this report.

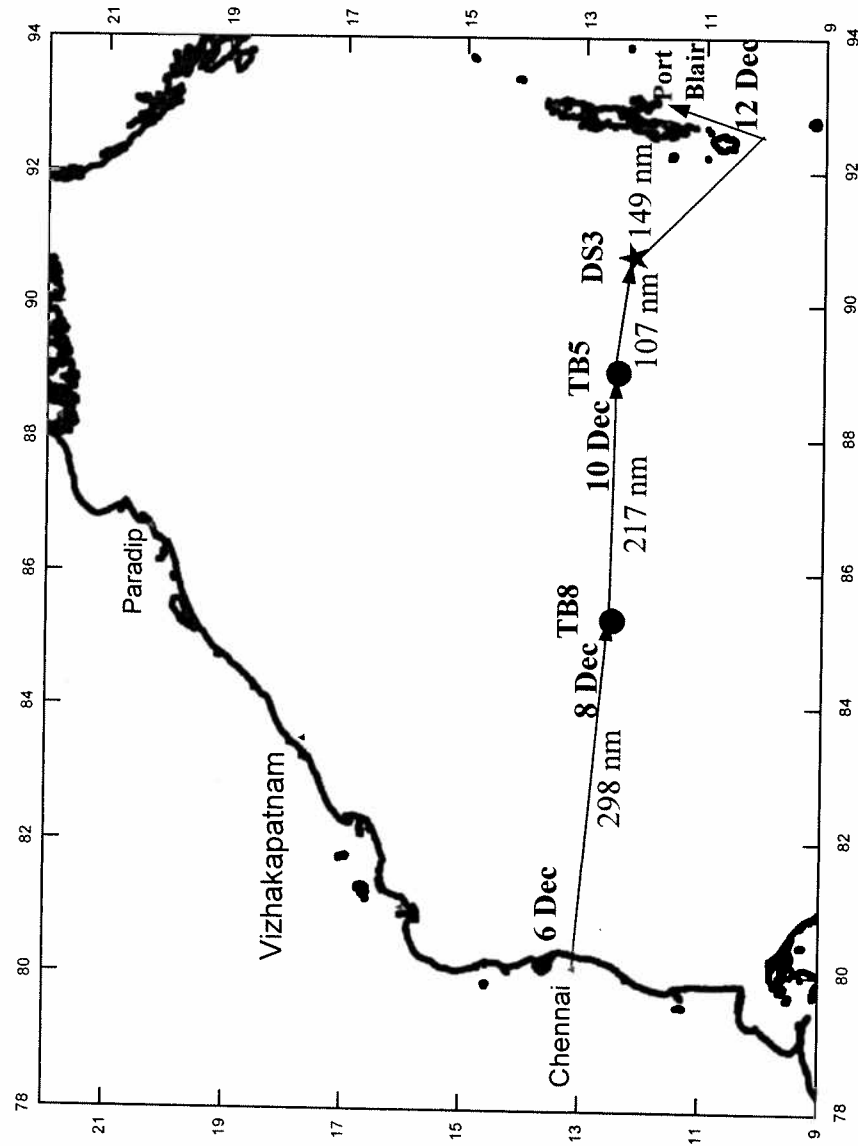
Date	Activities	Remarks
10.12.06	Ship arrived at TB5 location around 0700 hrs. The existing buoy retrieved and after servicing the same, it has been reconnected to the existing mooring. After completion of TB5 activities the ship sailed towards the data buoy location DS3.	
11.12.06	Reached buoy site DS3 and existing data buoy retrieved as it was stopped.	
12.12.06	As per plan the ship arrived Port Blair and 6 officials disembarked.	
13.12.06	Some essential materials for 2 nd cruise and two new team members joined at Port Blair. The ship sailed off from Port Blair around 1700 hrs.	
14.12.06	Ship sailed towards TB4 Tsunami buoy location.	The updated cruise track for subsequent 2 nd leg cruise plan handed over to Master of Sagar Kanya.
15.12.06	Hovering around TB4 buoy location	
16.12.06	As not much progress at the location TB4, decided to leave towards TB5 site.	The ship safety committee meeting was attended by the Chief Scientist.
17.12.06	The ship arrived to location TB5. The buoy was recovered and red floats added to the mooring.	Due to paucity of time, decided to move to site TB6 and it has been decided that during the voyage time to attend to the defects of the retrieved TB5 surface buoy.
18.12.06	Ship arrived TB6 location. The buoy from its mooring retrieved and newly tested buoy deployed. The BPR retrieved and our attempt to re-deploy it after its status verification was not successful as ship handling facility were not adequate for Tsunami buoy system and BPR deployment. It has been decided to come back to Chennai	
19.12.06 to 21.12.06	Sailing towards Chennai	
21.12.06	Ship reached Chennai.	

NATIONAL DATA BUOY PROGRAMME

(National Institute of Ocean Technology, Ministry of Earth Sciences, Govt. of India.)

5 Cruise track for Tsunami Buoy Deployment- 6th to 12th Dec 2006

(Part I- Chennai to Port Blair)



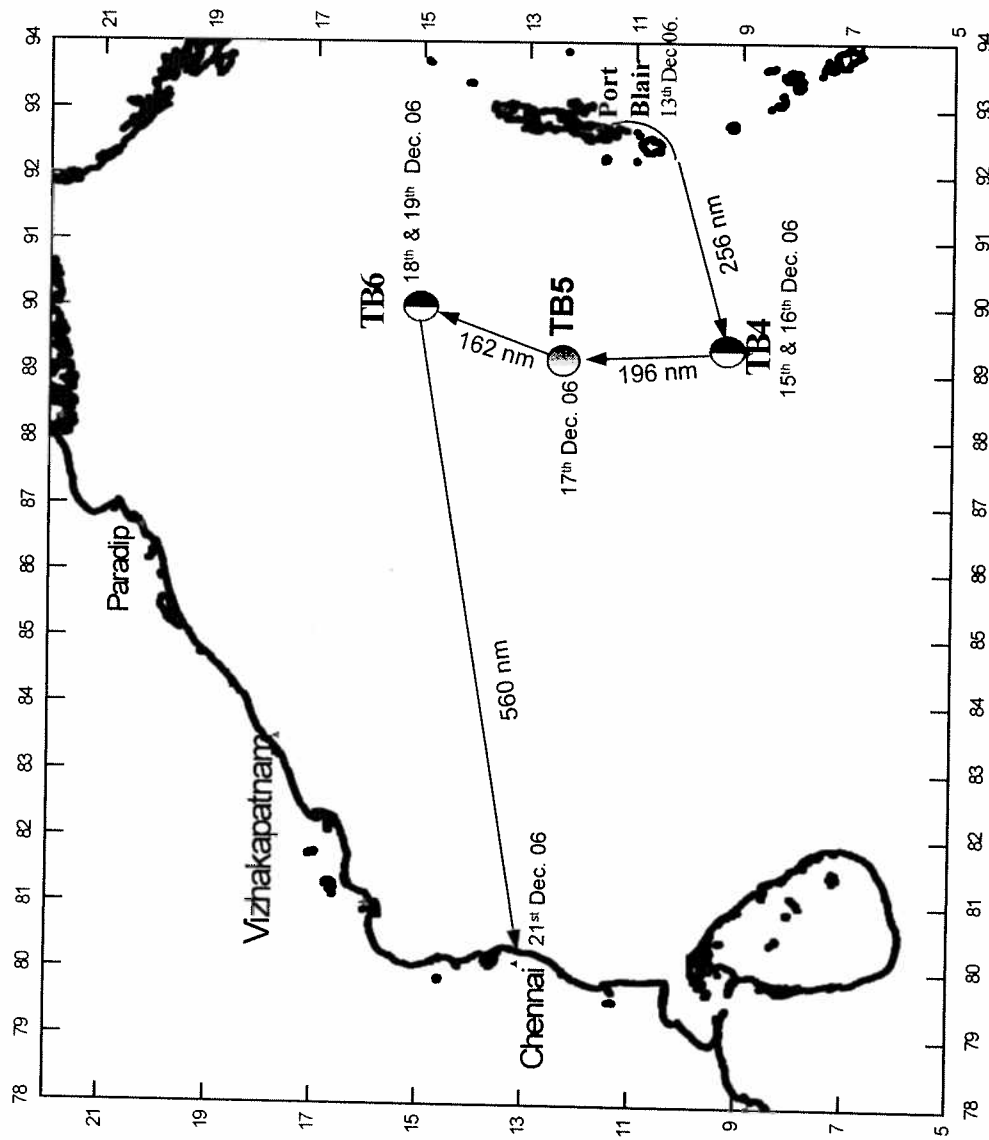
BUOY ID	LAT(° N)	LONG(° E)	Depth(m)
TB5	12° 30' 00"	89° 00' 00"	3300
TB8	12° 30' 00"	85° 18' 00"	3275
DS3	12° 11' 20"	90° 43' 34"	3156

NATIONAL DATA BUOY PROGRAMME

(National Institute of Ocean Technology, Ministry of Earth Sciences, Govt. of India.)

5 Cruise track for Buoy Deployment – from 13th to 21st Dec 2006

Part II - Port Blair to Chennai



BUOY ID	LATITUDE (° N)	LONGITUDE (° E)	Depth (m)
TB4	09°15' 03"	89°22' 01"	3500
TB5	12° 26' 01"	89° 00' 04"	3300
TB6	15° 00' 13"	90° 03' 37"	2800

6. PREPARATION OF TSUNAMI BUOY SYSTEM

Four numbers of Tsunami Surface Buoys; two numbers of Bottom Pressure Recorder and two numbers of data buoys along with mooring systems were transported from Chennai to the ship through trucks. The preliminary testing of buoys was carried out at NIOT Chennai. Tsunami systems were tested for the correct functionality.

For transport convenience the buoys were transported in semi assembled condition. Due to lack of space in the main deck the two shallow water buoys were kept in the front side of the ship.

All the exposed metal parts of the buoy and sensor assembly were painted with two coats of metal primer over that one coat of self-polishing anti fouling paint. 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 multi purpose wet lab on the star board side of the main deck, to communicate with the buoy while testing the assembly and to receive initial set of data from the buoy. This field station also enables us to communicate with shore station for ground support as well us to update configuration files. This field station comprises of a modem with power module, a PC with necessary software and an Inmarsat antenna fitted on the balloon deck. Buoy software and data transmission from the buoy to shore station at Chennai was also established.

6.2 TSUNAMI SYTEM CONFIGURATION

6.2.1 SURFACE BUOY

The Tsunami Surface Buoy has a discus shaped hull and a keel weight made of long pipe mounted under the hull to prevent capsizing of the buoy. The deep-water buoy has a diameter of 2.2 meters and a total height of 6.15 meters weighing about 900 Kg, when assembled with its mast and keel. The central cylinder of the buoy contains all electronic modules, power package and the wave sensor. The buoy is equipped with a mast to support the Inmarsat antenna and Beacon. Four solar panels are mounted top the buoy to charge the lead acid batteries. The buoys are also fitted with a latest ventilation system to prevent any hydrogen gas accumulation inside the cylinder.

7. Deployment activities at TB8 station

The team onboard analyzed the handling and rigging arrangement for the BPR and it was found that the CTD winch and LARS crane need to be used in tandem at first instance to lower the BPR and then when the BPR sea borne the load need to be smoothly transferred to CTD winch for the latter to carry out the controlled lowering. The surface system and the BPR were put on dry test. The data communication confirmed by the NIOT shore station The ship slowed down due to one SW pump failure The Ship engineers were quick enough to bring the stand by pump into action and the ship picked up her speed.

The team started their activities at 06:30 hrs. on 8th December 2006. Shore station reconfirmed the data communication from the system under test at 07:30 hrs. Master has been briefed at 09: 15 hrs about the specific activities at location TB8 (Lat 12° 30' N & Long 085° 30' E) and the requirement of position keeping. Around 15: 15 hrs the ship has been positioned at the intended site. The surface buoy installation began around 15:30 hrs. The Anchor drop was done around 17:30 hrs. The BPR deployment as planned on 07 Dec was started at 18:00 hrs. The LARS held the BPR weight through a PP rope used for the buoy mooring and the forward end of it assembled through subsurface floats connected to the CTD winch eye. An acoustic release was introduced between the CTD winch rope eye and the BPR mooring free end. The BPR system was lowered upto 1500m and the acoustic release has been activated around 19:30 hrs.

The CTD rope was retrieved around 21:00 hrs. Norinco Engineers were cooperative in operating the CTD winch smoothly as per our demand. To check the acoustic connectivity with the BPR the available test Deck surface acoustic modem was used. As the ship was in DP mode and it was above the BPR the acoustic connectivity could not be established. The ship has been advised to drift away from that location and by 22:00 hrs the link found. NIOT shore station confirmed the data reception.

The first DEEP OCEAN TSUNAMI BUOY SYSTEM for our country and as well to our neighborhoods has been achieved, India is the only country next to USA could understand and implement the Tsunami buoy technology successfully.

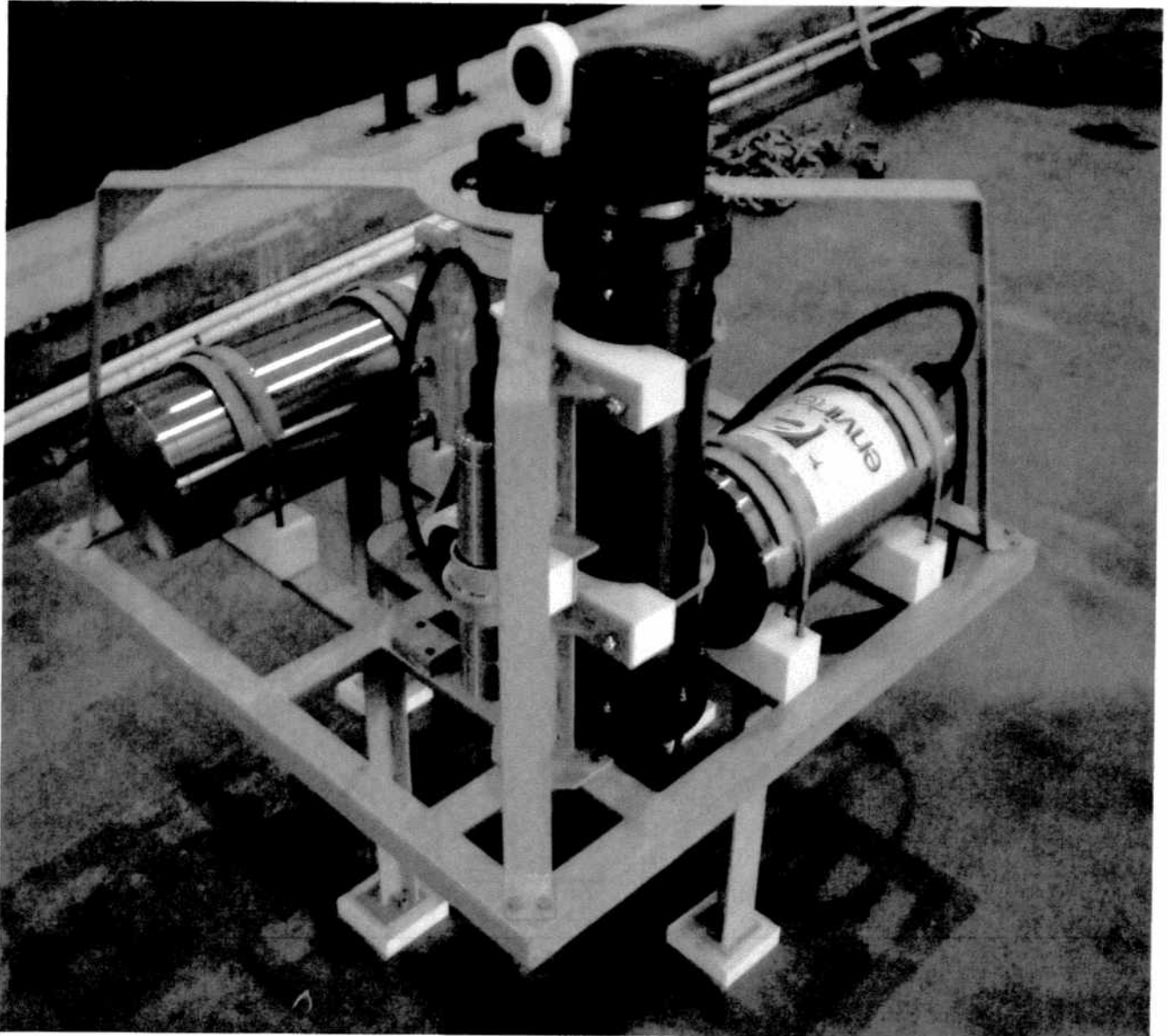
The ship was retained at station TB8 for data validation and confirmation from shore station. Around 06:30 hrs on 9th December 2007, the data reception has been confirmed by NIOT shore Station.

The data quality has been subsequently validated against a USA system and INCOIS confirmed its close correlation. For our country, establishment of a deep ocean Tsunami system of its own is a major milestone in the advancement of her Ocean Technology.

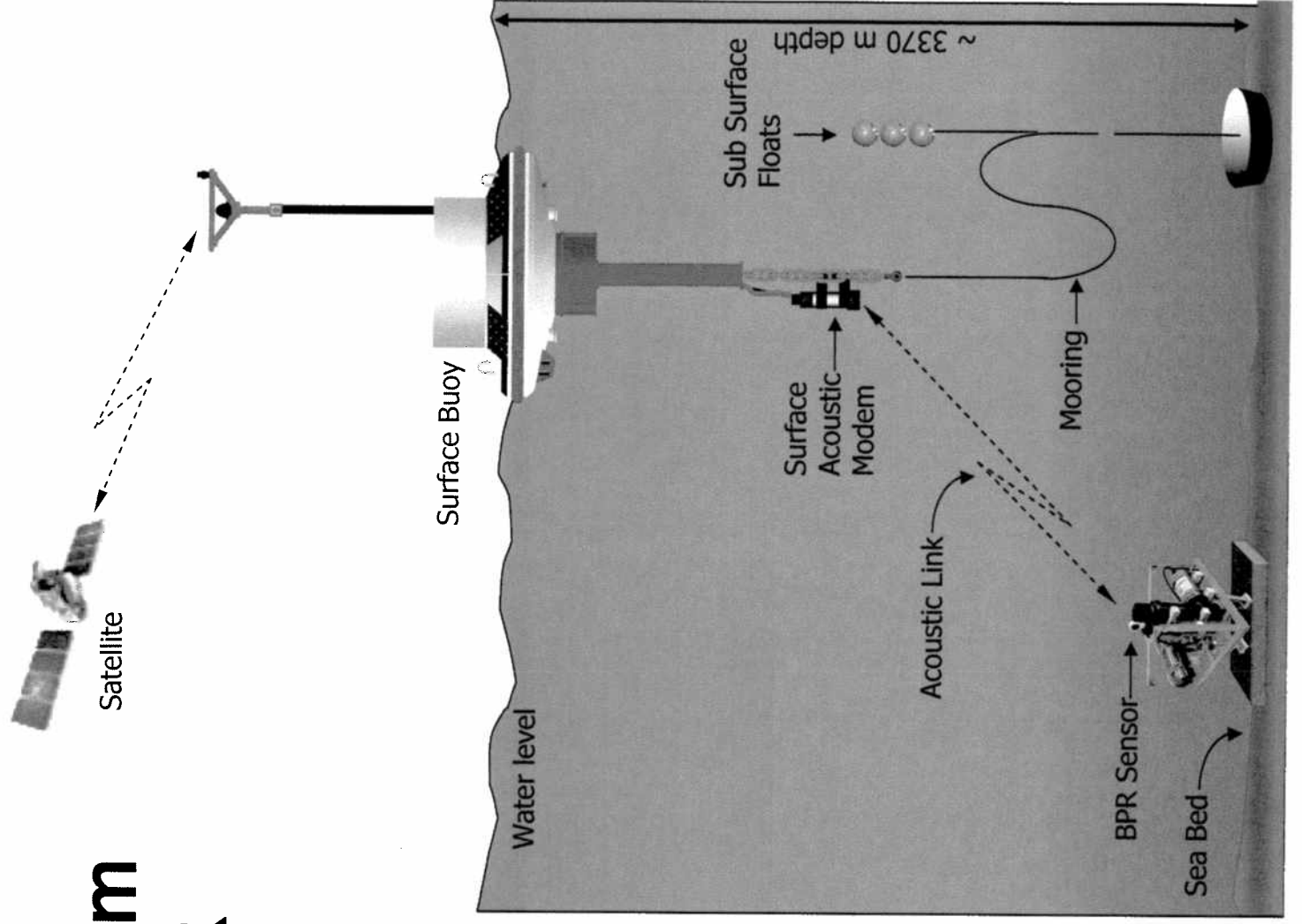
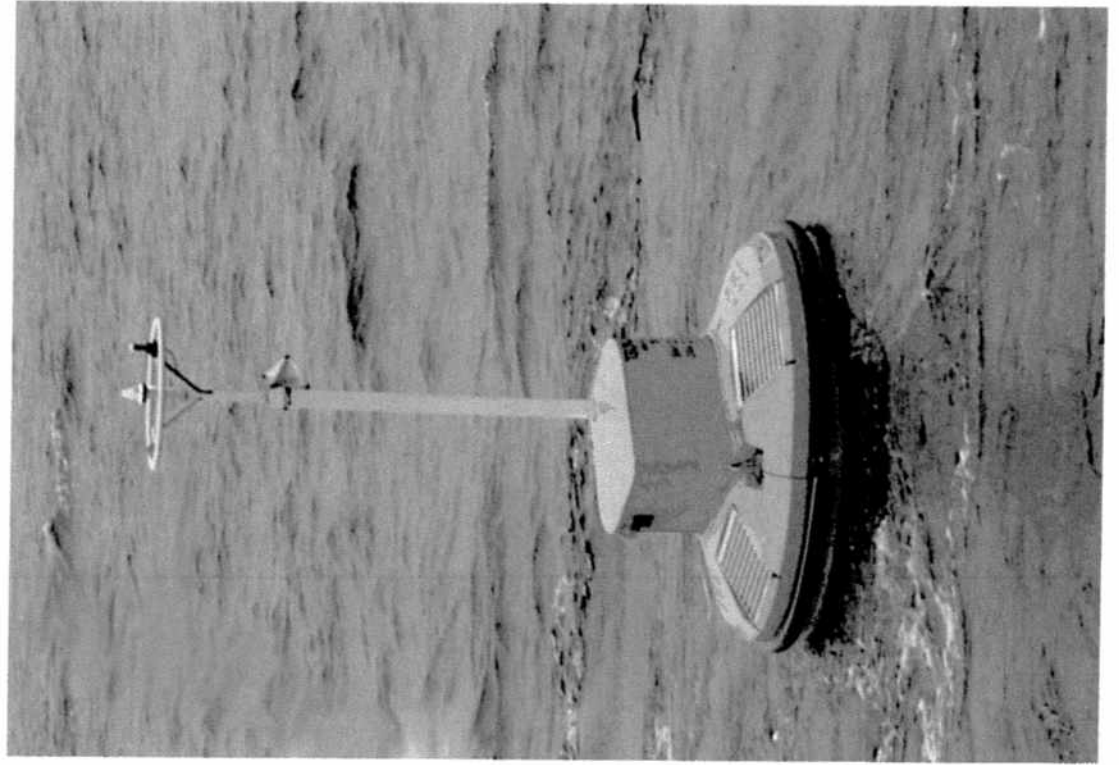
The ship has been advised around 06:45 hrs to proceed to TB5 station. The sea was rough and the sea state found to be seven. The surface buoy system to be deployed has been assembled and tested. The Buoy mooring arranged ready for deployment. Dry test of the Surface modem with buoy system through a bottom acoustic unit performed and data reception at NIOT got confirmed.



BPR from **envirtech**, Italy



Tsunami Buoy System With Envirotech BPR



8. Deployment activities at TB5 station

Ship arrived at the TB5 buoy location (Lat:12° 26.01'N & Long 089° 00.04'E) around 07:00hrs. on 10th December 2006 Gemini craft lowered to guide the ship to bring the buoy closer to her by using her capstan. The buoy at this location was retrieved and Red floats added to the mooring. On retrieval of the buoy, it was noticed that the cable connecting the surface modem was cut. Action initiated onboard to prepare a cable as it was not anticipated and no spare was in hand. By 12: 15 hrs a new cable was made and system checked. Around 14 :00 hrs the red floats recovery began. Just before lowering the red floats with the buoy mooring recovered from sea, the mid ship Atlas crane failed but the operation has been executed with out any hindrance. Due to the mid ship crane failure, it became difficult and dangerous to the personnel handling the Gemini craft to bring to aft Atlas crane. Discussed with the Chief officer and a safer method of Gemini lowering and men transfer in and out of it has been established. The retrieved buoy after servicing with a prepared cable and on satisfactory onboard test was reconnected to its mooring and deployed to the Sea. The data reception was confirmed by 16: 30 hrs on a Sunday by the NIOT shore Station. Thus the second system of Tsunami buoy got established.

9. Retrieval operation at DS3 buoy

The data buoy location was reached at 06:30 hrs. on 11th December 2006. The ship sailed towards the data buoy station DS3. The master informed the non-availability of mid ship Atlas crane for buoy deployment and its associated activities. The Chief Officer operated the LARS crane to recover the DS3 buoy and the mooring jettisoned. The operation was completed by 10:00hrs.

A message came from NIOT shore station that the TB5 BPR system is not returning the data and only buoy system is working. A meeting was held with the reps of Envirtech Italy, the supplier of BPR system and the Softel, the buoy CPU system integrator. The troubleshooting has been identified. As the ship was to make the scheduled stop over at Port Blair to transfer men and to bring certain buoy system components, it has been decided to attend to TB5 station technical issue during the second leg of cruise. Incidentally, the second leg cruise track fallen over TB5 which was middle between the TB4 and TB6 station. Accordingly the ship directed towards Port Blair as per the plan.

The ship arrived Port Blair outer harbor in the early hrs and she could be berthed around 13:00hrs on 12th December 2006. The six officials disembarked. Coordinated with NIOT office in ensuring the material transportation to Port Blair and the two personnel to join the team by 13th Dec.

Mr. Saravanan, Scientist from NIOT and Mr. Stig Lyng of Fugro Oceanor embarked the ship along with the required materials for the second leg of voyage by 09:30 hrs on 13th Dec. 06. Dr. Abdul Nazar, the officer-in charge of ANCOST, a division of NIOT was very useful in timely transferring the men and materials to the Ship. The second officer present at the bridge was briefed at 15:30 hrs about the next cruise plan. The ship sailed off from Port Blair by 1700hrs. The team worked till 24:00hrs to assemble and test one of the surface buoy systems to be deployed at station TB4.

The updated cruise track accounting for an activity at TB5 station and a data buoy maintenance operation at location MB 11 was given to the Chief officer present in the Bridge at 08: 15 hrs on 14th Dec. 06. Testing of the surface buoy system with the acoustic modems started. A standby mooring scope for TB 4 location kept ready.

10. Activities at TB4 station

The ship reached the site around 19:30 hrs. on 14th Dec. 06. The search on already deployed BPR through a test Deck Surface acoustic modem began and continued. Hence approached the Benthos and Fugro Oceanor experts over phone for advice. The BPR could not be traced till 00:30 hrs of 15 Dec 06.

At 06 :00 hrs on 15th Dec. 06, discussed with the Chief Officer, who was manning the Bridge about the ship positioning for her natural drift over the BPR location to carry out the acoustic link connectivity. Many iteration made. Around 11:30 hrs contact established with the BPR. It was decided to swap the buoy existing to the mooring by a new one tested. Buoy swapping operation completed by 17:00 hrs. Subsequent testing of BPR began. The Benthos Acoustic release was responding but not the CPU of the BPR. Benthos was informed about the difficulties to interact to the BPR CPU. Certain command tips obtained and tried out. The BPR responded for a while but it did not last for long nor it became functional. Decided to leave the system with out any disturbance for a while and to watch whether it reset of its own and closed the activity by 23 :00hrs.

The BPR acoustic inter action activity again began in the morning of 16th December 06, and there was no success. Hence decided to move to site TB5. There was a Ship safety committee meeting and self was invited. Following observations/suggestions were provided to the master:

- The Atlas cranes are sluggish and out lived. These cranes are to be replaced with new ones, which would enhance the operation capability of the ship.

11. Inspection of Tsunami buoy at TB5

Ship arrived to TB5 station on 17th Dec. 06. The buoy recovered from its mooring and the Red Floats added to it. It was found that the cable connecting the surface modem came off, hence the 24 V fuse gave way. Buoy system checked. The surface modem fitted with the buoy found defective. Measures taken to change the modem. As it was a Sunday, the required guidance from the Envirtech Engineers, Italy could not be obtained, hence decided to save time and proceed to next station TB6.

12. Activities at TB6 station

Ship arrived 09:30 hrs to the TB6 station on 18th Dec. 2006. The BPR and contact established search was began the buoy from its mooring retrieved and a new fully tested buoy deployed by 12:30 hrs. The BPR contacts after buoy deployment was tried out. As the response was not as it should, decided to activate its release. The command was given at 14:45 hrs. The BPR system tracked and retrieved it by 17 :00hrs. The system was checked and was reset. The BPR later assembled on a concrete dead weight and prepared for its deployment. The operational requirements of use of LARS and CTD winch have been briefed to the Chief and second officer present in the Bridge.

The securing arrangements were made for the BPR system mooring, its sub surface floats. Its free end connected to the CTD winch rope through the acoustic release. The BPR held by the PP rope used for buoy mooring through slipknot over LARS hook. The BPR lowering commenced around 21:30 hrs. It took long time of moving the BPR into water by the LARS crane. The PP rope possibly in tension gave way and the BPR fallen into the sea. While falling it had an impact with the Port Ship side Platform. The mooring chain was held on the platform. Through the Deck unit the BPR condition was checked. As there was no response decided to lift it. Operation completed after the release of the Concrete weight. The BPR after retrieval checked for its functional and found good. After discussions with the Fugro Oceanor rep and other colleagues on Board, it has been decided to call back the ship to Chennai. Accordingly the Bridge was informed in the mid night 24 :00 hrs

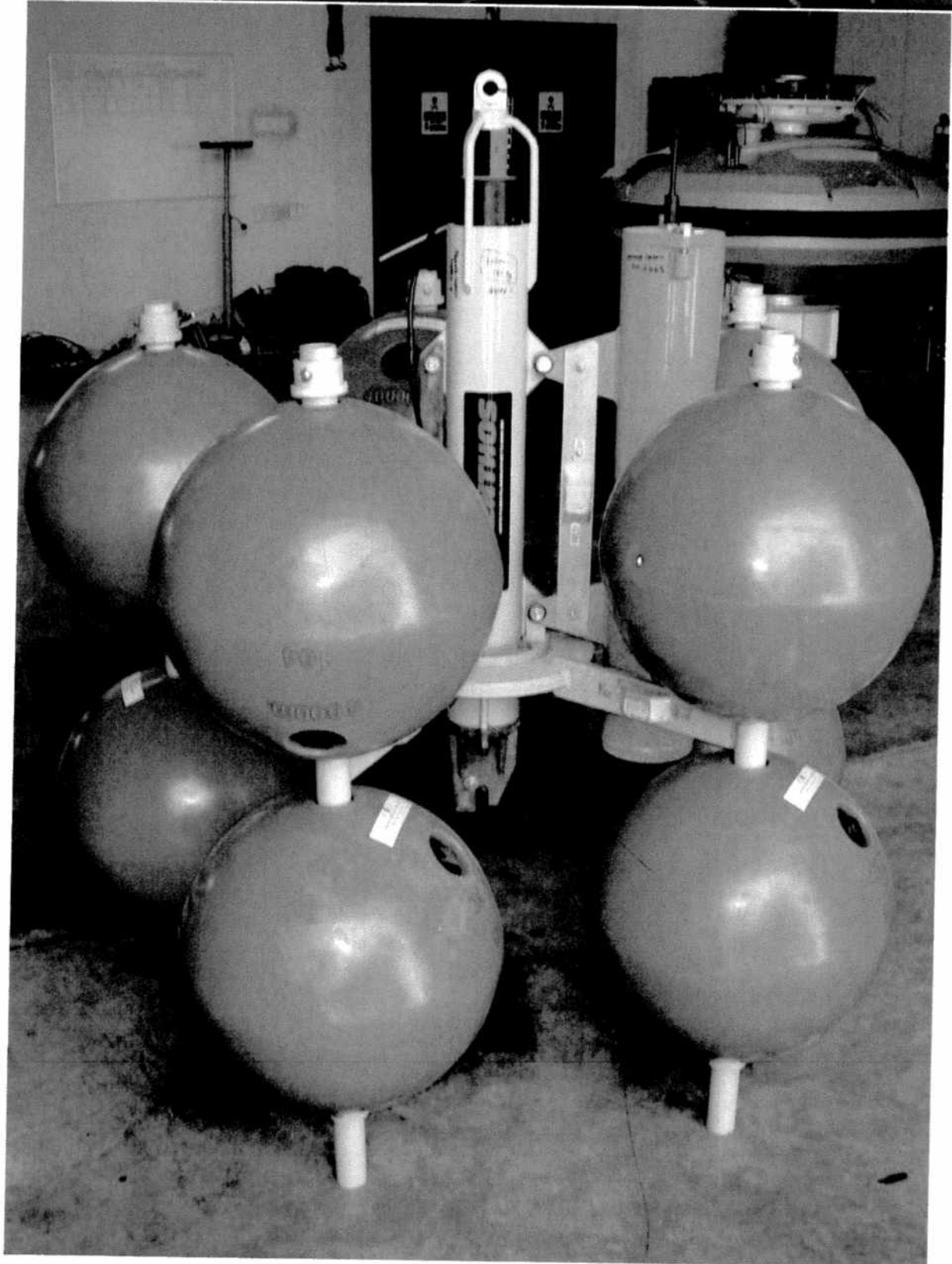
Ship sailed towards Chennai on 19th Dec. 2006. Started attending to TB5 surface buoy defects. Status report on 4 Tsunami buoys station furnished to Director NIOT. Team could resolve the TB 5 surface technical issue. The system was put under test.

The TB5 surface system testing showed encouraging results. It was therefore proposed to relay the buoy by seeking extension of Sagar Kanya ship time after disembarking the Fugro Oceanor representative at Chennai, freshen up with two more team members and to take armored cables from shore. The Group Director, NCAOR worked out a solution and accepted by us for the follow on cruise. Master briefed about the plan. Master arranged an Emergency drill as if there was a fire in the PORT wet lab. Cruise participants attended to it. Ship crew ably handled it.

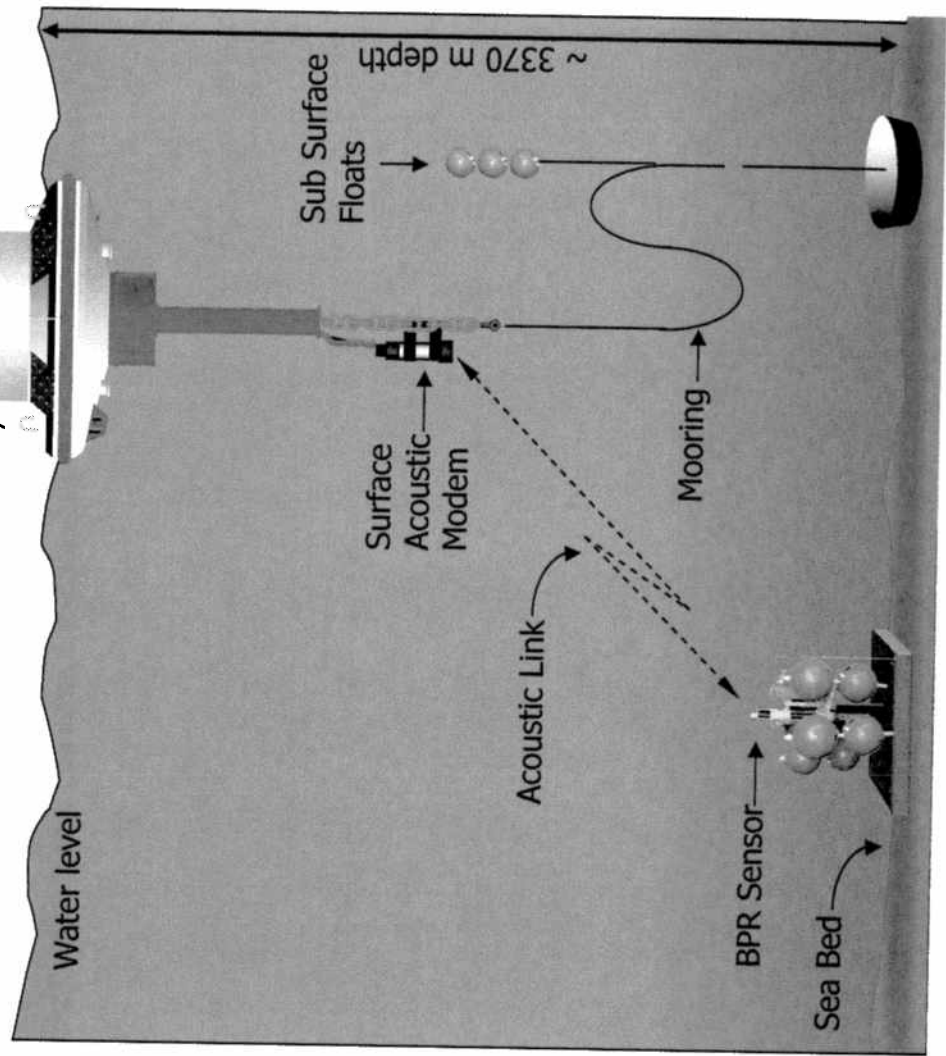
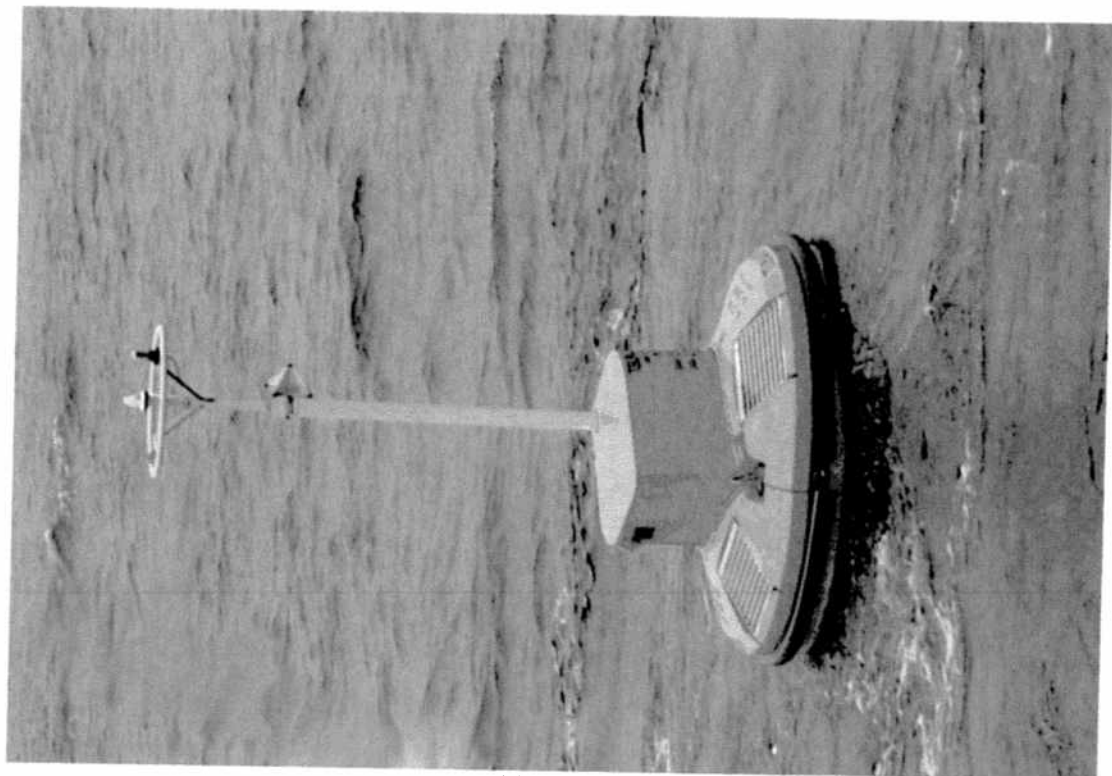
After that there was a briefing to all onboard the ship by the Chief Officer on actions to be taken when the Ship grounded/stranded and SOPEP. The drills performed for LSA, FIFI on regular manner onboard were systematic and executed sincerely.



BPR from Fugro OCEANOR



Tsunami Buoy System With Oceanor BPR



13. Feedback about Sagar Kanya

The following deck equipments were used during the cruise and their performance is indicated below.

1. ATLAS cranes in the mid ship and in the aft were used for deployment, retrieval and anchor dropping and their performance was satisfactory. These cranes are to be replaced with new ones which would enhance the operation capability of the ship.
2. Deep-sea winch with aluminium drum was used for laying the mooring ropes it worked satisfactorily.
3. LARS and CTD winch in combined manner have been used for deployment of BPR system. While one of the deployment was successful, the 2nd deployment was a failure.
4. During the DP mode, the ship vibrates severely. It would be advisable to carry out a NOISE and Vibration trial through professionals and initiate action to dampen it so that onboard electronic equipments performance is protected. Till such time the electronic equipments which are sensitive to vibrations may be provided with Anti vibration mounts.

14. Acknowledgement

The ship berthed at Chennai harbor around 08:00hrs. on 21st Dec. 06. Despite certain set backs, over all the cruise is a memorable one for all participants of their life time as they all have worked for the common cause to preserve human lives against onslaught of Tsunami. Towards fulfilling the objectives, the help rendered by NCAOR officials in charge of Sagar Kanya management, Master and his team onboard, Norinco Engineers shall be remembered. The field team expressed great satisfaction and appreciation of the Shore station team of NDBP / NIOT who have provided the ground support all the time of the cruise; but for them the mission would have been further more difficult.



CHIEF SCIENTIST