

**FRENCH-INDONESIAN COOPERATIVE INVESTIGATION
IN PHYSICAL OCEANOGRAPHY**

JADE 97 CRUISE

**on board the
K/R BARUNA JAYA IV**

26 February - 10 March 1997

CRUISE REPORT

**On board the Baruna Jaya IV, the 10th of March 1997
Michèle Fieux**

1 - Objectives of the cruise

The objective of the JADE (Java-Australia Dynamic Experiment) programme is the study of the throughflow between the Pacific and the Indian Oceans which represents a fundamental link as well in the study of the general oceanic circulation (WOCE (World Ocean Circulation Experiment) programme) as in the climatic studies which are related to it (CLIVAR (CLImatic VARIability) programme, Global Change). It includes the measurement of the characteristics of the water masses to study their origin and their mixing. It also includes direct current measurements in the narrow and deep passages which link the Banda Sea and the Indian Ocean north and south of Timor Island (Fig. 1).

A scientific collaboration between French and Indonesian scientists has included two cruises on board the Marion Dufresne in 1989 and 1992, and four cruises on board the Baruna Jaya I in 1990, 1992, 1993 and 1995.

The JADE 97 cruise is the sixth cruise of the Franco-Indonesian JADE programme.

The specific objectives of this cruise were:

- first, to measure directly the currents during one year in both deep passages north and south of Timor, i.e. in Ombai Strait and in Timor Passage, to determine the partition of the throughflow from the Banda Sea toward the Indian Ocean, between the two passages.

- second, to measure the evolution of the water masses between the south Banda Sea, the Ombai Strait, the passages east of Timor between Timor and Leti and east of Lakor, and along the Timor sea towards the Indian Ocean.

2 - Summary of the cruise

To fulfill the first objective, one currentmeter mooring was launched in Ombai Strait with 4 currentmeters (figure 1 and 2) and a second one in Timor Passage with three currentmeters in the deep layer (figure 3).

The second objective was not completely reached for two reasons. First, because the GMI CTD was not working as we hoped; we have only few data on the vertical and 12 water samples but no temperature nor pressure calibration. Second, we encountered bad weather with 40 knots wind in Ombai Strait which obliged us to find a shelter because neither the mooring nor the retrieval of the pressure gauge could be carried out. So afterwards, it was impossible to make any work east of Timor due to the restricted time left. We decided to concentrate on the passages between Timor, Alor, Kambing and Timor, and in the Timor Passage south of Roti. 14 stations were done in the first passages (figure 1). Then, after the launching of the second mooring south of Roti in the Timor Passage, the echosounder stopped working so it was impossible to make any CTD stations as planned. We had to go back to Kupang two days earlier than intended. All together, two currentmeters moorings were launched and 14 CTD stations were carried out.

All the currentmeters, but one, and the ADCP picked up in Bahari recorded nearly one year of measurements in Ombai Strait which are going to be very interesting.

3 - Description of the cruise

We were welcomed by Komandan Handoko on board the Baruna Jaya IV on the 24th of February. As one of the JADE 97 mooring site is in Ombai Strait and as two shallow pressure gauges are sited in the same passage, the cruise leg includes 1,5 days for the Shallow Pressure Gauge American-Indonesian programme. The participants include four French and two American scientists. As the American programme following the Jade cruise starts from Kupang, their equipment had to be loaded on board in Jakarta as well as ours. The french equipment was ready to be loaded on the 20th as planned, but the American container was stuck with customs clearance problems, and the cruise departure had to be delayed. The light part of the French equipment was loaded on board by hand on the 24th of February and when the ship reached the quay in Dermaga Umum Tanjung Priok, the heavy part was loaded with the ship crane on the 25th. But we had to wait till the 26th to load the American container equipment.

We left Jakarta on the 26th of February at 15.00 towards Buton Island to pick up the mooring equipment which had been found by Fadli Syamsudin at the end of January with the position given by the satellite beacon mounted on the ADCP buoy.

The cruise objectives were presented on the morning of 27th to Komandan Handoko and his crew. The two beacons were started for a test and the currentmeters were initialized. There were several problems with the CTD systems. The GMI CTD of Baruna Jaya 4 did not work and we had to spend a lot of time to reconstruct the wiring which had been changed during the Arlindo cruise which we did not know; furthermore the plug which connects the winch cable and the CTD was missing. We had to solder an electric cable to the pins of the CTD. The two deck units of the Guildline CTD were not working and one of them is in bad condition which seemed to be due to a bad storage.

We stopped in front of the village of Banabungi in the island of Kadatua, south of Sulawesi. We found the two currentmeters and the four floats which we knew were there. brought from the Sawu Sea by fishermen where they drifted after the breaking of one mooring launched in Ombai Strait. We brought back the instruments with the rubber boat. Then we went to the village of Bahari, south of Buton Island, and got back the five currentmeters, the ADCP and the release of the mooring launched in Ombai Strait in 1995. Thanks to Fadli who had come there at the end of January on his way from Kalimantan to Irian Jaya. Mardanis joined us in Bahari and carried out the salinity measurements. The oxygen measurements were not possible. The fishermen people in both places welcomed us very kindly.

During the call in front of Bahari, Nancy and Thomas dived to clean the hull mounted ADCP which is not working very well. It seems that there are several problems with the hull-mounted ADCP that kept us from recording reliable data. In front of Bahari, the GMI CTD was tested in water and seems to work however with a large shift in salinity.

At station 1, in the south Banda Sea, it was discovered that the CTD programme was not able to give the complete profile on the way down together with sampling on the way up. Two casts were made when we had time but it is not satisfactory. The transfer of data was also a problem. And when we tried to install reversing thermometers and pressure sensors, it was impossible to install the thermometer racks on the bottles. So we will not have any possibility of checking the temperature nor the pressure given by the CTD.

After station 1 there was enough time to reach the position of the american pressure gauge during the daylight on Alor side P1 (figure 1) and they managed to find it quickly and to replace it during the afternoon. Then we measured the drift of the ship for nearly 24 hours to get the variability of the surface current at the intended mooring position due to the tides. The drift was between 2 and 3 knots towards the E-NE, opposite to what we found in November 1995 (figure 4). There was a strong color front in Ombai Strait with green waters on the Timor side and blue waters on the Alor side. We made the last drift in the green waters, and the drift was a little stronger but in the same direction. On the 4th of March, in the afternoon, Nancy

and Thomas dived on North Timor pressure gauge P2 but the sea was rough, the visibility was very bad and they could not find it that day. CTD stations 2, 3 and 4 were done during the night with squalls up to 40 knots. So it was not possible to work the next day on the moorings and we waited in the shelter of Alor while we prepared the cable on the winch which is not adapted to launch moorings because it is too slow and the drum is divided in three parts. On the 6th of March, the weather was better and we launch successfully the first mooring M1 with 4 currentmeters, in 3300m depth. On the same day, the pressure gauge on the Timor side was successfully retrieved and a new one was installed despite the very bad visibility. 4 CTD stations were done in Ombai Strait. As we could not do the planned CTD programme east of Timor, we made 6 stations between Alor, Kambing and Timor. Between station 13 and 14, the mooring cable was rolled on the winch to be ready for the next mooring.

On our way towards Timor Passage, on the 8th of March, we stopped in front of Batek to search for the missing currentmeters which were described to be there by the fishermen in Banabungi. Nancy and Thomas dived with bad visibility and could not find anything.

We improved the bathymetry of the Timor Passage that we had from the previous JADE 92 cruise during the night of the 9th of March and made two drifts on the sill before the successful launching of mooring M2 in the morning right on the sill.

Then, to get the deep water characteristics on the Indian Ocean side of the sill, we steamed towards depth greater than 2500m. In the mean time the echosounder stopped working at a depth of 2100m at the beginning of the afternoon of the 9th. The crew tried to repair it during the afternoon but the power was too low. So it was impossible to make the deep stations we needed to compare with the currents at deep levels on the sill. So it was decided to go back to Kupang. We lost two days of shiptime previously scheduled. We arrived in Kupang in the early morning of the 10th of March.

4 - Cruise participants

<u>JADE 97 : French participants</u>		
Michèle Fieux	LODYC-CNRS	Co-Chief Scientist
Robert Molcard	LODYC-CNRS	Scientist
Jacky Lanoisellé	LODYC-CNRS	Engineer
Claudie Bournot	INSU-CNRS	Engineer

<u>Indonesian participants</u>		
Fadli Syamsudin	BPPT	Co-Chief Scientist
Handoko Manoto	BPPT	Engineer
Rosul	BPPT	Technician
Mustofa	BPPT	Technician
Suyatmin	BPPT	Technician
Tatang Sutardi	BPPT	Technician
Moh. Djakfar	BPPT	Technician
Mardanis	LIPI	Technician

<u>American participants for the SPG programme</u>		
Nancy Bray	CSIRO	Scientist
Thomas Moore	CSIRO	Scientist

4 - Acknowledgments

We would like to thank Komandan Handoko and all his crew for their warm welcome on board and we greatly appreciate the excellent professional and amicable support of our work at sea. Despite the design of the ship which is more dedicated to fisheries work, they managed to launch very well the two moorings and to stand 40 knots wind during a CTD station.

We appreciate very much the excellent and warm cooperation with Fadli Syamsudin and his BPPT team; they have been always very helpful. They had to face many problems in regard to the functioning of the CTD and the hull-mounted ADCP. They have done the best that they could in such conditions. Some more specific training regarding their new equipment will greatly help for future experiment. We would like to thank particularly Mardanis who managed to join us in Bahari and made the salinity measurements.

We would like to add that the food was excellent and we appreciate the thought of giving us bread, butter and jam for breakfast.

We wish to thank Philippe Garnier, conseiller Culturel, Scientifique et Technique à l'Ambassade de France for his help in getting the clearance for the equipment in time.

We acknowledge the support of INSU for the cruise and thank them to have allowed the crucial participation of Claudie Bournot.

Professor M.T.Zen and his team at BPPT led by Basri Ganie, have been supporting this Franco-Indonesian cooperative programme since the beginning and have put a lot of continuous efforts in the fulfilment of the scientific cooperation, we wish to thank them warmly.

CTD stations list

N° St.	Lat. S	Long. E	D	Time UT	Depth m	ctd db	D	Wind m/s
01	7°58.65	125°18.12	03	08.27	3950	3800		13.3
02	8°33.39	125°07.34	04	18.20	3163	2500		8.2
03	8°24.43	125°06.11	04	22.52	1864	1500		10.2
04	8°30.06	125°06.20	05	03.02	3242	3000		3
05	8°34.58	125°06.37	06	18.16	2700	2550		7.7
06	8°31.12	125°05.89	06	20.38	3240	3100		6.1
07	8°28.21	125°05.22	06	23.58	3230	3030		7.7
08	8°23.80	125°04.64	07	03.40	1008	1000		5.1
09	8°15.32	125°10.90	07	06.10	771	700		3.5
10	8°14.75	125°20.65	07	07.52	2211	2000		4.6
11	8°15.69	125°28.29	07	09.55	634	600		5.1
12	8°06.05	125°39.83	07	11.56	1000	998		10.2
13	8°20.40	125°34.67	07	15.00	1255	1050		12.4
14	8°27.59	125°35.90	07	16.56	1420	1390		10.4

(Position= at maximal depth of the CTD)

Stations CTD BARUNA JAYA IV (Fev./Mar. 1997)

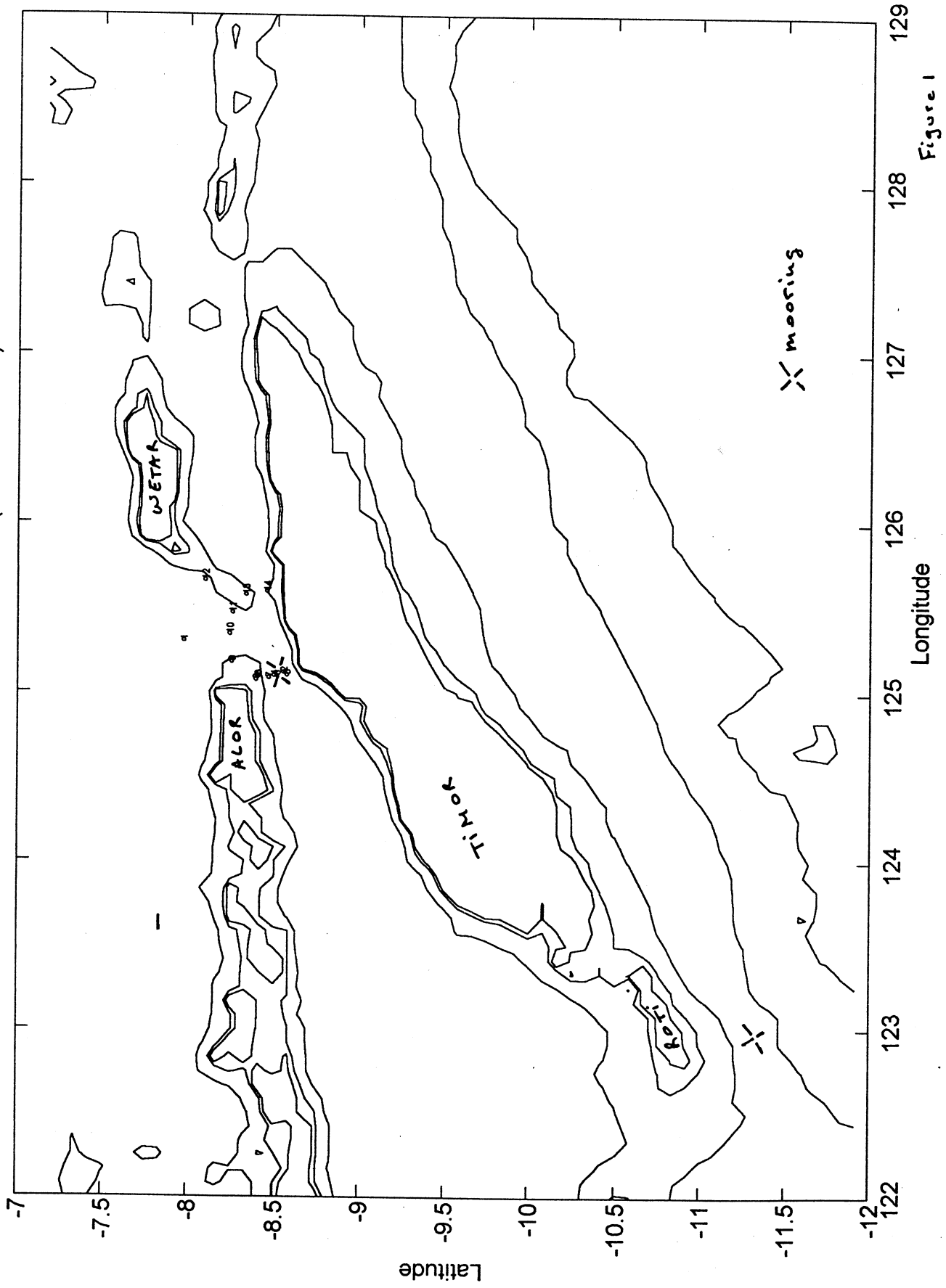


Figure 1

balisa Argos : 11429

20 m acier o.F

Début de mise à l'eau

Jour : 6 mars 1997
Heure TU : 00 ^h 00
Y : 8°30.59 S
G : 125°08.73 E
Depth : 3288 m

6 Nok 714 white

100 m

MC360-784

47 m acier F.F

6 Nok 714 white

6 m acier M.M

47 m acier F.F

200 m

Aa11862

44 m acier F.F

13 Nok 714 white

12 m acier M.M

13 Nok 620 green

44 m acier F.F

300 m

MC360-788

450 m acier F.F

4.0 Nok 620 green

SPLASH

Heure TU : 0310
Y : 8°28.48 S
G : 125°09.51 E
Depth : 3297 m

425 m acier F.F

5 Benthos

5 m chaîne Ø12

20 m acier F.F

1200 m

MC360-477

20 m acier F.F

triplets Billings

1 m tige

20 m acier F.F

AR661CC45

64 m (60 + 4 allong^t) squareline Ø16

Disparition de la tête

Heure TU : 04 01
Y : 8°27.932 S
G : 125°10.386 E
Depth : 3301 m

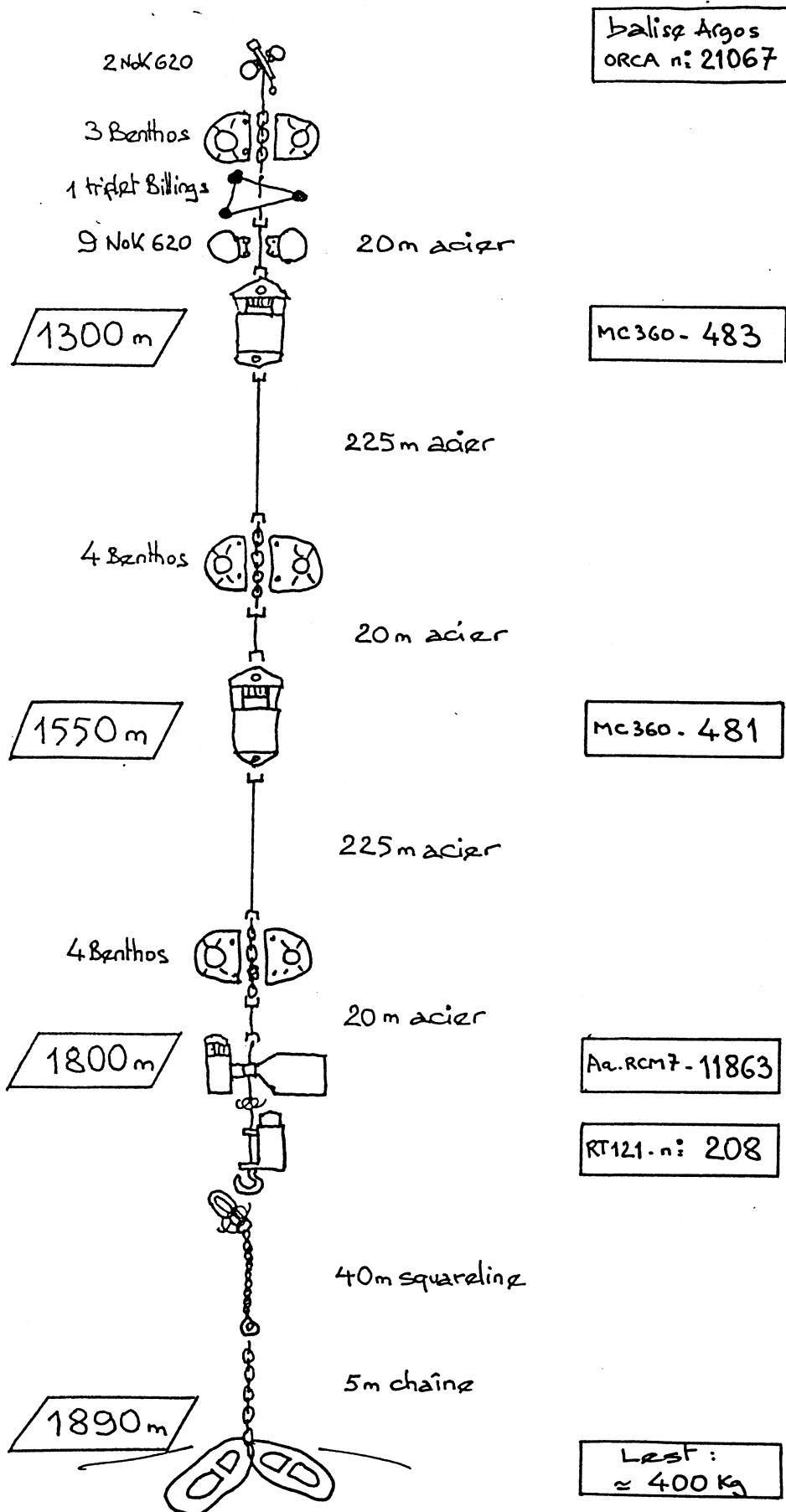
1940 m Parafil Ø11

5 m chaîne Ø12

3300 m

890 kg

Figure 2



Début de mise à l'eau

Jour : Dimanche 9 mars 97
Heure T.U. : 1 ^h 27
φ : 11° 16' 58
λ : 122° 52' 32
Depth : 1879 m

SPLASH !

Heure T.U. 2 ^h 29
φ : 11° 16' 52
λ : 122° 51' 72
Depth : 1885 m

Disparition de la tête

Heure T.U. : 2 ^h 34
φ : 11° 16' 47
λ : 122° 51' 79
Depth : 1898 m

Figure 3

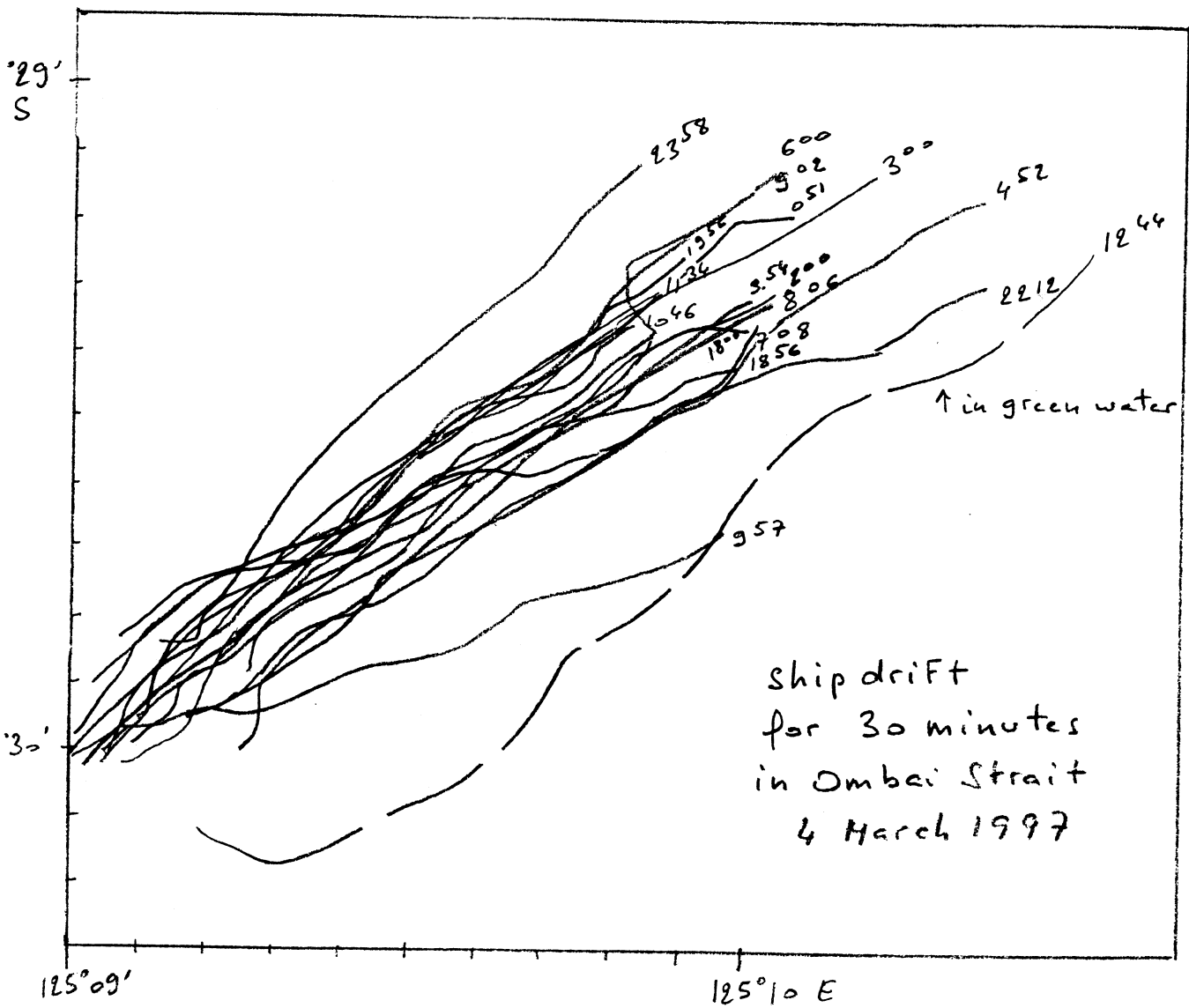
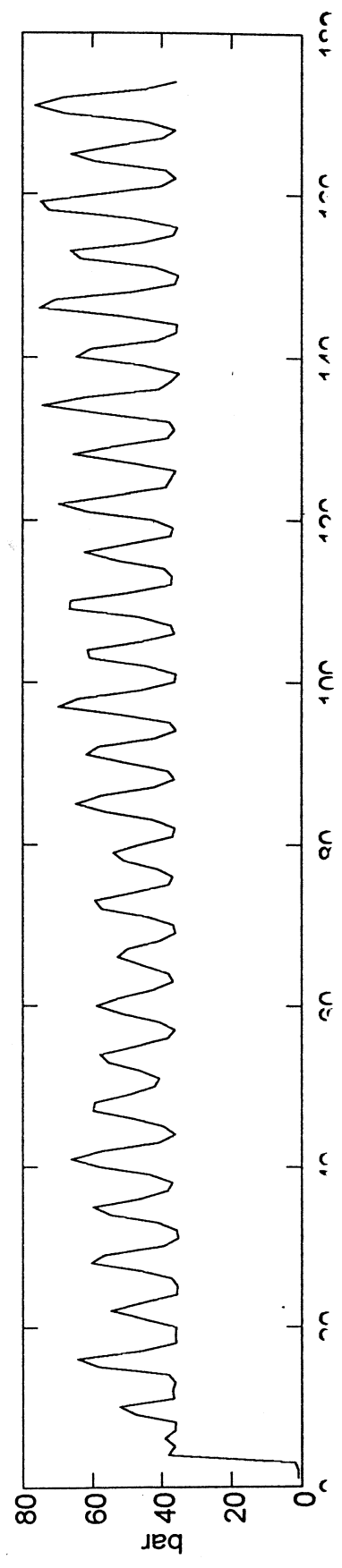
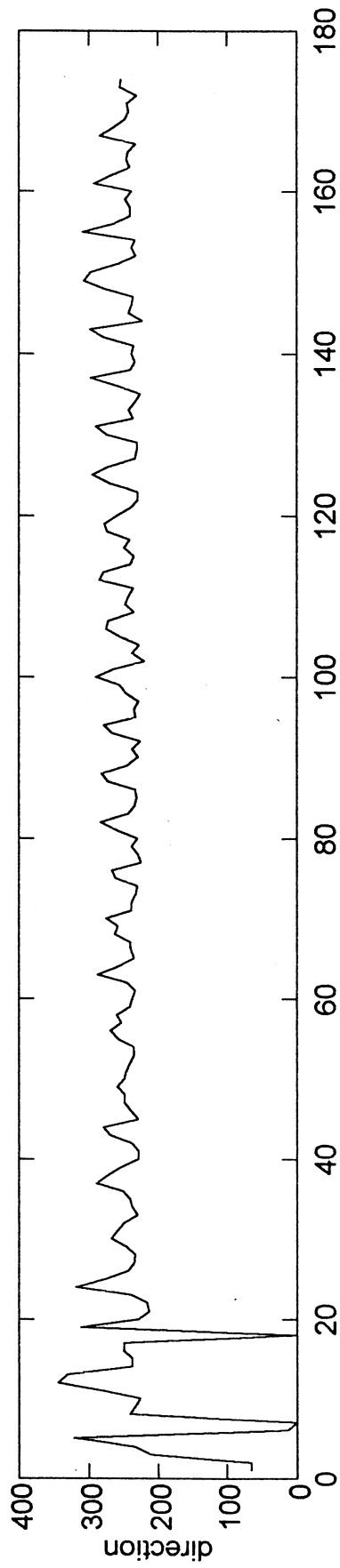
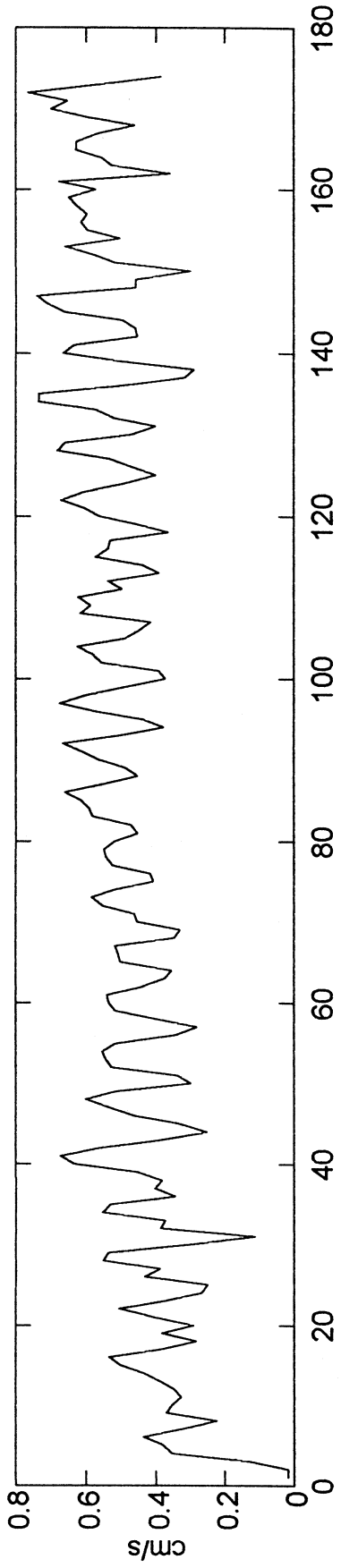


Figure 4

MC786 415 m



MC784 615 m

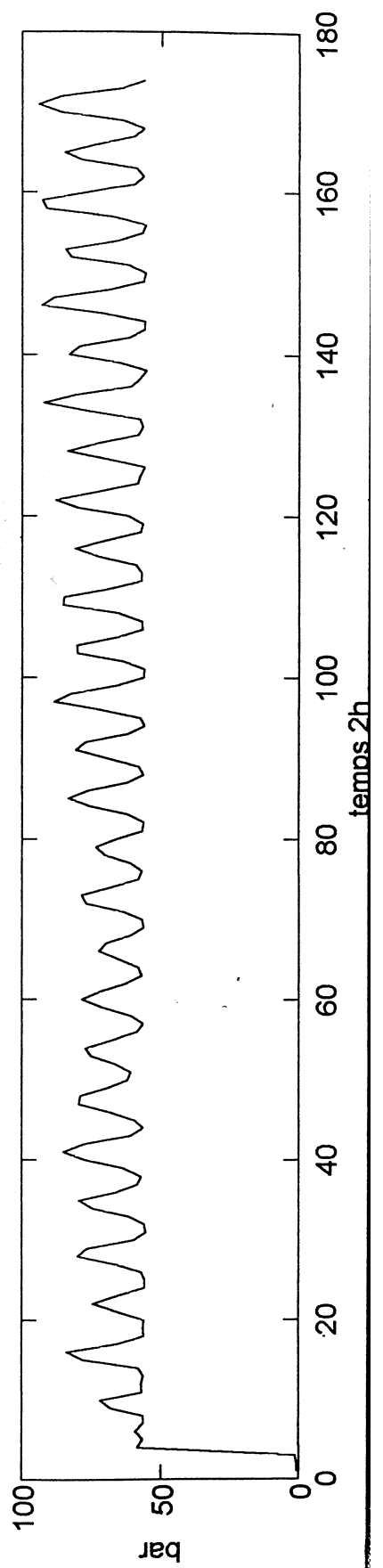
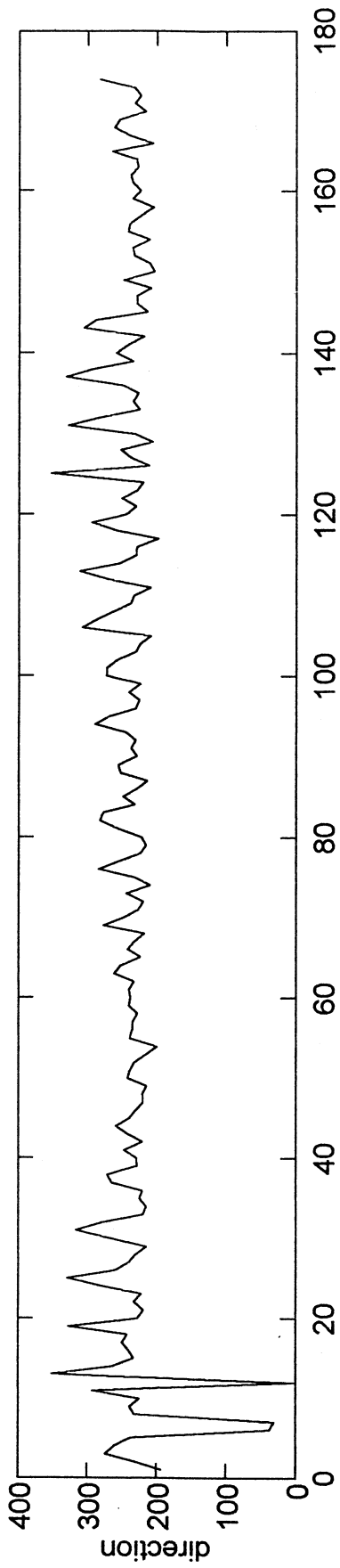
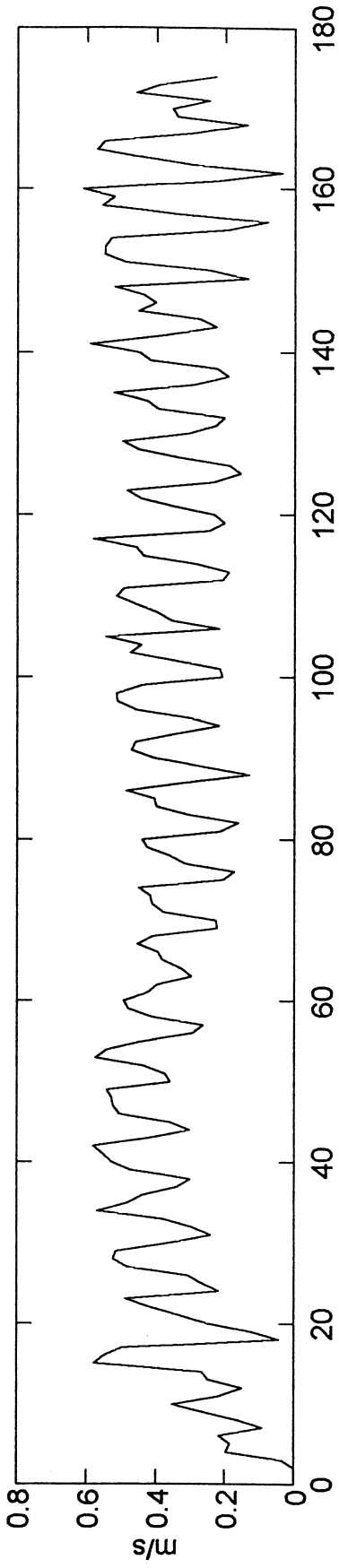


Figure 6

Aand11862 1020 m

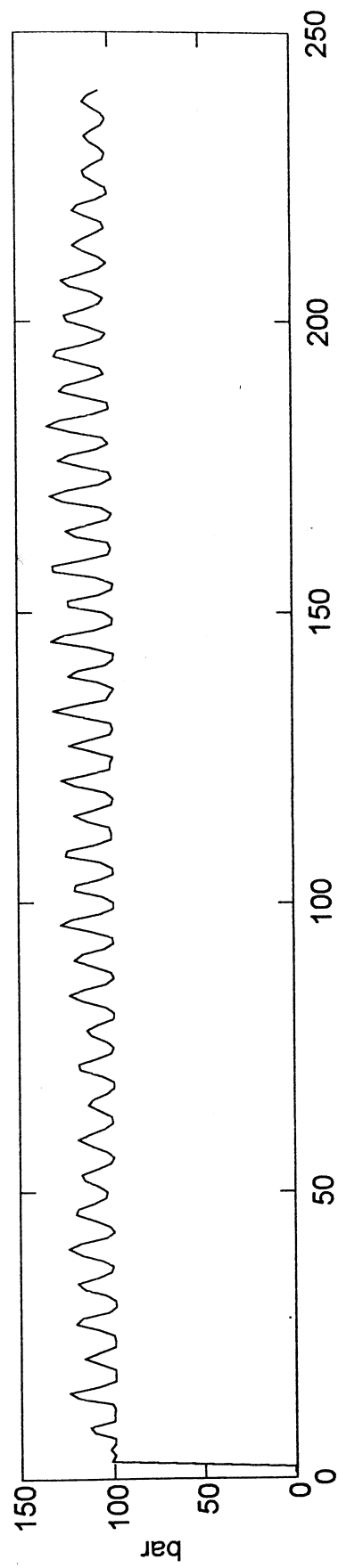
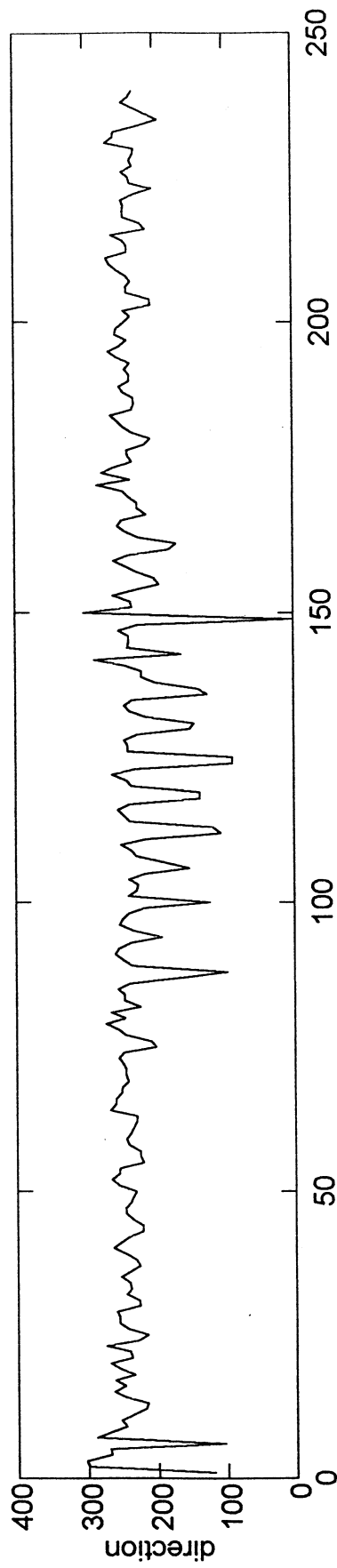
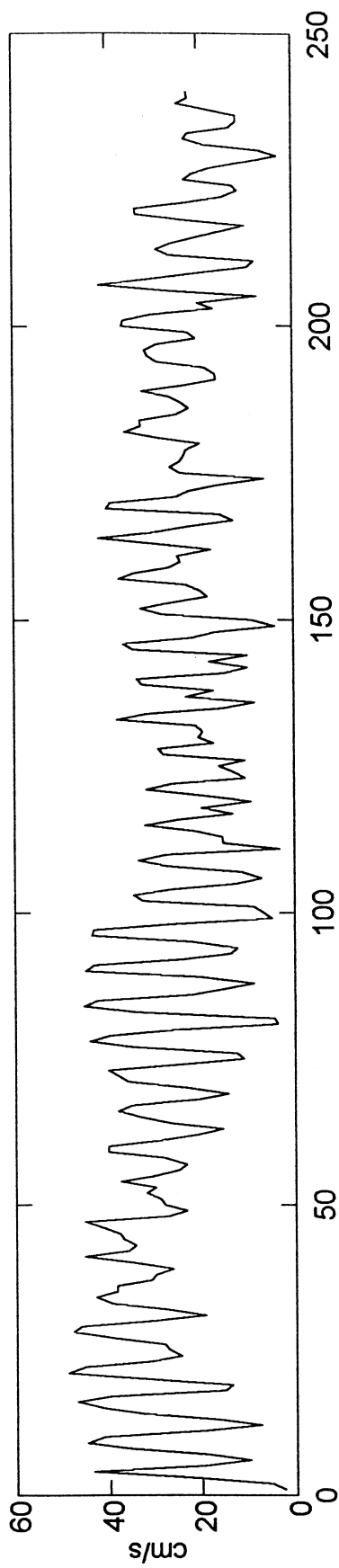


Figure 7

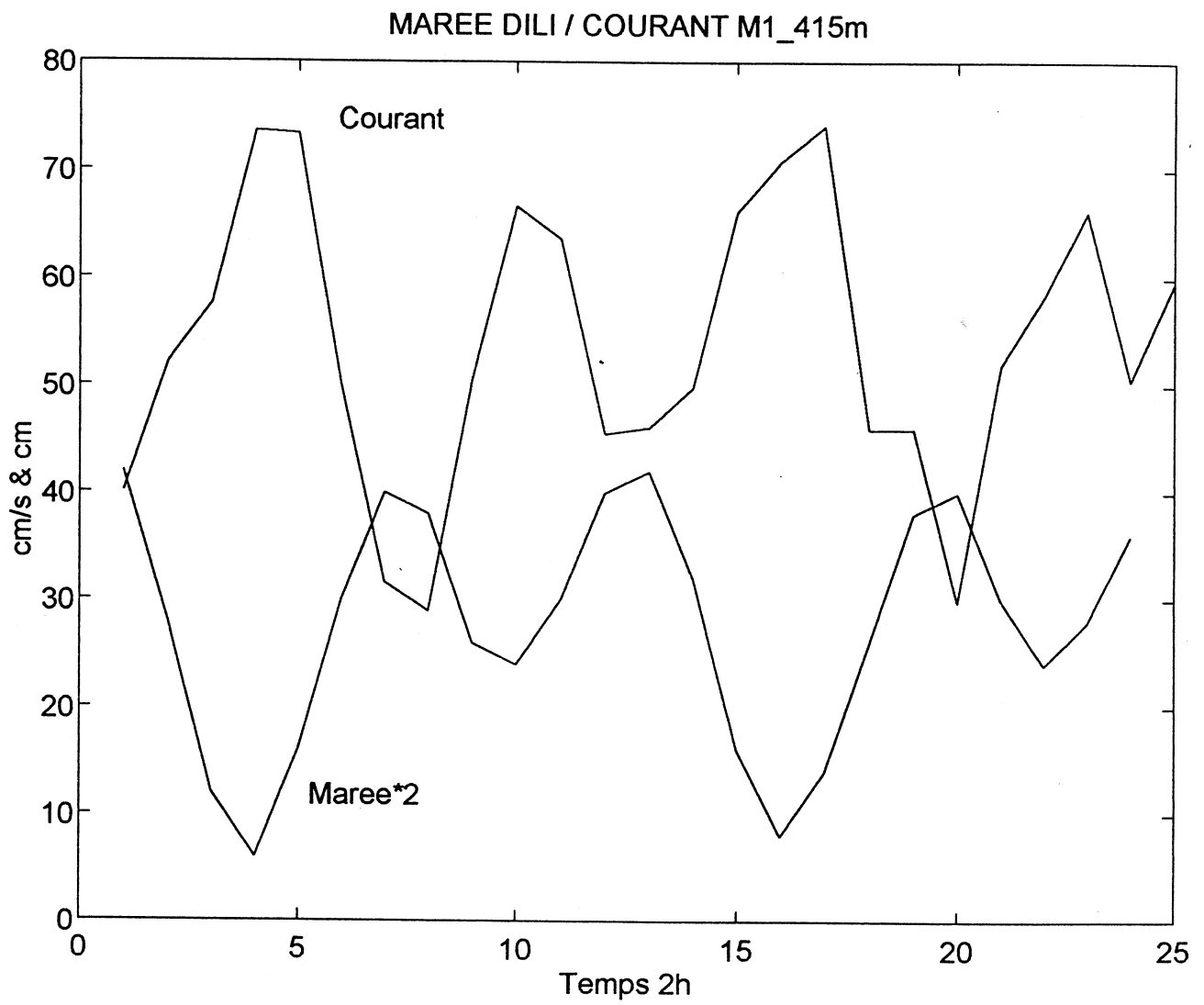
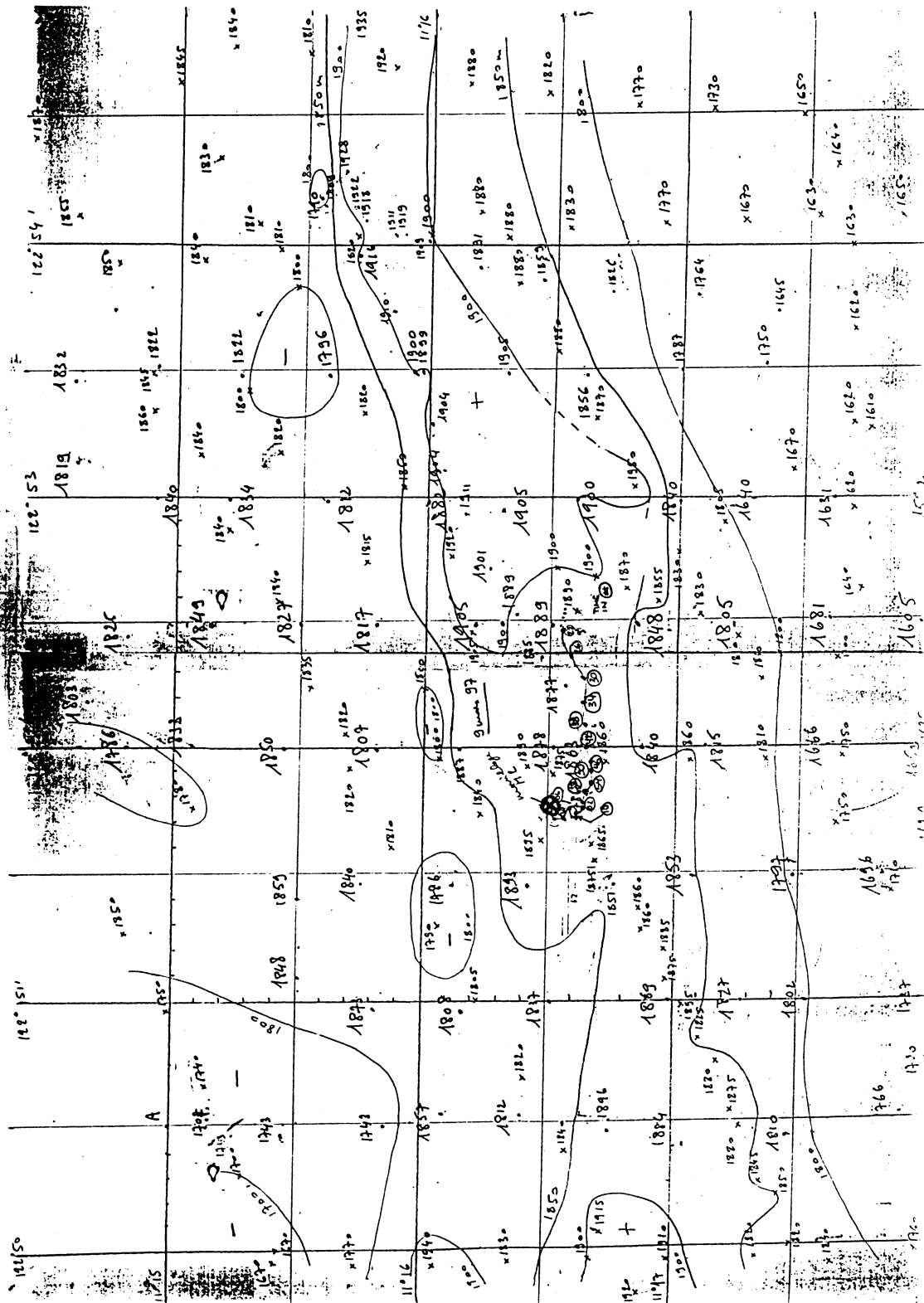


Figure 8



JADE 97 - Bathymetry of the Timor Passage
and mooring H2

Figure 9

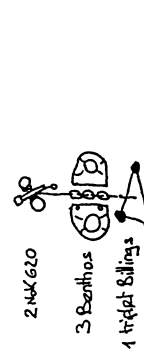
JADE 97

TIMOR

ADES 97

OMBAL

Balise Argos ORCA n° 21067



20m acier

1300 m

MC360-483

Début de mise à l'eau

Jour : Dimanche 9 mars 97
Heure T.U. : 1 ^h 27
Y : 11° 16' 58
G : 122° 52' 32
Depth : 1879 m

225m acier



20m acier

1550 m

MC360-481

SPLASH Y

Heure T.U. : 2 ^h 29
Y : 11° 16' 52
G : 122° 51' 72
Depth : 1885 m

225m acier



20m acier

1800 m

An. rent. - 11863

RT121.ni : 208

Disparition de la 121

Heure T.U. : 2 ^h 34
Y : 11° 16' 47
G : 122° 51' 79
Depth : 1898 m

40m Squareling

5m chaîne

1890 m

Leat : ≈ 400 kg

Balise Argos 11429

20m acier o.f

Début de mise à l'eau
Jour : 6 mars 1997
Heure T.U. : 00 ^h 00
Y : 8° 30.59 S
G : 125° 08.73 E
Depth : 3288 m

MC360-784

47m acier F.F

6m acier MM

47m acier F.F

44m acier F.F

12m acier MM

44m acier F.F

MC360-788

450m acier F.F

SPLASH Y
Heure T.U. : 0310
Y : 8° 28.48 S
G : 125° 09.51 E
Depth : 3297 m

425m acier F.F

5m chaîne ø 12

20m acier F.F

MC360-477

20m acier F.F

1m tige

20m acier F.F

AR 651cc 45

64m (60+4 allong) Squareling ø 16

1940m Parafil ø 11

5m chaîne ø 12

Disparition de la 121

Heure T.U. : 04 01
Y : 8° 27.952 S
G : 125° 10.386 E
Depth : 3301 m