

# SITE: South China Sea-Indonesian Seas Transport/Exchange and Impacts to Seasonal Fish Migration

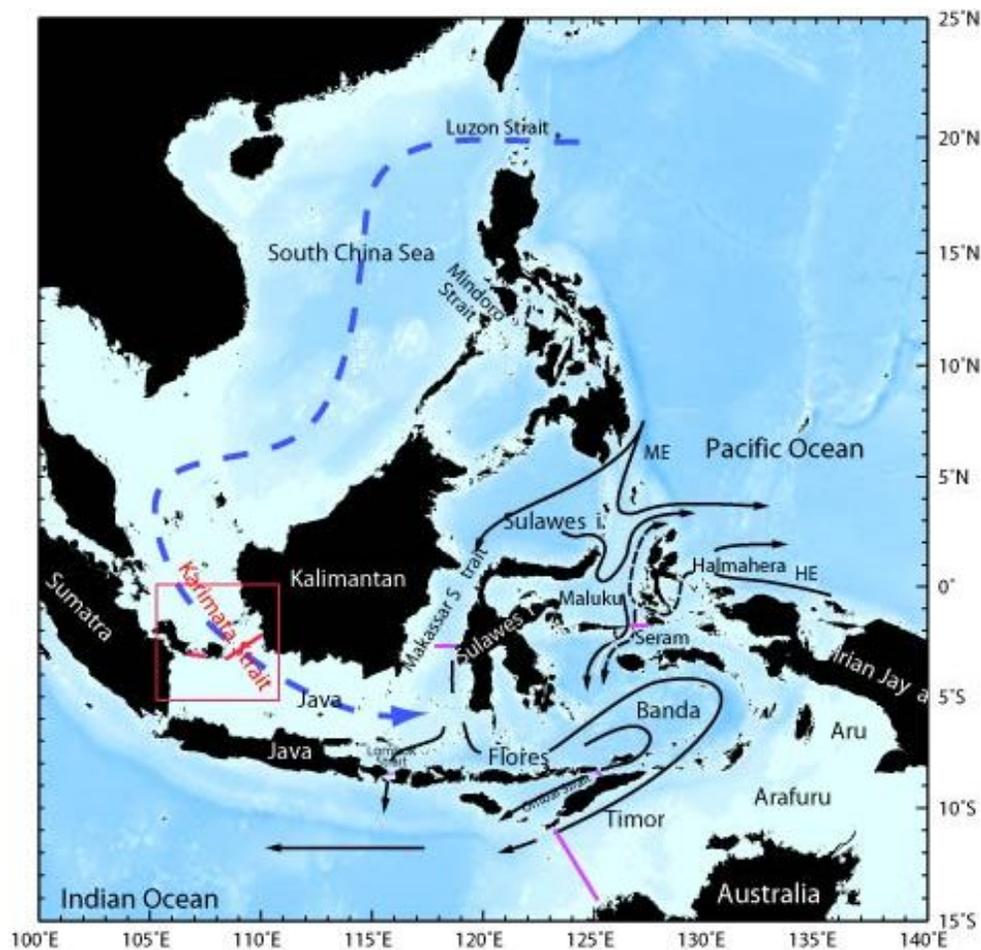
## *Cruise Report*

**Chief : Dr. Dwi Susanto (LDEO-USA)**

**Co-Chief: Mr. Bin Fan (FIO-China)**

**Co-Chief: Dr. Agus Supangat (BRKP-Indonesia)**

**December 1-5, 2007**



## **1. INTRODUCTION**

The islands of the Indonesian maritime continent extend along the equator between the landmasses of Asia and Australia and between the Pacific and Indian Oceans. The Pacific-to-Indian Ocean throughflow known as Indonesian throughflow (ITF) strongly influences the heat and freshwater budgets of the two oceans and therefore may be considered a key component in the ENSO and monsoon climate phenomena. Due to this unique position, they experience a strong response to monsoon and ENSO climate phenomena. Indonesia experienced an estimated US \$9.5 billion dollars in losses (*BAPPENAS*, 1999) due to the 1997/1998 El Niño, affecting all aspects of life: public health, agriculture, forestry, fisheries, transportation and tourism. Hence, being able to predict ENSO variability will not only benefit for Indonesia, but also the people around the world which influence by global climate change.

Although the Indonesian Throughflow (ITF) measurements have been conducted for more than two decades, the ITF branch through the South China Sea-Karimata Strait has always been ignored and has received little observational attention (Godfrey, 1996). There have been no field measurements to quantify the total transport and its associate heat-freshwater fluxes, even though trajectories of sea surface drifters of the Global Drifter Program from August 1988 to June 2007 have indicated that the Karimata Strait is another important channel for the Throughflow from the SCS to the Indonesian Seas. Because this SITE may have strong impacts on seasonal fish migration between Java Sea and South China Sea, we plan to deploy an array of three or four trawl resistance bottom mounted ADCPs. To be efficient and cost effective, the proposed project will be carried out by an international research collaborative between PIs from Indonesia, China, and the United States. Hereafter, the project is called SITE (South China Sea - Indonesia Seas Transport/Exchange).

Indonesia, China and the United States will benefit from the proposed oceanic observation. Indonesian scientists from various Agencies and Universities coordinate by BRKP will participate in the field/research work. They will share the data and get the experiences from the capacity building package included in the project. The research outcomes will help Indonesia to deal with the climate-related variations and also seasonal fisheries migration. China will use the data to enhance its prediction skill on the monsoon and inter-annual climate anomalies and the

United States could enhance their prediction skill on ENSO variability and global climate change, which in turns will benefit to Indonesia.

## **2. OBJECTIVES**

### **Science Objectives:**

- To measure the variability of Karimata Strait flow by deploying three TRBM ADCPs in the Karimata Strait.
- To determine the effects of the Karimata Strait flow on the circulation and mesoscale dynamics in the internal Indonesian Seas and south China Sea
- To combine this with INSTANT data to determine the effects of the Karimata SITE flow and its interaction with the primary Indonesian throughflow
- Investigate the effect SITE flow to migration/distribution of the fish in the Karimata Strait

### **Cruise Objectives:**

- To deploy three TRBM ADCPs in the Karimata Strait
- To collect property and velocity profiles in the Karimata Strait via onboard ADCP and CTD
- To collect fish abundance data via onboard echosounder
- To measure cross section bathymetry of the Karimata Strait.

## **3. CRUISE ACTIVITY**

There are four main activities during the cruise: ocean current measured by onboard ADCP, bathymetry using multibeam, deployment of 3 TRBM ADCP and fish abundance measured by onboard echosounder.

The day to day activities are given below. NOTE: Time in this Day to Day Activity refers to WIB (Western Indonesian Time = GMT+7 hours)

### **Day 1: Saturday December 1, 2007**

At 15:30pm R/V Baruna Jaya IV depart from the Cilegon Port. While sailing, we set all instruments inside the TRBM. We just realized that the R/V Baruna Jaya IV has speed problem.

The maximum speed is 6.5 knots. This is a major hurdle/set back, because the total cruise track is about 900nm (i.e. assuming the average speed is 10knots, it will take 90 hours to complete the track without any measurements). For a ship average of 6knots, it will take 135hours to cover the total track (without any measurements). We have to adjust the cruise plan accordingly. Original plan are 15 CTD Stations, 3 TRBM stations, on the way ADCP with frequency 150 kHz and echosounder (SIMRAD EY60) frequency 120KHz. We may have to reduce the CTD stations. Weather condition clear, light wind and calm sea state. Air temperature 27-28C and barometric pressure is 1015-1016mb.

**Day 2: Sunday December 2, 2007**

Gathering for an introduction of the cruise, cruise plan, and a safety exercise. While sailing in the Java Sea toward the CTD station S1 in the Karimata Strait, we continue setup all instruments for the TRBM (ADCP, CTD, tides, Beacon). Weather condition clear, light wind and calm sea state. Air temperature 27-28C and barometric pressure 1015-1016mb. Light rain occurs in the evening and heavy rain at night with moderate sea.

**Day 3: Monday December 3, 2007**

Weather condition in the morning is raining and moderate sea state. At the Gaspar Strait (Bangka-Belitung Island) and east of Bangka Island the ship speed could only reach 4-5 knots. At 8:00am BJ IV is about 10 miles south of the original CTD station S1. To save the daylight time, we decided to stop at current position and to take a CTD cast as S1 new (Time: 8:36am WIB) Position: 01° 52,74' S - 106° 33,65' E). All positions of CTD stations and TRBMs move southward about 10miles from the original positions. Wind condition start to pick up and moderate sea state while sailing to position S2, which is also as a position of A-1 (TRBM1). Arrives at S2 station at 11:20, position: 1° 42.715 S and 106° 44.562 E. Take a CTD cast and prepare for deployment of the first TRBM (USA). Weather is cloudy and about to rain, moderate sea state, temperature 27C and barometric pressure is 1016mb. During the first deployment, because of moderate sea and less coordination among technician to maintain the balance of TRBM, the TRBM swings moderately and hit to the A-frame couple times. Because ADCP can only be activated less than 10 hours before deployment, and we plan to test the communication

via modem, the TRBM will be deployed with ADCP off. After TRBM is approximately 15m below the surface, we send acoustics signal via surface modem to interrogate the bottom modem at the TRBM. We can communicate to turn off and on the ADCP, however we fail to set the ADCP parameters. I decide to pull the TRBM back to the deck.

China Team decides to deploy their first TRBM in here and directly put in the bottom and then interrogate via modem to set the ADCP parameter. On 13:16pm TRBM releases to the bottom at position  $01^{\circ} 02,39' S - 106^{\circ} 44,29' E$ . Weather moderate-high wind ~ 9knots and moderate seas, several attempts to interrogate and to wake up the ADCP are failed. We could power off and power on the ADCP, however, we fail to set the deployment parameter. Heavy rain and wind ~8knots and moderate high sea state some scientists got a sea-sick. The sea state may be influenced by storm with a center at 5N in the South China Sea. We discuss either to go to the nearby port (take about 24 hours to reach it) or continue to the next CTD station. We decide to continue to the next CTD station because there is a tendency that the wind speed may subside. On 1800 arrives at S3 CTD stations and take a CTD cast at a position:  $01^{\circ} 34,71' S - 107^{\circ} 02,45' E$ . Weather light rain and moderate wind 7-8knots. Continue to S4 CTD stations and arrive on 22:58 ( $01^{\circ} 23,65' S - 107^{\circ} 22,11' E$ ). Wind NW 3 knots.

#### **Day 4: Tuesday December 4, 2007**

CTD cast on 02:10am at station S5. Cloudy and wind NW 3knots. Because it is night, rather than waiting for 4 hours in the station to deploy A2, we decide to continue to S6 since we plan to go back to A1 at the end of the cruise. At 05:30am, we do CTD cast at station S6. Just after the CTD cast, there is a problem with pitch (always in reverse direction). Ship anchored. Onboard BPPT team inform the ship condition the BPPT office in Jakarta and Dr. Agus Supangat inform the ship condition to Dr. Sugiarta in BRKP. Without uncertainty if the ship problems can be fixed, mooring TRBM (A-2) is deployed in this location  $1^{\circ} 05.544' S$  and  $107^{\circ} 59.181' E$  at 11:00WIB. The ADCP has been preset to start record data at 12:00WIB or (05:00 GMT) on December 4, 2007. At 14:00pm no possibility for the ship to fixed. Dr. Dwi Susanto requests a help to Mr. First Admiral Rampangilei (Head of the Indonesian Hydrographic Office) to help us to coordinate an evacuation plan of all scientists from the R/V Baruna Jaya using any Navy ship in

the region. At 16:30 China team used the acoustics modem to communicate with the underwater TRBM, and it was successful. We got the observation data from the underwater TRBM, and then set the deployment parameter again. At 1730 Admiral Rampangilei calls Dr. Dwi Susanto and informs that either Navy Ship *Cepu* or *Teluk Cirebon* may on the way to rescue the scientists and asked Dr. Dwi Susanto to coordinate with Colonel Estu Prabowo (Vice chairman of the Hydrographic Office) . At 2100 Cal Estu Parbowo calls Dr. Dwi Susanto to ask the exact and detailed position. At 23:00, Col. Estu Prabowo calls Dr. Dwi Susanto and reassure a confirmation that Indonesian Navy ship *Teluk Cirebon* has already been on the way to help us since 17:00 and now is close to the Baruna Jaya IV position.

#### **Day 5: Wednesday December 5, 2007**

At 01:30, KRI *Teluk Cirebon* makes a first contact with Baruna Jaya IV. An evacuation plan is discussed. Several attempts to make a close side by side failed because of moderate wind and seas. Because of no possibility using small boat or raft boat, another attempt is made. On 0300, Navy Ship *Teluk Cirebon* can attach side by side with Baruna Jaya IV. On 3:30am all 16 personnel (14 scientists, 1 BPPT, and 1 security officer safely evacuated to Navy Ship *Teluk Cirebon*). Meet with the Captain of Navy Ship *Teluk Cirebon* Major Agas Endrasgoro to thank him and all crews for their help and hospitality. Ship is heading to Pontianak Port. Arrives at Pontianak Port on 1400 and is welcomed by the regional Navy Officer in Pontianak. Dr. Dwi Susanto call Mr. First Admiral Willem Rampangilei to thank of his and his staff for their coordination and support to send the Navy Ship. Mr. Norman from BPPT who just arrived in the morning arranges the local transportation to airport and all tickets to Jakarta. All scientists fly to Jakarta this late afternoon.

#### **4. INSTRUMENTS**

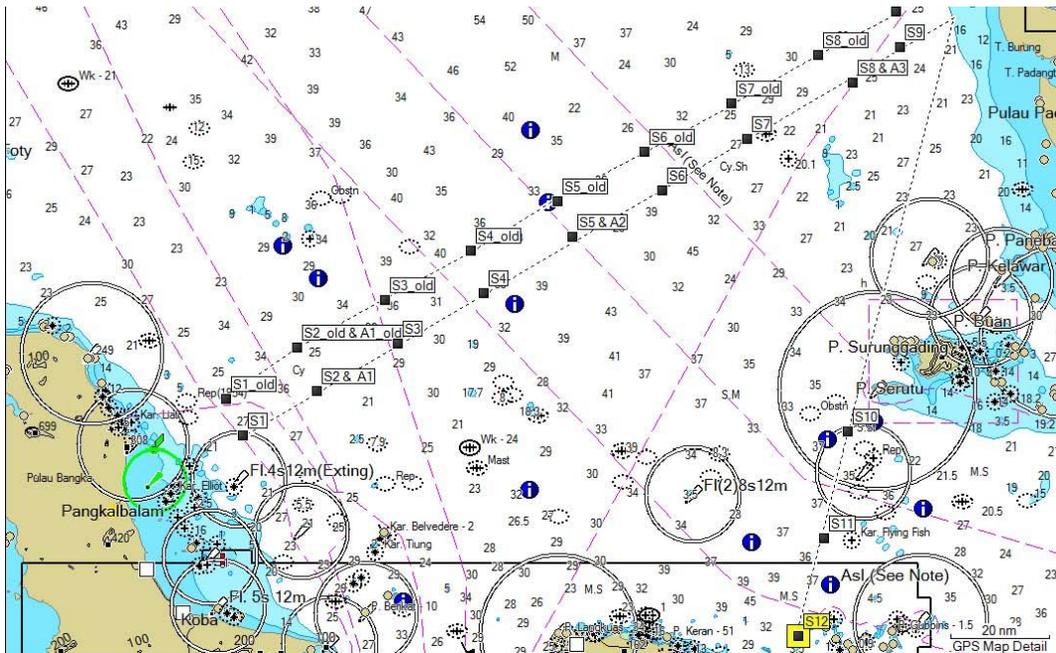
- Three trawl-resistance-bottom-mount (TRBM) system housing of ADCP, two acoustics release, one tide recorder, one Iridium beacon, one bottom modem. The US TRBM has Microcat CTD 37SMP with an integrated pump to measure current, tide, and stratification
- Echsounder (SIMRAD AY60) with frequency 120kHz to estimate fish abundances.

- Onboard ship ADCP at 150kHz to measure current
- Multibeam to measure bathymetry.

### 5. CTD AND TRBM LOCATIONS

CTD Stations (S) and TRBM Stations (A)

Station	Position	
S1	1 52.430 S	106 33.380 E
S2	1 43.384 S	106 48.301 E
A1	<b>1 42.715 S</b>	<b>106 44.562 E</b>
S3	1 33.802 S	107 04.677 E
S4	1 23.620 S	107 22.051 E
S5	1 12.211 S	107 40.104 E
S6	1 02.857 S	107 58.197 E
A2	<b>1 05.544 S</b>	<b>107 59.181 E</b>



Map of the CTD stations and TRBM locations. The original CTD stations and TRBM locations (old) were moved 10 miles southward to save the daylight when we arrive at S1 (new) at 08:00 December 4 2007. The TRBM (A2) deployed nearby S-6 at location where R/V Baruna Jaya IV has problem. CTD S7 to S12 and TRBM A3 cancelled. TRBM A1 has been successfully deployed in the bottom, however, the ADCP still in disable mode.

## 6. PERSONNEL

There are 13 scientists, 2 students, one security officer, and six technicians on board of Baruna Jaya IV with 16 crews lead by Ship Master Ishak.

	Name	Institution
1	Dr. Dwi Susanto (chief)	LDEO-USA
2	Mr. Bin Fan (co-Chief)	FIO-China
3	Dr. Zexun Wei	FIO-China
4	Dr. Yonggang Wang	FIO-China
5	Mr. Daolong Wang	FIO-China
6	Dr. Agus Supangat (co-Chief)	BRKP/DKP
7	Novi Susetyo Adi, M.Si	BRKP/DKP
8	Aida Heriati, S.Si	BRKP/DKP
9	Dr. Wijopriono	PRPT/DKP
10	Khairul Amri, M.Si	PRPT/DKP
11	Asep Priatna, SPi	PRPT/DKP
12	Letda Laut (P) Fadeli Hasairin	Dephan
13	Ikhsan Budi Wahyono, Skel	BPPT
14	Dr. Moon-Bo Shim	BPPT-NORI
15	Anan Fauzi, ST	BPPT
16	Syamsul Bahri	BPPT
17	Rosul	BPPT
18	Tatang Sutardi	BPPT
19	Tri Suharyanto	BPPT
20	Muksis	BPPT

21	Bayu Kresna	STP
22	Manggiring Sitanggung	STP
	<b>CREW BARUNA JAYA IV</b>	
1	Ishak	Nakhoda
2	Ucu	Mualim I
3	Anwar	Mualim II
4	Ade	KKM
5	Eka	Masinis I
6	Sriyanto	Masinis II
7	Sugiarto	Electricien
8	Yayan	Juru Mudi I
9	Kasipandi	Juru Mudi II
10	Adi Kurnia	Juru Mudi III
11	Ahmat	Juru Minyak I
12	Samsuri	Juru Minyak II
13	Torsolim	Juru Minyak III
14	Adi	Koki
15	Santos	Pelayan I
16	Bahrul	Pelayan II

## 7. SUGGESTIONS

We would to urgently suggest to the Agency for Assessment and Application of Technology (BPPT) who operate and maintain the R/V Baruna Jaya IV to properly maintain the ship in standard condition for research cruise including all the emergency safety equipments such as rubber boat and life-craft etc to make sure all instruments and equipments work properly. Because of the trouble of the ship, some objectives of the cruise are not finished. BRKP of Indonesia will do their best to arrange the new plan to finish the cruise as soon as possible. We suggest that, for deployment of the TRBM, the heavy sea state and strong wind condition should be avoided, and the ship should be anchored to make it possible to communicate between the desk and underwater TRBM.

## 8. Acknowledgement

Thanks to the master and crew of the RV Baruna Jaya IV for their cooperation and hard work during the voyage. In particular the BPPT technicians and ship's deck crew were outstanding in their handling and help with the CTD and TRBM deployments. Captain Ishak handled the ship beautifully during deployments despite some difficult circumstances. We are grateful to Dr. Inroyono Soesilo and Dr. Sugiarta Wirasantosa (BRKP) for their strong partnership in the SITE program. This cruise was sponsored by BRKP-Indonesia and FIO-China and LDEO-USA. We would like to thank to Mr. First Admiral Willem Rampangilei (Head of Hydrographic Office; JANHIDROS) and Colonel Estu Prabowo their coordination to arrange the Navy Ship Teluk Cirebon to evacuate us. We are also would like to thank to Major Agam Endrasgoro (Master of the navy ship Teluk Cirebon) and his crews for their strong commitments and support to rescue and evacuate all scientists from R/V Baruna Jaya IV and also their hospitality while we are on board the Teluk Cirebon. Thank you to the head of regional navy officer and his staff in the Navy Port in Pontianak.

## 9. Bibliography

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- Godfrey, J. S., The effect of the Indonesian Throughflow on ocean circulation and heat exchange with the atmosphere: A review. *J. Geophys. Res.*, 101, 12,217-12,238, 1996.