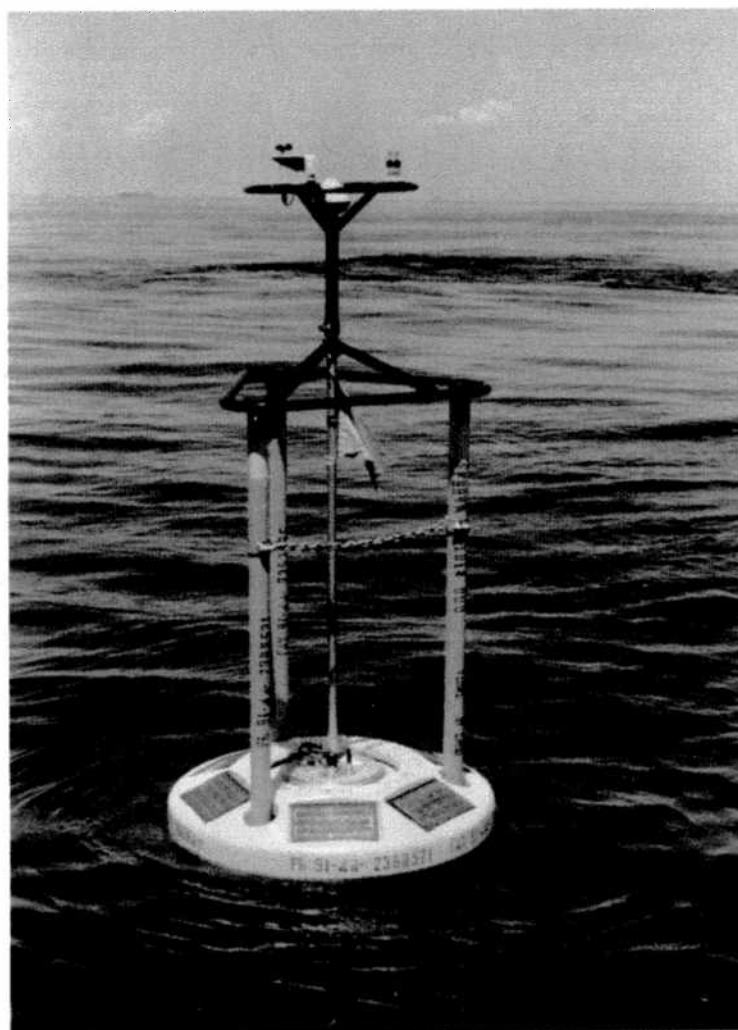


SERVICING AND DEPLOYMENT OF DATA BUOYS
IN THE ARABIAN SEA

CRUISE REPORT

ORV SAGARKANYA
SK - 139



13th November to 26th November 1998

TUTICORIN TO GOA

NATIONAL DATA BUOY PROGRAMME
NATIONAL INSTITUTE OF OCEAN TECHNOLOGY
CHENNAI

ORV SAGAR KANYA CRUISE REPORT (SK – 138)

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1. CRUISE SUMMARY

The Sagar Kanya cruise 138 was undertaken to service the existing data buoys in the West Coast and the buoy at Tuticorin Port, to retrieve shallow water Seawatch buoy at DS2 and to deploy a Wavescan buoy at new DS2 location at a depth of 1500m.

It was also aimed to collect CTD / Current meter & bathymetry data for Ocean Thermal Energy Conversion Plant site off Kulasekarapatnam and collection of ambient noise data at different locations during the cruise.

Ship sailed off Tuticorin at 1900 hrs. on 13th November'98 and berthed at Goa Port on 26th November'98 at 1200 hrs. During the cruise, servicing of buoys SW2, SW3 and SW5 were carried out. A Wavescan buoy was deployed at new DS2 location (off Lakshadweep) and retrieved Seawatch buoy from DS2 (old) location. The servicing of DS1 buoy could not be accomplished due to bad weather conditions.

2. LIST OF PARTICIPANTS

1.	Mr.Tata Sudhakar	Chief Scientist
2.	Mr.D.Sivakumar	NIOT
3.	Mr.V.Gowthaman	"
4.	Mr.G.Senthil Kumar	"
5.	Mr.R.Vaithyanathan	"
6.	Mr.Torgeir Jensen	M/s.Oceanor, Norway
7.	Mr.S.Narayanan	NIOT
8.	Mr.M.Palaniappan	"
9.	Mr.Shibu Zacob	"
10.	Mr.C.V.Rajagopalan	NORINCO
11.	Mr.Jagadeesh Negali	"
12.	Mr.Rajeev K.C.	"
13.	Mr.P.S.Manmohan	"
14.	Mr.Firoz Sharif	"
15.	Mr.N.Rajendran	Scientific Hand – M/s.Tradex India, Chennai
16.	Mr.Naseem Basha	Scientific Hand – M/s.Tradex India, Chennai

Ship's Complement

17.	Capt.N.Sreekumar	Master
18.	Mr.P.G.Prakash	Chief Officer
19.	Mr.L.C.Lohani	2 Officer
20.	Mr.Packirisamy Akilan	Jr.Officer
21.	Mr.G.R.Kamat	Radio Officer

22.	Dr.H.V.Subrahmanyam	Medical Officer
23.	Mr.R.G.S. D'Silva	Purser Officer
24.	Mr.Aniruddha Home	Chief Engineering Officer
25.	Mr.A.K.Neogi	2EO
26.	Mr.H.K.Jain	3EO
27.	Mr.M.N.Muralidharan	3EO
28.	Mr.J.C.Sharma	Electrical Officer
29.	Mr.A.R.D'Cruz	Electrical Officer
30.	Mr.M.F.Rodrigues	Catering Officer
31.	Mr.Robert Luis	Asst. Catering Officer
32.	Mr.H.A.Sahibole	ERPO-I
33.	Mr.A.W.Rodricks	ERPO-2
34.	Mr.J.P. Goes	Electrician
35.	Mr.Madan Singh	P.O.(M)
36.	Mr.C.Carvalho	-do-
37.	Mr.M.G.Kharva	Deck Serang
38.	Mr.K.Saravanan	D/T/C
39.	Mr.R.A.Jethva	SHM
40.	Mr.D.P. Kapadiya	-do-
41.	Mr.Jagadeesan P.S.	SHM
42.	Mr.Gulla Gurumurty	-do-
43.	Mr.K.Lokanadham	-do-
44.	Mr.G.M.Desai	-do-
45.	Mr.N.M.Patel	S'man II
46.	Mr.N.G. Mazarello	-do-
47.	Mr.B.S.Talwadia	DUH
48.	Mr.Mohd.Yusuf Moideen	Crew Cook
49.	Mr.A.R.A.M. Surkhot	Er.Serang
50.	Mr.V.K.Rajput	D/Greaser
51.	Mr.N.K.Patel	-do-
52.	Mr.V.G.Tambe	-do-
53.	Mr.V.P.Naik	Err.II
54.	Mr.M.Rajasekhar	Tr.Err.II
55.	Mr.K.Guhan	Tr.Err.II
56.	Mr.V.F.Sequeira	Ch.Cook & Bkr.
57.	Mr.J.S.Fernandes	2 nd Cook
58.	Mr.C.D.V. Rebello	-do-
59.	Mr.N.Mukhtar Ismail	3 rd Cook
60.	Mr.A.F.Vaz	G.S.
61.	Mr.C.Braganza	-do-
62.	Mr.Servulo D'Costa	-do-
63.	Mr.S.A.Fries	-do-
64.	Mr.Rosario Costa	-do-
65.	Mr.S.Carneiro	-do-
66.	Mr.Pedro F.Pereira	-do-
67.	Mr.Caetano Travasso	Laundryman

68.	Mr. Shaik Abdul Gafoor	Uty. Stwd.
69.	Mr. J.M. Barretto	Uty. Hand
70.	Mr. P. Lalji Solanki	Uty. Hand

NIOT team at shore station, Chennai.

1. Mr. Premkumar Programme Director, NDBP
2. Dr. Y. R. Rao
3. Mr. K. Santanam
4. Mr. Ravichandran
5. Mr. Ramasundaram

3. OBJECTIVES OF THE CRUISE

Main objectives of the cruise are:

- Servicing of data buoys (SW5, DS1, SW2 and SW3)
- Retrieve Seawatch shallow water buoy at DS2
- Deployment of a Wavescan Buoy at deep water at new DS2 location
- Collection of CTD / Current Meter, ADCP data collection for 24 hrs at OTEC site off Kulasekarapatnam.
- Bathymetry Survey at OTEC site using Hydrosweep system.
- Collection of Ambient Noise during the cruise.

4. CRUISE SCHEDULE

DAY	TIME (HRS)	EVENT
13 November 98	19.00 hrs.	Departure from Tuticorin Port
14 – 15 November 98		CTD / Current Meter and ADCP data collection
15 – 16 November 98		Tuticorin buoy retrieval and redeployment
16 November 98		Bathymetry survey off Kulasekarapatnam for OTEC Project
19 November 98	08.00 hrs. 14:00 hrs.	Deployment of Wavescan buoy at DS2 location Retrieval of Seawatch buoy at DS2 location
21 November 98	0800 – 1400 hrs.	DS1 location – Retrieval was not possible due to bad weather
22 November 98	1500 hrs.	Retrieval and redeployment of SW2 Seawatch buoy

25 November 98	0600 – 1800 hrs.	DS1 location – Retrieval was not possible due to bad weather condition.
26 November 98	0700 hrs.	Retrieval and redeployment of SW3 buoy at off Goa.

5. Preparation of Data Buoys

As per program one Wavescan and one Seawatch buoy tested at NIOT and loaded on board Sagar Kanya at Tuticorin port. The Wavescan buoy was meant to be deployed at DS2 (New) location and the Seawatch buoy at Tuticorin. A Gemini craft along with out board motor was borrowed from Coast Guard and taken on board ship to be used for recovery and deployment of buoys. The Gemini craft was assembled on board before the Tuticorin operation. The buoys are painted with antifouling paint and fitted with zinc anodes against corrosion.

Setting up field station: A field station was setup on board for communicating with buoys during the testing and also to receive the data from moored buoys after deployment. The inmarsat antenna was installed on balloon deck and the modem with computer and software in wet lab starboard side.

Buoy Configuration:

The Wavescan buoy is of discuss shape hull with a diameter of 2.76 m and a height of 6.15 Mts. from keel to mast. The weight of the buoy is 994kg when fully assembled. The meteorological sensors, GPS and Inmarsat antennas are fitted on mast. The buoy has wave sensor inside the aluminum cylinder and the current meter is installed at the instrumentation protection frame. The buoy is powered by internal batteries, which are charged by four solar panels.

The Seawatch buoy is a vertically stabilised buoy, mounted on a transparent frame surrounding the central buoyancy. It has a height 8.2 Mts. and diameter of 1.75 m with total weight of 604 kg. The meteorological sensors are fitted on mast ring along with Inmarsat antenna. The buoy uses small antenna for GPS position and Inmarsat communication. The wave sensor is installed in the center stainless steel cylinder and current meter installed along with the green sensors at the bottom portion of the mast. The buoy is powered by internal batteries, which are powered by 6 solar panels. The buoy also has lithium batteries as backup.

Both buoys communicate with shore station using Inmarsat satellites. These buoys fitted with a radar reflector and beacon light, which has day light switch to make it glow only during the dark period for collision avoidance.

The details of sensors mounted on the buoys:

SL. NO.	PARAMETERS	RANGE	MODEL / MAKE
1.	Wave height and direction	± 20m, 0-360°	MRU-6/ SEATEX
2.	Wind speed and direction	0-60 m/Sec., 0-360°	1453S2 / Lambrecht
3.	Air Pressure	800 - 1100hPa	PTB - 200 A/ Vaisala
4.	Air Temperature	10 - 50°C	Omega Eng. ON-905-55036
5.	Current Speed and direction	0 - 600 Cm/Sec., 0-360°	NE Sontotec UCM-60
6.	Water Temperature	-5°C to 45°C	NE Sontotec UCM-60
7.	Conductivity	2 – 77 m mho/Cm	NE Sontotec UCM-60
8.	Dissolved Oxygen	0 – 200% sat	WTW Trioxmatic 700
9.	Radioactivity	137 Cs with 95% level of confidence	Oceanor
10.	Hydrocarbon	0-50 mg/l	Aquatracka
11.	Chlorophyll –A	0.01 – 100 µl	Aquatracka
12.	Optical Sensor	5% of reading	Oceanor

6. DATA BUOYS SERVICING AND DEPLOYMENT

Servicing of buoy at Tuticorin (SW5):

The blue Seawatch buoy deployed off Tuticorin (SW5) was replaced with green Seawatch buoy having oceanography sensors. The buoy was recovered on 15th early morning using Gemini craft and dummy floats were attached to the mooring. The dummy floats were replaced with green buoy on 16th November 98. The operation was carried out with great difficulty, as the Gemini craft couldn't tow the buoy due to High wind conditions. However, the task has been completed after repeated attempts.

Deployment of Wavescan buoy at DS2 (New) and retrieval of Seawatch buoy from DS2 (old) location:

A Seawatch buoy was deployed at DS2 location during the 135 cruise of SagarKanya. This buoy was not functioning due to failure of battery. It was decided to recover this buoy and deploy a new Wavescan buoy at N 10° 40' E

72° 30' location. This new location was in about 1830 m deep and also falls on the helicopter route between Kavaratti and Agatti islands. This will be useful to check the buoy, physically during the emergencies. The Wavescan was prepared and tested to deploy at new DS2 location. This operation was finished in just two hours.

The retrieval of DS2 (old) at location N 10° 38' & E 72° 30' was carried out on 19th November afternoon. The buoy was deployed on coral reef at a depth of 24mts. The Gemini craft was used to detach the buoy from mooring. It was observed that the anchor was sunk in the sand making the mooring length very less. The buoy couldn't be detached manually as the rubber cord is fully stretched. The buoy was lifted using the ship crane after good maneuvering by the ship Captain. After lifting the buoy it was observed that mooring can't be recovered and the rubber cord over stretched and became dangerous if it breaks accidentally. We were forced to cut the rubber cord to release the buoy from mooring.

Servicing of DS1 buoy:

The DS1 buoy was deployed during January'98 cruise of SagarKanya. The ship reached DS1 location on 21st morning. The Gemini craft was lowered to hook the buoy to the ship crane, as the deep-sea wench was not available. As this operation was very critical, a discussion was held, in advance, with ship personnel and Oceanor representative before the operation. The retrieval couldn't be carried out due to high winds and possible damage to the buoy during operation. We waited till 14.00 hrs and sailed towards SW2 location, as the conditions were not favorable.

After completion of SW2 operation, we returned back to DS1 location on 24th November to have second trial. But the weather condition did not allow us to carryout the operation.

Servicing of SW2 Buoy:

The green Seawatch buoy was deployed at ONGC oil fields during the January'98 cruise of SagarKanya which was not functioning. The buoy was replaced with a green buoy on 22nd November 98 evening. It was observed that the buoy was intact and very less marine growth was observed even 9 months after deployment.

Servicing of SW3 Buoy:

This buoy was serviced in October 98. But current meter was not functioning due to possible fouling. So it was decided to replace the buoy with another green buoy. The operation was carried out on 26th morning using Gemini craft. The operation was completed in less than 2 hours.

7. DATA COLLECTION AT OTEC SITE

I Location : OTEC site off Tuticorin, 8° 26.1191N, 78°36.8870E
Time : 14-11-1998, 1 AM onwards till 15-11-1998 1 am

Four CTD operation were conducted at an interval of approximately 5 – 6 hours for the purpose of monitoring the temperature of surface and under water at a depth of 1000m for one full day and we plot the temperature profile. This measurement required for various process designs calculations like heat exchanger, etc. The average temperature measured from the 4 operations gave the following results:

1. The surface water temperature was 28.3°C
2. The temperature of the water at 1000m depth was 6.45°C.

II Location : OTEC site off Tuticorin, 8°26.1191N, 78°36.8870E
Time : 14-11-1998, 1 AM onwards till 15-11-1998 1 am

Five RCM-7 operation were conducted at an interval of 6 hrs for the purpose of monitoring the temperature, current, conductivity of surface and under water at a depth of 1000m for one full day. The various parameters thus measured with a sampling time interval of 30 seconds and the instrument held for 5 minutes at each position to get repeated samples. These parameters are needed for the mooring and sea water pipe design calculations.

III Location : OTEC site off Tuticorin, 8° 26.1191N, 78°36.8870E
Time : 14-11-1998, 1 AM onwards till 15-11-1998 1 am

ADCP was used during the above period and the readings are taken with a time interval of approximately 30 minutes and thus we stored 40 files of data. The current measurements up to 260 Mts. depth were configured. These measurements required for the purpose of analysis and design of sea water systems.

IV Location : OTEC site off Tuticorin, 8°26 N, 78° 36E
Time : 14-11-1998, 1 AM onwards till 15-11-1998 1 am

The echo sounder plots are also taken during the entire duration. The depth measured was 1100 m throughout the operation.

V Location : OTEC site off Tuticorin,
Time : 16-11-1998, 1.30 PM onwards till 16-11-1998 9.30 PM

The bathymetry of the OTEC site with the requirement of a depth of 1100 m and nearest to shore was conducted at 8° 28N, 78° 30E to 8° 22N to 78° 36E on an

area approximately 100 sq.km. to be used for the purpose of placing the anchoring and the seawater pipe.

8. AMBIENT NOISE DATA COLLECTION

Ambient Noise was collected at different locations during the entire cruise.

9. PERFORMANCE OF EQUIPMENT ON BOARD SAGAR KANYA

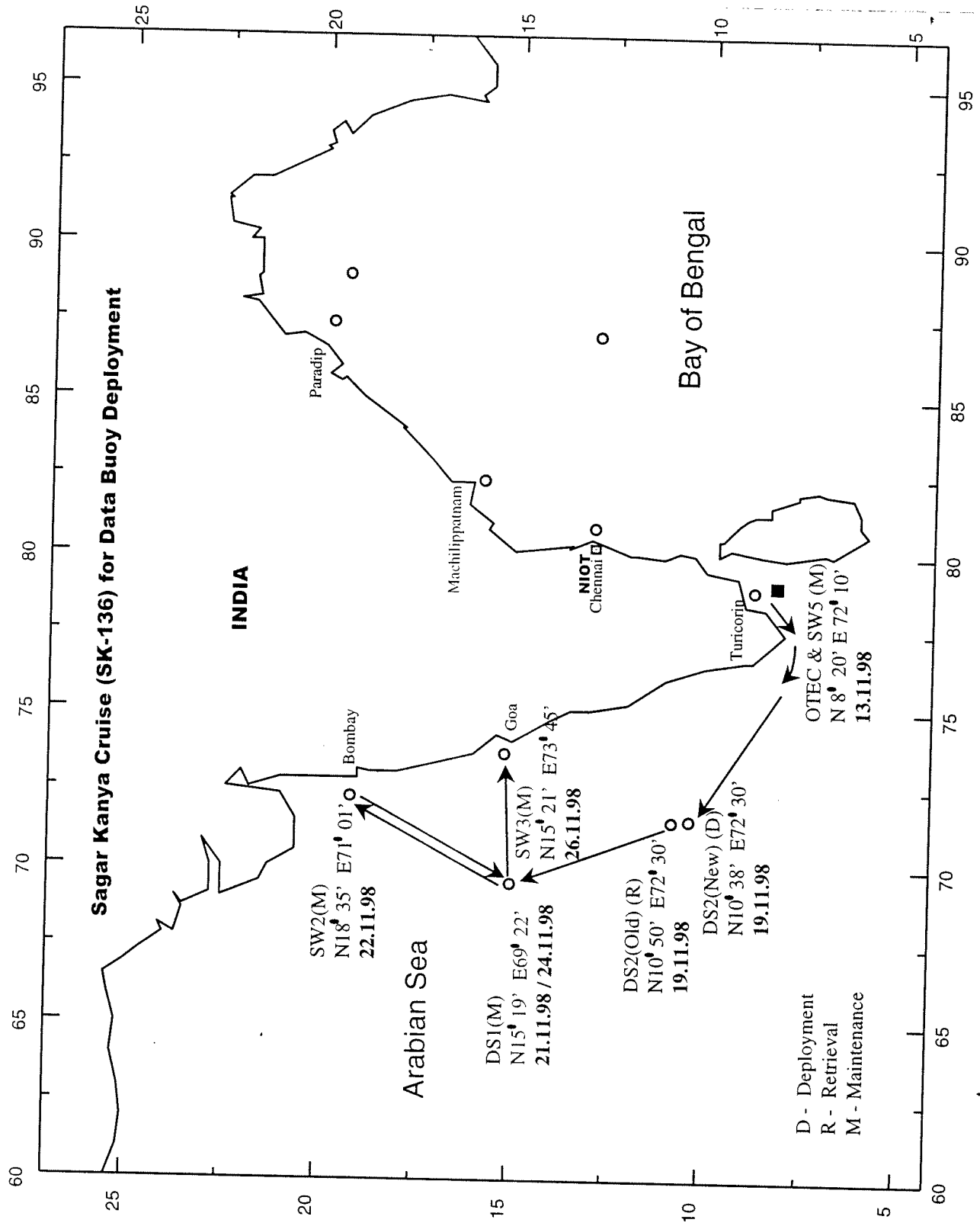
The following equipment was used during the cruise and their performance is indicated below.

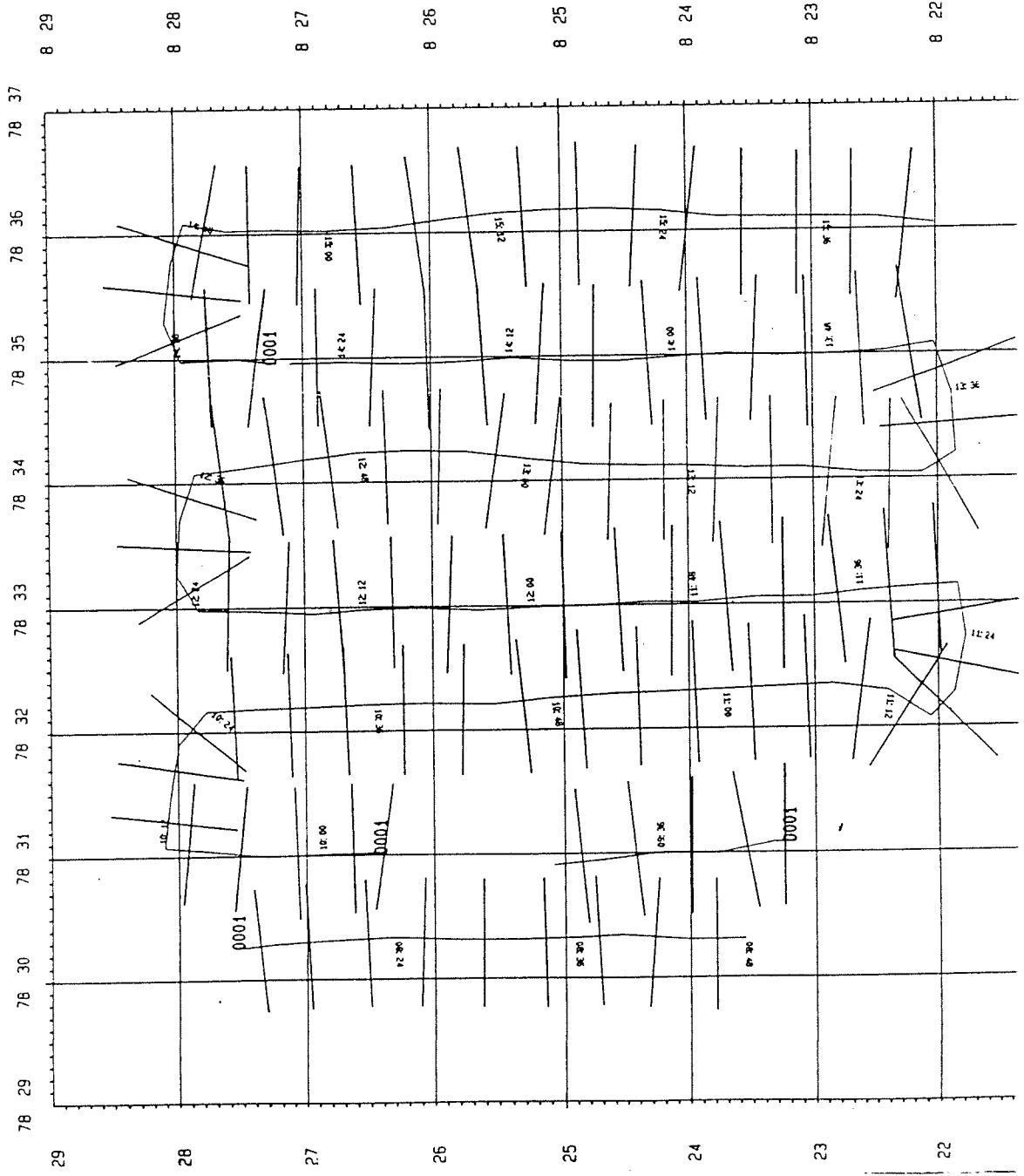
1. Deck equipment: Atlas cranes, Jib boom, NMF crane etc. Worked satisfactorily.
2. CTD & ADCP was used for OTEC work and working satisfactorily. NIOT current meter was used with hydrographic wench up to depth of 1100 Mts.
3. Hydrosweep System: The equipment was not functioning at the beginning of the cruise due to Harddisc problem. Due to non-availability of new version Harddisc, the system was reconfigured to old version (without backscatter). This work was carried out in presence of Norinco Engineers who are in-charge of maintenance of this system.
4. INS was used during the hydrosweep survey.

10. ACKNOWLEDGEMENT

We thank the Department of Ocean Development, New Delhi for providing ship time on ORV SagarKanya. We express our thanks to Dr.Pandey, Director, Antarctic Study Center and Dr. M. Sudhakar, Program Manager, SagarKanya Ship Cell for co-ordinating the cruise. Our sincere thanks to Capt. N. Seekumar, the officers and crew of ORV SagarKanya for their cooperation throughout the cruise and their sincere effort in helping us to complete task even in unfavorable weather conditions. We greatly acknowledge the timely help of Coast Guard (Eastern Region) for providing the Gemini Craft and Out-Board Motor without which data buoys could not have been retrieved and redeployed. We are also thankful to NORINCO staff for their cooperation during deck operations.

We express our sincere thanks to Prof. M. Ravindran, Director, NIOT and for entrusting the task expressed above. We are also thankful to all NDBP colleagues at NIOT for helping us at various stages for the successful completion of the cruise.





MERCATOR PROJECTION

REFERENCE + 8: 00

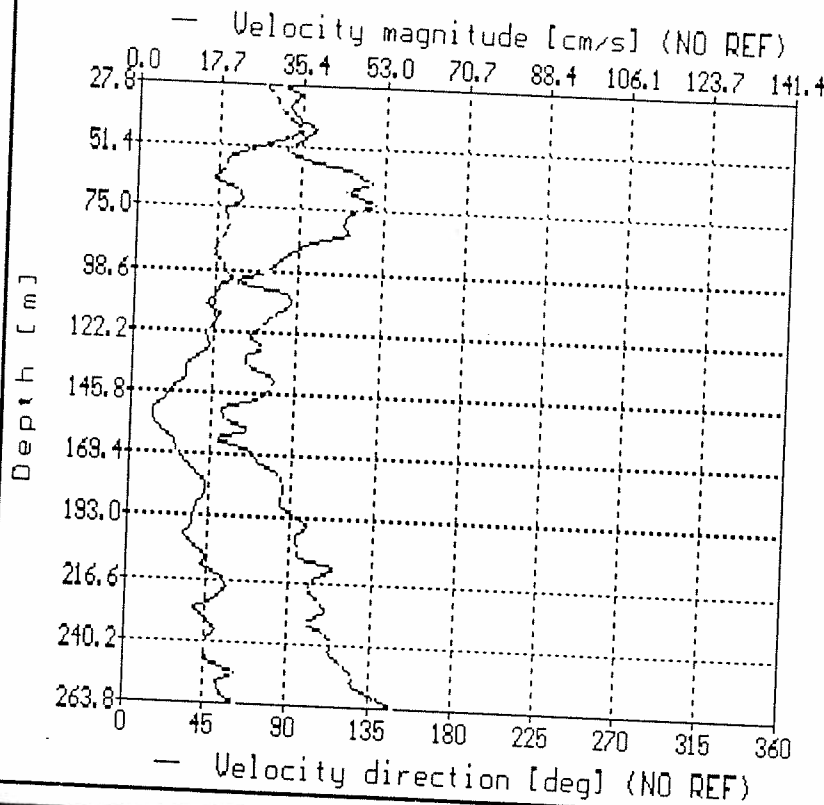
SCALE 1 : 50000

WORLD GEODETIC SYSTEM 1972

OTEC ARBA -
NIOT, CHENNAI
TRACK PLOT
OFF KULASAKARAPATNAM
HYP1/OTEC1
D00/N10/PNR 20.11.98

Exit playback menu

Currents in the OTEC area during
(NOV 14, 1998)



SEGMENT 15

14-NOV-98 10:32:16.90
Pitch Roll Head. Temp
0° 0° 142° 28C

VESSEL (NAU)

Lat 26° 26' 2.4'' N
Lon 20° 51' 26.7'' E
East 6.7 cm/s
North -37.3 cm/s
Spd: 0.74 kts Crs:170°

TRANSECT 015

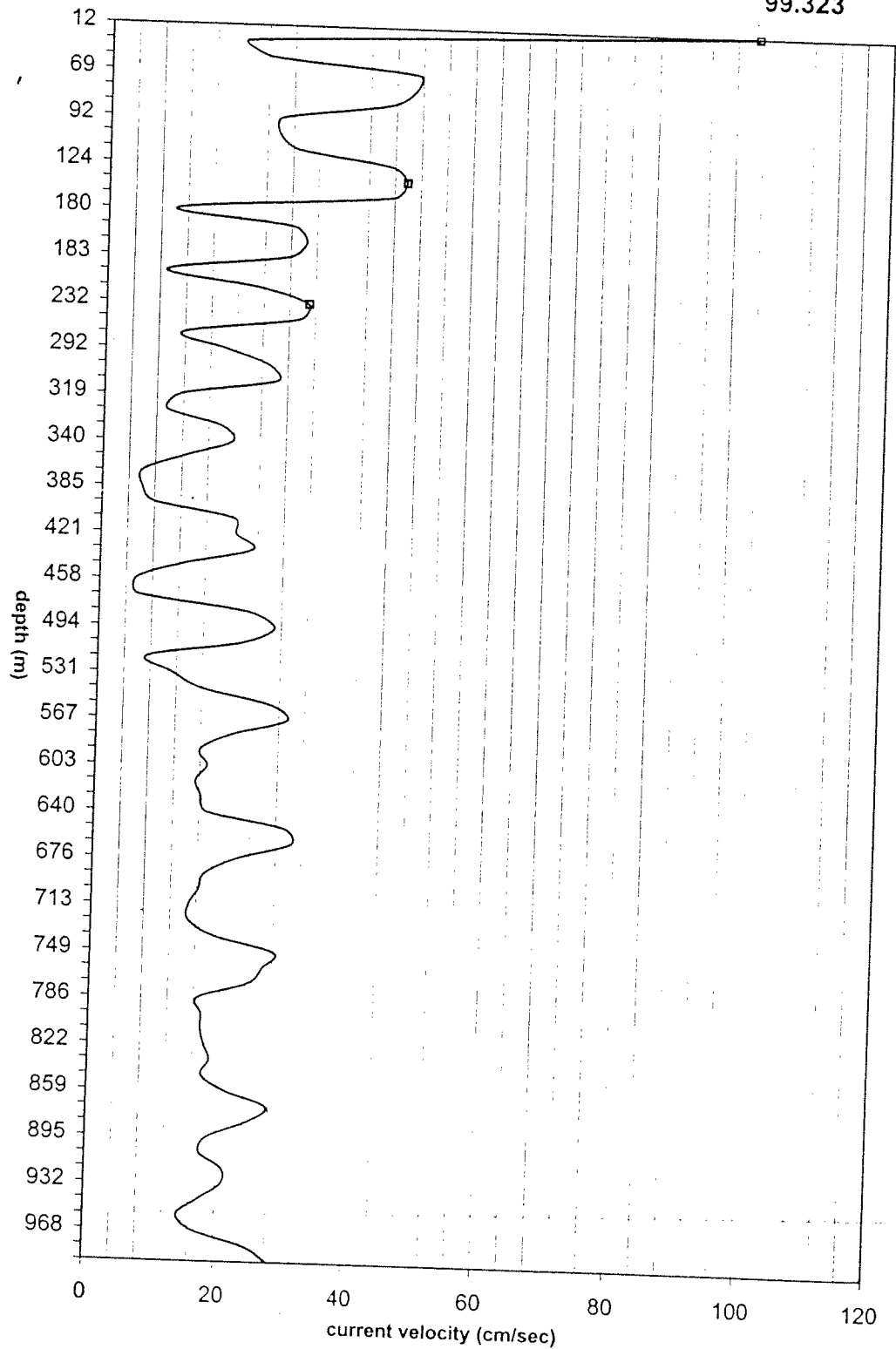
Made good 624.34 m
Length 907.03 m
Time 44 min 30.00 s
Σ Q 0.0 m³/s
Average every OFF

RECORDING TURNED OFF

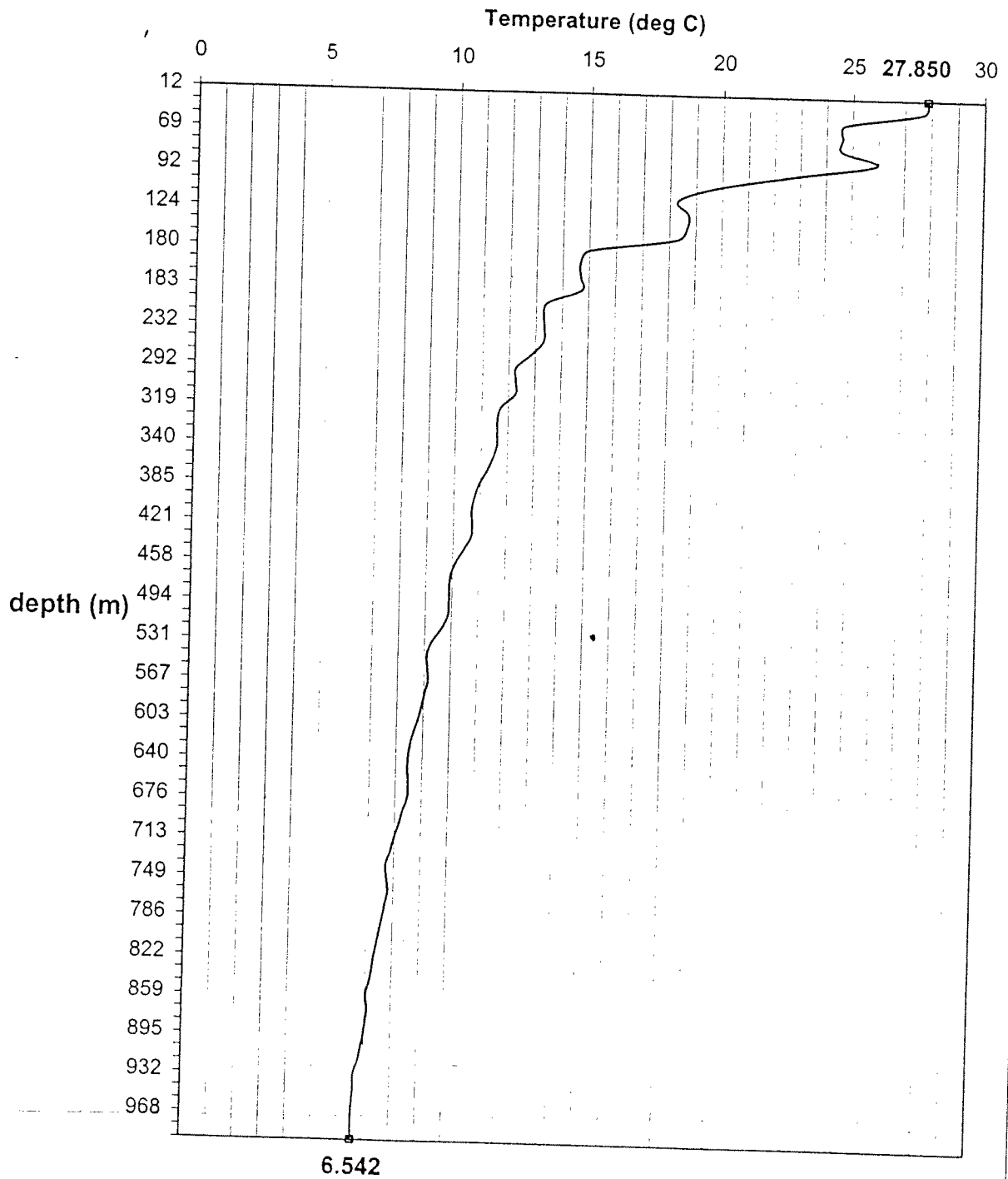
CFG File TATA.CFG
Raw Data NOT LOADED
Avg Data OTEC016P.000
Nav Data NOT LOADED

Current profile(Magnitude)
SK-139, lat 8,25E, lon78,32N, OTEC site
readings taken at 8:00a.m
on 14-11-1998, with niot current meter

99.323



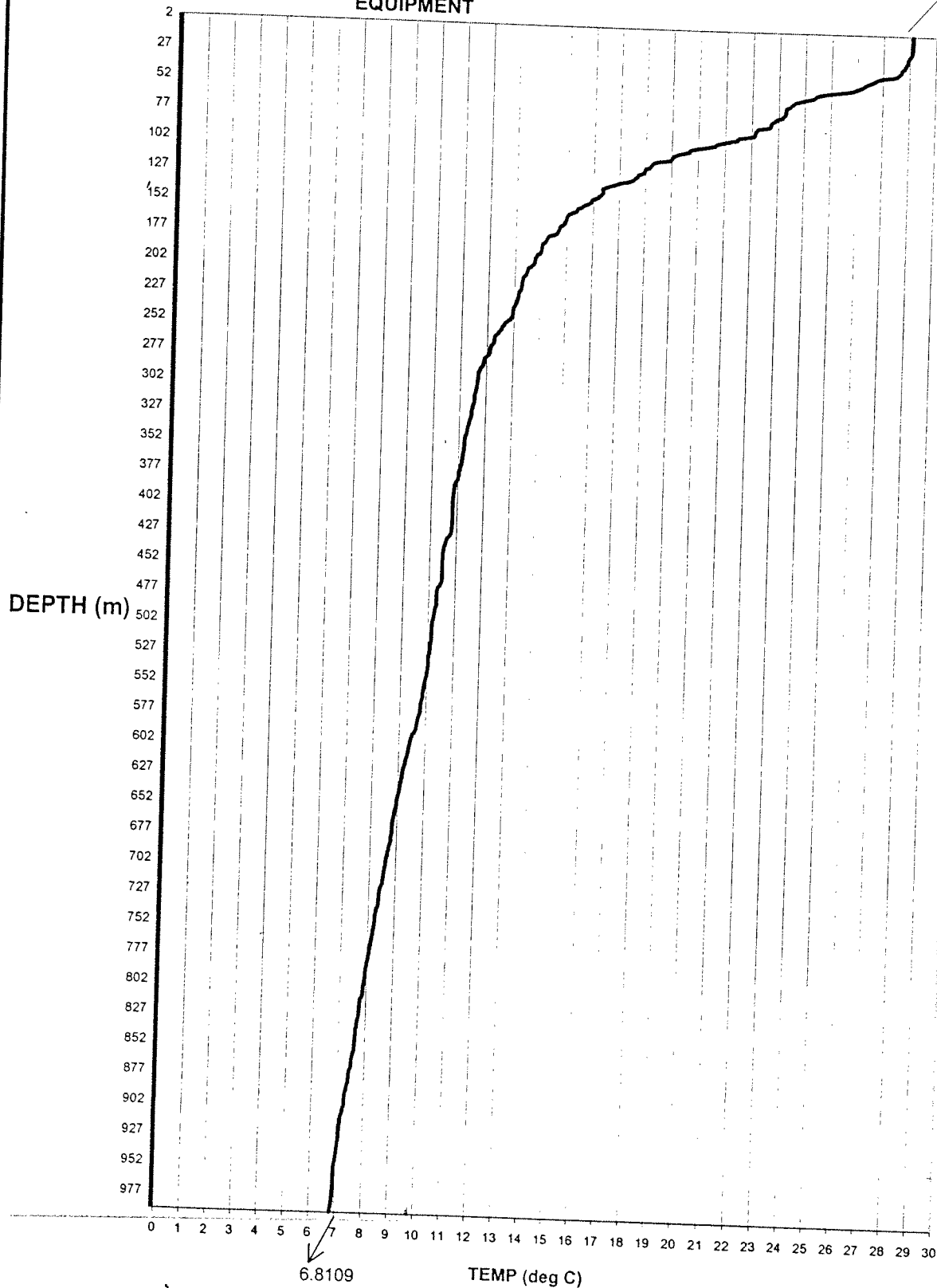
Temperature profile
SK-139, lat 8,25E, lon78,32N, OTEC site
readings taken at 8:00a.m
on 14-11-1998, with niot current meter



TEMPERATURE PROFILE OTEC SITE

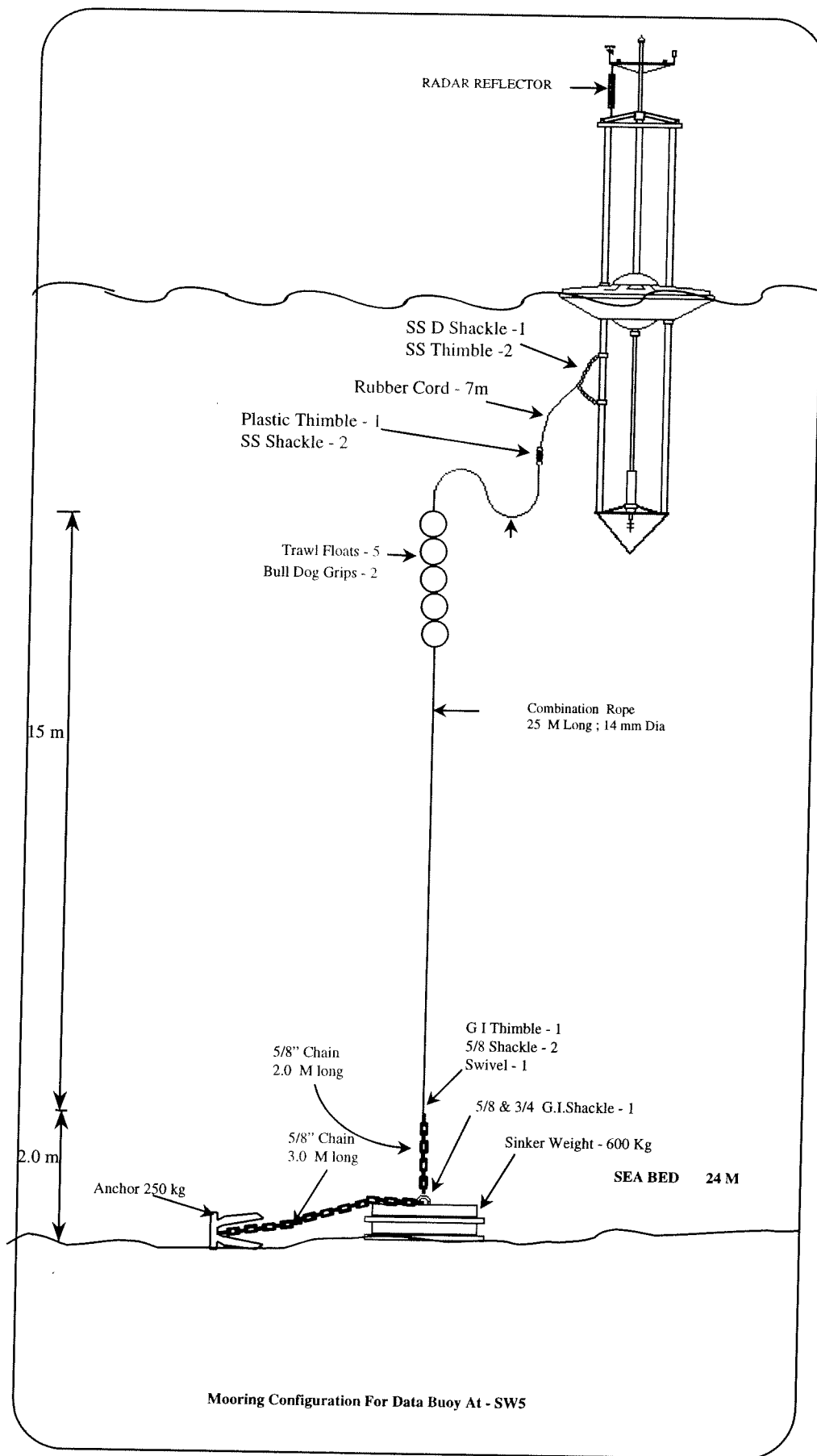
14-11-1998, 12.45 A.M, WITH SAGAR KANYA CTD
EQUIPMENT

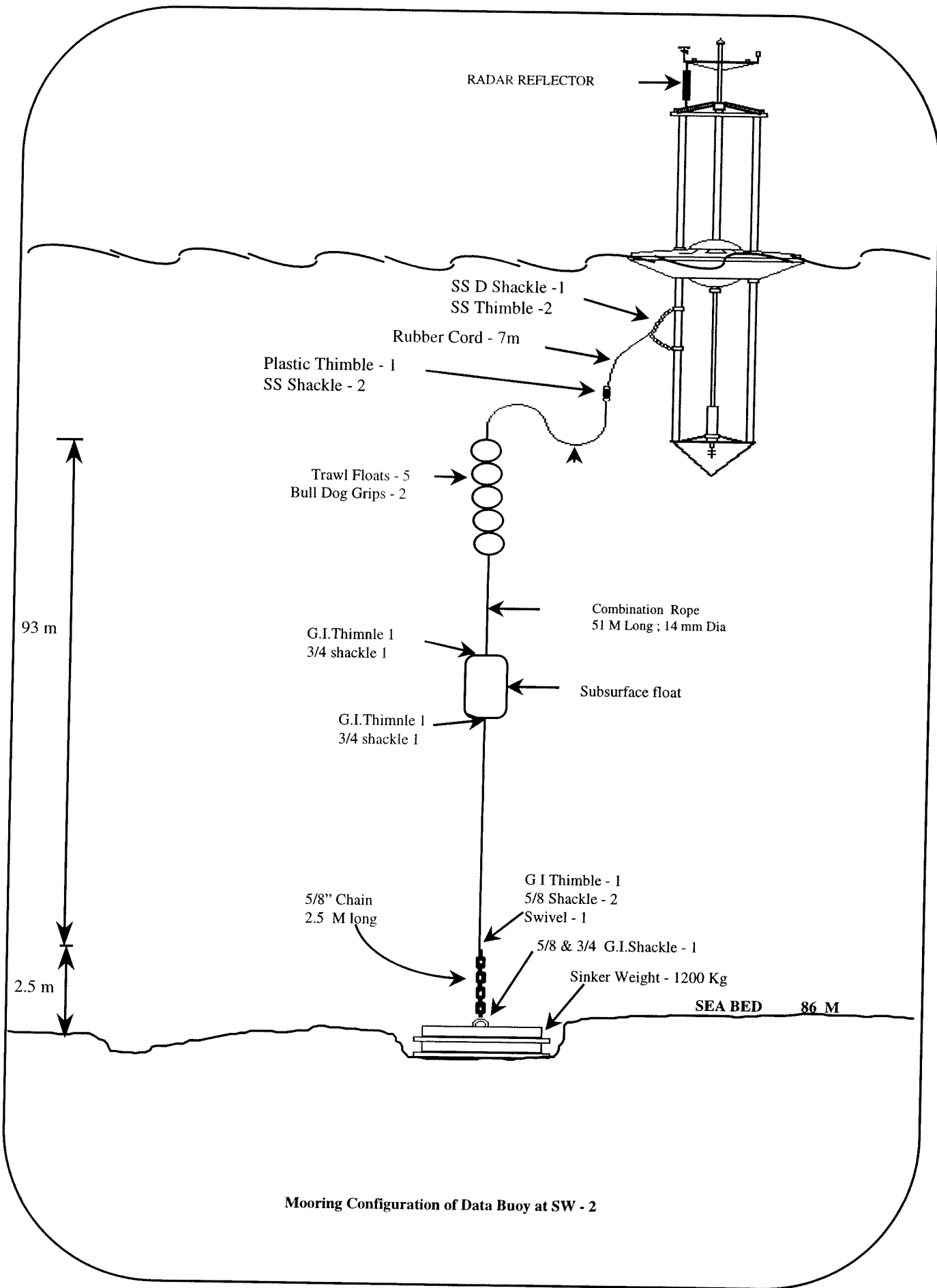
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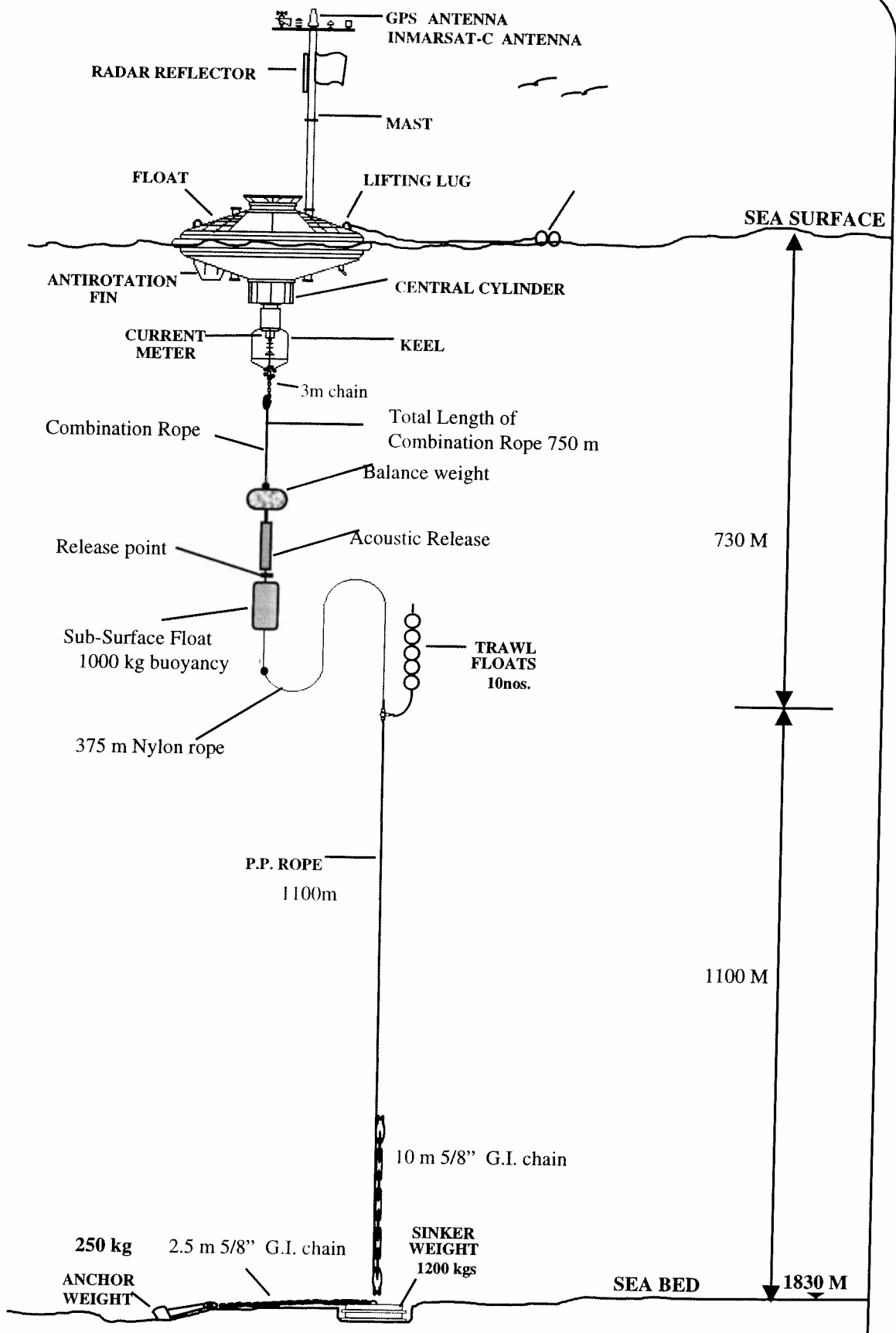
6.8109

TEMP (deg C)

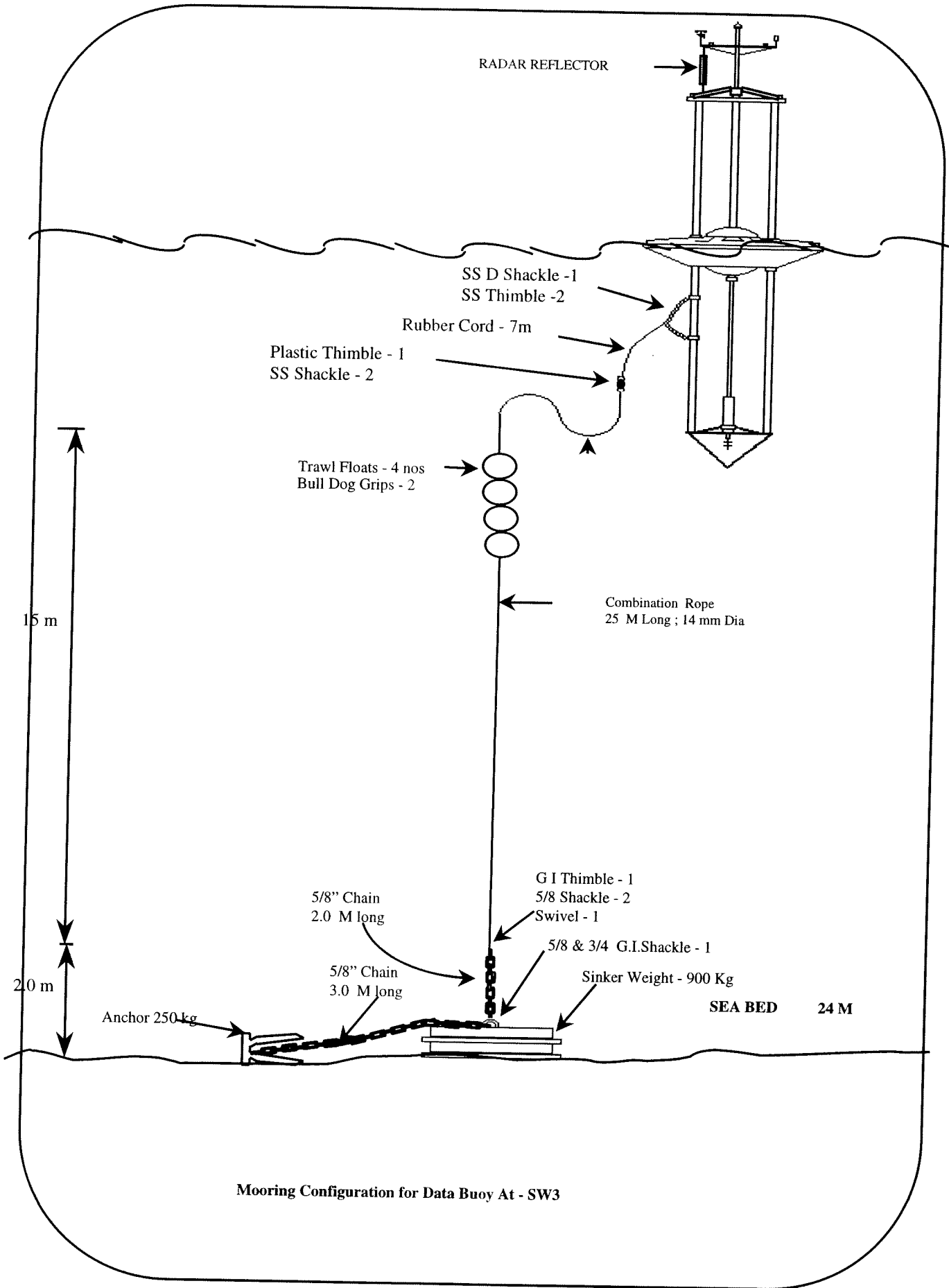


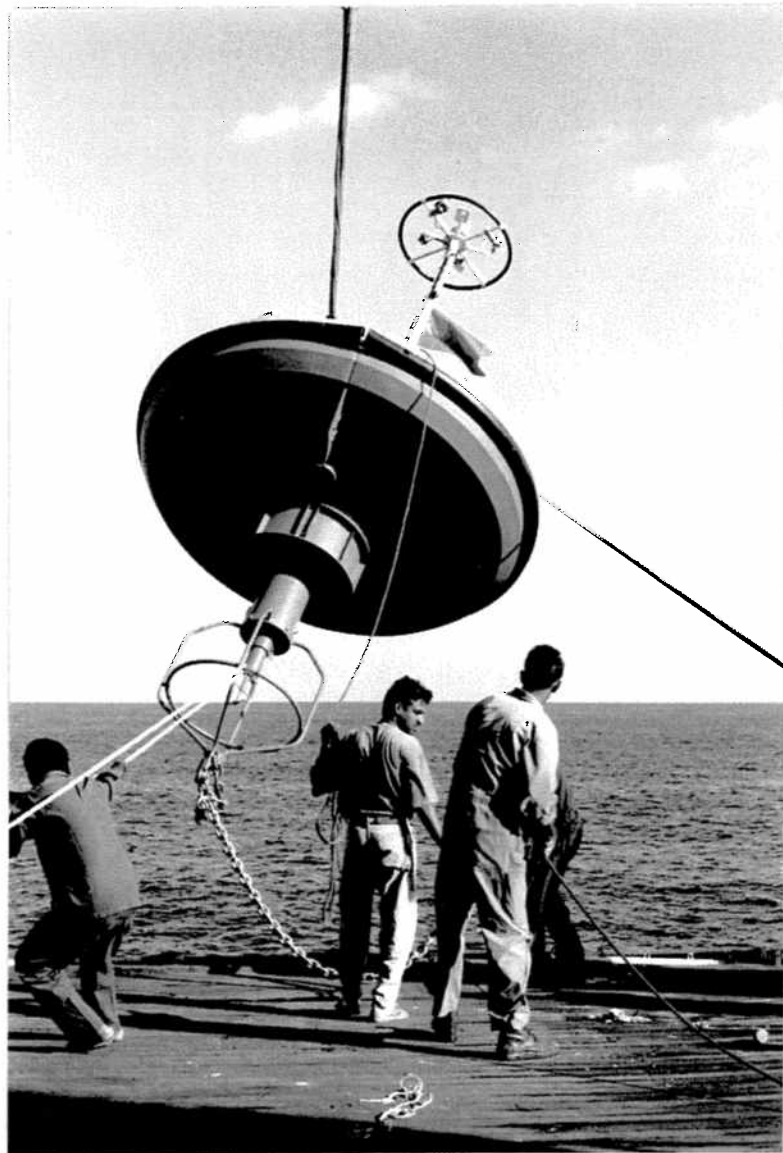
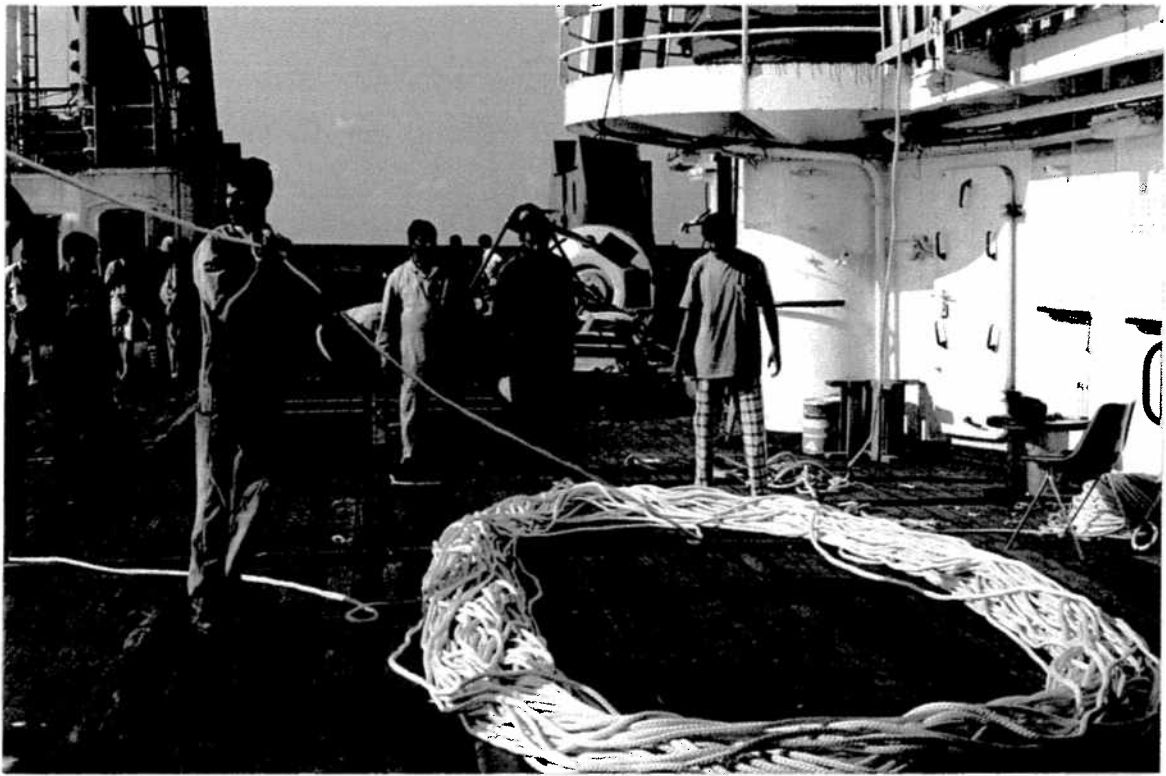


Mooring Configuration of Data Buoy at SW - 2



Mooring Configuration For Data Buoy At - DS2





Deployment of the Wavescan Buoy at DS2 location



Retrieval of Seawatch Buoy at Goa



Retrieval of Seawatch Buoy at SW2 location Near ONGC's Drilling Ship



CTD Operation at OTEC Site