

Departamento de Geologia Marinha  
Relatório Técnico – Projecto INGMAR  
INGMARDEP 09/FCT/2002 – 20/06/2002

**Report of the cruise PALEO 1 (PO287) on FS POSEIDON  
(April 22 – May 3, 2002)**



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O Responsável pelo Projecto

Aprovado para distribuição

Data ..../..../....

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O Director do Departamento  
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Ministério da Economia

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Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA E DA TECNOLOGIA



Instituto Geológico e Mineiro  
Ministério da Economia



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## *Cruise objectives*

During the scientific cruise Pos 287, titled PALEO I, the Departamento de Geologia Marinha (DGM) of the Instituto Geológico e Mineiro (IGM) collected sediment samples along the western Portuguese shelf and continental margin with the German research vessel "FS Poseidon". The cruise was supported by the INGMAR project "Paleoceanography and Environment", funded by the Fundação para a Ciência e a Tecnologia, and took place between April 22 and May 3, 2002.

The environmental part of the cruise focuses on the shelf areas of the Ave-Douro, the Lis, the Tejo, and the Mira river mouths. The study intends to reconstruct the concentrations of heavy metals and organic pollutants in the shelf sediments and to, thereby, differentiate between their natural (geogenic) and anthropogenic input during the last 200 years. In the Mira area, a few cores will also be used to study authigenic minerals like glauconite. The paleoceanographic part encompasses coring in the Tejo estuary and fan and along four transects across the continental margin between 39 and 41.5°N. The core transects will be used to monitor temporal and spatial variations in the upwelling-related productivity off Portugal and to reconstruct changes in the surface and deep waters, especially the Mediterranean Outflow (MOW), during the last glacial –interglacial cycle (i.e. the last 110 000 years).

### **Environment**

The major aim of the environmental studies is to differentiate between geogenic and anthropogenic inputs of heavy metal and organic pollutants (like PCB) to the sediments of the Portuguese shelf with a special focus on the changes during the last 200 years, i.e. since the onset of the industrial revolution. As their distribution is controlled by various factors including the geology of the river's hinterland and the sediment components carrying them, areas with different controlling factors need to be sampled and a data base for the "natural" variability of the metals and pollutants, equal to a geochemical background, needs to be established. The four shelf areas off the Ave and Douro rivers, the Lis, Tejo, and Mira river, respectively, were chosen based on their morphology, the differences in the river's catchment geology, the various types of industry and agriculture, and the population size along the river. The morphology plays an important role in the type and amount of sediment caught on the shelf, whereas the rocks cropping out in the river's hinterland greatly influence the types of heavy metals to be found. The geochemical background will be based on the metals' spatial and temporal distribution during the late Holocene, approximately the last 6000 years, i.e. way before major anthropogenic influences. This will be accomplished by studying numerous box core sequences and one gravity core in each area. Another research aspect intends to identify and characterise the types of sediment components that carry the heavy metals and organic pollutants to the shelves and fix them to the sediment thereby controlling their distribution on the shelves and their mobility in the water.

The Mira area is also known as a major accumulation area of authigenic minerals, especially glauconite, on the Portuguese margin. Several box cores were taken on the upper slope, which will allow to study the evolutionary stages of these minerals and to evaluate, if they are formed locally or just accumulated.

### **Paleoceanography**

The paleoceanographic studies mainly focus on four transects of 6-12 m long gravity cores (with accompanying box and multi-cores), which were retrieved across the continental margin

between 39 and 41.5 °N and cover water depths of 400 to 3000 m. They will supplement already existing transects in the south (ENAM cruise) and cores retrieved during the two IMAGES along the Portuguese margin in 1995 and 2001. The new sites will be used for multi proxy studies of the temporal and spatial variability in the upwelling related productivity off Portugal during the last 110 000 years and changes in the hydrography, with a special focus on the surface water currents and the variations in the strength and volume of the Mediterranean Outflow (MOW). On the base of the last aspect the coring sites were positioned above the current depth interval of the MOW, within (1-2 cores) and below it. The surface sediments of the paleoceanographic transect and environmental study areas will furthermore increase the database for the assemblage distributions of diatoms, planktonic and benthic foraminifera. The diatom and planktonic foraminifera assemblage data build the modern analog database for the global and local transfer functions used to calculate paleo-surface water temperatures and – productivities.

### **Holsmeer project**

The coring sites in the Tejo river and in the Tejo fan will be used to reconstruct variations of the Tejo's discharge volume in relation to climatic changes in the Portuguese hinterland. The cores will complement the cores studied by DGM students within the European funded HOLSMEER project, which focuses on the climate of the last 2000 years.

### ***Personal***

#### *Participants from DGM-IGM:*

José H. Monteiro (chief scientist)  
Antonio Ferreira (co-chief scientist environment)  
Antje Voelker (co-chief scientist paleoceanography)  
Pedro Freitas  
Vitor Magalhaes  
Mario Mil-Homens  
Susana Muinos  
Silvia Nave  
Emilia Salgueiro  
Sandra Vaqueiro

#### *Other participants:*

Teresa Drago (IPIMAR, Lisboa, Portugal)  
Klaus Ricklefs (Forschungs- und Technologiezentrum Westküste, Büsum, Germany)  
Gerd Schriever (OKTOPUS GmbH, Hohenwestedt, Germany) (only 22<sup>nd</sup> – 23<sup>rd</sup> April)  
Robert Wilson (Scripps Institution of Oceanography, San Diego, USA) (only 22<sup>nd</sup> – 23<sup>rd</sup> April)

### ***Equipment employed during the cruise***

3.5 kHz system for seismic surveys  
Box corer (50 x 50 cm)  
Multicorer  
6 or 12 m long gravity corer  
1 m Kastenlot corer (17 x 17 cm)

## *Chronology*

### **22-4-2002**

- 11:10H – Sailing from Cais Marítimo de Alcântara.
- 11:42H – Station PO287-001 on the Tagus Estuary to test the Box-corer, the multi corer and the kastenlot (8 operations).
- 15:15H – Transit to profile AP1 in the Esporão da Estremadura.
- 22:53H – Begin profile AP1.

### **23-4-2002**

- 02:20H – End profile AP1
- 02:20H – Transit to AP1a, Esporão da Estremadura
- 04:49H – Begin profile AP1a
- 09:50H – End profile AP1a
- 09:56H – Begin Station (P13) PO287-002-1
- 10:50H – End Station PO287-002
- 12:35H – Begin Station (P14) PO287-003-1 to 4
- 18:45H – End Station PO287-003
- 18:45H – Transit to Cascais to exchange personal

### **24-4-2002**

- 03:00H – Cascais
- 03:30H – Transit to 3.55kHz profile AP2 Ave -Douro
- 19:22H – Begin profile AP2

### **25-4-2002**

- 07:28H – End profile AP2
- 08:02H – Begin Station (E1) PO287-004
- 08:35H – End Station PO287-004
- 09:10H – Begin Station (E2) PO287-005
- 09:55H – End Station PO287-005
- 10:22H – Begin Station (E3) PO287-006
- 11:50H – End Station PO287-006
- 12:15H – Begin Station (E4) PO287-007
- 13:22H – End Station PO287-007
- 14:00H – Begin Station (E5) PO287-008
- 14:45H – End Station PO287-008
- 15:04H – Begin Station (E6) PO287-009
- 16:20H – End Station PO287-009
- 16:47H – Begin Station (E7) PO287-010
- 17:10H – End Station PO287-010
- 17:35H – Begin Station (E8) PO287-011
- 19:00H – End Station PO287-011
- 19:05H – transit to profile AP4
- 22:15H –Begin profile AP4

**26-4-2002**

00:15H– Abandon profile AP4  
02:39H – Begin profile AP3  
04:22H – Abandon Profile AP3  
04:28H – Transit to Station E9  
06:09H – Begin Station (E9) PO287-012  
06:40H – End Station PO287-012  
07:21H – Begin Station (E10) PO287-013-1 and 2  
08:22H – End Station (E10) PO287-013  
09:50H – Begin profile AP3  
11:57H – Abandon Profile AP3  
12:00H – Transit to Liz area  
18:53H – Begin profile AP6

**27-4-2002**

08:37H – End profile AP6  
09:08H – Begin Station (E11) PO287-014  
09:35H – End Station PO287-014  
09:51H – Begin Station (E12) PO287-015  
10:24H – End Station PO287-015  
10:38H – Begin Station (E13) PO287-016  
12:45H – End Station PO287-016  
13:06H – Begin Station (E14) PO287-017  
13:50H – End Station PO287-017  
14:42H – Begin Station (E15) PO287-018  
16:47H – End Station PO287-018  
17:16H – Begin Station (E16) PO287-019  
18:04H – End Station PO287-019  
18:24H – Begin profile AP5  
23:15H – Abandon profile AP5

**28-4-2002**

05:00H – Begin profile AP6a  
07:32H – End profile AP6a  
07:41H – Begin Station (E17) PO287-020  
08:44H – End Station PO287-019  
09:31H – Begin Station (E18) PO287-021  
09:56H – End Station PO287-021  
10:26H – Begin Station (E19) PO287-022  
10:53H – End Station PO287-022  
12:29H – Begin Station (P9) PO287-023  
14:45H – End Station PO287-023  
15:32H – Begin Station (P10) PO287-024  
16:31H – End Station PO287-024  
17:16H – Begin Station (P11) PO287-025  
19:43H – End Station PO287-025



19:45H – Transit to SP Profile AP7

**29-4-2002**

06:07H – Begin profile AP7 offshore Cascais

08:57H – End Profile AP7

09:06H – Begin Station (H3) PO287-026

10:32H – End Station PO287-026

11:19H – Begin Station (H2) PO287-027

11:53H – End Station PO287-027

12:14H – Begin Station (H1) PO287-028

14:10H – End Station PO287-028

14:11H – Transit to Profile AP8 offshore Vila Nova de Mil Fontes

19:36H – Start Profile AP8

**30-4-2002**

03:36H – End Profile AP8

03:36H – Start Profile AP8a

06:12H – End Profile AP8a

07:00H – Begin Station (E20) PO287-029

08:04H – End Station PO287-029

08:23H – Begin Station (E21) PO287-030

08:45H – End Station PO287-030

09:07H – Begin Station (E22) PO287-031

09:37H – End Station PO287-031

09:59H – Begin Station (E23) PO287-032

10:26H – End Station PO287-032

10:39H – Begin Station (E24) PO287-033

10:50H – End Station PO287-033

11:52H – Begin Station (E25) PO287-034

12:54H – End Station PO287-034

13:32H – Begin Station (E26) PO287-035

13:55H – End Station PO287-035

14:33H – Begin Station (E27) PO287-036

15:02H – End Station PO287-036

15:36H – Begin Station (E28) PO287-037

16:03H – End Station PO287-037

16:26H – Begin Station (E29) PO287-038

16:56H – End Station PO287-038

17:20H – Begin Station (E30) PO287-039

17:41H – End Station PO287-039

18:45H – Begin Profile AP9

**1-5-2002**

05:50H – End Profile AP9

06:02H – Begin Station (A4) PO287-040

06:50H – End Station PO287-040

07:23H – Begin Station (A3) PO287-041

08:14H – End Station PO287-041  
 08:50H – Begin Station (A2) PO287-042  
 09:27H – End Station PO287-042  
 10:37H – Begin Station (A1) PO287-043  
 11:00H – End Station PO287-043  
 11:40H – Begin profile AP10 for survey of a rock outcrop offshore Sines.  
 13:09H – End profile AP10  
 13:10H – Transit to Esporão da Estremadura

**2-5-2002**

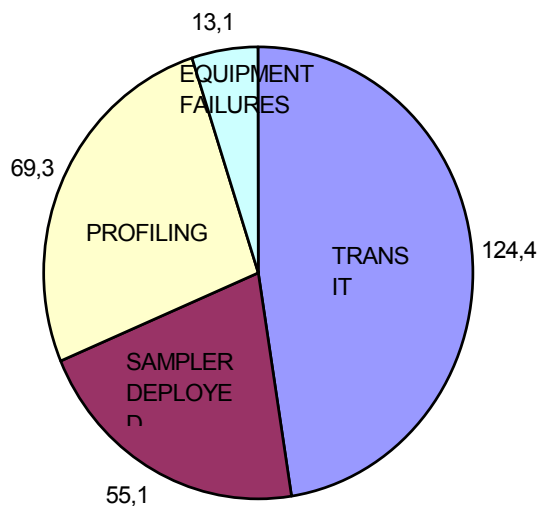
02:05H – Begin profile AP11 no Esporão da Estremadura  
 07:34H – End profile AP11  
 08:17H – Begin Station (PA) PO287-044  
 14:12H – End Station PO287-044  
 15:48H – Begin Station (PB) PO287-045  
 17:23H – End Station PO287-045  
 17:30H – Transit to Lisbon

**3-5-2002**

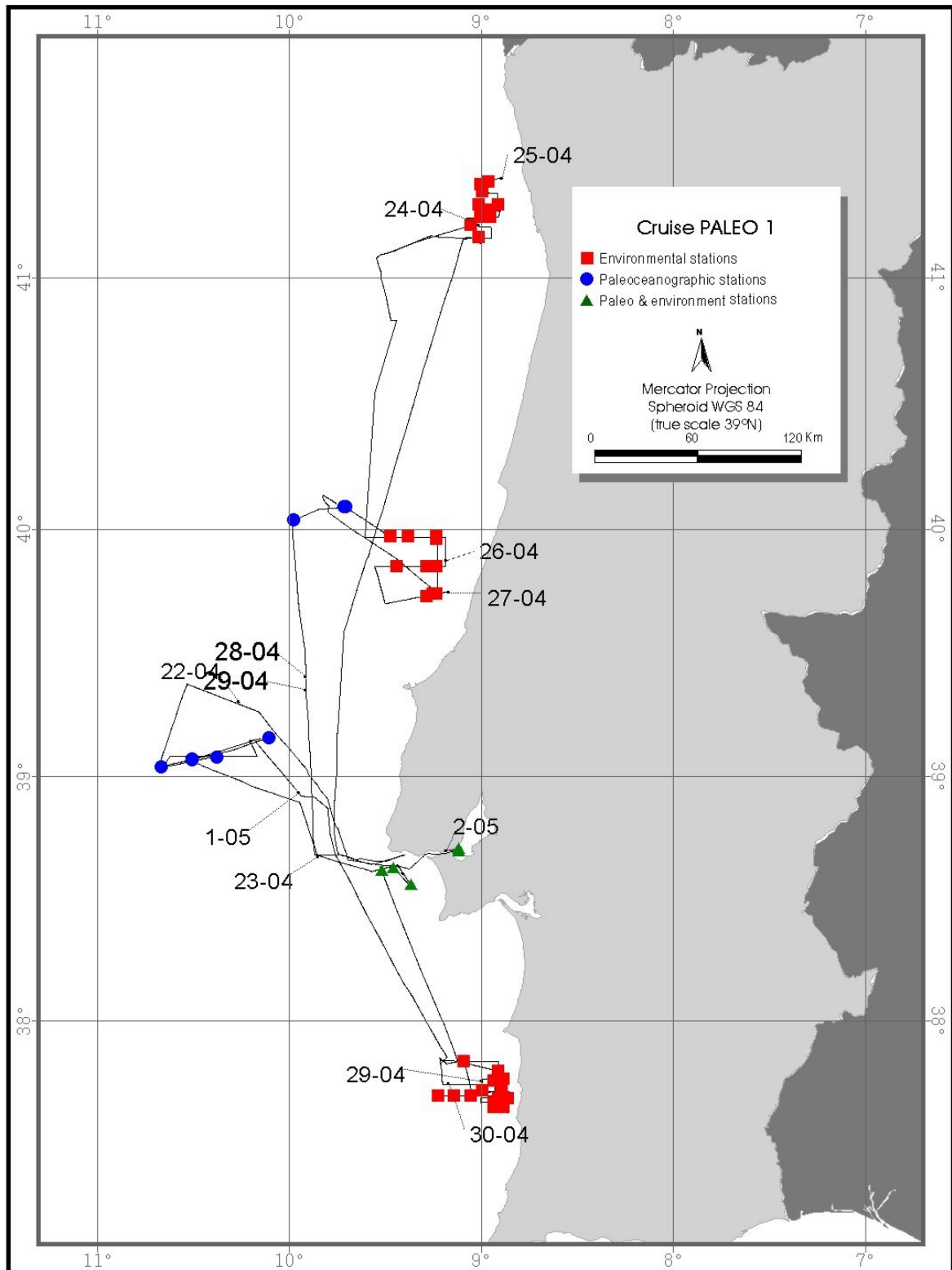
08:00H – Arrival to the dock, End of Cruise.

*Time occupation*

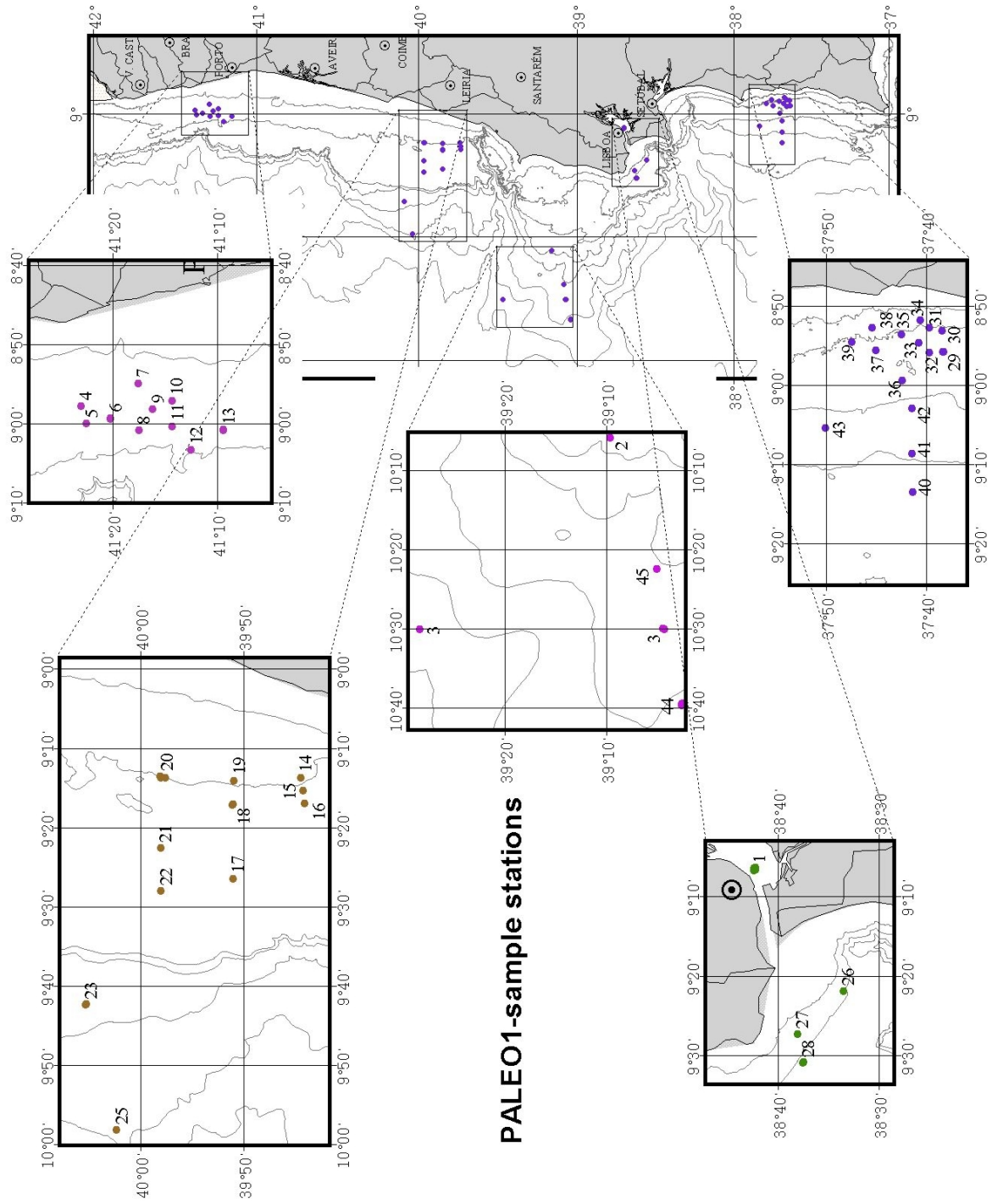
**PO287 TIME (HOURS) OCCUPATION**



## Map of transect and operations



# Details of sampling areas



Annex 1 – Sample and sub-sample lists  
(Emília Salgueiro)

# Sample list

cruise	cruise	station	operation	instrument	date	begin	end	time used	bottom	depth	latitude		longitude		objective
											degrees	minutes	degrees	minutes	
PALEO1	PO287	1	1	B	22-Abr-02	11:51	12:06	0:15	?	13	38	42,30	9	6,4	test-Paleo
PALEO1	PO287	1	2	M	22-Abr-02	12:18	12:25	0:07	?	12	38	42,20	9	6,3	test-Paleo
PALEO1	PO287	1	3	G3-NR	22-Abr-02	13:35	13:38	0:03	?	14	38	42,20	9	6,6	test-Paleo
PALEO1	PO287	1	4	K-NR	22-Abr-02	14:31	14:34	0:03	?	13	38	42,20	9	6,6	test-Paleo
PALEO1	PO287	1	5	K-NR	22-Abr-02	14:42	14:45	0:03	?	13	38	42,20	9	6,6	test-Paleo
PALEO1	PO287	1	6	K-NR	22-Abr-02	14:46	14:47	0:01	?	13	38	42,20	9	6,6	test-Paleo
PALEO1	PO287	1	7	K-NR	22-Abr-02	14:48	14:50	0:02	?	13	38	42,20	9	6,6	test-Paleo
PALEO1	PO287	1	8	M	22-Abr-02	14:52	14:58	0:06	?	58	38	42,30	9	6,63	test-Paleo
PALEO1	PO287	2	1	B	23-Abr-02	9:56	10:10	0:14	?	225	39	9,63	10	5,856	test-Paleo
PALEO1	PO287	3	1	B	23-Abr-02	12:41	13:56	1:15	13:15	1505	39	4,43	10	29,96	test-Paleo
PALEO1	PO287	3	2	M-NR	23-Abr-02	14:38	14:59	0:21	-	1502	39	4,30	10	30	test-Paleo
PALEO1	PO287	3	3	M	23-Abr-02	15:00	16:27	1:27	15:40	1502	39	4,30	10	30	test-Paleo
PALEO1	PO287	3	4	G	23-Abr-02	17:16	18:26	1:10	17:45	1506	39	4,29	10	30	test-Paleo
PALEO1	PO287	4	1	B	25-Abr-02	8:15	8:26	0:11	8:19	78	41	23,00	8	57,7	Environment
PALEO1	PO287	5	1	B	25-Abr-02	9:13	9:22	0:09	9:16	87	41	22,44	8	59,91	Environment
PALEO1	PO287	6	1	B	25-Abr-02	10:23	10:36	0:13	10:26	84	41	20,14	8	59,27	Environment
PALEO1	PO287	6	2	G	25-Abr-02	11:30	11:36	0:06	11:34	84	41	20,14	8	59,33	Environment
PALEO1	PO287	7	1	B	25-Abr-02	12:28	12:40	0:12	12:30	68	41	17,53	8	54,86	Environment
PALEO1	PO287	8	1	B	25-Abr-02	14:00	14:06	0:06	14:02	88	41	17,46	9	0,77	Environment
PALEO1	PO287	9	1	B	25-Abr-02	15:06	15:15	0:09	15:09	77	41	16,10	8	58,09	Environment
PALEO1	PO287	10	1	B	25-Abr-02	16:49	16:56	0:07	16:51	66	41	14,30	8	57,04	Environment
PALEO1	PO287	11	1	G	25-Abr-02	17:54	18:00	0:06	17:56	80	41	14,29	8	57,06	Environment
PALEO1	PO287	11	2	B	25-Abr-02	18:35	18:49	0:14	18:42	80	41	14,28	9	0,28	Environment
PALEO1	PO287	12	1	B	26-Abr-02	6:21	6:30	0:09	6:24	97	41	12,47	9	3,29	Environment
PALEO1	PO287	13	1	B	26-Abr-02	7:23	7:30	0:07	7:25	81	41	9,37	9	0,75	Environment
PALEO1	PO287	13	2	G	26-Abr-02	8:10	8:16	0:06	8:12	81	41	9,39	9	0,72	Environment
PALEO1	PO287	14	1	B	26-Abr-02	9:10	9:18	0:08	9:13	98	39	44,40	9	13,62	Environment
PALEO1	PO287	15	1	B	27-Abr-02	9:54	10:02	0:08	9:56	111	39	44,17	9	15,22	Environment
PALEO1	PO287	16	1	B	27-Abr-02	10:40	10:49	0:09	10:43	120	39	43,98	9	16,87	Environment
PALEO1	PO287	17	1	B	27-Abr-02	13:13	13:24	0:11	13:17	134	39	50,99	9	26,38	Environment

continuation

cruise	cruise	station	operation	instrument	date	begin	end	time used	bottom	depth	latitude		longitude		objective
											minutes	degrees	minutes	degrees	
PALEO1	PO287	18	2	G	27-Abr-02	15:41	15:50	0:09	15:43	124	39	51,02	9	17,08	Environment
PALEO1	PO287	18	3	G	27-Abr-02	16:36	16:45	0:09	16:38	124	39	50,98	9	16,99	Environment
PALEO1	PO287	19	1	B	27-Abr-02	17:39	17:48	0:09	17:43	101	39	50,88	9	13,99	Environment
PALEO1	PO287	20	1	B-NR	28-Abr-02	7:42	7:50	0:08	7:45	100	39	57,97	9	13,62	Environment
PALEO1	PO287	20	2	B-NR	28-Abr-02	7:53	8:01	0:08	7:55	100	39	57,55	9	13,63	Environment
PALEO1	PO287	20	3	B-NR	28-Abr-02	8:22	8:31	0:09	8:25	100	39	58,07	9	13,5	Environment
PALEO1	PO287	21	1	B	28-Abr-02	9:33	9:43	0:10	9:36	128	39	58,02	9	22,52	Environment
PALEO1	PO287	22	1	B	28-Abr-02	10:28	10:37	0:09	10:31	138	39	57,97	9	27,96	Environment
PALEO1	PO287	23	1	B-NR	28-Abr-02	12:33	13:10	0:37	12:48	640	40	5,30	9	42,31	Paleo
PALEO1	PO287	23	2	B-NR	28-Abr-02	13:17	13:49	0:32	13:32	640	40	5,27	9	42,22	Paleo
PALEO1	PO287	23	3	B-NR	28-Abr-02	14:04	14:33	0:29	14:17	640	40	5,27	9	42,22	Paleo
PALEO1	PO287	24	1	B-NR	28-Abr-02	15:33	16:24	0:51	15:54	1194	40	?	9	?	Paleo
PALEO1	PO287	25	1	B-NR	28-Abr-02	17:18	18:42	1:24	17:49	1690	40	2,29	9	58,08	Paleo
PALEO1	PO287	26	1	B	29-Abr-02	9:08	9:14	0:06	9:10	96	38	33,49	9	21,84	Environment
PALEO1	PO287	26	2	M	29-Abr-02	9:27	9:41	0:14	9:35	97	38	33,47	9	21,89	Environment
PALEO1	PO287	26	3	G	29-Abr-02	10:08	10:17	0:09	10:11	97	38	33,46	9	21,87	Environment
PALEO1	PO287	27	1	B	29-Abr-02	11:28	11:36	0:08	11:31	85	38	38,04	9	27,25	Environment
PALEO1	PO287	28	1	B	29-Abr-02	12:15	12:25	0:10	12:19	105	38	37,46	9	30,87	Environment
PALEO1	PO287	28	2	M	29-Abr-02	12:37	12:52	0:15	12:46	106	38	37,45	9	30,87	Environment
PALEO1	PO287	28	3	G	29-Abr-02	13:53	14:01	0:08	13:56	107	38	37,38	9	30,86	Environment
PALEO1	PO287	29	1	B-NR	30-Abr-02	7:00	7:14	0:14	7:08	134	37	38,22	8	55,71	Environment
PALEO1	PO287	29	2	B	30-Abr-02	7:29	7:37	0:08	7:33	134	37	38,33	8	55,66	Environment
PALEO1	PO287	30	1	B	30-Abr-02	8:30	8:38	0:08	8:33	108	37	38,34	8	52,99	Environment
PALEO1	PO287	31	1	B	30-Abr-02	9:09	9:16	0:07	9:11	104	37	39,66	8	52,68	Environment
PALEO1	PO287	32	1	B	30-Abr-02	10:02	10:12	0:10	10:05	134	37	39,69	8	55,83	Environment
PALEO1	PO287	33	1	B	30-Abr-02	10:39	10:50	0:11	10:43	119	37	40,68	8	54,55	Environment
PALEO1	PO287	34	1	B	30-Abr-02	11:53	12:01	0:08	11:56	90	37	40,55	8	51,66	Environment
PALEO1	PO287	34	2	G	30-Abr-02	12:43	12:50	0:07	12:45	90	37	40,55	8	51,65	Environment
PALEO1	PO287	35	1	B	30-Abr-02	13:33	13:40	0:07	13:35	106	37	42,43	8	53,53	Environment
PALEO1	PO287	36	1	B	30-Abr-02	14:35	14:45	0:10	14:39	145	37	42,39	8	59,28	Environment
PALEO1	PO287	37	1	B	30-Abr-02	15:38	15:48	0:10	15:41	128	37	45,02	8	55,52	Environment

continuation

cruise	cruise	station	operation	instrument	date	begin	end	time used	bottom	depth	latitude		longitude		objective
											minutes	degrees	minutes	degrees	
PALEO1	PO287	38	1	B	30-Abr-02	16:28	16:36	0:08	16:30	92	37	45,36	8	52,68	Environment
PALEO1	PO287	39	1	B	30-Abr-02	17:21	17:29	0:08	17:23	116	37	47,44	8	54,45	Environment
PALEO1	PO287	40	1	B	1-Mai-02	6:06	6:35	0:29	6:16	493	37	41,35	9	13,45	Environment
PALEO1	PO287	41	1	B	1-Mai-02	7:25	7:45	0:20	7:31	380	37	41,43	9	8,59	Environment
PALEO1	PO287	42	1	B	1-Mai-02	8:52	9:07	0:15	8:57	240	37	41,37	9	2,82	Environment
PALEO1	PO287	43	1	B	1-Mai-02	10:39	10:56	0:17	10:45	292	37	50,04	9	5,32	Environment
PALEO1	PO287	44	1	B	2-Mai-02	8:21	9:50	1:29	8:53	1866	39	2,55	10	39,64	Paleo
PALEO1	PO287	44	2	M	2-Mai-02	10:06	12:15	2:09	11:12	1861	39	2,55	10	39,45	Paleo
PALEO1	PO287	44	3	G	2-Mai-02	12:30	14:08	1:38	13:06	1862	39	2,43	10	39,37	Paleo
PALEO1	PO287	45	1	B	2-Mai-02	15:50	16:53	1:03	16:17	1216	39	5,00	10	22,45	Paleo

B – box corer  
M – multi corer  
G – gravity corer  
K - kastenlot  
NR – no recovery



# Sub-sample list

cruise	cruise	station	operation	instrument	Core Length (cm)	Gravity Core		Surface Samples									Liners						U-Channel	Other Sampling			
						Sections	Water BF	BF-Schonfeld	PF	Org	Diat	Arch	Carb / Geoch	Alk	GS	BF	PF	Org	Diat	Arch	Corg	GS			Alk	A	Scales Fish
PALEO1	PO287	1	1	B	33,0		X		X	X	X	X		X	X	X	X	X	X	X							
PALEO1	PO287	1	2	M	3 to 24										X						1/2	X	1/2				1 liner for testing of coulter
PALEO1	PO287	1	3	G3-NR	241,0	3																					
PALEO1	PO287	1	4	K-NR	0,0																						
PALEO1	PO287	1	5	K-NR	0,0																						
PALEO1	PO287	1	6	K-NR	0,0																						
PALEO1	PO287	1	7	K-NR	0,0																						
PALEO1	PO287	1	8	M	0,0									X	X		X	X	X								
PALEO1	PO287	2	1	B	2,0																						Rocks for petrological studies
PALEO1	PO287	3	1	B	34,5		X		X	X	X	X	X	X	X	X	X	X	X	X				X	X		1 bag of surface material as display sample
PALEO1	PO287	3	2	M-NR	0,0																						
PALEO1	PO287	3	3	M	~15		X								X												
PALEO1	PO287	3	4	G	36,0	1																					
PALEO1	PO287	4	1	B	20,4		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		1 bag of surface for Mario Mil-Homens
PALEO1	PO287	5	1	B	48,5		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		
PALEO1	PO287	6	1	B	24,5		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		
PALEO1	PO287	6	2	G	575,5	6																					
PALEO1	PO287	7	1	B	~20																						1 liner for Teresa Drago; Bags for Teresa and Mario Mil-Homens Shells for possible C14 dating
PALEO1	PO287	8	1	B	46,3		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		
PALEO1	PO287	9	1	B	38,5		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		
PALEO1	PO287	10	1	B	21,8		X	X	X	X	X	X	X	X	1/2	1/2					X	X	X				
PALEO1	PO287	11	1	G	0,0	0																					
PALEO1	PO287	11	2	B	27,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		X
PALEO1	PO287	12	1	B	40,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		X
PALEO1	PO287	13	1	B	28,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		X
PALEO1	PO287	13	2	G	376,5	4																					
PALEO1	PO287	14	1	B	35,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		X
PALEO1	PO287	15	1	B	54,5		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		X
PALEO1	PO287	16	1	B	52,6		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		
PALEO1	PO287	17	1	B	23,0		X		X	X	X	X	X	X	1/2	1/2	X				X	X	X				

continuation

cruise	cruise	station	operation	instrument	Core Length (cm)	Gravity Core		Surface Samples										Liners					U- Channel	Other Sampling			
						Sections	Water BF	BF- Schonfeld	PF	Org	Diat	Arch	Carb/ Geoch	Alk	GS	BF	PF	Org	Diat	Arch	Corg	GS			Alk	A	Scales Fish
PALEO1	PO287	18	1	B	55,5		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
PALEO1	PO287	18	2	G	0,0	0																					
PALEO1	PO287	18	3	G	85,0	1																					
PALEO1	PO287	19	1	B	48,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	20	1	B-NR	0,0																						
PALEO1	PO287	20	2	B-NR	10,0																						1 bag of surface sample
PALEO1	PO287	20	3	B-NR	10,0																						1 bag of surface sample
PALEO1	PO287	21	1	B	31,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	22	1	B	20,0			X	X	X	X	X	X	X	1/2	1/2	X		X	X	X						
PALEO1	PO287	23	1	B-NR	0,0																						
PALEO1	PO287	23	2	B-NR	0,0																						
PALEO1	PO287	23	3	B-NR	0,0																						
PALEO1	PO287	24	1	B-NR	0,0																						
PALEO1	PO287	25	1	B-NR	0,0																						
PALEO1	PO287	26	1	B	56,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	26	2	M	~19		X								X	X		X	X		X						
PALEO1	PO287	26	3	G	327,0	4																					
PALEO1	PO287	27	1	B	58,0			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	28	1	B	50 to 54		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	28	2	M	27.5 to 32.5										1/2	1/2		1/2	X		1/2						
PALEO1	PO287	28	3	G	626,0	9																					
PALEO1	PO287	29	1	B-NR	0,0																						
PALEO1	PO287	29	2	B	12,5		X					X	X	X				X	X	X							
PALEO1	PO287	30	1	B	33,5		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	31	1	B	34,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	32	1	B	30,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	33	1	B	~31		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	34	1	B	29,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PALEO1	PO287	34	2	G	24,0	1																					
PALEO1	PO287	35	1	B	20,0			X		X	X	X	X	X				X	X	X							1 bag with rocks
PALEO1	PO287	36	1	B	20,0			X				X	X	X				X	X	X							
PALEO1	PO287	37	1	B	30,0		X	X	X	X	X	X	X	X	1/2	1/2	X		X	X	1/2		1/2				

continuation

cruise	cruise	station	operation	instrument	Core Length (cm)	Gravity Core		Surface Samples										Liners					U- Channel	Other Sampling			
						Sections	Water BF	BF- Schonfeld	PF	Org	Diat	Arch	Carb / Geoch	Alk	GS	BF	PF	Org	Diat	Arch	Corg	GS			Alk	A	Scales Fish
PALEO1	PO287	38	1	B	15,0							X						X	X	X							
PALEO1	PO287	39	1	B	39,0		X	X	X	X	X	X		X	X	X	X	X	X	X	X		X			X	
PALEO1	PO287	40	1	B	38,5		X	X	X	X	X	X		X	X	X	X	1/2	X	1/2	X		X	X		X	
PALEO1	PO287	41	1	B	25,0		X	X	X	X	X	X		X	1/2	1/2			X	X	X		X			X	
PALEO1	PO287	42	1	B	20,0													X				X	X				
PALEO1	PO287	43	1	B	28,0		X			X		X			1/2	1/2	X	X	X	1/2	1/2	X	X		X	X	X
PALEO1	PO287	44	1	B	34,5		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
PALEO1	PO287	44	2	M	20,0										1/2	1/2			X	1/2	1/2						
PALEO1	PO287	44	3	G	548,5	6																					
PALEO1	PO287	45	1	B	40,0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X

B – box corer  
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K - kastenlot  
NR – no recovery