

ORV - SAGAR KANYA

CRUISE REPORT

Cruise No. SK - 315

(28th July to 27th August, 2014)



Submitted by

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Objectives:

This cruise is principally dedicated to the recovery and deployment of deep ocean ATLAS moorings at six sites; the recovery and deployment of two deep ocean subsurface ADCP moorings, recovery at a third ADCP site, and deployment of an ATLAS and a subsurface ADCP at one new site as detailed in Table and deployment of Twenty ARGO floats along with ship enroot.

The moorings are a part of the Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA). This array is under development as part of a multi-national effort to provide data essential for monitoring, understanding, and predicting basin scale ocean-atmosphere variability such as the Asian monsoon, the Indian Ocean Dipole, and the Madden-Julian Oscillation.

Cruise Track:

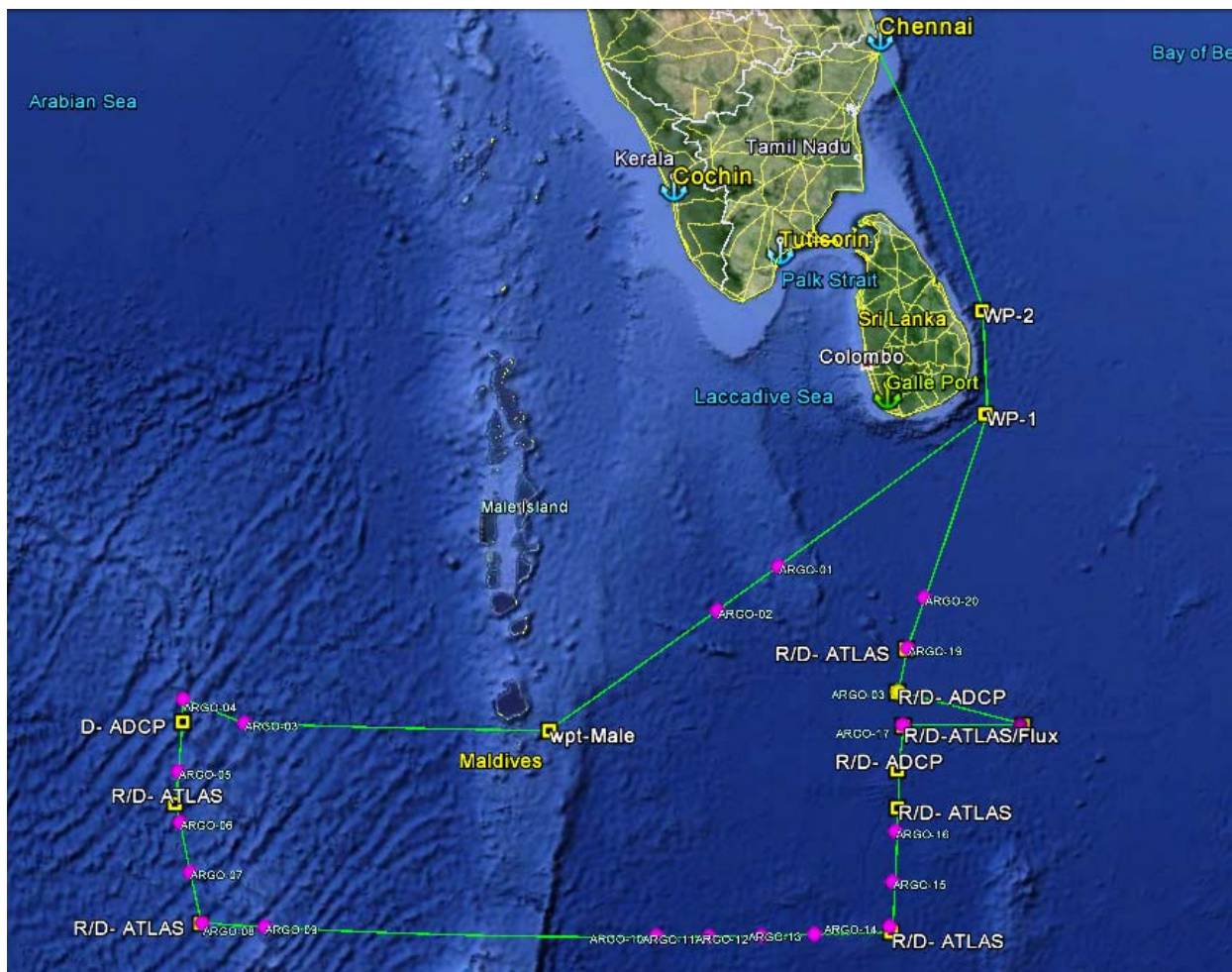


Table 1: Mooring Operations:

“D” = deployment, “R” = Recover locations are nominal locations. Exact positions are provided to ship operators at that time of operations.

Mooring ID	Operation	Mooring Type	Deployment Lat	Deployment Long	Comments
IO051	D	ADCP	00 00.0N	67 00.0E	Nominal location. New site, bathymetric surveyed. EZ
RA113A	D	ATLAS	00 00.0N	67 00.0E	Nominal location. New site, bathymetric surveyed. EZ
RA105A	R	ATLAS	01 37.2S	66 48.6E	EZ. Not transmitting
RA114A	D	ATLAS	01 37.2S	66 48.6E	EZ
RA104A	R	ATLAS	04 01.2S	67 13.2E	EZ. Not transmitting
RA115A	D	ATLAS	04 01.2S	67 13.2E	EZ
RA103A	R	ATLAS	04 00.6S	80 28.2E	
RA116A	D	ATLAS	04 00.6S	80 28.2E	
RA102A	R	ATLAS	01 30.6S	80 31.2E	
RA117A	D	ATLAS	01 30.6S	80 31.2E	
IO041	R	ADCP	00 46.1S	80 29.9E	
IO052	D	ADCP	00 46.1S	80 29.9E	
RA098B	R	ATLAS/Flux	00 04.2N	80 35.4E	
RA118A	D	ATLAS/Flux	00 04.2N	80 35.4E	
IO043	R	ADCP	00 02.1N	82 57.1E	
IO038	R	ADCP	00 43.1N	80 28.2E	
IO053	D	ADCP	00 43.1N	80 28.2E	
RA108C	R	ATLAS	01 32.4N	80 37.8E	
RA119A	D	ATLAS	01 32.4N	80 37.8E	

Scientific Participants SK-315

Sr. No.	Name of Participants	Designation	Institute	Nationality
1.	Mr. NEELAKANDAN SURESH KUMAR	Chief Scientist	INCOIS	INDIA
2.	Mr. JOHN MICHAEL STRICK	Dy. Scientist	NOAA/PMEL	USA
3.	Mr. WILLIAM LESTER HIGLEY JR	Scientific	NOAA/PMEL	USA
4.	Mr. KOREY EDWARD MARTIN	Scientist	NOAA/PMEL	USA
5.	Mr. RUPESH SAWANT	Onboard Asst.	NCAOR	INDIA
6.	Mr. MAHADEVAN GANAPATHY	AMC Engineer	NORINCO	INDIA
7.	Mr. RAGUNATH JOTHIVEL	AMC Engineer	NORINCO	INDIA
8.	Mr. MADAR PARSHURAM DURGAPPA	AMC Engineer	NORINCO	INDIA
9.	Mr. VEL KUMAR MURUGAN	AMC Engineer	NORINCO	INDIA
10.	Mr. KIRUBAKARAN NARAYANASAMY	Deployment Asst.	INCOIS	INDIA
11.	Mr. RAJAPART RAMALINGAM	Deployment Asst.	INCOIS	INDIA
12.	Mr. THIVAKAR SANKAR	Deployment Asst.	INCOIS	INDIA
13.	Mr. MAGESHKUMAR NANDHAKUMAR	Deployment Asst.	INCOIS	INDIA
14.	Mr. SUBRAMANIAN NATESAN	Deployment Asst.	INCOIS	INDIA

Recovery and Deployment of RAMA mooring Buoy:

The Research Moored Array for African Asian Australian Monsoon Analysis and Prediction (RAMA) moored buoy is an international program of Global Ocean Observation System. (GOOS). RAMA ATLAS – Autonomous Temperature Line Acquisition System & ADCP –Acoustic Doppler Current profiler buoys were recovered and redeployed at assigned locations in Equatorial Indian Ocean by MoES/INCOIS & NOAA/PMEL scientists.

The recovery operations start with sighting the buoy on Radar or visually from Bridge. Then the vessel moved close (up to 50-100 m) to the buoy float with the help of DP or main propulsion. Buoy is then released from the anchor weights by sending acoustic pulses to the Acoustic Release unit which connected between the Mooring line and Anchors. After that a small inflatable boat can be used to carry scientists and seaman's, lowered from the ship main deck midships Starboard from main deck. This boat approached to the buoy and all meteorological sensors (wind speed and direction, solar radiation, humidity and air temperature) taken off from the buoy tower. The buoy is then hooked with a rope (working Line ~300m) which is passed to the boat from ship stern. Finally the buoy was recovered on the main deck using A-frame and Win-tech Electric winch capstan or Deep Sea Friction winch and after recovery of the buoy, the cable was pulled by winch and all sub-surface sensors were taken off from the mooring cable. Similar procedure followed for recovery of all RAMA buoys during the cruise.

Deployment of RAMA-ATLAS buoy was performed from midships of the ship using ATLAS Crane or National OilWell Crane, before the deployment, the top tower section fitted with all meteorological sensors and clamped on it, then a cable Nilspin (Conductive Cable) was connected to the bottom tower of float and subsurface sensors were clamped at defined Depths on the mooring cable. The cable was laid along the Main Deck of the ship towards the ship aft. The ATLAS buoy was deployed using the midships ATLAS crane and ADCP deployed by A-frame from main deck and mooring cable passed over the Hanging Pulley Block connected in the deep sea winch and then by finally pass it Wintech Electrical Winch tech by wrapping with 4-5 straps in winch of PMEL heaving capacity ~6 Ton . For Surface Buoy after completing Pay out ~ 700 m of Nilspin cable, the nylon rope was connected to the buoy mooring line for remaining length till up to seabed. At the end before connecting Anchors an Acoustic release was connected to the line, followed by the heavy anchor weight. The anchors were dropped from the ship aft by using National OilWell Crane and deep see winch capstan. Similar procedure followed for all RAMA & ADCP buoy deployments.

Complete details of Buoy Retrievals/Deployments:

Sr. No.	Mooring Descriptions	Date	Mooring Locations	
			Latitude	Longitude
1	ADCP DEPLOYED	5-Aug-14	00°11.3 N	67°07.9 E
2	ATLAS DEPLOYED	6-Aug-14	00°25.3 N	67°00.1 E
3	ATLAS RECOVERED	7-Aug-14	01°37.2 S	66°48.6 E
4	ATLAS DEPLOYED	7-Aug-14	01°37.2 S	66°48.8 E
5	ATLAS RECOVERED	9-Aug-14	04°01.2 S	67°13.2 E
6	ATLAS DEPLOYED	9-Aug-14	04°01.5 S	67°13.8 E
7	ATLAS RECOVERED	14-Aug-14	04°00.6 S	80°28.2 E
8	ATLAS DEPLOYED	14-Aug-14	03°54.3 S	80°27.2 E
9	ATLAS RECOVERED	16-Aug-14	01°34.6 S	80°31.2 E
10	ATLAS DEPLOYED	16-Aug-14	01°30.2 S	80°29.6 E
11	ADCP RECOVERED	17-Aug-14	00°46.1 S	80°29.9 E
12	ADCP DEPLOYED	17-Aug-14	00°46.0 S	80°29.6 E
13	ATLAS/T-Flux RECOVERED	18-Aug-14	00°04.2 N	80°35.4 E
14	ATLAS/T-Flux DEPLOYED	18-Aug-14	00°04.9 N	80°33.8 E
15	ADCP RECOVERED	19-Aug-14	00°02.1 N	82°57.1 E
16	ADCP RECOVERED	21-Aug-14	00°43.1 N	80°28.2 E
17	ADCP DEPLOYED	21-Aug-14	00°36.9 N	80°27.2 E
18	ATLAS RECOVERED	22-Aug-14	01°32.4 N	80°37.8 E
19	ATLAS DEPLOYED	22-Aug-14	01°32.0 N	80°37.9 E

ARGO FLOAT DEPLOYMENTS:

Sr. No.	Float ID	Model Name	DEPLOY		DEPLOYED ON
			LATITUDE	LONGITUDE	
1	7104	APEX-APF9A	03°05.50' N	78°12.01' E	01-Aug-2014, 14:04 GMT
2	7105	APEX-APF9A	02°15.60' N	77°04.44' E	02-Aug-2014, 00:58 GMT
3	OIN 13IND ARL 21	ARVOR-L	00°00.13' N	68°12.73' E	04-Aug-2014, 19:42 GMT
4	7109	APEX-APF9A	00°25.47' N	67°00.01' E	06-Aug-2014, 10:42 GMT
5	OIN 13IND ARL 23	ARVOR-L	00°59.62' S	66°52.29' E	06-Aug-2014, 21:54 GMT
6	OIN 13IND ARL 25	ARVOR-L	02°00.05' S	66°52.49' E	07-Aug-2014, 21:51 GMT
7	OIN 13IND S31 01	PROVOR CTS31	02°59.58' S	67°02.28' E	08-Aug-2014, 06:32 GMT
8	7110	APEX-APF9A	04°01.52' S	67°14.27' E	09-Aug-2014, 15:00 GMT
9	OIN 13IND ARI 09	ARVOR-I	04°01.72' S	68°29.85' E	10-Aug-2014, 01:14 GMT
10	OIN 13IND S31-02	PROVOR CTS31	04°01.00' S	75°59.93' E	12-Aug-2014, 04:56 GMT
11	OIN 13IND ARL 22	ARVOR-L	04°01.20' S	76°59.38' E	12-Aug-2014, 11:58 GMT
12	OIN 13IND ARL 27	ARVOR-L	04°01.17' S	77°59.07' E	12-Aug-2014, 19:19 GMT
13	OIN 13IND ARI 10	ARVOR-I	04°00.93' S	79°00.03' E	13-Aug-2014, 02:33 GMT
14	7113	APEX-APF9A	03°54.01' S	80°27.08' E	14-Aug-2014, 21:20 GMT
15	7112	APEX-APF9A	02°59.97' S	80°28.39' E	15-Aug-2014, 04:08 GMT
16	7111	APEX-APF9A	01°59.93' S	80°29.82' E	15-Aug-2014, 11:53 GMT
17	OIN 13IND S31-03	PROVOR CTS31	00°04.65' N	80°34.24' E	18-Aug-2014, 14:39 GMT
18	7106	APEX-APF9A	00°01.34' N	82°52.46' E	19-Aug-2014, 15:06 GMT
19	7107	APEX-APF9A	01°32.51' N	80°38.43' E	22-Aug-2014, 14:37 GMT
20	7108	APEX-APF9A	02°29.80' N	80°57.17' E	22-Aug-2014, 22:42 GMT

CTD operations:

Conductivity, Temperature, and Depth (CTD) with water sample collection casts were made up to 700/2000 meters depth at selective locations where RAMA buoys were deployed/recovered.

Sl. No	STATION NO	DATE	DEPTH (m)	START TIME (IST)	END TIME (IST)	LATITUDE	LONGITUDE
1	SK315001	06-Aug-14	2000	06.20 hrs	09.30hrs	00°25.35 N	67°00.14 E
2	SK315002	07-Aug-14	700	22.00hrs	23.20hrs	01°37.94 S	66°48.74 E
3	SK315003	08-Aug-14	2000	23.00hrs	01.45hrs	04°02.43 S	6711.70 E
4	SK315004	13-Aug-14	2000	21.55hrs	00.45hrs	03°53.36 S	80°26.98 E
5	SK315005	15-Aug-14	2000	21.45hrs	00.50hrs	01°29.36 S	80°31.11 E
6	SK315006	17-Aug-14	700	04.26hrs	05.35hrs	00°44.42 S	80°29.93 E
7	SK315007	18-Aug-14	2000	03.00hrs	05.45hrs	00°04.13 N	80°47.61 E
8	SK315008	22-Aug-14	1700	03.00hrs	05.50hrs	01°31.62 N	80°37.85 E

Diary of Events

28-July-2014, Day 1

- Scientific Equipments were offloaded from the trucks and completed loading by 12:00 Hrs.
- PMEL and INCOIS team Signed ON at 13:00 Hrs and accommodation allotted to all of them.
- PMEL Electrical winch is successfully fitted in main deck with local workshop team.
- All scientific gears were inventoried and verified by PMEL.
- Vessel departed from Chennai port -19:30 Hrs.

29-July-2014, Day 2

- 13:30 Hrs, familiarisation meeting were carried for SK-315 scientific participants.
- 16:00 Hrs, onboard Safety drills were conducted with scientific team and ship officers & crew members.
- NOAA scientists set up the lab facility & instruments on deck and staged the mooring hardware and gears according to the order of operations.

30-July-2014, Day 3

- 08:00 Hrs, Vessel propelled to first site of RAMA-ATLAS buoy deployment in 0N|67E.
- 10:30 Hrs, Pre-cruise meeting conducted for cruise operation and plan with Master, Officers, deck crew members, Scientific team and Norinco Engineers..

31-July -2014, Day 4

- 10:00 Hrs, All Argo floats set up for satellite check in Balloon Deck.

01-Aug-2014, Day 5

- Argo floats SAT-Check completed and data reception were confirmed from INCOIS.
- 12:00 Hrs, A brief meeting with Norinco engineers regarding bathymetry queries.
- 19:34 Hrs, deployed first Argo float in 03°05.50 N | 78°12.01 E.

02-Aug-2014, Day 6

- 06:28 Hrs, deployed 2nd Argo float in 02°15.60 N | 77°04.44 E
- 14:00 Hrs, Small Boat practised with seaman and deckhands.

03-Aug-2014, Day 7

- 14:00 Hrs, Crossed Maldives island and Vsl. propelled to 0N|67E.

04-Aug-2014, Day 8

- 15:00 Hrs, Due to some internal parameter –vacuum changes inside the float the nke-Argo float, deployment plan aborted.

05-Aug-2014, Day 9

- Rectified the ARGO floats problems and ready for deployments.
- 00:46 Hrs, deployed 3rd Argo float in 00°00.138' N | 68°12.732' E.
- 08:00 Hrs, Vessel arrived 0N|67E new site for RAMA-ATLAS & ADCP deployment.
- Since the new site need the bathy for fixing the Anchor Position.
- 19:00 Hrs, after successful Multibeam survey we started new deployment of ADCP mooring.
- 23:45 Hrs, ADCP deployment operation completed.

06-Aug-2014, Day 10

- 06:00 Hrs – CTD for 2000 meter casting carried out.
- 09:00-15:00 Hrs, Deployment of ATLAS buoy completed.
- 16:12 Hrs, deployed 4th Argo float in 00°25.47' N | 67°00.01' E.
- 16:30 Hrs, Vsl. started towards next site.

07-Aug-2014, Day 11

- 03:24 Hrs, deployment of 5th Argo float in 00°59.62' S | 66°52.29' E.
- 08:40 Hrs, Vsl. arrived 1.5S|67E and sited the ATLAS buoy through radar monitor.
- 22:30 Hrs, Successfully retrieved & re-deployed the ATLAS buoy in 1.5S|67E.

08-Aug-2014, Day 12

- 02:51 Hrs, deployed 6th Argo float in 02°00.05' S | 66°52.49' E.
- 12:02 Hrs, deployed 7th Argo float in 02°59.58' S | 67°02.28' E.

09-Aug-2014, Day 13

- 09:00-18:30 Hrs, retrieved ATLAS buoy @ 4S|67E and deployed new buoy successfully.
- Due to DP manning found that the Acoustic Release deck unit had serious noise from AT& BT operation.
- 20:30 Hrs, deployed 8th ARGO float in 04°01.52' S | 67°14.27' E.

10-Aug-2014, Day 14

- 06:44 Hrs, deployed 9th ARGO float in 04°01.72' S | 68°29.85' E.
- Vessel propelled towards 4S|80.5E RAMA Atlas mooring.

11- Aug-2014, Day 15

- Vsl. propelled 4S|80.5E site.

12- Aug-2014, Day 16

- 10:26 Hrs, deployed 10th Argo float in 04°01.00' S | 75°59.93' E.

- 17:28 Hrs, deployed 11th Argo float in 04°01.20' S | 76°59.38' E.
- 11:15 Hrs, Safety meeting carried out in officer recreation hall.
- 16:15 Hrs, safety fire drill practised onboard.

13- Aug-2014, Day 17

- 00:49 Hrs, deployed 12th Argo float in 04°01.17' S | 77°59.07' E.
- 08:03 Hrs, deployed 13th Argo float in 04°00.93' S | 79°00.03' E.
- 19:30 Hrs, Vsl. arrived 4S|80.5E site.
- 20:30 Hrs, Vsl. started survey for 5nm for deploy ATLAS Buoy.
- 22:00 Hrs, Multibeam survey completed.
- 22:30 Hrs, CTD for Seabird & Idronaut unit for 2000 & 1000 meters.

14- Aug-2014, Day 18

- 09:00 Hrs, Recovery operation commenced.
- Unfortunately the PMEL Welded winch onboard went to malfunction and didn't start, the problem reported by internal circuit is fault overload & Bus under voltage.
- Recovery operation is got delayed by five hours,
- At last we skipped the PMEL winch and planned to use Deep Sea friction winch onboard by fixed external DRUM with supporting SS-shaft.
- 13:30 Hrs, Recovery operation ATLAS buoy started. But the operation time went very long time due to slow speed of winch.
- 21:30 Hrs, successfully completed the recovery operation.
- 22:30 Hrs, at night we have started the New ATLAS buoy deployment at 4S|80.5E.

15- Aug-2014, Day 19

- 01:30 Hrs, 4S|80.5E ATLAS buoy anchored dropped in water.
- 02:30 Hrs, fly by carried out and confirmed that buoy data.
- 02:50 Hrs, deployed 14th Argo float in 03°54.01' S | 80°27.08' E.
- 08:00 Hrs, Independence Day celebrated onboard.
- 09:58 Hrs, deployed 15th Argo float in 02°59.97' S | 80°28.39' E.
- 17:23 Hrs, deployed 16th Argo float in 01°59.93' S | 80°29.82' E
- 21:30 Hrs, Vsl. arrived 1.5S|80.5E site for Recover & Deploy of ATLAS buoy.
- CTD cast taken for 2000meters.

16- Aug-2014, Day 20

- 06:00 Hrs, Recovery operation commenced for RAMA-ATLAS buoy.
- 15:15 Hrs, Recovery buoy operation completed.
- 16:30 Hrs, New deployment started and completed by 21:30 Hrs.
- Vsl. propelled to for ADCP R/D.

17- Aug-2014, Day 21

- 04:00 Hrs, Vsl. arrived the station.
- 04:30-05:15 Hrs, CTD cast finished for 700 meters.
- 06:00 Hrs, Recovery for ADCP started and completed by 12:00 Hrs.
- 13:00-16:00 Hrs, ADCP deployment completed. Vsl departed for next site.

18- Aug-2014, Day 22

- 00:30 Hrs, Vsl. arrived station 0N|80.5E for ATLAS Flux R/D.
- 03:00-05:00 Hrs, completed CTD cast for 2000meters.
- 06:00-13:30 hrs, Recovery operation completed.
- 15:30 Hrs, deployment started and ATLAS buoy deployed.
- 19:45 Hrs, deployment finished and Fly by over the buoy is done.
- 20:09 Hrs, deployed 17th Argo float in 00°04.65'N | 80°34.24' E.

19- Aug-2014, Day 23

- Vsl. reached 0N|83E location for recovery of ADCP
- 14:30 Hrs, Recovery operation of ADCP started out.
- 15:30 Hrs, ADCP buoy released from Anchors.
- 16:30 Hrs, ADCP buoy on Deck.
- 20:00 Hrs, Recovery operation were completed.
- 20:30 Hrs, deployed 18th Argo float in 00°01.34' N | 82°52.46' E.

20- Aug-2014, Day 24

- 17:00 Hrs, Vsl. arrived 0.45N | 80.5E.
- Due to bad light we skipped the recovery plan for ADCP and decide to deploy ADCP 6nm away from old position.
- From the Cooling water pipe line connection to main generators got busted out and started leaking and this caused our mooring work delayed. Followed this occurrence we avoid the deployment.

21- Aug-2014, Day 25

- 06:00 Hrs, decide to deploy the ADCP and recovery of ADCP upon weather permit later.

- 09:30 Hrs, finished ADCP deployment in 0.45N|80.5E.
- 10:00 Hrs, Since the Sea state became very worst and we stayed while to see the how weather going to favour for our Recovery operation later.
- 14:30 Hrs, weather became alright and we started the recovery operation. Wonderful DP operation by Captain.
- 18:45 Hrs, recovered the ADCP onboard and headed toward the next and last site 1.5N | 80.5E for R/D of ATLAS buoy.

22- Aug-2014, Day 26

- 02:30 Hrs, Vsl. arrived ATLAS buoy location and started for CTD 1.6nm away from buoy location.
- 03:00 Hrs, CTD cast taken for 1700 meter, due to bad weather they didn't go for 2000 meter cast.
- 06:00 Hrs, Recovery started and successfully finished by 14:30 Hrs.
- 16:00 Hrs, last ATLAS buoy deployed in water.
- 19:45 Hrs, Buoy deployment got over.
- 20:07 Hrs deployed the 19th Argo float in 01°32.51' N | 80°38.43' E.
- Vsl. headed on the way to Chennai via Srilankan way points.

23- Aug-2014, Day 27

- 04:00 Hrs, deployed the last and 20th ARGO float in 02°29.80' N | 80°57.17' E.
- Vsl scheduled the ETA to Chennai 26-Aug-2014, 18:00 Hrs.

24- Aug-2014, Day 28

- Vessel headed towards Chennai port, ETA is revised to 27-Aug-2014| 06:00Hrs due Engine problems.

25- Aug-2014, Day 29

- Vessel headed towards Chennai port

26- Aug-2014, Day 30

- Vessel headed towards Chennai port,
- 09:30 Hrs, Ship shutdown the Starboard propeller and used port propeller for streaming to port, due to oil leakage in the Starboard side propeller this action has been taken.

27- Aug-2014, Day 31

- Vessel arrived Chennai port.
- 08:30 Hrs, vessel got birthed in piers (North Quay)
- 12:00 Hrs, offloading works of SK-315 started out and completed.
- Scientific team were signed off successfully @ 16:00 Hrs.

Summary of the scientific works done during cruise SK-315:

1. 07-ATLAS & 03-ADCP buoys were deployed and 06-ATLAS & 03-ADCP buoys were recovered in Latitudes 1.5N, to 4S along with 67E & 80.5 E longitude lines of RAMA Moorings
2. 20 Argo Floats were deployed along with Ship enroots.
3. Conductivity-Temperature-Depth (CTD) profiles taken every RAMA buoy locations.
4. Bathymetry surveys were accomplished for all RAMA deployment locations.

Acknowledgements

I on behalf of the scientific team of RAMA cruise SK-315, would like to thank Director, NCAOR for providing the research vessel "ORV Sagar Kanya" and all the facilities onboard for our operations i sincerely thank to Captain CAPT. LEO XAVIER RATO, Chief Officer Mr. RAJARAM ROY, Chief Engineer Mr. SWAROOP SHEKHAR JEE and all Officers, CTO, Doctor, Electrical Engineers and Crew members onboard ORV-Sagar Kanya, for their excellent cooperation and good team work throughout the cruise in making this voyage a very successful, I am also thankful to Dr. M. Ravichandran, INCOIS for the kind support and valuable suggestions.

I am grateful to Dr. Anil Kumar and Mr. M. M. Subramaniam, NCAOR for all the administrative and logistic supports during the cruise. I sincerely thank agents Mr. Anuj Sharma -ASPL and their team for make out all the paper works in-time during our Sign-On / Sign-Off process and logistical matters.

Thanks to M/s NORINCO Engineers onboard for their untiring works during RAMA and CTD operations. Finally I would like to thank all the members of scientific team of SK-315 to make this a successful and enjoyable cruise.

Date: 27-Aug-2014

(N Suresh Kumar)
Chief Scientist, SK-315