INDONESIAN THROUGHFLOW MONITORING
RECOVERY AND REDEPLOYMENT OF MAKASSAR MOORING
May 27 – June 4, 2009

Cruise Report

by

Dr. Dwi Susanto
Chief Scientist

Lamont-Doherty Earth Observatory of Columbia University
Palisades, New York 10964

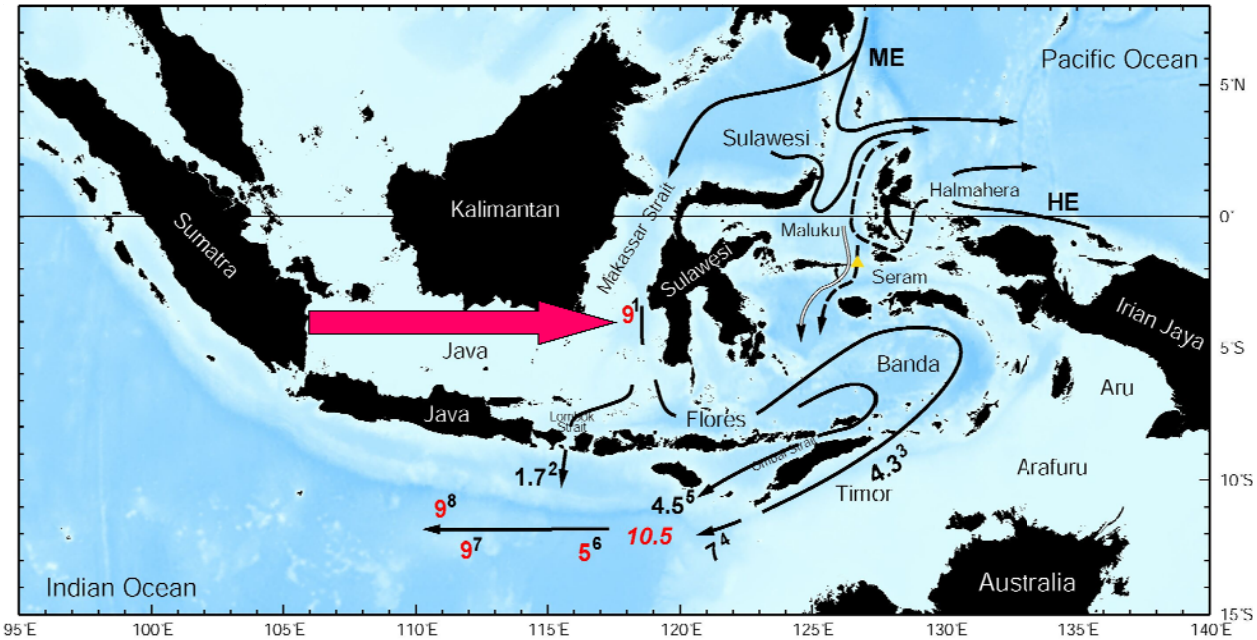


Figure 1. ITF-monitoring mooring at Makassar Strait.

1. INTRODUCTION

It is well known that Indonesian Throughflow (ITF) plays an important role in global ocean circulation and climate. Indonesian seas provide the only connection between tropical/ subtropical Pacific into Indian Ocean, which Makassar Strait the main pathway of the ITF. Single mooring has been deployed in the Makassar Strait since November 2006 as continuation of the INSTANT program, and we plan to recover and redeploy it again for the next two year and beyond.

Scientific Objective: The Makassar ITF monitoring objective is to directly measure the ITF volume transport and its variability in the Makassar Strait, the main entrance of ITF from the Pacific Ocean. The Makassar ITF monitoring program is a joint collaborative effort between Lamont Doherty Earth Observatory of Columbia University, sponsored by NOAA-OCO, and the Agency for Marine and Fisheries Research (BRKP), Department of Marine Affairs and Fisheries of Government of Indonesia.

Cruise Objective: The cruise objective is to recover the Makassar ITF mooring using R/V Geomarin III to recover the data, refurbish and redeploy it for the next two years. To have a bathymetric survey in the vicinity of the mooring site, an east-west section of the Makassar Strait The voyage starts from Cirebon Port to Makassar Strait and end at Cirebon port (See ship track in Figure 2)..

The R/V Geomarin III is the newest Indonesian's R/V ship built by PT. PAL Surabaya, an Indonesian's shipyard. Our cruise is a virgin voyage, because the R/V Geomarin III will officially be launched by the State Minister of Energy and Mineral Resources in June 20, 2009.

2. DETAILED ACTIVITY

Sunday, May 24, 2009:
Preliminary assessment of the R/V Geomarin III in Cirebon. Bruce Huber, Bagus Hendrajana and myself (Dwi Susanto) go to Cirebon using Cirebon Express train from Jatinegara train station at 06:00am and arrive in Cirebon at 09:15am. Mr. Yudi Muliawan the head of Geomarin division of Marine Geological Institute (*Pusat Penelitian dan Pengembangan Geologi Lau*t, P3GL) in Cirebon pick us up. Mr. Sudarisman (Master of Geomarin III) gives us detailed tour of the ship from scientific facilities, safety equipment to engine. For our purposes, some modification are needed i.e. remove the seismic streamer and hydrophones winch, add a large rolling block in the A-frame to make sure that our mooring wire and shackle can pass thru, remove one of the wire feeder, readjust the wire on the main winch. P3GL and Geomarin III master and crews agree to our request and will finish by our sail date either on Wednesday or Thursday (May 27/28). After lunch on the ship, we visit the P3GL office and its facilities. Return to Jakarta using Cirebon Express train at 15:15pm. Arrive in Jatinegara train station at 18:30pm. Return to hotel.

Monday, May 25, 2009:
Requesting the name of security officer who will joint our cruise. Continue working on the shipment and airfreight to be cleared from the custom in the Tanjung Priok and Soekarno-Hatta airport. When Bruce entered Indonesia, his passport was stamped that he has to report to the immigration office within 7days of arrival. We plan to report at Cirebon immigration office.

Tuesday, May 26, 2009:
Mr. Eky Agung go to Cirebon to report to the immigration office on behalf of Bruce Huber and two BRKP guests from the First Institute of Oceanography, China. At 15:00pm our shipment gets a clearance from the custom at the Tanjung Priok Port, and then it is directly transported to Cirebon using a truck. The truck arrives at Cirebon at 23:30pm but cannot enter the Cirebon port so the equipments are stored overnight at P3GL office. At 18:00pm a meeting with Dr. Gellwyn Yusuf chairman of BRKP accompany by Dr. Budi Sulistyo to report our cruise plan. Get a confirmation from the PT Fessindo that airfreight cannot be released this evening but all necessary documents have been cleared so Wednesday morning all airfreight will be out from the storage. Inform all cruise participants and security officer that Thursday morning will be our cruise starting date, so they have to be ready on Wednesday 07:00am leaving for Cirebon using train.

Wednesday, May 27, 2009
Eight participants (including myself and Bruce) checked out the hotel and leaving for Cirebon using Argojati express train from Jatinegara train station at 09:10am and arrive at Cirebon at 12:30pm. Fill up the Geomarin IIII with fuel. Got a confirmation that the airfreight has been cleared from the airport storage. Two BRKP member using train leaving Jatinegara at 13:00pm while three people with truck leaving Jakarta for Cirebon to carry our airfreight equipments. They arrive at Cirebon at 22:00pm. Have dinner with the head of P3GL Cirebon and the Geomarin III Master and discuss final preparation for the cruise. Dr. Susilohadi (Head of the P3GL Facility Division in Bandung arrives on the ship at 01:30 midnight, to launch our cruise). All crew and participants already at the R/V Geomarin III, however, we still waiting a stamp from the immigration office in Cirebon for Bruce Huber. They promise to finish by 10am morning on Thursday.

Thursday, May 28, 2009
Final preparation for the cruise. We got a immigration clearance for Bruce at 11:00am. Meeting on the ship and ready to sail. At 11:40am, Geomarin III starts sailing for Makassar Strait, bon voyage!!!. In the middle of the Java Sea, cloud hanging in the sky and rain lightly in the afternoon. At 16:00pm, safety drill. At 19:00pm, I give presentation on the overview of the project and cruise plan as well as mooring operation.

Friday, May 29, 2009
Raining hard in early morning and clear by 7am. Average ship speed 11.0-11.5 knots. Working on deck for mooring preparation, re-adjust the winch; recheck working boat and water pressure hose for cleaning the instrument. Plot the mooring triangulation and bathymetric survey. Bruce gives detailed presentation on the mooring operation. Cloudy weather with moderate to high waves throughout the day. At midnight, we will enter Indonesian central time (one hour ahead of Jakarta).

Saturday, May 30, 2009
On the way to Makassar Strait. The ship speed average is 11.0-12.0 knots. Master and crew have a morning meeting. Mooring practice on the deck by lifting the anchor and prepare some fixed and slip stoppers, to make sure each person understand his duty and safety.
Weather is sunny with some cloud in the horizon. Arrive at western part of Labani Channel in the Makassar Strait at 20:10. At 21:38 arrive 1 km west of mooring to check if we can interrogate the mooring. Great!!, we get clear respond from the acoustic release mooring. Repeat 3 times and set

this position as one of the triangulation points. Continue to the 2nd and 3rd triangulation points. Triangulation ends at 22:35pm. Continue bathymetric survey until morning (Figure 2) .

Sunday, May 31, 2009
At 07:20am, ship arrives at mooring location and starts drifting test. Average drifting speed is 0.8knots with current southeastward. Interrogate the mooring. Release the mooring at 07:57am. At 08:02am we spot the top ADCP at the surface almost at the same time with the second ADCP. Within 45minutes all 3 benthos floats up at the surface. Deploy workboat to carry winch wire attach it to top ADCP. At 08:54am workboat attach winch wire to the top ADCP. Start mooring recovery processes. At 9:10am top ADCP on the deck, and at 10:45am both acoustics releases are on deck. At 10:30, testing CTD for 450m depth. CTD could record the binary data, however, there is a software problem to convert the binary data to ascii readable data. Test CTD again to 700m depth. Ship continues bathymetric survey until morning. Unspool the used mooring wire on the deck and spool the new mooring wire to the winch; finish by 21:30pm.

Monday, June 1, 2009
Ship continues bathymetric survey east-west direction, north of the mooring position. While Bruce preparing and testing the ADCP and acoustic releases, crew and technician of the Geomarin III spools the old wire. Between 11:00am-12:05pm we put both ADCP into the housing ready for deployment. At 14:45 drifting test at mooring site. The average speed is 0.5knot southward. It is perfect for mooring deployment. The ship using the dynamic position stands at the old mooring position. At 15:12pm mooring deployment starts and end at 17:18pm when **we drop the anchor at 2°51.8901'S 118°27.7757'E, at 2147.1 m water depth.** At 17:25pm top ADCP is submerged. Triangulation to find out final position of the mooring. Using Matlab software, we get final result of triangulation: **2°52.035'S 118°27.853'E, at 2133m** (about 305 south of the anchor dropped)**.** Continue bathymetric survey, east-west direction north of the mooring position until 23:30pm, and then return to Cirebon.

Tuesday, June 2, 2009
At the end of the bathymetric survey, at western side of the Makassar Strait, the ship turns heading to 235^{o} and we encounter high waves and rain for about 2 hours. Moderate waves throughout morning on the way to Cirebon. Average ship speed 11-12 knots

Wednesday, June 3, 2009
Morning rain till sunrise. Over the Java Sea on the way to Cirebon, the weather is sunny with moderate winds and waves. Clean the deck, wet lab, and repack all equipments.
All scientists and technicians return their safety gear to the main officer.

Thursday, June 4, 2009
R/V Geomarin III is expected to arrive at Cirebon Port at 5am and may have to wait an hour for higher tide.

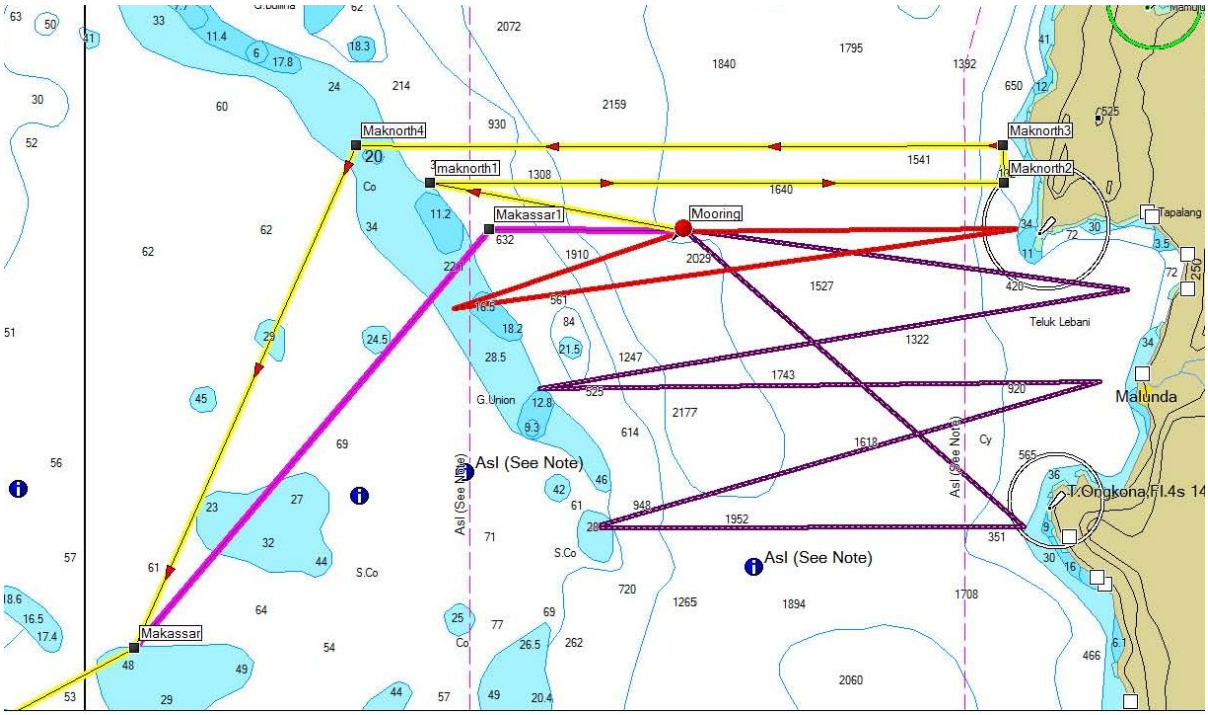
3. PERSONNEL

No	Name	Institution	Note
1	Dr. Dwi Susanto	LDEO-Columbia University	Chief Scientist
2	Bruce Huber	LDEO-Columbia University	Mooring Specialist
3	Dr. Agus Supangat	BRKP	Co-chief
4	Bagus Hendrajana	BRKP	Engineer
5	Eky Agung Winanda	BRKP	Scientist
6	Candra Dwi Puspita	BRKP	Scientist
7	Hariyanto Triwibowo	BRKP	Engineer
8	Riswan Hasan	BRKP	Technician
9	Wahyu Hidayat	BRKP	Technician
10	Fan Bin	FIO	Mooring specialist
11	Li Shujiang	FIO	Scientist
12	Capt. Sudarisman	PPPGL	Master Geomarin 3
13	Erni Herawati	PPPGL	Scientist
14	Edi Rohendi	PPPGL	Scientist
15	Ikhwan Anshori	PPPGL	Surveyor
16	Sarip	PPPGL	Technician
17	Landung Murjiyanto	PPPGL	Chief Officer
18	Asep Utang	PPPGL	Foreman
19	Suryanto	PPPGL	Chief Engineer
20	Suci Yudi U	PPPGL	Bosun
21	Martin Siregar	PPPGL	Electrician
22	Danu Mursito	PPPGL	1st Engineer
23	Jojo Suparjo	PPPGL	1st Oiler
24	Afrizal	PPPGL	2nd Officer
25	Ade Irawan	PPPGL	2nd Oiler
26	Ateng Marzuki	PPPGL	3rd Oiler
27	Sonny Ariyanto	PPPGL	3rd Engineer
28	Ristiawan	PPPGL	2nd Engineer
29	Mas'ud Sanudin	PPPGL	3rd Officer
30	Johnson	PPPGL	Mess Boy
31	Epri Hamsah	PPPGL	Q Master
32	Tato Winarto	PPPGL	Q Master
33	Slamet Wahyudi	PPPGL	Q Master
34	Andri	PPPGL	Q Master
35	Dedi Hermawan	PPPGL	Master Chef
36	Sutrisna	PPPGL	Chef
37	Kus Priyatno	PT PAL	Electrical Eng.
38	Mayor Jakfar Sadiq	Dishidros	Security Officer

Figure 2. Track Geomarin III from Cirebon Port to Makassar Strait and Cirebon Port.

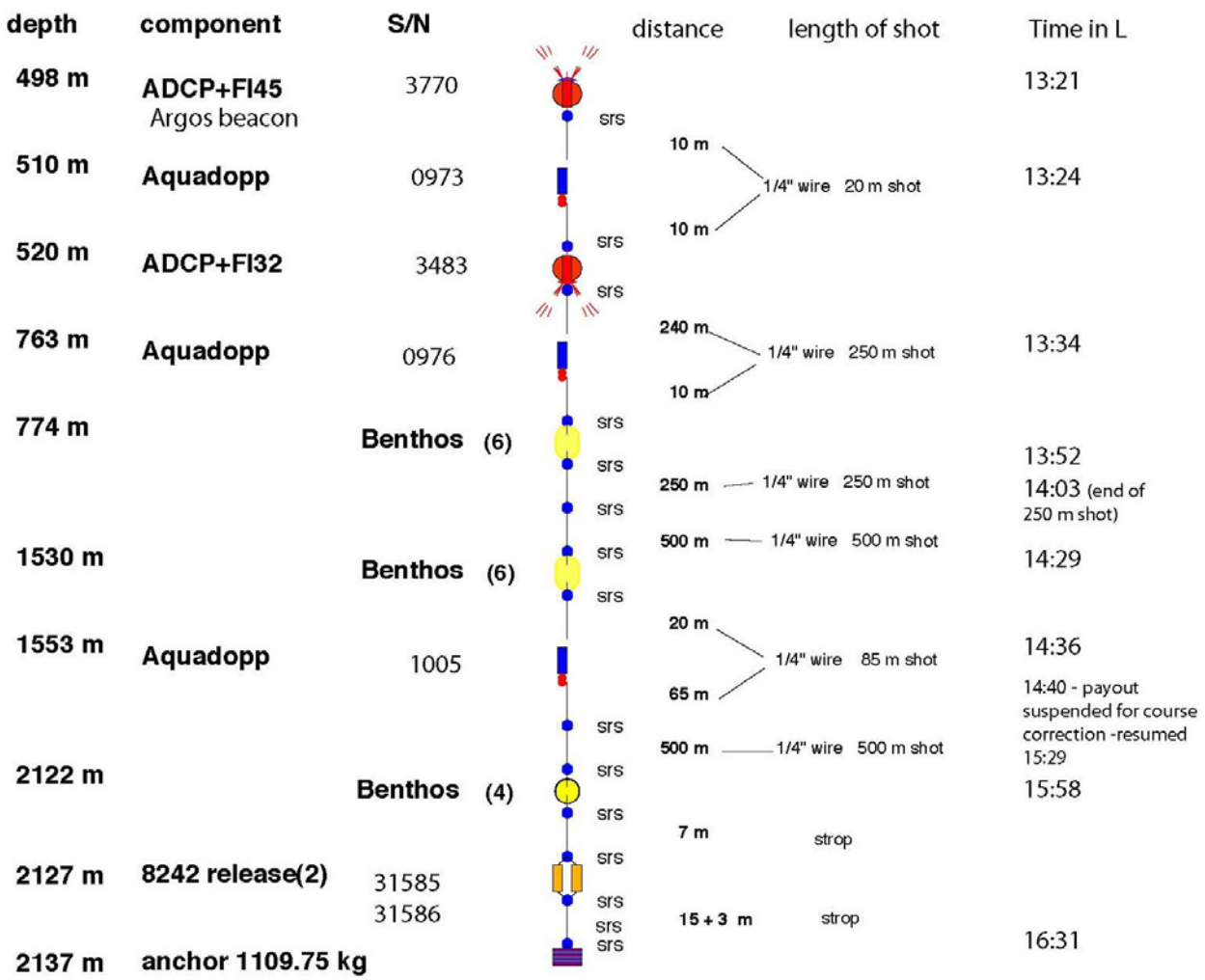
a. From Cirebon Port to Makassar Strait

b. Track Geomarin III on mooring site in the Makassar Strait



Configuration of Mooring Recovered

Makassar Monitoring Mooring Nov–2006



Target Position: 02 51.110′ S 118 27.330′ E Target Depth: 2132 m

Date: 29 Nov 2006
Anchor Drop:
Time (L) 1631 Time (Z) 0831
Lat: 02° 51.543 S Lon: 118° 27.838′ E Depth: 2209

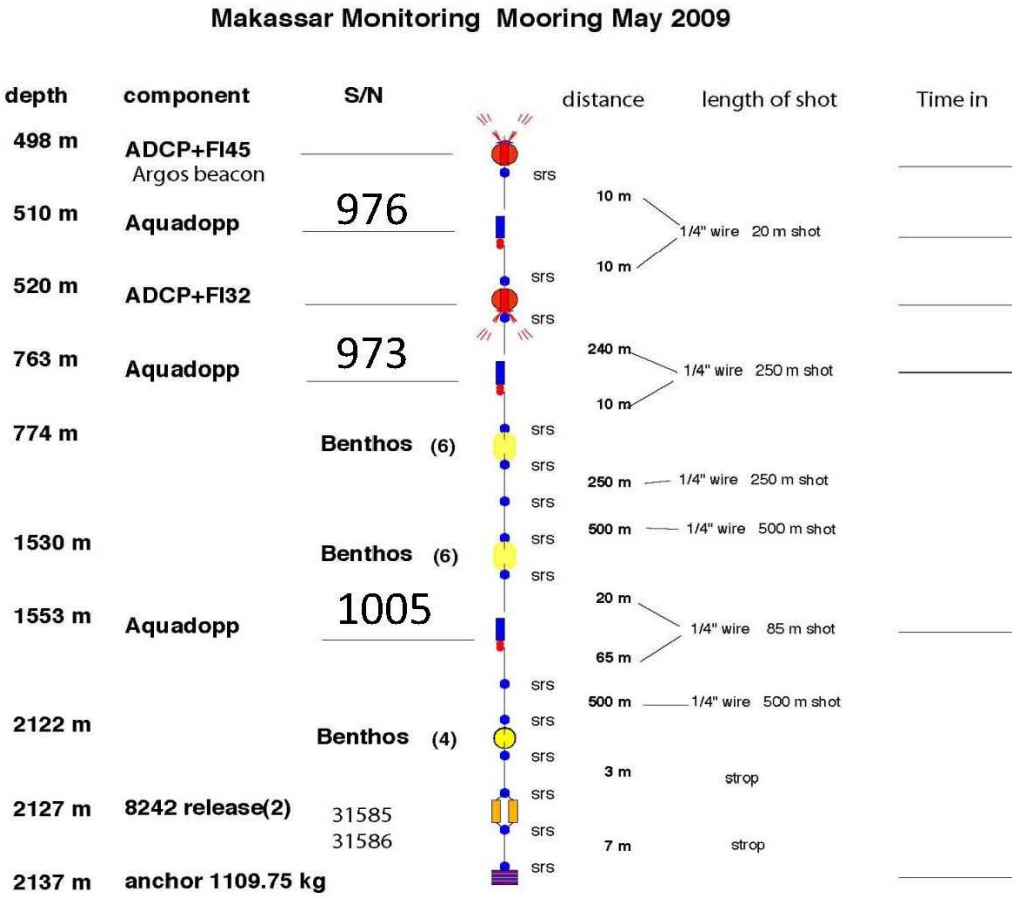
Top Float Down: Time (L) not visible from vessel

TRIANGULATED POSITION: 02 51.883' S 118 27.776' E DEPTH: 2197 m

SN	ENABLE	DISABLE	RELEASE
31585	506373	506414	527073
31586	506437	506452	527102

*position changed Nov 27 2006 per alg - now mid way between INSTANT makwest deployments

Configuration of Mooring Redeployed in June 1, 2009



Target Position: Target Depth:

Date: June 1, 2009

Anchor Drop:

Time (L) 17:18 Time (Z) 09:18:33

Lat: 2° 51.8901 S Lon: 118° 27.7757 E Depth: 2147.1m

Top Float Down: Time (L) 17:25

Triangulation: 2° 52.035 S, 118° 27.853 E; Depth: 2133m

*position changed Nov 27 2006 per alg - now mid way between INSTANT makwest deployments

Some Photos During the Mooring Recovery and Redeployment

Cirebon Train Station

R/V Geomarin IIII

Lecture on the project and cruise

Mooring design and operation by Bruce

Mooring Recovery

Mooring Recovery

Mooring Deployment

Aquadopp current meter

Anchor Drop

Photo Action

4. CONCLUSION

Excellent data return! Everything worked but the downward looking WorkHorse ADCP placed directly below the upward looking long range ADCP near 500 m depth. But then there was a current meter at 510 m within the its intended range of coverage. Most importantly was the long rangers worked, as they cover the entire thermocline that provide continuous record for 30 months!. What a wealth of data, 2.5 years record of the Makassar contribution to the ITF. All three aquadopp current meters are out of memory on February 6, 2009. We have a fantastic observational data set. We look forward to process and produce the data in collaboration with other scientists to produce better prediction of ocean circulation and climate.

5. ACKNOWLEDGEMENTS

We would like express our sincerely thank to Capt. Sudarisman and his crews for their excellent help to achieve the cruise objectives and make the science team comfortable. The Indonesian scientific and technical team, led by Dr. Agus Supangat from the Agency for Marine and Fisheries Research (BRKP) and technical team from Marine Geological Institute (P3GL) are valuable in the mooring operation and CTD test. Lamont's Bruce Huber with his remarkable range of knowledge facilitated all aspects of mooring recovery and redeployment of our endeavors. We would like to thank to Mayor Jafar Sadiq, security officer from the Indonesian Navy for his support and coordination.

Note that this is my 15th cruises (6 of them as a Chief Scientist) in the Indonesian Seas and I feel comfortable in deploying and recovering moorings because of full support and coordination from our partner the Agency for Marine and Fisheries Research (BRKP) and the Indonesian Agencies who maintained the R/V (BPPT, LIPI and P3GL).

Lastly but not least, I would like to thank to NOAA-OCO for providing the funding for the US part for the Makassar ITF monitoring program. I would like to thank our Indonesian partner, the BRKP, especially to Dr. Budi Sulistyo and Dr. Gellwynn Yusuf.

Dr. Dwi Susanto
Java Sea, June 3, 2009