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RRS Charles Darwin cruise 14/86, 2-17 July 1986

E. IONIAN SEA

Outline scientific programme

2 July, 2230 hrs	:	dep Patras.
3 July (am) - 6 July (am)	:	Current meter rig deployment during day time with short overnight periods of single channel profiling (CSP lines 1,2,3).
6 July (am - late pm)	:	Steaming to start of multichannel seismic (MCS) survey lines.
6 July, 2200 hrs - 7 July, 0350 hrs	:	Hydrophone streamer/airgun array deployment.
7 July, 0400-1000 hrs	:	MCS system trials.
7 July, 1000 hrs - 11 July, 0400 hrs	:	Surveying of MSC lines 1,2,3 across continental margin.
11 July, 0400-1100 hrs	:	Recovery of hydrophone streamer/airgun array.
11 July, 1100 hrs - 14 July, 0300 hrs	:	Single channel profiling (CSP lines 4-8).
14 July, 0500 hrs - 16 July, 1700 hrs	:	Current meter rig recovery; core and grab sampling.
17 July, 0900 hrs	:	arr Patras.

Activity summary

Current meter rig deployments	:	8 stations, 29 meters
Core samples	:	4
Grab samples	:	8
MCS profiling	:	700 km
CSP profiling	:	850 km
Gravity profiling	:	1800 km
Magnetic profiling	:	700 km

General report

The cruise programme was disrupted even before the cruise began by delayed departure of the ship from the UK. Darwin was originally scheduled to leave Patras for the cruise area on Friday 27 June but did not in fact sail until late in the evening of Wednesday 2 July, thus shortening the duration of the cruise by 5½ days. In consequence, the single-channel profiling and bottom sampling (coring, grabbing) programmes had to be reduced significantly. Winch problems and equipment failures led to further significant reductions in the amount of scientific work achieved.

In spite of these difficulties the cruise was successful in some respects, several areas of work progressing smoothly and efficiently. The new ship demonstrated either actual or potential excellence as a platform for a wide range of oceanographic, sedimentological and geophysical activities.

The cruise was very successful organisationally, with a well run ship and with excellent cooperation between master, officers, crew and scientists. As always, the RVS technical staff were outstandingly helpful and kept the scientific programme going in spite of sometimes extreme difficulties with ship's gear and scientific equipment.

A. GEOPHYSICAL PROGRAMME (M. Brooks, Principal Scientist).
(Univ. Coll. Swansea)

Gravity surveying. A new temporary reference station was established on the quay at Patras and this was tied directly to the Greek National Datum, thus forming a common datum with earlier gravity measurements collected during Shackleton 1/82 and Discovery 137/1983 cruises.

A good network of gravity tracks was achieved in the area of the Apulian rise in the NE Ionian Sea and three long gravity profiles were obtained across the continental margin.

Single-channel seismic profiling. 40 in^3 and 160 in^3 air gun sources were used variously in conjunction with a Geomechanique 30 m hydrophone to collect single channel data along tracks on the Apulian rise and across the Cephalinia transform fault. A problem of hydrophone noise was encountered at towing speeds above 4.5 knots, even when the hydrophone was deployed to the full extent of the connecting cable and towed from the port-side crane, with its telescopic arm fully extended, 3-4 m away from the ship's wake. The quality of the recorded seismic sections was in general rather poor.

Multichannel seismic profiling. The Sercel SN 358 system was used to collect 48-channel (24 fold) multichannel data along three profile lines crossing the western continental margin of Greece.

The hydrophone streamer was deployed very efficiently and towed excellently throughout the survey period at a uniform depth of 10 m. An active section was damaged during streamer deployment and its replacement at the end of the survey period delayed streamer recovery by 2 hours. Air gun deployment was laborious and the four-gun array represented a barely adequate source. It had been understood by the PI that Bolt would advise prior to the cruise on an optimal gun array but in the event no technical information was available as to the source signature and no adequate means existed for source monitoring. Major development work is undoubtedly required on array design and far-field monitoring of source signature. Moreover, the present system is very cumbersome to deploy and gun failures led to lengthy delays.

Even more serious, however, were the problems encountered during operation of the Sercel tape decks. Both gave trouble sporadically but one major failure took 26 hours of continuous effort to repair. In light of this experience, I regard it as foolhardy to send the Sercel system to sea without a spare tape deck but well nigh criminal not to have, at the very least, replacement circuit boards to facilitate testing and repair of decks on location.

As the seismic field tapes have not yet been returned to the UK after post-cruise copying by the Public Petroleum Corporation of Greece, we do not yet know what the overall quality of our MCS data is. There will clearly be major data gaps associated with tape deck failures. In addition, the remarkable degree of 'user unfriendliness' of the system and the laborious necessity for tape changes and tape formatting every 20 minutes or so will inevitably have led to operator errors and further degradation of the survey dataset.

B. OCEANOGRAPHIC/SEDIMENTOLOGICAL PROGRAMME (M.B. Collins, Principal Scientist)
(Univ. Coll. Cardiff)

Current meter deployments. Current meters were deployed at the beginning and recovered towards the end of the cruise, so that the length of records could be as long as possible within the single cruise programme. In the event, the records ranged between 10 and 12 days but have already been shown to identify some interesting features of surface and near-bed flow in the region (see below). The meters were deployed in such a way that they followed the axis of the major valley/canyon system running south from the Otranto Straits, between southern Italy and Greece/Albania (Fig 1). On one of the rigs, current meters were placed at 1119 m and 1200 m above the seabed. On the others, attempts were made to deploy the meters in such a way as to examine the structure of the near-bed velocity profile. Hence, meters were placed logarithmically at around 3, 10, 30 and 100 m above the bed (Table 1).

The logistics of deployment and recovery of the arrays from Darwin were, in principle, not a problem. In practice, the rig with around a 1000 m of wire was manoeuvred with some difficulty on the after deck; this was due mainly to the need for utilising a small winch, in place of the larger one which held the multi-channel seismic profiling system. Under such circumstances, the procedure should be re-examined for the future.

Another limitation on the current metering programme was the restriction placed upon working at night. Although this was quite a reasonable decision, on the basis of health and safety at sea, the principal scientists were unaware of such a development within the cruise planning stage of the research programme. Clear indications of such restrictions should be made at an early stage in discussion between RVS and principal scientists.

Typical output from the current meters at Station CM1, together with corresponding barometric pressure, is shown on Figure 2; these represent only a preliminary interpretation of the data set.

Seabed sampling. The seabed was sampled by using either a piston corer or Day grab from the frame located amidships over the starboard side of the vessel. The programme was fitted around the other major aspects of the research cruise programme, namely the multichannel seismic work and the measurement of currents. In total, 4 piston cores and 8 grab samples were collected along the sediment transport system under investigation. The piston cores varied between 45 cm and 586 cm in length.

Very real problems were encountered on this sedimentological part of the cruise programme, due to:
(i) the absence of a deep-tow sub-bottom profiling/side-scan sonar system on board, which was requested originally, together with required constant manual adjustment whilst in use; and
(ii) the winch system used for coring - this was slow and continually requiring input and maintenance from the RVS technicians. (NB. The same system was used for testing acoustic releases prior to current meter deployments; it was found similarly unreliable for this exercise.

Supplementary data collection. XBTs and seabed photography; the latter from a camera system mounted on to the Day grab. Some basic geotechnical measurements were also carried out on board, using vane shear and penetrometer techniques on sub-samples of the core and grab samples.

In spite of the technical difficulties, some valuable scientific objectives were successfully achieved. In this respect, the scientific party wish to acknowledge the crucial role played by all the ship's company and, also, by the shore-based staff at Research Vessel Services, Barry. To all personnel who were involved with the planning, organisation or execution of Darwin cruise 14/86, we extend our sincere thanks.

M. Brooks
M.B. Collins
November 1986

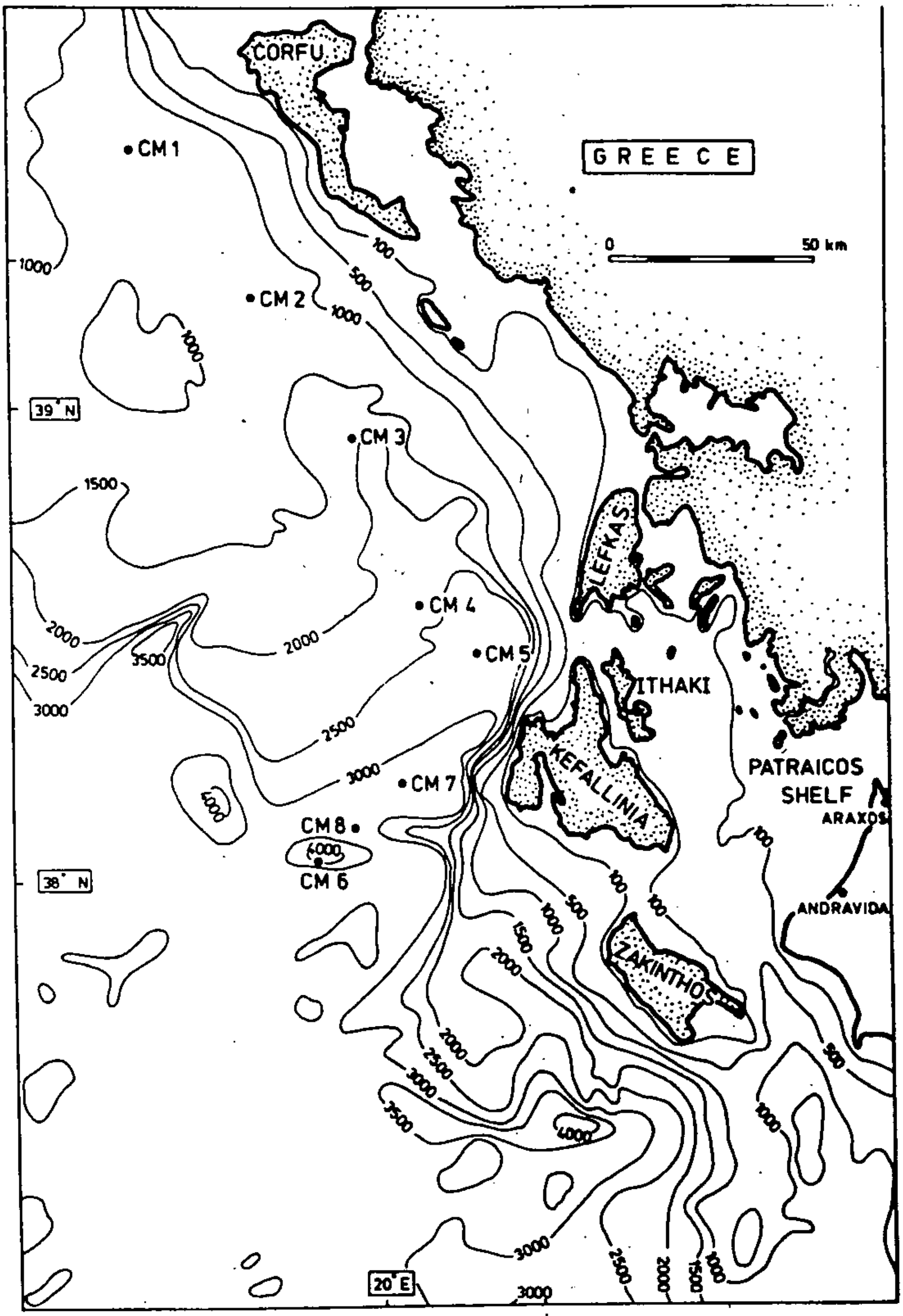
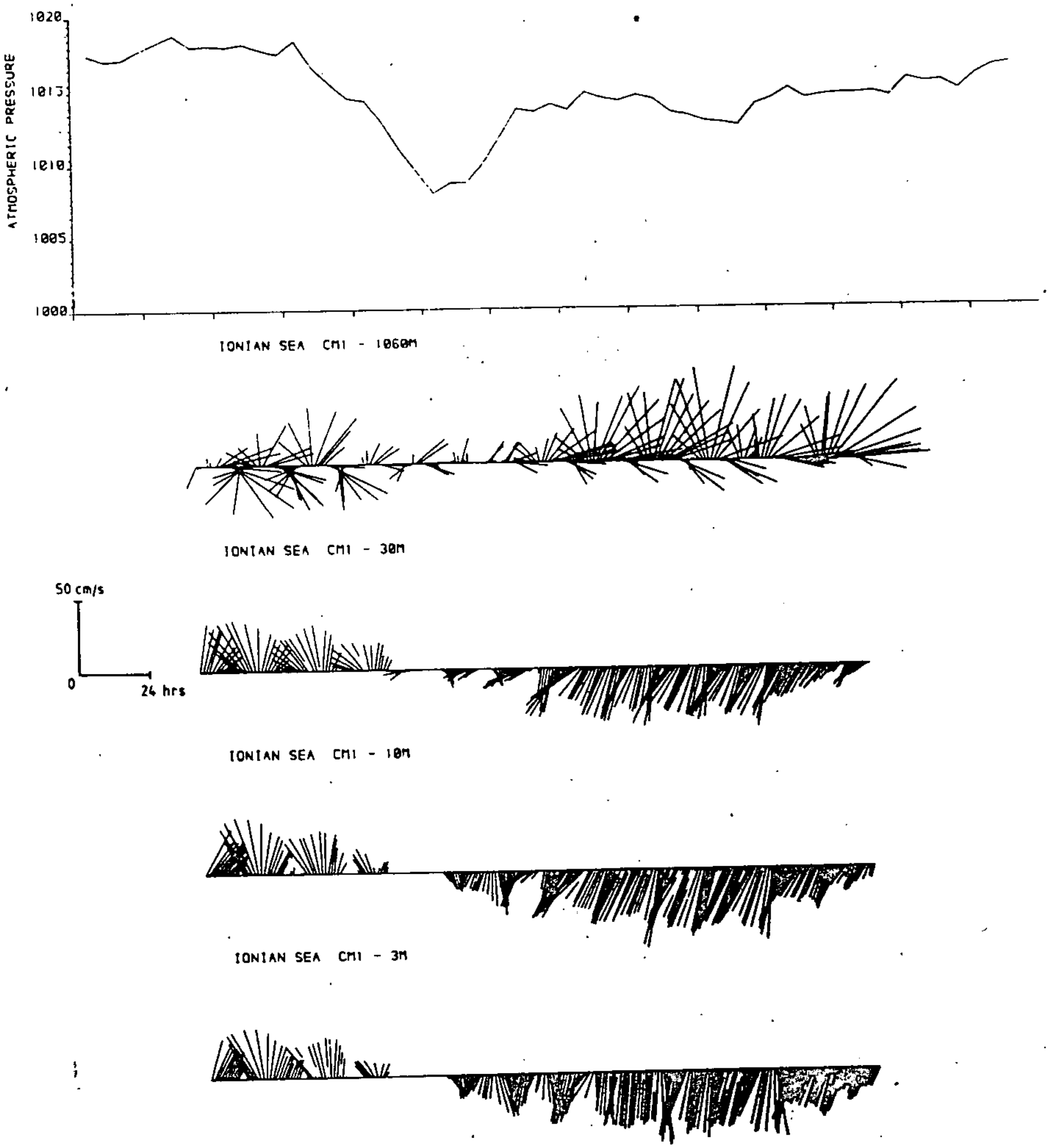


Figure 1. Location of self-recording current meter stations maintained during RRS Charles Darwin Cruise 14/86 (bathymetry in metres).

Figure 2. Preliminary analysis of records from CM1 (Darwin Cruise 14/86). Upper part of Figure shows variation in barometric pressure during the cruise period: lower parts show stick-plots of currents at 1060m (near-surface), 30m, 10m and 3m.



STATION NO.	POSITION LATITUDE	LONGITUDE	DEPTH (m)	z (m)	SERIAL NO.	R	SI	R/C	SENSORS	FIRST RECORD	LAST RECORD
IS/7-86/CM1	39° 30.2'N	19° 19.1'E	1170	1120	UCM22	-	20	32	T	0840 04/7/86	1520 14/7/86
				1119	7062	M	2	2	T,C,P	0822 04/7/86	1520 14/7/86
				100	5915	M	2	2	T,C,P	0822 04/7/86	1520 14/7/86
				30	5913	M	2	2	T,C	0822 04/7/86	1520 14/7/86
				10	5908	M	2	2	T,C	0822 04/7/86	1520 14/7/86
				4	5228	M	2	2	T,C	0822 04/7/86	1520 14/7/86
				3	6942	M	2	2	T,C	0822 04/7/86	1520 14/7/86
IS/7-86/CM2	39° 14.6'N	19° 38.2'E	1395	30	4817	M	2	2	T,C	1302 03/7/86	1020 14/7/86
				5.5	UCM24	-	20	32	T,C	1320 03/7/86	1020 14/7/86
				5	6456	M	2	2	T,C	1302 03/7/86	1020 14/7/86
IS/7-86/CM3	38° 55.2'N	19° 56.2'E	1860	100	5318	M	2	2	T,C	0520 05/7/86	0750 14/7/86
				30	8245	M	2	2	T,C	0520 05/7/86	0750 14/7/86
				10	8244	M	2	2	T,C	0520 05/7/86	0750 14/7/86
				4	8243	M	2	2	T,C	0520 05/7/86	0750 14/7/86
				3	8242	M	2	2	T,C	0520 05/7/86	0750 14/7/86
IS/7-86/CM4	38° 35.5'N	20° 07.7'E	2400	30	3257	N	2	2	T	0738 03/7/86	0616 15/7/86
				5	6749	N	2	2	T	0738 03/7/86	0616 15/7/86
IS/7-86/CM5	38° 28.7'N	20° 16.4'E	2945	100	8250	M	2	2	T	1102 05/7/86	0850 15/7/86
				30	8249	M	2	2	T	1102 05/7/86	0850 15/7/86
				10	8248	M	2	2	T	1102 05/7/86	0850 15/7/86
				4	8247	M	2	2	T	1102 05/7/86	0850 15/7/86
				3	8246	M	2	2	T	1102 05/7/86	0850 15/7/86
IS/7-86/CM6	38° 03.2'N	19° 50.7'E	3645	30	6751	N	2	2	T	1726 05/7/86	1726 15/7/86
				5	6750	N	2	2	T	1726 05/7/86	1726 15/7/86
IS/7-86/CM7	38° 13.0'N	20° 05.4'E	3120	5	6152	M	2	2	T	1726 05/7/86	1200 15/7/86
IS/7-86/CM8	38° 08.6'N	19° 56.3'E	3650	30	3258	M	2	2	T	1726 05/7/86	1410 15/7/86
				10	3261	N	2	2	T	1726 05/7/86	1410 15/7/86
				4	3926	N	2	2	T	1726 05/7/86	1410 15/7/86
				3	3259	N	2	2	T	1726 05/7/86	1410 15/7/86

KEY: z - height of meter above sea bed.
R - Aanderaa RCM4/5 rotor type: M - modified; N - normal.
SI - sampling interval (mins).
R/C - Revs/count for Aanderaa RCM's and no. of Bursts for UCM's.

TABLE 1. SUMMARY OF CURRENT METER DEPLOYMENTS - RRS CHARLES DARWIN CRUISE 14/86.

TABLE 2. RRS CHARLES DARWIN CRUISE 14/86, 2-17 July, 1986:

PISTON CORE AND GRAB STATIONS.

Sample Type	Reference	Location Latitude	Location Longitude	Depth (m)	Core Length	Comments
Piston Core	IS/86/1A	39°30.4'	19°18.7'	1180	93cm	Pilot Only
Piston Core	IS/86/1B	39°31.3'	19°18.0'	1160	586cm	Piston Core
					82cm	Pilot Core
Piston Core	IS/86/2	38°56.0'	19°56.5'	1815	54cm	Piston Core
Grab (S)	IS/86/1(DG)	39°30.2'	19°19.3'	1189		Day Grab
(B)		39°29.1'	19°20.1'	1180		and Camera
Grab (S)	IS/86/2(DG)	39°26.8'	19°40.4'	1200		Day Grab
(B)		39°26.0'	19°37.2'			and Camera
Grab (S)	IS/86/3(DG)	39°16.5'	19°53.0'	1025 (Wire)		Day Grab
(B)		39°16.9'	19°53.0'	1005 (PES)		and Camera
Grab (S)	IS/86/4(DG)	39°06.3'	20°26.4'	212 (Wire)		Day Grab
(B)		39°06.3'	20°26.4'	215 (PES)		and Camera
Grab (S)	IS/86/5(DG)	39°04.0'	20°29.0'	229 (Wire)		Day Grab
(B)		39°04.0'	20°29.0'	230 (PES)		and Camera
Grab (S)	IS/86/6(DG)	38°56.4'	20°25.9'	450 (Wire		Day Grab
(B)		38°56.1'	20°26.0'	450 (PES)		and Camera
Grab (S)	IS/86/7(DG)	38°54.1'	20°30.5'	293 (Wire)		Day Grab
(B)		38°54.1'	20°30.5'	310 (PES)		and Camera
Grab (S)	IS/86/(DG)	38°45.3'	20°22.5'	1418 (Wire)		
(B)		38°45.2'	20°22.8'	~1400 (PES)		
Piston Core (S)	IS/86/3	38°32.8'	20°13.8'	2830 (Wire)	168cm	Piston Core
(B)		38°31.6'	20°12.2'	2800 (PES)		
Piston Core (S)	IS/86/4	38°07.7'	20°00.2'	3442 (Wire)	469cm	Piston Core
(B)		38°08.2'	20°01.3'	3370 (PES)	39cm	Pilot Core

Key: (S) - At surface;

(B) - On bottom.