

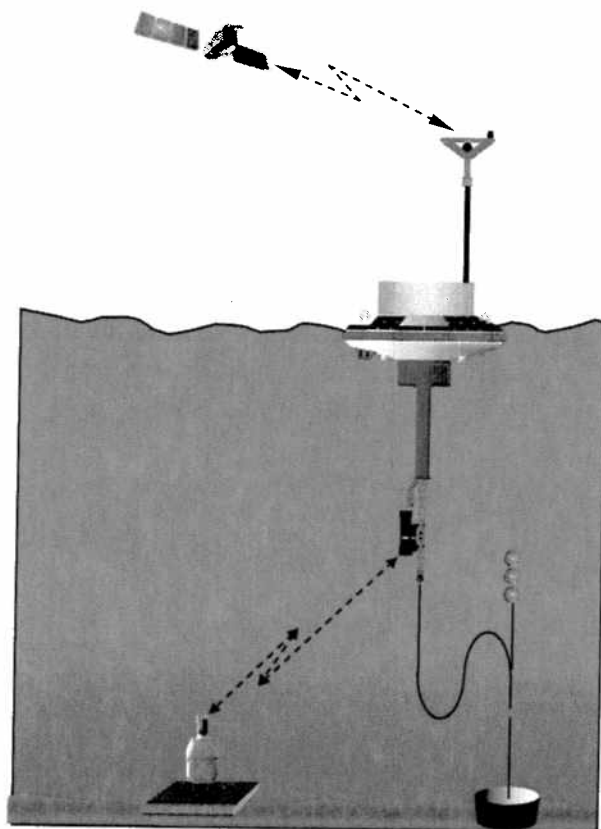
DEPLOYMENT OF TSUNAMI BUOYS IN BAY OF BENGAL

CRUISE REPORT

ORV SAGAR KANYA SK-238

30th August to 13th September 07.

Chennai to Chennai



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

ORV SAGAR KANYA CRUISE REPORT SK-238

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1. CRUISE SUMMARY

The Sagar Kanya cruise SK-238 was undertaken to establish seven Deep Ocean Pressure Recording Systems (DOPR) for Tsunami warning and deployment of one data buoy off Pondicherry.

2. OBJECTIVES OF THE CRUISE

The main objectives of the cruise are:

- Deployment of new Tsunami system at TB9 location.
- Re-establishment of systems at TB4, TB5, TB6, TB7, TB8 and TB10 locations.
- Recovery of Envirtech systems from TB5 and TB8 location for service and maintenance.

3. 1 LIST OF PARTICIPANTS

1	Mr. Tata Sudhakar	Chief Scientist, NIOT, channei.
2	Mr.Krishnamoorthy Ramesh	NIOT, channei.
3	Mr.Gandhirajan Senthil Kumar	NIOT, channei.
4	Mr.Gopalakrishnasami Vengatesan	NIOT, channei.
5	Mr.Kuthalingam Ramasundaram	NIOT, channei.
6	Mr.Punniamoorthy Ramesh	NIOT, channei.
7	Mr.Varadaraj Mani Baskaran	NIOT, channei.
8	Mr.Sivalingam Elango	NIOT, channei.
9	Mr.Naderi Darioosh	M/s. Sonardyne, UK
10	Mr.Jeyaraj Vishwanathan	NORINCO, Goa
11	Mr. Hafizur Rehman	NORINCO, Goa
12	Mr.Mukundkumar Babulal Chavan .	NCAOR, Goa.
13	Mr.Anil Kumar Lalji Patel	NCAOR, Goa.
14	Mr.Karumathil M.Jayakrishnan	NORINCO, Goa
15	Mr.Ayyadurai Thirunavukkarasu	NIOT, channei.
16	Mr.Govindan Raguraman	NIOT, channei.
17	Mr.Stanley Maria Antony Prabakar	Filed assistant
18	Mr.Alphonse Maria T.Pasali Kumar	Filed assistant
19	Mr.Bose Rack Peller	Filed assistant
20	Mr.Jesiah Antony Irudayaraj	Filed assistant
21	Mr.Michael Edison	Filed assistant
22	Mr.Jesu Antony Robert	Filed assistant
23	Mr.Ramkumar Thilipkumar	NORINCO, Goa

3. 2 SHIP STAFF

SN	NAME IN FULL	RANK
1	Capt. K.S.Pandian	Master
2	Devendra Kumar	Ch. Offr.
3	Pratap Purushottam Patkar	2/Officer
4	Stephen Agnelo Coutinho	Rd/Offr.
5	Justin Pereira	Med.Offr
6	Pandurang Chandar More	Purser
7	Pritish Ranjan Bandyopadhyay	Ch.E/Offr
8	Saktidas Chakrabarti	2/E/Offr.
9	Sanjay H.Churi	3/E/Offr.
10	Durga Sankar Das	4/E/Offr.
11	George Mathew	E/Engr
12	Francis S.Lobo	CTO
13	Anthony A Silveira	A/CTO
14	Syed B.Hussain	P.O.Mt.
15	Chhote Lal Dass	P.O.Mt.
16	T.N.Sasidharaan	ERPOI
17	Manji Jadav Baria	Electrician
18	Kirtikumar Kanjibhai Rawal	D/Serang
19	Vasant Balram Kadam	S/H'Man
20	Rapik Fakir G.H.Dave	S/H'Man
21	Kumar Kabir Dheerendra	S/H'Man
22	Mansoor Sadiq Hussain Sheikh	S/H/MAN
23	Dahyabhai Chhikabhai Khalasi	S/H'Man
24	Hiralal D.Tandel	SHMAN
25	Hrusikesh Rout	SM-2
26	Dineshkumar D.Tandel	Dk/U/Hd
27	Murugavel Gandhi	Cr.Cook
28	Rashid Kasim Kurupkar	ER/SRG
29	Sheik Mohammed A.Hameed	D/Grsr.
30	Akash Kumar Vishwakarma	D/Grsr.
31	Nanubhai M.Marolia	D/Grsr
32	Bhagubhai R.Patel	D/Grsr
33	Kan Sakar Kapadia	D/Grsr.
34	Ramesh Palaka	ERRII
35	Bamifacio Maria V. C.Dacosta	C/C/Bkr.
36	AfansoJose Casimiro	2nd Cook
37	John Maria Jose	2nd Ck
38	Ahmed Ateeq	3/Cook
39	Alvito S.P.Rodrigues	G.Stwd

40	Kalpeshbhai Thakorbhai Tandel	G/Stwd.
41	Roni Kumar Mohanbhai Tandel	G/Stwd.
42	Nolaso Joasinh .Monteiro	G.Stwd
43	Usman Mohammed	G.Stwd
44	Burondkar Ikabal Mohamood	G/Stwd.
45	Mahesh Bhalachandra Vaity	U/Stwd.
46	Vasantlal Fakirbhai.Tandel	S/U/Hd.
47	Shameer Thaivalappil Ibrahim	S/U/Hd.
48	Faiz Mohammed	L'Man

4. Diary of events

Date	Time	Event
30.8.07	14.30	Scientist Boarded the ship.
	22.00	The buoys and accessories in the seven trucks were loaded and Ship sailed out from Chennai.
31.8.07	07.00 -	Reached location near Pondicharry.
	09:30	Deployed a wave buoy at N 11° 52.43' E 79° 54.29'.
	11.00	Sailed towards TB7 location.
1.9.07		Ship sailing towards TB7 location. Preparations are on for replacing the surface at TB7. Weather is bad, wind speed is > 25knots. Requested NIOT for daily weather forecast.
2.9.07	07.00 -	Ship reached the TB7 location. Weather is bad and winds > 25knots. No recovery possible. Checked the BPR and found the battery is draining. Prepared new BPR and buoy for deployment. Capt suggested calling off the operation due to bad weather.
	18.00 hrs	Abandoned the operation and sailed towards TB10 location.

3.9.07	14.00	Reached the TB10 location No recovery possible due to bad weather. Deployed new buoy 5 miles from the old position. N 7° 05.851' E 87° 02.221'.
	17:00 -	BPR deployment attempted.
	23.30	Twice the BPR got entangled to the ware rope. Deployment of BPR postponed to next day.
4.9.07	13.10	New BPR deployed. N 7° 05.667' E 87° 02.255'. Weather improved. Had internal meeting and took decision to put a standby system in this location. Received weather report for NORTH bay of Bengal and confirmation about Naval exercise in the TB5 and TB4 locations.
	17.05	Replaced TB10 buoy and made operational.
	19.00	Seeing the weather at Northern buoys and no sailing zone requested NIOT for new location at TB3 NIOT provided tentative location for new deployment. Ship started towards TB3 location
5.9.07	13:00	Reached TB3 location. Carryout survey using deep sea echo sounder and sub bottom profiler.
	17.00	Deployed new surface buoy system N 6° 47.977' E 89° 48.713'.

	23.55	<p>Deployed new BPR in the second attempt. N 6° 46.490' E 89° 49.524'.</p> <p>No proper data received from BPR after the release. Decided to wait till next day morning for data confirmation.</p>
6.9.07	08.00	Data confirmation from shore station.
	08.30	Started sailing towards TB7 location. Preparations for TB7 buoy recovery and deployment of new BPR system underway.
	18.00	Received message from shore station about MB10 buoy malfunctioning. Diverted the ship to TB10 location. Tentative ETA provided to NCOAR.
7.9.07	08.00 -	TB10 buoy recovered and new dummy floats dropped. System analyzed and problem rectified by upgrading the software.
	18.00	New buoy deployed and recovered the dummy floats. Started sailing towards TB7 location. ETA 1100 hrs.
8.9.07	11.55	TB7 buoy replaced with new buoy. Weather is very good and decided to attempt the recover the BPR.
	13.00	BPR released.

	15.30	BPR recovered.
	19.40 – 23.00	<p>New BPR deployed. N 9° 31.0304' E 85° 31.5627'.</p> <p>Lost the link to the ship as well as to shore station after release. Suspected the failure of flotation around the BPR. Deployed new BPR floats to see there performance.</p> <p>N 9° 30.4831' E 85° 29.9361'.</p> <p>Found them deformed after recovery.</p>
9.9.07	09.00	<p>New BPR deployed with floats recovered from last deployment. System performance satisfactory.</p> <p>Sailed towards TB8 location.</p>
10.9.07	07.00 – 18.30	<p>Tried to contact Envirtech BPR, NO contact Started testing floats by dropping up to 3000m</p> <p>Found deformation in the floatation and informed NIOT the status. NIOT confirmed abandoning the deployment of TB8. Continued the Envirtech BPR search. NO contact.</p>
	19.00	<p>Started sailing towards Chennai. ETA 06.00 hrs 12th September 07.</p>
11.9.07		Packing of material.

12.9.07		Ship reached Chennai. Ship sailed back to deep sea due to Tsunami alert from out anchorage.
13.9.07	05.00	Ship berthed chennai harbour.
	14.00	Formalities completed and left the ship.

5. TSUNAMETER SYSTEM

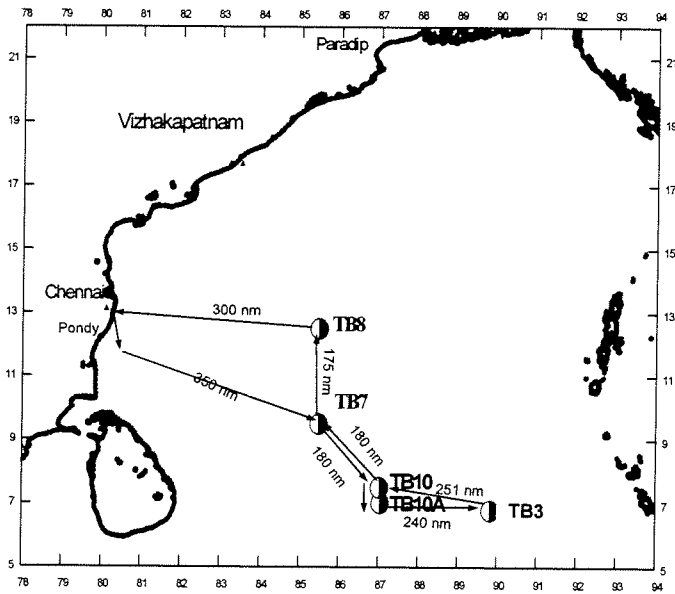
Description of the system:

The tsunami detection system is combination of a surface buoy and Bottom pressure recording system which is placed on the sea bottom. The BPR continuously measures the hydrostatic pressure and communicates to surface buoy using acoustic communication. The surface buoy receives the data from the BPR and sends to reception system at NIOT via Inmarsat C satellites. In case of event of detection of Tsunami the BPR goes into event mode and sends the data every 5 minutes to surface buoy.

The BPR consists of a high precision pressure gauge and acoustic transceiver. The BPR is equipped with primary lithium batteries for its power requirements. The surface buoy equipped with acoustic transceiver, inmarsat c satellite communication system and CPU which control the all the activities. The surface buoy is powered by 4 solar panels, which charges rechargeable batteries. The Buoy is equipped with a radar reflector and beacon lamp.

6. Cruise track

Deep Ocean Tsunami Buoys System Establishment
 (National Institute of Ocean Technology, Ministry of Earth Sciences, Govt. of India.)
 Bay of Bengal –ORV Sagar Kanya Cruise Track –Aug /Sep 2007.



BUOY ID	LATITUDE (° N)	LONGITUDE (° E)	Depth (m)
TB7	09° 31' 04"	85° 30' 03"	3675
TB10	07°00' 55"	87° 03' 18"	3851
TB10A	07°00' 55"	87° 03' 18"	3851
TB3	06° 46' 38"	89° 49' 22"	3043
TB8	12° 31' 12"	85° 30' 33"	3373

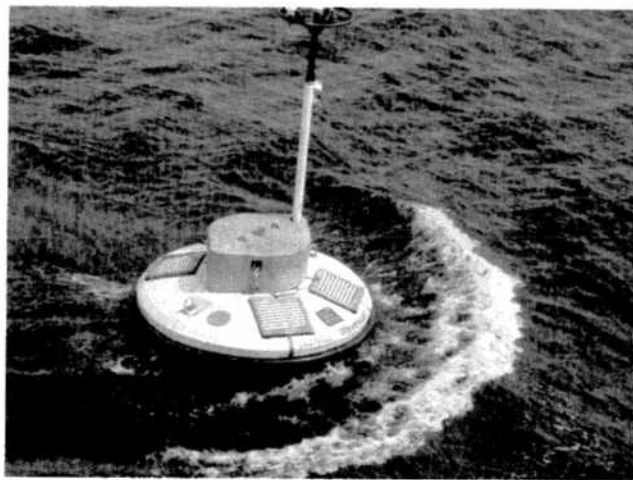
Cruise conducted between 30 Aug to 13 Sep 07

7. TSUNAMI SURFACE BUOY MARKINGS

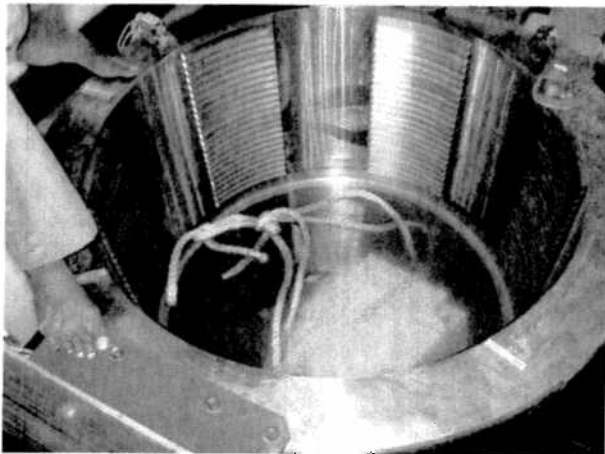
The buoy is fitted with radar reflector and a beacon light, which will flash during the nighttime. A nameplate is also fixed in the hull of the buoy, clearly indicating the address and phone numbers of NIOT.

8. PHOTOGRAPHS

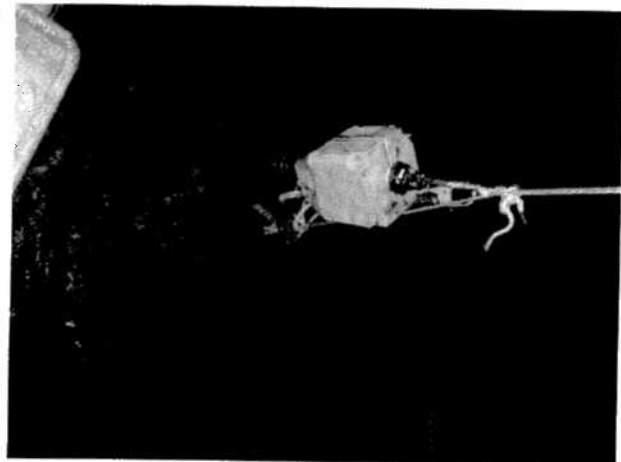
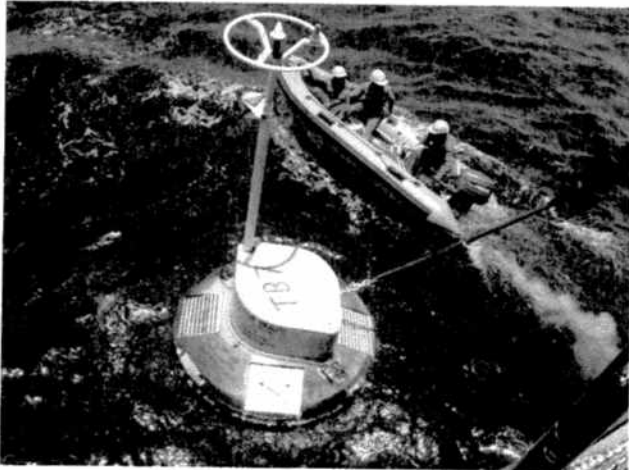
8.1 Deployment of Met Ocean Buoy off Pondicherry.



8.2 Pressure testing of the BPR floats at NIOT.



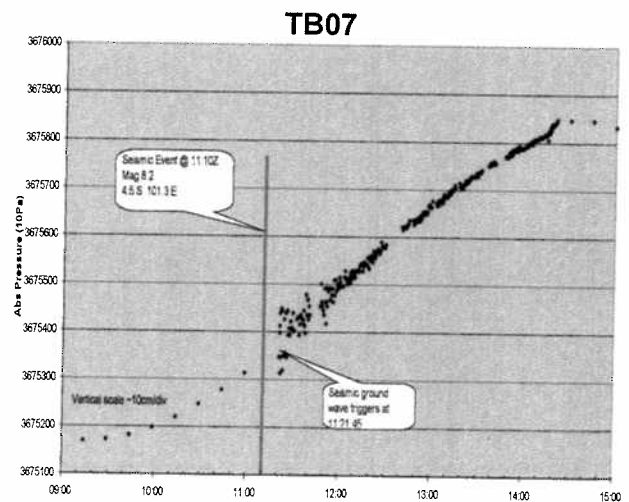
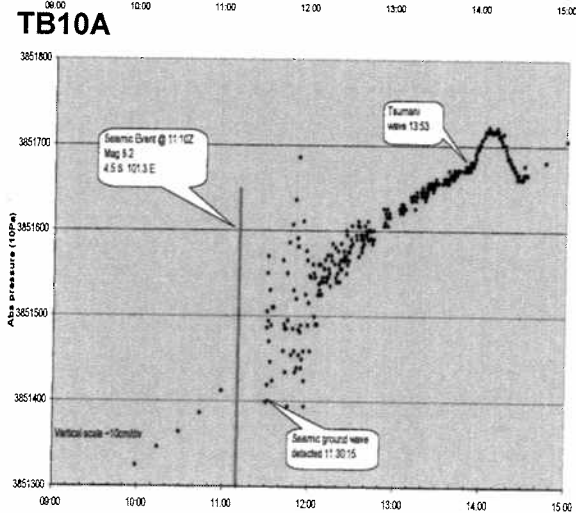
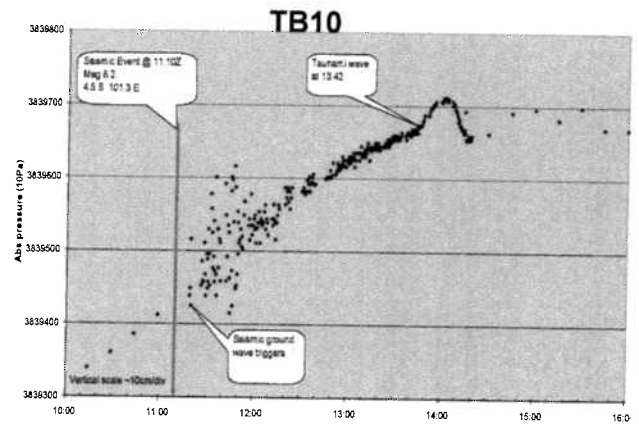
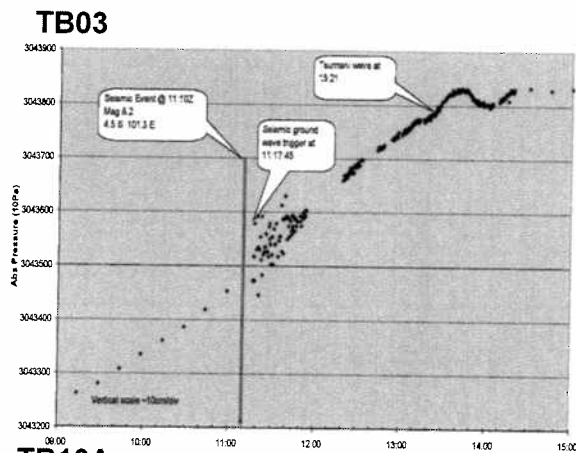
8.3 Deployment of tsunami surface Buoy and BPR system.



9. Tsunami detection by the systems deployed during this cruise.

On 12th September at 16.30 IST (11.00 GMT) an earthquake of 8 magnitude has occurred off Sumatra. All the four buoys deployed in the Bay of Bengal have triggered for the seismic event. TB10, Tb10A and Tb3 have reported Tsunami of 2cm.

The following graphs show the data received from all the four buoys. The red line indicates time at which the earthquake occurred. The seismic signal and tsunami wave three buoys (TB10, TB10A & TB7).



10. Equipment used ON BOARD SAGAR KANYA and their performance.

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

1. Deep sea echosounder and sub bottom profiler were used for survey of location.
2. Two atlas and LARS crane is used for deployment of buoys. The mid ship crane needs maintenance.
3. Deep sea winch, zip boom are used for BPR deployment.
4. CTD winch is used for deployment of surface acoustic modem for interrogating the BPR during deployment.

11. Acknowledgments

We express our sincere thanks to Dr. Rasik Ravindra, Director, NCAOR and Dr. M. Sudhakar, Group Director, NCAOR, for providing the ship time. Our sincere thanks to Captain, officers and the crew of ORV Sagar Kanya for their cooperation throughout the cruise and their sincere effort in helping us to complete the task. Thanks for the Norinco engineers for supporting us during the operations.

We express our sincere thanks to Dr. S.Kathirolu, Director, NIOT 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.