

INSTANT Cruise Report
Baruna Jaya VIII
Nusa Tenggara Moorings and SPGA, Legs 1 and 2.
June 12 – July 6 2005

1. Introduction:

INSTANT Scientific Objectives

The aim of INSTANT is to directly measure the leakage of warm and fresh waters from the western equatorial Pacific into the South Indian Ocean via the Indonesian passages. The size and depth distribution of this Indonesian Throughflow (ITF) has not been well determined, and this has led to ambiguity of the mean and variability of the ITF. The INSTANT project will consist of a 3-year deployment of *in situ* velocity, temperature and salinity data from the sea-floor to the surface in the major inflow and outflow straits that make up the Indonesian choke point. The array is designed to measure the mass, heat and freshwater transports that flow into and out of the Indonesian Seas. Five nations are participating in INSTANT: Indonesia, France, the Netherlands, the USA and Australia. The Indonesian Ministry of Marine and Fisheries is sponsoring the Indonesian involvement.

Cruise Objectives

The objective of Legs 1 and 2 of the INSTANT cruise is to survey and service equipment in the outflow passages of the Indonesian Throughflow along the Nusa Tenggara island chain. Specific objectives of the cruise are:-

- To recover and redeploy 7 of the INSTANT moorings comprising the INSTANT array in Indonesian waters of Timor, Ombai and Lombok Straits first deployed in December 2003, and recover and redeploy the mooring in Timor Leste waters first deployed in August 2005.
- To deploy 5 of the INSTANT shallow pressure gauges (SPGA): one on either side of Ombai Strait at Alor and Timor Leste, one at Roti and two on either side of Lombok Strait.
- To collect property and velocity profiles in the Straits via ADCP and CTD measurements.
- To provide training for young Indonesian scientists on ocean mooring technology, the oceanography of the Indonesian Throughflow and other topics.

Itinerary

Leg 1

Depart Jakarta: 11:30 Sunday 12 June 2005.

Arrive Kupang: 07:30 Tuesday 28 June 2005.

Leg 2

Depart Kupang: 17:00 Tuesday 28 June 2005

Arrive Padang Bai: 11:00 Thursday 6 July 2005

Science Personnel:

Janet Sprintall (SIO, USA, Co-chief Scientist)
Indra Jaya (IPB, Indonesia, Co-Chief Scientist, Leg 1)
Susan Wijffels (CSIRO, Australia, Co-chief Scientist)
Robert Molcard (LODYC, France, Co-chief Scientist)
Gani Ilahude (LIPI, Indonesia, Co-chief Scientist, Leg 2)
Dwi Susanto (LDEO, USA, Co-chief Scientist)

II Nusa Tenggara Moorings: Cruise Summary

As part of the December 2002 Implementation Agreement between all INSTANT partners, 28 ship-days (23 science days and 5 days transit/port calls) were allocated for oceanographic research during legs 1 and 2 on the BJVIII. The original IA cruise plan called for two separate legs with departure from Bali. The ship plan was revised for departure from Jakarta. In the IA, it is agreed between all parties that all transit time from Bali to Jakarta, and all port calls are to be paid for by Indonesia (i.e. in the IA, for legs 1 and 2, this amounts to 4 days transit and 1 day port call). However, in a pre-cruise meeting between the cruise Co-Chief Scientists and BRKP and LIPI, the additional 5 days required to complete the 28 day cruise of Leg 1 and 2 was paid for by Dr. Susan Wijffels by exchanging the cost of 2 INSTANT training visits to CSIRO for ship time payments.

The planned cruise departure date of 7 June from Jakarta was delayed until 12 June 2005.

Clearance to deploy the mooring and pressure gauge in Timor Leste waters was not achieved before the cruise departure. The IA states that it is the responsibility of Indonesia BRKP to gain clearance from Timor Leste for the redeployment and the recovery cruises. The Chief Scientists were hopeful that BRKP would continue to pursue this with Timor Leste while Leg 1 was underway. We also approached respective representatives from Australia, France and delegates of the ATSEF group who met in Dili on June 25-26, to help with the facilitation of clearance between Timor Leste and Indonesia. Clearance was finally given on 30 June 2005, and we are extremely grateful to the Timor Leste Minister for Agriculture, Forestry and Fisheries, Mr. Estaulislau Aleixo da Silva, Dr. Indroyono, Dr. Suharsano, Dr. Sugiarta, Dr. Tonny Wagey and Dr. Merrilyn Wasson of ATSEF, and Dr. Dwi Susanto and Captain Danil on the Baruna Jaya VIII for their hard work and diplomacy in attaining clearance and making the INSTANT program a true success. The resulting data have proved the INSTANT mooring in Timor L'Este waters is indeed crucial for INSTANT science goals.

The cruise track and location of the mooring and pressure gauge deployments are shown in Figure 1. The positions and times of the mooring recovery and deployments are given in Table 1; the pressure sensors in Table 2; and the CTD casts are in Table 3.

Overall, we had 100% success in mooring recoveries and redeployments on INSTANT Legs 1 and 2, which strongly attests to the capable design and deployment strategies of the CSIRO and LOCEAN Mooring team. The data returned by instrument and mooring is given in Table 4.

During the two legs, X young Indonesian students and scientist participated in the voyage by standing watch, assisting in CTD and fish survey work, carried out their own research such as plankton sampling, worked on the INSTANT data as it came aboard and attended numerous lectures/training sessions by the chief scientists and engineers. Hence we believe the training goals for the cruise were achieved as well.

III Brief Chronological Cruise Narrative

(All times are local, and indicated if clocks are advanced or retarded relative to GMT)

LEG 1:

Jakarta (WIB) Time (GMT+0700)

12 June 2005: Departed Jakarta at 1130 in relatively calm seas after a ceremonial send-off by Dr. Indroyono Soesilo (Chairman, Agency for Marine and Fisheries Research, BRKP); Dr. Sugiarta Wirasantosa (Director of Research Center for Maritime Territories and Non-living Resources, BRKP) and Dr. Suharsono (Head of P20-LIPI). Aboard are 32 scientists and engineers from Indonesia, France, USA and Australia. Watches were established for the students, on the same 4 hour system as the ship's crew, and the underway acquisition systems started. CSIRO mooring engineers Danny McLaughlan and Lindsay Pender met with Captain Danil and the deck crew to discuss mooring deployment and recovery strategy, and the safety procedures for this work.

13 June 2005: Transit to Lombok Strait, all underway systems up and running and mooring preparation underway. Robert Molcard (LOCEAN) gave a presentation on the Timor and Ombai mooring data. Ship safety drill held at 1400.

14 June 2005: Good conditions, calm seas. Continue transit to Lombok St. «GreetingLine» (SIO) gave a talk on the shallow pressure gauge data. Students, Dwi Yannea Qurnia Hani (IKT-IPB Indonesia), Ferry Fernendi (IPB-Indonesia), Dian Wisudawati (ITK-IPB Indonesia) and Kandaga Pujiana (ITB-Indonesia) gave excellent talks on their proposed research in the Lombok Strait. Clocks forwarded 1 hour to Wita time at ~1600. CTD Station1 done north of Lombok Strait at 20:07 (local time) and completed at 20:57.

WITA Time (GMT+0800)

15 June 2005: Completed CTD Station 2 at 00:56 local time, just north of Lombok. Calm seas with strong internal wave packets visible, moving in a north-westerly direction every ~35 minutes. The volcanoes Mt Agung (Bali) and Mt Rinjani (Lombok) are

spectacular in the clear morning light. Swath mapper was on incorrect GMT time since Jakarta, so now corrected.

Recovery of Lombok 1 (West) began at 0700. Released at 0725, sited at 0745. Zodiac launched to grapple mooring line with line from ship, but needed to get the BJVIII closer as limited length and drag great. Top float on board at 0847, completed recovery at 1007. Recovery of Lombok 2 (East) began at 1250 local. Released at 1253, sited at 1256. Text-book recovery with lovely flat glassy seas, and mooring streaming to the south in the main Throughflow. Happily, we are having neap tides in Selat Lombok for the next few days, so our strongest flow will be the ITF. Recovery float and top ACM on board at 1329 with complete recovery at 15.05 local. Both recoveries the mooring streamed out southwards with the main ITF. On to CTD station 3, 4, 5, 6 and 7 between both mooring locations.

16 June 2005: Arrived at Gili Trewangan to meet with Deputy Village Chief Tuapik at ~8.30 am and to notify them that we will be recovering and redeploying the pressure gauge. Indonesian students go ashore on east side of island to the village. Paul, Janet, Sumadyo, Widodo, Ariane and Antonio leave BJVIII at ~13.30 to search for Lombok pressure gauge. Unsuccessful snorkeling, so called Chief Taupik at ~1600 and he came and located the pressure gauge at ~1630, too late for recovery. Tied a marker buoy to it, and will retrieve it in 2 days time. Picked up Indonesian students at ~2000, and steamed to CTD stations in strait.

17 June 2005: Completed CTD Stations 8, 9 and 10 along the axis of Lombok Strait during the early morning. Depart BJVIII with strong southward current at 0930 for Bali pressure gauge. Recovered and redeployed the Bali pressure gauge in good visibility, and went back at BJVIII by 1200. Steam to Lombok West (formerly known as Lombok 1) site and begin mooring layout at 1455, and anchors released at 1743. Strong current and windage to the southwest.

Lombok West:

Anchor Dropped GMT 0943 (LT 1743 17/06/05)

Depth = 910.69 m

Latitude: 8° 26.594'S

Longitude: 115° 45.492'E

Ranged in Position: 115° 45.487'E, 8° 26.774' S

Completed CTD Station 11, north of Lombok Strait.

18 June 2005: Completed CTD stations 12 and 13 north of Lombok Strait during early morning. Sumadyo, Janet and Widodo recovered and redeployed the Lombok pressure gauge relatively quickly as it's location was now marked by a buoy, and Paul Harvey had pre-prepared the replacement pressure gauge for ready deployment. Departed ship at 9.30 am, 40 minute dive and back at ship at 11.00 am. Completed CTD station 14 at mooring location. Mooring preparation for Lombok East (formerly known as Lombok 2) continues until 3 pm. Began drift for mooring deployment at 1500, and current and wind going to the southwest. Started mooring at 1517, and strong windage put us further west than expected, but the bathymetry in this region is relatively flat, so we reached a nominal

target depth when anchors were dropped at 1736. Successful triangulation occurred from 1947-1952.

Lombok East:

Anchor Dropped GMT 0936 (LT 1736 18/06/05)

Depth: 1133.21 m

Latitude: 8° 24.424'S

Longitude: 115° 53.905'E

Ranged in Position: 115° 53.769'E, 8° 24.566'S

After ranging in, we spent quiet time moving the Timor anchors up from the hold to the aft deck ready for deployment. Began transit to Timor Passage at 2200.

19 June 2005: Completed CTD stations 15 and 16 south of Lombok St on transit to Timor. Clear weather, glassy seas with strong slow roller of a swell coming in from the south-west. Spent the day catching up on data processing and preparing for the Timor deployments. Susan Wijffels gave an excellent matlab tutorial to the students on looking at echo intensity in the LR-ADCP data from Lombok 2 (now east) 2003 deployment. Upon examination of available pressure data from the Lombok 1 data, it was found that the mooring must have been located 40 m deeper at ~960 m depth. In the 2003 Deployment cruise we were unable to successfully range in on this mooring, and so the depth of 921 m was only nominal.

20 June 2005: Making steady progress to Timor Strait. Still beautiful calm weather, with steady rolling swell from the south west. Sperm whale spotted heading east through Savu Strait at ~1600. PIs spent the day downloading and analyzing the wealth of mooring data collected in Lombok Strait. Students Agus Atmadipura (IPB, Indonesia) and Ariane Koch-Larrouy (LODYC France) gave excellent and informative talks to many interested personnel in the evening.

21 June 2005: Completed CTD station 17 on transit to Timor Passage. At 0700 we began recovery of Timor 4 (southern most) mooring. Mooring releases were not responding to polling, but were released at 0707 and top buoys spotted by the captain at 0709. At 0759 the first buoy was aboard, and mooring completely recovered by 0925. We steamed for 75 minutes to Timor 3, and arrived on site at 1040. Slight, localised rain showers around the mooring location, but it cleared up before recovery. Mooring was released at 1050 and sited by Nani at 1052. Top float was on board by 1126. Much fishing long-line on this mooring, at least to ~400 m depth. Finished recovery of Timor 3 at 1317 and decided to transit to Timor 1 for a daily tri-fecta recovery! This should enable us more time for the down-load and refurbishing of instruments. Since the ranged in depth varied from the bathymetry during the deployment in January 2003, we range on this mooring before recovery, to find a depth of 992 m. Anchors were released at 1537, but the mooring did not show. We transponded on the other release at 1611 and the ADCP buoy appeared at 1613 spotted by Indrayana. First buoy was on board at 1645 and recovery completed by 1810. Timor 1 mooring was streaming out eastward from the ship, against the expected flow. At 1930 we started triangulation of the Timor 2 mooring and had response, so we

will attempt a recovery tomorrow. Completed CTD Stations 18 and 19 along the Timor Passage sill. Full moon tonight!

22 June 2005: Completed CTD stations 18, 19 and 20. Began transponding for Timor 2 at ~0600 and it was sighted at 0720. Yeah! Began recovery at 0800, and brought on board the 8 floats and single remaining deep current meter at 1800 m depth (with good data!) and the acoustic releases. NB: This actually means we recovered 4 moorings within one 24-hour (GMT) day – surely a remarkable feat! We began a CTD survey along Timor Passage and Ndao/Roti Strait after Timor 2 recovery. Completed CTD stations 20, 21, 22, 23, 24 (aborted due to wire angle in strong currents), 25, 26, 27 and 28. Foreign participants spent the day downloading data, checking and refurbishing the instruments ready for deployment on the Timor moorings. We now have only 2 working Argos beacons (1 spare and 1 recovered from Lombok mooring), and the Ombai mooring beacons are from the same batch (the bolt on the cap corrodes, possibly due to a software problem). We are pursuing many avenues to see if we can get working beacons for our moorings. Widodo and Anna gave excellent presentations on their scientific activities.

23 June 2005: Arrived at Ndao ~0900, and Indra Jaya, Dwi, Widodo, Security Officer Budi and Indra visited the chief to get permission to recover/redeploy the pressure gauge. Janet, Noni, Sumadyo and Widodo (with able assistance by Spencer) easily recovered and redeployed the Roti gauge at ~11-11.43, and back at the BJVIII by ~1230. As we were keen to do the fish survey saw-tooth pattern around Roti we did not have time to visit the island of Ndao. Clear calm conditions for our survey work. This work uses the EK500 swath mapper feature of dual frequency target strength to identify respective fish species using an empirical relationship between signal strength and species. We have a prospective solution to our Argos beacon problem: we have located 2 spare beacons in Paris, and one of the LODYC students will fly to Jakarta with these beacons and give it to Ari (BRKP) who will be joining the ship in Kupang. This is a relief as the alternative of deploying with no beacons is terrifying! We will deploy the moorings in order of priority for including the 3 available beacons (for both Timor and Ombai): Timor 3, 4 and 1!

24 June 2005: We continued the saw-tooth survey pattern around Roti in the morning, and then proceeded to Timor 3 mooring location for deployment, arriving at ~ 13.30. There is a ~10 knot wind from the north-east and it is sunny and clear. After drift tests, we began the mooring deployment at 1414. The deployment went smoothly under the capable hands of Danny McLaughlan and the deck crew of the BJVIII.

Timor 3:

Anchor Dropped GMT 0834 (LT 1634 24/06/05)

Depth: 1380m

Latitude: 11° 22.094'S

Longitude: 122° 57.556'E

Ranged in Position:

Since the weather and seas were co-operating we decided to deploy Timor 4, and arrived on position at 2010 local time. As the wind and current were fairly strong and set to the west-south-west, after drift tests, Susan and Captain Danil decided to begin the mooring

recovery just up stream of the target mooring location. We began the recovery at 2026 and again everything went smoothly, and Captain Danil was within a remarkable 0.003 nm of the target mooring location at the time of anchor drop! Considering this was our first night-time deployment, this deployment went very smoothly, although after triangulation, everyone quickly disappeared to turn in!

Timor 4:

Anchor Dropped GMT 1400 (LT 2200 24/06/05)

Depth: 899 m

Latitude: 11° 31.707'S

Longitude: 122° 58.437'E

Ranged in Position: 11° 31.766'S, 122° 58.360'E

25 June 2005: After completing CTD station 29 on the southern slope of the continental shelf of Timor in the wee hours, we proceeded to Buka Bai on the south-west tip of Roti to drop the anchor at ~0730, and retrieve the Timor 2 anchors from the hold. Beautiful bay, with a fresh wind coming out of the south-east. We see numerous blue-sailed traditional fishing boats working in this large bay. By 1245 we pull up the anchor and are on our way to Timor 2, arriving at ~1600. After drift tests, Robert Molcard and Captain Danil decided to hold station for this mooring deployment on the sill.

Timor 2:

Anchor Dropped GMT 1044 (LT 1844 25/06/05)

Depth: 1874 m

Latitude: 11° 16.484'S

Longitude: 122° 51.798'E

Ranged in Position: 122° 51.5065'E, 11° 16.6084'S

Excellent presentations were given by Salvienty Makarin (BRKP-DKP, Indonesia) and Adriani Sunuddin (IPB, Indonesia) in the evening.

26 June 2005: After ranging in last night, we proceeded back to Roti and continued with our saw-tooth fish survey around the island. Our colleagues at ATSEF met yesterday and today in Dili, and we received good news of clearance to deploy our moorings in Timor Leste. The documents are to be signed tomorrow (Monday) in Dili and faxed to the ship. We also heard that Fabiano has arrived in Jakarta with the 2 French beacons that we will use on our Ombai Moorings. With this knowledge of the arrival of our Ombai beacons, we began the deployment of our last Timor mooring (equipped with beaco) at 1710, with strong 30 knot winds from the ENE to ESE. We started ~ 1.5 nm upstream nearly due east.

Timor 1:

Anchor Dropped GMT 1047 (LT 1847 26/06/05)

Depth: 996 m

Latitude: 11°9.756'S

Longitude: 122° 46.801'E

Ranged in Position: 11° 09.677'S 122 46.803'E

27 June 2005: Completed CTD Stations 30 and 31 on north side of Savu Strait and on the Savu sill. Continued to Roti Island and completed the remainder of the fish survey around the island.

28 June 2005: Picked up the Kupang pilot at 0630, and was alongside at 0730. Science parties had a pleasant day wandering the streets of Kupang. Five new students joined our ship, and other students and scientists departed. We left for Ombai Strait at 1700. At an evening meeting between Captain Danil, the security officer and the Chief Scientists we were informed that an agreement for clearance between Indonesia and Timor Leste had still not been reached, so we are unable to deploy /recover the South Ombai instruments as yet. We are canvassing our embassies and colleagues to see if we can help facilitate and expedite the clearance issues, as time is now critical.

29 June 2005: Arrived at Ombai North (1) mooring site for recovery ~ 0845, and began transponding for moorings 800 m upstream of last ranged in position. Currents were 0.5 knots to the ESE. Top buoy spotted starboard abeam by SO Budi. Two very large sperm whales were curious about the released mooring and spent quite some time diving around the floating buoys. We have spotted many whales in this region this morning. Recovery began at 0930 and was completed by 1130. Only one floating buoy package was visible after the beacon floatation, although there were 5 packages for the remainder of the mooring and all were recovered. After lunch, Susan, Sumadyo, Janet and the boat drivers went to recover the North Ombai pressure gauge in both boats. Sumadyo and Janet successfully recovered and redeployed the gauge. Rising tide (low tide was at 1200 local time in Dili) made the surge and current fairly strong, and the suspended sediment made for low visibility, but it's a beautiful site to dive on. Local traditional fishermen in dugouts watched the show. Unfortunately, we have been informed that clearance between Indonesia and Timor Leste is unlikely. Apparently we can recover our mooring from Timor Leste waters but not redeploy there, yet we requested to BRKP/DKP that the clearance should be for both. These are highly unusual clearance conditions. While waiting for clearance, we have begun a CTD survey of the northern part of Ombai Strait (CTD Stations 32 and 33).

30 June 2005: Continuing with CTD stations around western Wetar Strait (CTD 34, 35, 36, 37). At 1200 we sounded the South Ombai (2) mooring and it responded. We also heard that clearance documents had arrived in BRKP, but there are still details to be worked out concerning whether an observer will join us for the deployment or not. We have to wait until tomorrow to determine this. Large pods of spinner dolphins were sighted this afternoon near the entrance to Wetar Strait. We completed CTD stations 38 through 41 along the axis of Wetar Strait. Utami Kadarwati and Ary Widyanto gave terrific talks on the activities of BRKP Indonesia in detecting climate change from salt pond data and the repository of hydrographic data.

1 July 2005: Completed tow-yo CTD station 42 (4 down-up casts) just north of the sill at Wetar. Completed CTD stations 43-44 westward across the sill. Since clearance has been received by the ship, we moved on station, and began recovery of Ombai South (2) mooring by sounding the releases at 1430. After much suspense, Susan spotted the

syntactics at ~ 1500, way off in the distance ~ 2 miles to SW in the direction of main current. Unfortunately we lost the top of the mooring, down to ~125 m, but recovered the ADCP and an SIO T-logger and SBE39 (with pressure!) that was located at the top of the mooring. The data indicated that the top of the mooring broke off ~ Feb 2005. We hooked up the ADCP floatation on board at 1532 and completed the mooring recovery by 1753. A long recovery, but very rewarding! In the evening we undertook a fish survey along the south-east coast of Alor Island.

2 July 2005: Recovered and redeployed the shallow pressure gauge on Timor Leste this morning. Divers were Janet, Paul, Sumadyo and Nani. We redeployed a new anchor that is more modular than the old one deployed at this site in August 2003. All divers were back on board the BJVIII by 11.30 and we then completed CTD station 45 in southern Ombai Strait. We began the mooring layout for Ombai north at 1530 but the currents were not co-operative at first. This was near low tide (1600 at Dili) and on first drift there was a westward flow in the surface layer, but by the time we began our deployment west of the mooring (into the current) the flow had turned very weak and it was clear that we would be steaming hard and deploying way east of our target position. Fortunately we had only deployed a few instruments above the ADCP, so these were recovered and we repositioned the ship east of the target and began mooring deployment again at 1815. The ship maintained a steady 2 knots and the current swung around towards the east (with a very sudden change toward the SSE at ~1923 during the deployment). Captain Danil expertly maintained the BJVIII on the 1330 target isobath during the difficult and dangerous parachute-release-anchor stage.

Ombai North:

Anchor Dropped GMT 1312 (LT 2112 2/07/05)

Depth: 1315 m

Latitude: 8° 24.057'S

Longitude: 125° 02.013'E

Ranged in Position: 8° 24.044'S 125° 02.268'E

After deployment undertook fish survey on north-east corner of Alor.

3 July 2005: Completed CTD stations 46-48 in Wetar St and South Ombai. Began mooring deployment of Ombai South at 1515. This is a long mooring, but the bathymetry is very flat. Currents were weak and to the NNW, little tidal influence compared to Ombai North deployment. The lack of anticipated current meant that we overshot our target location by about a mile, although the depth was still perfect. There were many false killer whales (paus) and dolphins around the ship for this evening's deployment.

Ombai South:

Anchor Dropped GMT 1225 (LT 2025 3/07/05)

Depth: 3203 m

Latitude: 8° 32.356'S

Longitude: 125° 01.985'E

Ranged in Position: 8° 32.335'S 125° 02.262'E

4 July 2005: Underway transit to Padang Bai.

5 July 2005: Underway transit to Padang Bai.

6 July 2005: Arrived Padang Bai at 10:00. Foreign science team and some of Indonesian science team departed ship at 12:00.

Table 1: Mooring recovery times, anchor drop positions and final ranged in positions and depths. Depths are from the EA500 with speed of sound from local CTD stations (error ~ 10 m).

Mooring	Date/Time (GMT) Recovered	Date/Time (GMT) Deployed	Anchor Drop	Ranged in Position	Depth
Lombok West (1)	15/06/2005 0235	17/06/2005 0943	115° 45.492'E 8° 26.594'S	115° 45.487'E 8° 26.774'S	910 m
Lombok East (2)	15/06/2005 0705	18/06/2005 0946	115° 53.905'E 8° 24.424'S	115° 53.769'E 8° 24.566'S	1133 m
Timor 4 (Ashmore)	21/06/2005 0125	24/06/2005 1400	122° 58.437' E 11° 31.707' S	122° 58.360' E, 11° 31.766' S	899 m
Timor 3 (S-slope)	21/06/2005 0517	24/06/2005 0834	122° 57.556' E 11° 22.094' S	122° 57.404' E 11° 22.193' S	1380 m
Timor 2 (Sill)	21/06/2005 2355	25/06/2005 1044	11° 16.484' S 122° 51.798' E	11° 16.6084'S 122° 51.506'E	1874 m
Timor 1 (North)	21/06/2005 1010	26/06/2005 0910	122° 46.801' E 11° 09.756' S	122° 46.803' E 11° 9.677' S	995 m
Ombai South (2)	01/07/2005 0732	03/07/2005 1225	125° 1.985'E 8° 32.356'S	125° 02.262'E 8° 32.335S	3203 m
Ombai North (1)	29/06/2005 0330	02/07/05 1312	125° 2.013' E 8° 24.057' S	125° 02.268'E 8° 24.044'S	1315 m

Table 2: Location and dates of shallow pressure gauges deployed and recovered

Pressure gauge	Date/Time Recovered (GMT)	Date/time deployed (GMT)	GPS Position
Bali	17/06/2005 0230	17/06/2005 0300	115° 42.612'E 8° 24.127'S
Lombok (new location!)	18/06/2005 0200	18/06/2005 0230	116° 01.472'E 8° 20.874'S
Roti/Ndao Island	23/06/2005 0330	23/06/2005 0410	122° 40.941E 10° 49.191S
North Ombai (Alor)	29/06/2005 0700	29/06/2005 0745	125 04.346E 8° 21.073S
South Ombai (Timor Leste)	02/07/2005 0200	02/07/2005 0235	125 06.579E 8° 39.868E

Table 3: Locations, times and depths of CTD casts completed.

Station	Start Date/Time (GMT)	Latitude	Longitude	Bottom Depth (m)
01	14/06/2005 12:07	7° 30.042' S	115° 11.14' E	660
02	14/06/2005 16:22	7° 54.988' S	115° 30.067' E	1237
03	15/06/2005 08:26	8° 23.096' S	115° 84.967' E	1177
04	15/06/2005 10:38	8° 24.857' S	115° 50.22' E	1207
05	15/06/2005 13:20	8° 27.062' S	115° 45.182' E	864
06	15/06/2005 16:02	8° 30.121' S	115° 41.444' E	1059
07	15/06/2005 18:41	8° 37.367' S	115° 44.403' E	671
08	16/06/2005 16:20	9° 00.115' S	115° 39.911' E	733
09	16/06/2005 20:20	8° 49.675' S	115° 42.088' E	272
10	16/06/2005 21:30	8° 44.789' S	115° 42.215' E	793
11	17/06/2005 13:40	8° 20.098' S	115° 50.088' E	1334
12	17/06/2005 17:14	8° 00.174' S	115° 50.803' E	1414
13	17/06/2005 21:15	8° 05.078' S	116° 04.953' E	1408
14	18/06/2005 04:55	8° 20.082' S	115° 55.032' E	1230
15	18/06/2005 19:32	9° 09.132' S	115° 59.935' E	1373
16	18/06/2005 23:00	9° 10.679' S	116° 13.898' E	2132
17	21/06/2005 0930	11° 25.292' S	122° 39.986' E	2051
18	21/06/2005 1612	11° 10.049' S	123° 04.993' E	1808
19	21/06/2005 1942	11° 29.923'S	122° 55.107' E	1057
20	21/06/2005 2055	11° 26.621' S	122° 52.579'E	1304
21	22/06/2005 0127	11° 21.146'S	122° 49.790'E	1662
22	22/06/2005 0442	11° 16.881'S	122° 47.458'E	1868
23	22/06/2005 0625	11°12.085'S	122° 44.972'E	1186
24	22/06/2005 1107	10°47.23'S	122° 06.928'E	Aborted
25	22/06/2005 1615	10° 24.992'S	122° 27.058'E	1969
26	22/06/2005 1926	10° 32.072'S	122° 08.090'E	733 (overwritten)
27	22/06/2005 2112	10° 37.130'S	122° 16.109'E	1159
28	22/06/2005 2255	10° 42.852'S	122°25.014'E	835
29	24/06/2005 1809	11° 38.054'S	123° 00.000'E	620
30	26/06/2005 1833	10° 47.247'S	122° 07.102'E	1269
31	26/06/2005 2046	10°32.169'S	122° 07.930'E	722
32	29/06/2005 1045	8° 25.012'S	125° 00.064'E	1903
33	29/06/2005 1323	8° 27.304'S	125° 01.474'E	2803
34	29/06/2005 1613	8°29.516'S	125° 03.013'E	3212
35	29/06/2005 1942	8° 27.889'S	125° 08.105'E	3294
36	29/06/2005 2059	8° 26.019'S	125° 13.507'E	3178
37	30/06/2005 0144	8° 23.94'S	125° 18.938'E	2610
38	30/06/2005 0620	8° 22.067'S	125° 05.790'E	311

39	30/06/2005 0745	8° 19.808'S	125° 10.021'E	625
40	30/06/2005 0955	8° 19.285'S	125° 14.285'E	1383
41	30/06/2005 1430	8° 5.057'S	125° 20.128'E	4630
42	30/06/2005 1716	8° 5.802'S	125° 20.191'E	4644 (tow- yo: 4 casts)
43	30/06/2005 1959	8° 14.970'S	125° 20.029'E	2178
44	30/06/2005 2157	8° 18.796'S	125° 18.744'E	1233
45	02/07/2005 0444	8° 35.739'S	125° 06.606'E	1942
46	02/07/2005 2218	8° 04.090'S	125° 0.122'E	3004
47	03/07/2005 0044	8° 03.962'S	125° 04.573'E	2634
48	03/07/2005 0610	8° 31.909'S	125° 04.351'E	3219

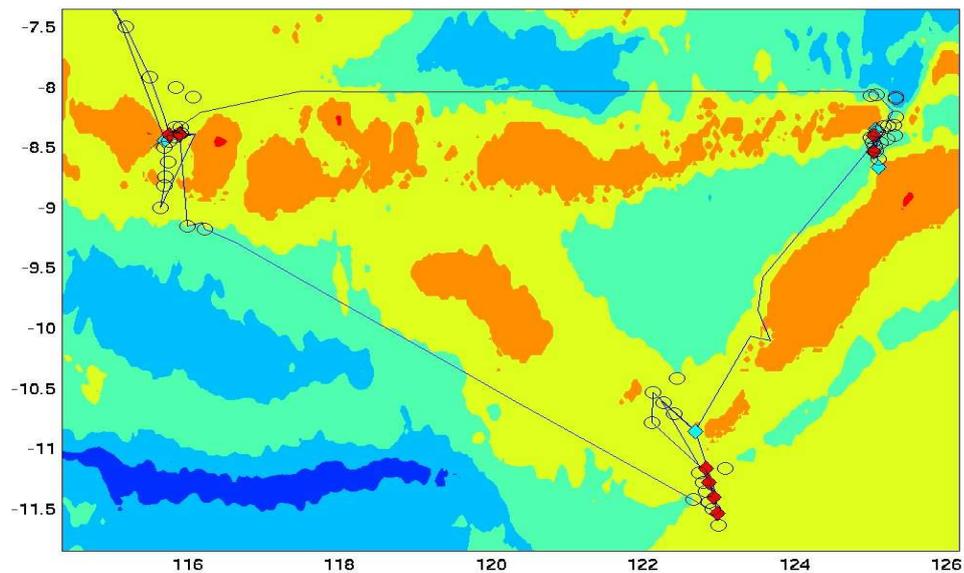


Figure 1: Ship track for legs 1 and 2 (black line) with the locations of the INSTANT moorings (red diamonds), shallow pressure gauges (cyan diamonds) and CTD stations (open circles).

Table 4: Data recovery from the INSTANT 2003 deployment by instrument and mooring for Ombai and Lombok (upper table) and Timor (lower table). Yellow indicates significant percentage data return (in most cases 100%). All instruments except the RCM7 at 1800 m on the Timor 2 mooring were recovered in August 2004. All ADCPs were upward looking and mostly returned velocity to near the surface.

Z	Lombok W 800	Lombok E 1200	Ombai N 1500	Ombai S 3200
99.9	Tidbit T	Tidbit T	Tidbit T	Tidbit T
100	ACM+T	ACM+T	ACM+T	ACM+T
101		SBE39		SBE39
125	SBE37SM	SBE37SM	SBE37SM	MCAT TS
140	ADCP300	SBE39	ADCP300	SBE39
160	Tibit	Tibit	NO INST HERE	
170	VMCM+TSP	SBE39	SBE37SM	SIO-T
200	SIO-T	SIO-T	SIO-T	ADCP75
250	VMCM+TSP	SBE39	VMCM+TSP	VMCM+TSP
300	SIO-T	ADCP75		
350	VMCM+TSP	VMCM+TSP	VMCM+TSP	VMCM+TSP
400	Tidbit T	Tidbit T	Tidbit T	SIO-T
450	VMCM+P	RCM8PT	RCM8PT	RCM8PT
550			SIO-T	SBE37SM
650				
700			RCM8PT	RCM8PT
800		SIO-T		
1000			RCM8PT	RCM8PT
1400				
1500				RCM8PT
1700				
1800				
2000				
3000				

Z	Timor 1 800	Timor 2 1890	Timor 3 1500	Timor 4 700
99.9			Tidbit T	
100	ACM+T		ACM+T	ACM+T
101	SBE39			SBE39
125	SBE37SM		MCAT TS	MCAT TS
140	Tidbit T-no data		SBE39	SBE39
160	Tidbit T		SBE39	SBE39
170	SBE39		MCAT TS	SBE39
200	ADCP150		ADCP150	ADCP150
250	VMCM+TSP		VMCM+TSP	VMCM+TSP
300	Tidbit T			Tidbit T
350	ACM+T		VMCM+TSP	VMCM+TSP
400	SBE37SM	ADCP	SBE39	Tidbit T
450	RCM8PT	SBE39T	RCM8PT	RCM8PT
550		RCM7PT(-10m) SBE37STP	MCAT TS	
650				
700	RCM8PT	RCM7PT	RCM8PT	
800				Tidbit T
1000		RCM7PT	RCM8PT	
1400		RCM7SPT		
1500				
1700				
1800		RCM7PT(-10m) SBE37STP		
2000				
3000				

Ship Crew

Irham Danil, B. Sc.	Master
Martoni Wibowo	Chief Officer
Bangun Aritonang	Second Officer
Indra A.S.	Third Officer
Indrayana Hasan	Fourth Officer
Edy Endrotjahyo	Bosun
M. Hasanuddin	Quatermaster
Sugiman	Quatermaster
Jefri Juliansyah	Quatermaster
Arifin Djelan	Chief Cook
Maulana Yusuf	Second Cook
Supardi	Junior Cook
Zaenudin	Steward
Sukarman	Chief Engineer
Eddy Tjasmoro	First Engineer
Deni Purnomo	Second Engineer
Sudirman	Third Engineer
M. Husni	Forth Engineer
Ali Samilun	Foreman
Yefrizal	Greaser
Mudi Setiabudi	Greaser
Fadil	Greaser
Praditya Avianto, A. Md.	Administrator
Priyadi Dwi Santoso S.T.	Electrician

Security Officer:

Kapten Laut Budi Nawanto, DISHIDROS Indonesia

Science Crew

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A.G. Ilahude, P2O LIPI, Indonesia (Leg 2)
Susan Wijffels, CSIRO, Australia.
Robert Molcard, LODYC, Paris, France.
Dwi Susanto, Lamont-Doherty Earth Observatory, USA

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Lindsay Pender, CSIRO, Australia
Danny McLaughlan, CSIRO, Australia
Paul Harvey, Scripps Institution of Oceanography, USA
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Dwi yannea Qurnia Hani, ITK-IPB Indonesia
Adriani Sunuddin, IPB Indonesia
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M. Priyono Haryono, ITB Indonesia
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Furcon, LIPI Indonesia

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