

**P.O.L.**

RRS 'James Clark Ross'

October 16, 1999 to  
December 14, 1999

ACCLAIM: Sea level measurements  
in the Drake Passage

Cruise Report No. 36

**PROUDMAN  
OCEANOGRAPHIC  
LABORATORY**

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**Bidston Observatory  
Birkenhead, Merseyside, L43 7RA, UK  
Tel: 0151 653 8633  
Telex: 628591 Ocean B G  
Fax: 0151 653 6269**

Director: Dr. B.S. McCartney

***Natural Environment Research Council***

**PROUDMAN OCEANOGRAPHIC LABORATORY**

**CRUISE REPORT NO. 36**

**RRS JAMES CLARK ROSS**

**OCTOBER 16, 1999 – DECEMBER 14, 1999**

**ACCLAIM: Sea Level Measurements in the Drake Passage**

**G.W. Hargreaves**

**2000**

## DOCUMENT DATA SHEET

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ABSTRACT  ACCLAIM Bottom Pressure Recorders have been used for making measurements of the Antarctic Circumpolar Current (ACC) since 1988, initially in the Scotia Sea and then later across the Drake Passage between the Falkland Islands and the Antarctic peninsula. Some of the Bottom Pressure Recorders (BPRs) are combined with Inverted Echo Sounders (IES) and deployed along the track of TOPEX/POSEIDON satellites that collect altimeter data from the area.  During this cruise the BPR/IES were recovered and re-deployed in the Drake Passage. In addition, a small CROCUS type BPR was recovered from the Scotia Sea near Signy Island and MYRTLE (Multi Year return Tidal Level Equipment) was deployed for a five-year duration in its place.  The Sea Level Recorders at Stanley, Rothera and Signy were serviced. The system at Signy was improved and the Stanley Sea Level Recorder (SLR) fitted with a new system for logging wave data.	
ISSUING ORGANISATION  Proudman Oceanographic Laboratory Bidston Observatory Bidston Prenton CH43 7RA UK  Director: Dr A.E Hill	TELEPHONE: (0151) 653 8633  FAX: (0151) 653 6269  TELEX: 628591 OCEAN BG
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## CRUISE PERSONNEL

### POL Personnel

#### Leg 1

Senior Scientific Officer	Peter Foden
Higher Scientific Officer	Steve Mack

#### Leg 2

Scientific Officer	Geoff Hargreaves
Higher Scientific Officer	Steve Mack

### Ship Personnel

Captain	Christopher Elliot
Chief Officer	Robert Patterson
Second Officer	Dave Gooberman
Third Officer	Paul Hislop

Chief Engineer	Dave Cutting
Second Engineer	Bill Kerwell

Bosun	George Stewart
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## OVERVIEW

ACCLAIM - Antarctic Circumpolar Current Levels from Altimeter and Island Measurements -is providing real time data from it's network of sea level stations in the Southern Ocean as a contribution to the World Ocean Circulation Experiment (WOCE). The associated research work at POL is an integral part of the many other UK contributions to Core 2, the Southern Ocean component of WOCE, and interacts with international work from the United States, South Africa, Australia, France and Germany. The principal objective is to study variations in the flow of the Antarctic Circumpolar Current (ACC) on large time and space scales, however the ACCLAIM network is also a component of GLOSS (Global Sea Level Observing System). These BPR's have supplied sea level data that has provided knowledge of tidal behaviour in this remote area.

ACCLAIM Bottom Pressure Recorders (BPR's) have been deployed since 1988, initially in the Scotia Sea and then later in the Drake Passage. Bottom Pressure Recorders are currently deployed in both locations to further aid the investigation of the ACC.

## **POL CRUISE OBJECTIVES**

- 1) To service the Sea Level Recorder at Port Stanley, Falkland Islands.
- 2) To recover the CROCUS BPR in the Scotia Sea.
- 3) To service the Sea Level Recorder at Signy.
- 4) To deploy MYRTLE in the Scotia Sea.
- 5) To recover two IES/BPR's and one CROCUS in the Drake Passage.
- 6) To re-deploy two IES/BPR's and one CROCUS in the Drake Passage.
- 7) To service the Sea Level Recorder at Rothera
- 8) To service the Sea Level Recorder at Vernadsky (time and ice conditions permitting)

## **LEG 1**

October 16, 1999 - November 7, 1999

## **SHIP PREPARATION**

POL personnel, Peter Foden and Steve Mack, joined RRS James Clark Ross at Montevideo, Uruguay on October 16, 1999. The ship immediately sailed for Port Stanley, Falkland Islands and during the crossing, the equipment was located onboard the ship and prepared for use upon arrival at Port Stanley.

## **SERVICING STANLEY SEA LEVEL RECORDER 20/10/99**

The Stanley Sea Level Recorder (SLR) consists of two logging systems, one measuring tidal information and the other measuring wave information. The tide logger samples data every 15 minutes and transmits the data via a satellite link to the UK four times a day. The wave logger samples data every one second, storing it to a computer that is connected to the telephone network via a modem.

It was known, before leaving POL that the computer storing the wave data was failing to respond to requests via the modem. The cause for this failure was unknown and could have resulted from a number of events. Upon arrival at the Sea Level Recorder, the reason for the lack of a response became apparent. The logging hardware was operating correctly however the computer had crashed and was not working. Upon closer inspection it was discovered that the hard disk drive had become corrupted, thus causing the computer to fail. It was not possible to repair this fault at this time since no spares were available, however a message was despatched



to POL for a replacement system to be prepared for installation during Leg 2 of the cruise.

The tide logger was operating perfectly well. The data stored locally was downloaded and timing errors were noted. The logger was then re-started.

#### Stanley Sea Level Recorder Servicing Summary

Servicing the tide logger went smoothly and the data was successfully recovered. The wave logger proved more troublesome and could not be repaired during this visit.

### **RECOVERY OF SCOTIA SEA BPR (POL 11) 26/10/1999**

#### **EVENTS**

07.00 GMT	Vessel on station.
07.30, 07.45, 07.56 GMT	Release command transmitted.
08.20 GMT	Released from the seabed.
09.15 GMT	On the surface.

Total time on station: 2 hours 15 minutes.

#### Scotia Sea BPR (POL 11) Recovery Summary

Conditions were fairly rough and it was difficult to obtain clear communication with the acoustic release. The BPR is a CROCUS type fitted with a Burnwire release that takes a number of minutes to activate. The ship was drifting with the wind and had to return to the deployment position a couple of times during the recovery in order to determine precisely whether the BPR had released. The CROCUS surfaced 150m away from the ship.

## DEPLOYMENT OF MYRTLE (POL 11) 26/10/1999

### EVENTS

10.00 GMT            Vessel on station  
10.14 GMT            Released into the water  
11.17 GMT            On the seabed

Total time on station: 1 hour 17 minutes

### MYRTLE (POL 11) Deployment Summary

All of the acoustic releases functioned to the seabed. The frame was monitored using the two main frame releases and the podule acoustic releases were also tested and responded well. The acoustic transponders inside the podule were also tested and were found to be inactive, as expected.

## SERVICING SIGNY SEA LEVEL RECORDER 27/10/1999

The Sea Level Recorder is situated in the loft of the generator shed and is housed in a metal enclosure, which in turn is fitted inside a wooden crate insulated with polystyrene, to try and give some protection from the severe cold temperatures that are experienced during an Antarctic winter. The sea sensors are situated in the middle of the bay, laying on the sea floor and are connected to the logger by armoured cable. This system has two modes of operation: winter and summer. During the summer, when the base is occupied, the system runs off trickle charged batteries from the electricity supply and during the winter it runs off lithium batteries. This was the first call of the summer season to Signy so the system was still set to winter mode of operation. Upon inspection of the Tide Gauge it was found that the door to the cupboard had been left open and all three lithium batteries were discharged causing the system to stop operating. New lithium batteries were fitted and the system started operating ok. A fault was noticed on the charging circuit for the rechargeable battery. One of the connections was broken and this may have caused operational problems when used in MAINS mode during the summer. A new SRAM memory card was fitted and the system re-started. A capacitor was placed across the power supply to the sensors to help improve the signal-to-noise ratio of the sensor output.

### Servicing Signy Sea Level Recorder Summary

A lot was achieved in a short space of time. The system was checked over and improvements were made. New batteries and a new data storage card were fitted and the data signal from the sensors was improved.

## **TESTING THE STANLEY SEA LEVEL RECORDER AT 9/11/1999**

The logger was checked and timed. The DCP (Data Collection Platform - a device to transmit data to a satellite) time and date was reset to 1988 since it was not known if the system was year 2000 (Y2K) compliant and would recognise 2000 as a valid year date. Setting the year to 1988 will not affect the operation of the system since the main criteria is that the time is set exactly to Greenwich Mean Time (GMT). Each DCP has an allocated time slot of one minute that means that any time drift in the clock could result in data loss and corruption for us, and other users of the system.

### **LEG 2**

November 10, 1999 - December 14, 1999

### **SHIP PREPARATION**

Geoff Hargreaves joined RRS James Clark Ross at Stanley, Falkland Islands, on 9/11/1999. Steve Mack and Peter Foden were already onboard from Leg 1. A CROCUS BPR logger had already been configured and started ready for deployment in the Drake Passage by Steve and Peter. Peter Foden disembarked on 10/11/1999 and returned to the UK. The ship sailed on the afternoon of 10/11/1999, heading for Rothera.

### **STANLEY SEA LEVEL RECORDER 10/11/1999**

A replacement computer had been transported from POL with Geoff Hargreaves and was installed in the Sea Level Recorder. The serial port card was fitted and the two serial leads from the tidegauge hardware were connected to it.

### **RECOVERY OF DRAKE PASSAGE NORTH IES/BPR (POL 8) 11/11/1999**

#### **EVENTS**

13.12 GMT	Vessel on station
13.15 GMT	Released from the seabed
13.42 GMT	On the surface

Total time on station: 30 minutes

Drake Passage North IES/BPR (POL 8) Recovery Summary

The recovery went very smoothly. Acoustic conditions were good and the release fired first time.

**RECOVERY OF DRAKE PASSAGE CENTRE (POL 9) BPR 12/11/1999**

EVENTS

08.09 GMT            Vessel on station  
08.14 GMT            Release command transmitted  
08.29 GMT            Released from seabed  
10.17 GMT            On the surface

Total time on station: 2 hours 8 minutes

Drake Passage Centre BPR Recovery Summary

The recovery went very well. This unit is a CROCUS BPR fitted with a Burnwire release. Acoustic conditions were good and the four-ping indication of the burnwire release activating was clearly detected by the deck unit.

**DEPLOYMENT OF DRAKE PASSAGE CENTRE BPR (POL 9) 12/11/1999**

10.48 GMT            Vessel on station  
10.53 GMT            Released into the water  
12.03 GMT            On the seabed

Total time on station: 1 hour 15 minutes

Drake Passage Centre BPR (POL 9) Deployment Summary

The deployment went smoothly. The acoustic transponder performed well to the seabed and was disabled before leaving the site. This is a CROCUS type BPR.

## RECOVERY OF DRAKE PASSAGE SOUTH (POL 6) 13/11/1999

### EVENTS

01.28 GMT            Vessel on station  
01.31 GMT            Released from the seabed  
01.52 GMT            On the surface

Total time on station: 24 minutes

### Drake Passage South (POL 6) Recovery Summary

It was dusk when the ship arrived on station and the decision was made to release the unit since the weather forecast was not good for a recovery if the ship waited until daylight. Even though it was dusk when the BPR was released visibility was still fairly good, however twenty minutes later it was total darkness. Fortunately, when the BPR surfaced, the flashing light activated enabling easy location.

## DEPLOYMENT OF DRAKE PASSAGE SOUTH (POL 6) 13/11/1999

### EVENTS

02.20 GMT            Vessel on station  
02.26 GMT            Released into the water  
02.48 GMT            On the seabed

Total time on station: 28 minutes

### Drake Passage South (POL 6) Deployment Summary

The deployment went smoothly and both acoustic release units communicated well to the seabed.

## **PORT LOCKROY AND ROTHERA**

The ship arrived at Port Lockroy on Sunday 14/11/1999 and deposited two personnel ashore to operate the base as a museum of Antarctic exploration history during the summer. The ship spent a few hours at the base unloading supplies and then sailed for Rothera. During the afternoon of 15/11/1999, the ship entered the pack ice trying to gain access to Adelaide Island and the base of Rothera. A deep depression of 931mbar produced strong winds that packed the ice tightly together making progress difficult. The ship stopped twenty-five miles into the ice to wait for conditions to improve. After four days drifting in the ice, the wind changed direction and the ship was able to make progress towards the edge of the ice, now only twelve miles away. Eventually the ship broke free of the ice and was able to make another attempt to reach Rothera. The conditions were still too difficult to safely make progress through the ice, so the ship returned to the ice edge. This situation continued until 8/12/1999, when it was decided that the ship would head North to the American base of Palmer to put personnel and cargo ashore for a flight transfer to Rothera.

## **DISEMBARKATION AT PALMER 9/12/1999**

POL personnel Geoff Hargreaves and Steve Mack disembarked at Palmer along with fourteen other personnel who were needed at Rothera due to fieldwork requirements. Personnel were transferred by the ship's crane to the base, via the deck of an American survey ship (RV Laurence M. Gould) that was alongside the quay at Palmer. The personnel were then transferred to Rothera by Twin Otter aircraft that were waiting at the top of a glacial ice runway.

## **SERVICING ROTHERA SEA LEVEL RECORDER 10/12/1999**

The system consists of two logging systems sited in the pumping station that supplies seawater to the reverse osmosis (RO) plant for making fresh water. The sensors are situated in the seawater intake well from where the water is drawn for the RO plant. Logger No1 was timed and both the calibrated and raw data were downloaded. During the download, problems were noted with the data near to the end of the data set. Upon closer inspection, the problems started just before leaving the UK to service the Sea Level Recorder. Due to the computer battery level getting low, Logger No2 data was not downloaded until the next day. When the data was downloaded from Logger No2, it was noticed that this had the same data problems as Logger No1, so the problem was not with Logger No1.

Upon inspection of the data from Logger No1, it was discovered that the full tide signal had failed and some time later both the half tide and barometer had also failed. However, some time after all the sensors had failed the half tide and barometer sensors recovered and were being logged again. Further investigation at the logger revealed that all three sensors were being powered from the same supply. When the sensor frequency outputs were measured it was found that there was no signal from the full tide but the half tide and barometer were

functioning normally. It was concluded that the full tide sensor has flooded causing the malfunction of the sensor and also a reduction in the supply voltage for a short while. This drop in the supply voltage to the sensors caused the half tide and the barometer to stop working. The power supply to the sensors was split across two independent supplies and also the power connection to the full tide sensor was cut inside the junction box situated in the well.

#### Servicing Rothera Sea Level Recorder Summary

The servicing of the Sea Level Recorder servicing went very well given that most of our equipment was still onboard RRS James Clark Ross. Tools and test equipment were borrowed from the meteorologists on the base and enabled the fault with the sensor to be detected and isolated. The data from both loggers was recovered and they had both worked very well. The full tide sensor was left in-situ since a replacement sensor and the tools needed for the task were not available.

#### **SERVICING STANLEY SEA LEVEL RECORDER 14/12/1999**

A Dash 7 aircraft transported POL personnel Geoff Hargreaves and Steve Mack from Rothera to Stanley on 13/12/1999. During the stay at Rothera base, a message had been received from POL that the Sea Level Recorder at Stanley had stopped working. Upon investigating the reason for the failure it was discovered that the electricity mains supply had been disconnected causing the system to operate on its back-up battery, until it eventually discharged causing the system to stop functioning.

The mains supply was reactivated and the system restarted again. The system was contacted from POL to ensure that the modem was functioning correctly. The DCP time needed re-setting since this had also failed. Since the DCP synchroniser (the device used to set the time) was onboard the ship, the DCP had to have its time set using another method. Upon applying power to the DCP, it automatically sets the time to midnight (00.00), thus it was necessary to return to the Sea Level Recorder later that night at 00.00 GMT (21.00 local time) to apply the power to the DCP.

#### **DEPLOYMENT OF DRAKE PASSAGE NORTH CROCUS BPR (POL 8) 28/12/1999**

##### **EVENTS**

02.45 GMT	-	Vessel on station
02.54 GMT	-	Released into the water

## Drake Passage North CROCUS BPR Deployment Summary

This CROCUS BPR was deployed by the crew of RRS James Clark Ross on their passage north to Stanley after having successfully reached Rothera.

### CONCLUSIONS

The weather played had an important part upon the work undertaken during the two legs of the cruise. This ranged from the very cold temperatures and snow storms on the crossing to and from Signy, to the severe depression causing gale force winds to compact the ice and beset the ship whilst trying to gain access to Rothera. Despite this, all of the POL objectives were achieved, with the small exception that an Inverted Echo Sounder was not deployed at Drake Passage North. At this site, only a Bottom Pressure Recorder was deployed for safety reasons since the ship's crew deployed this frame. For this reason a CROCUS type BPR was used that utilises a Burnwire release system, instead of the MKIV frame that uses a pyro system that is a type of explosive. Unfortunately an Inverted Echo Sounder cannot be installed in a CROCUS frame, so one could not be deployed.



## APPENDIX 1 - BPR TECHNICAL INFORMATION

### STANLEY SEA LEVEL RECORDER INFORMATION

The system at Stanley consists of a tide logger storing samples every fifteen minutes to a memory card (SRAM) and also a wave/tide recorder that is sampling every one second and is storing data to a laptop PC running Linux. This PC is connected to a telephone line via a modem and can be contacted from the UK.

Before POL staff left the UK to service this Sea Level Recorder it was known that communication with the PC via the modem had failed, but the cause of this failure was unknown. Upon arrival at the installation (20/10/1999), it was discovered that the laptop PC had crashed and any attempts to reboot also failed. It was determined that the hard disk drive was damaged and needed replacing. A replacement was not available at this time so a message was sent to POL so that a replacement PC could be configured and brought to Stanley with Geoff Hargreaves on his flight to the Falkland Islands.

The tide logger was still working perfectly and this was serviced.

Timebase scan

Expected

14.15.00 GMT on 20/10/1999

Actual

14.14.37 GMT on 20/10/1999

The calibrated data were downloaded from the memory card and stored as stan2010.txt and the raw data stored as stan2010raw.txt.

The SRAM memory card was replaced with another card fitted with a new backup lithium battery.

Sensors fitted.

Full Tide DQ 47594

Half Tide DQ 47598

Barometer DQ 39239

The logger was re-started but the **timebase was not reset**.

The timebase scanned at 22.44.37 GMT on 21/10/1999

Stanley Sea Level Recorder was re-visited on 9/11/1999 and the logger was checked and found to be working properly. The DCP time and date was reset to 1988 to avert any potential problem with the year 2000 rollover problem. It was not known whether the system would have problems with the year 2000 and since the date part isn't important but time is, the time was set accurately and the date inaccurately.

The arrival of Geoff Hargreaves, in the evening of 9/11/1999 in Stanley, meant that the wave/tide logger could be serviced and re-started. A replacement laptop PC was installed into

the SLR on 10/11/1999 and connected to the telephone network. At this time, no other work was possible since the ship was leaving to sail for Rothera.

During the servicing of the SLR at Rothera, a message was received from POL that communication with the modem had failed once again. Upon the arrival of POL staff in Stanley via a dash 7 flight from Rothera base, the SLR was visited and the source of the failure located. The mains electric supply to the SLR had been disconnected causing the system to initially operate from its backup batteries, until eventually they drained and the system crashed. Power was restored and the system re-started.

Data were downloaded to stanley99a.cal and stanley99a.raw for calibrated and raw data respectively.

Tide logger (TDS) timebase started at 13.30.00 GMT on 14/12/1999  
First scan at 13.45.00 GMT on 14/12/1999

Wave/tide logger timebase started at 14.00.00 GMT on 14/12/1999.  
This logger scans every second.

The outputs from the wave/tide logger are fed into the serial ports of the laptop PC. The PC is fitted with a PCMCIA serial port card and the wave data is fed into this port and tide data is fed into serial port one, on the back of the laptop.

## SCOTIA SEA BPR (POL 11) RECOVERY INFORMATION

<i>Location details</i>	-	<i>Latitude</i> 60°03.08' S
		<i>Longitude</i> 047°09.96' W
		<i>Depth</i> 2500m
On station	-	07.00 GMT on 26/10/1999
Release command transmitted	-	07.30, 07.45, 07.56 GMT
Released from seabed	-	08.00 GMT
On the surface	-	09.15 GMT

The sea was fairly rough and acoustic conditions were noisy making initial contact with the BPR difficult. The release command was transmitted but there was no acknowledgement from the acoustics to say that it had been received. It was not known whether the command had been received and no acknowledgement was transmitted or whether the acknowledgement signal had been missed. The release command was transmitted a further two times. The ship had drifted off position during the recovery attempt, so it returned to the deployment location. Once back on position, the acoustic release was interrogated again and revealed that the BPR had released from the seabed.

Equipment fitted:

Benthos TR7000 acoustic release (61198) with command codes,  
ID 03, Tx 12.0 kHz, Rx 10.0 kHz, Enable A, Disable B, Release C, Pinger D.  
Logger P3 with sensor DQ 68485  
Benthos Radio Beacon 154.585 MHz

Logger

Timebase scan

Expected	Actual
21.00.00 GMT on 2/11/1999	20.58.45 GMT on 2/11/1999

The timebase is 75 seconds fast.

Data were downloaded to Scotia\_CROCUS\_9899.raw.

Data Arrangement

The raw data are made up of six columns

Column	Data
1	Scan number
2	Time
3	Pressure (DQ 68485)
4	Temperature (DQ 68485)
5	Blank
6	Blank

Old Batteries

Acoustic release	-	Red 11.96V
		Orange 11.94V
Release battery	-	26.6V
Logger battery	-	14.54V

**MYRTLE DEPLOYMENT INFORMATION**

<i>Location details</i>	-	<i>Latitude 60°02.98' S</i>
		<i>Longitude 047°10.20' W</i>
		<i>Depth 2354m</i>

On station	-	10.08 GMT on 26/10/1999
Release into the water	-	10.14 GMT
On the seabed	-	11.17 GMT

MYRTLE is a special frame in that it has a lot more equipment on it than a normal BPR and it will be deployed for a much longer duration. It consists of a main logger mounted onto the

frame, with two acoustic releases to recover the frame. It also has four recoverable pods, each recording the same data as the main logger. These four pods are released by two additional acoustic releases having different release codes for each pod. Three of the four pods are fitted with acoustic transponder boards so that their progress to the surface can be monitored. The other pod (Satpod) is fitted with a satellite transmitter and this will self-release, then transmits data back to the UK. To release this pod a long-term timer module is fitted.

#### Acoustic Information

Main frame release 51314	-	Rx 14.5kHz, Tx 12.0kHz, Release A
Main frame release 51329	-	Rx 10.0kHz, Tx 12.0kHz, Release D
Main pod release	-	Rx 11.0kHz, Tx 12.0kHz, Satpod A, Pod2 B, Pod3 C, Pod4 D
Secondary pod release	-	Rx 11.5kHz, Tx 12.0kHz, Pod2 C, Pod3 D, Pod4 E
Podule transponders	-	Satpod - none fitted
	-	Pod2 - Rx 12.5kHz, Tx 12.0kHz
	-	Pod3 - Rx 10.5kHz, Tx 12.0kHz
	-	Pod4 - Rx 13.0kHz, Tx 12.0kHz

#### Logger

Timebase started at 13.00.00 GMT on 22/10/1999  
First scan at 14.00.00 GMT on 22/10/1999

#### Long-term Timer

Long-term timer set to release on January 10, 2001 from 23/10/1999

23/10/1999 is day 296. 1999 has 365 days, 2000 has 366 days.

Number of days to release date is  $70 + 366 + 10 = 446$  days.

446 days = 10704 hours.

Started at 19.57 GMT. Time is not critical to the timer.

First wakeup at 20.49.47 GMT on 23/10/1999. Message: Release in 446 days, 23 hours.

#### Satpod

Satpod switched on at 21.07 GMT on 22/10/1999. Satpod fitted into the frame and the first scan recorded by Satpod is 02.00 GMT on 23/10/1999.

#### Pod2

Pod2 started at 14.00 GMT on 23/10/1999. First scan recorded is 01.00 GMT on 26/0/1999.

#### Pod3

Pod3 started at 18.30 GMT on 23/10/1999. First scan recorded is 01.00 GMT on 26/0/1999.

#### Pod4

Pod4 started at 22.00 GMT on 23/10/1999. First scan recorded is 01.00 GMT on 26/0/1999.

The Satpod was fitted into the frame first and had the infrared transmitter connected to it immediately since this logger will stop logging if it receives no data after a fixed period of time.

The other pods did not have the transmitter connected immediately since these units will not stop logging. The transmitters were connected at 00.30 GMT on 26/10/1999.

Recovery Equipment

Benthos radio beacon on Pod2 - 154.585 MHz, Channel A  
 Benthos radio beacon on Pod3 - 154.585 MHz, Channel A  
 Benthos radio beacon on Pod4 - 154.585 MHz, Channel A

Batteries

Main frame acoustic release (51314) - Red 14.73V  
 Orange 14.73V  
 Main frame acoustic release (51329) - Red 14.74V  
 Orange 14.73V  
 Main pod acoustic release (48513) - Red 14.73V  
 Orange 14.74V  
 Secondary pod acoustic release - Red 14.73V  
 Orange 14.73V  
 Pod2 acoustic battery - Red 14.57V  
 Orange 14.57V  
 Pod2 logger battery - Red 14.58V  
 Orange 14.57V  
 Pod3 acoustic battery - Red 14.57V  
 Orange 14.56V  
 Pod3 logger battery - Red 14.57V  
 Orange 14.58V  
 Pod4 acoustic battery - Red 14.55V  
 Orange 14.56V  
 Pod4 logger battery - Red 14.54V  
 Orange 14.54V  
 Satpod - 10.43V  
 Main logger - Red 14.73V  
 Orange 14.73V  
 External logger pack (top) - Red 14.74V  
 Orange 14.73V  
 External logger pack (bottom) - Red 14.73V  
 Orange 14.74V

The Satpod satellite transmitter operates from an 11V supply. Two battery packs were installed into the pod but were modified from 14V to 11V. The remaining unused cells from each pack were then combined to give a 12V supply. This supply was then reduced to 11V by diodes and then coupled together with the other two supplies, each protected by diodes. The end result is a single supply of 10.43V.

## SIGNY SEA LEVEL RECORDER INFORMATION

The sea level recorder at Signy consists of a sensor housing, placed on the seabed in the middle of the bay, connected to the shore by armoured cable. The logging electronics are situated in the loft of the generator shed, housed inside a metal box that is installed inside a polystyrene insulated wooden crate. The insulated wooden crate is used to protect the system during the Antarctic winter when the base is closed, and no heating is available. The SLR has two operational modes: summer and winter. During summer operating mode, the system runs off the base mains supply with a trickle charged backup battery. For winter use, three high capacity lithium batteries are used and a switch is fitted to change over from summer to winter operation.

Upon arrival at Signy it was discovered that the door to the SLR had been left open during the winter and all three lithium batteries were discharged. A broken wire was also detected that meant the SLR would not work when powered from the mains supply. This was repaired and new lithium batteries installed. The logger was then restarted using the lithium batteries since the mains electricity supply was not operational yet. A problem was noticed with the signals coming in from the sea sensors. The pressure signal was noisy but being recorded however the temperature signal was not being recorded. This was investigated with an oscilloscope and it was discovered that the temperature signal was very noisy and was being swamped by the noise. A capacitor was placed across the power supply to the sensors and this improved the signal to noise ratio. The signals still have an element of noise but the logger is able to measure and record them.

### Timing Information

Timebase started at 19.00.00 GMT on 27/10/1999

First scan at 19.15.00 GMT

### Batteries

Lithium batteries	-	Red	14.73V
		Orange	14.74V
	-	Red	14.73V
		Orange	14.74V
	-	Red	14.73V
		Orange	14.73V

## DRAKE PASSAGE NORTH IES/BPR (POL 8) RECOVERY INFORMATION

<i>Location details</i>	-	<i>Latitude</i>	<i>54°56.56' S</i>
		<i>Longitude</i>	<i>058°21.41' W</i>
		<i>Depth</i>	<i>1198m</i>
On station	-		13.12 GMT on 11/11/1999
Release command transmitted	-		13.15 GMT
On the surface	-		13.42 GMT

Equipment fitted to frame

Benthos XT6000 acoustic releases, 46481(11.5/C) and 47178(14.5/C)  
Logger SSDL 2 with sensors QT 49187, DQ 46251, DQ 43513  
Inverted Echo Sounder with POL ADC board and 1.4Gb disk drive  
Benthos Radio Beacon 154.585 MHz

Acoustic release 46481 was used to release the frame from the ballast weight. Once it had released, the release command was transmitted to the second release to make the second pyro safe for recovery onto the ship. Both of these units were fitted with the pyro release system. Acoustic conditions were excellent and no problems were encountered in communicating with both releases.

#### Logger

Timebase

Expected scan time

17.30.00 GMT on 11/11/1999

Actual scan time

17.31.02 GMT on 11/11/1999

The timebase is 62 seconds slow.

Data were downloaded to dpn9899.raw.

#### Data Arrangement

The raw data are made up of eight columns

Column	Data
1	Time
2	Date
3	Temperature (QT 49187)
4	Pressure (QT 49187)
5	Temperature (DQ 46251)
6	Pressure (DQ 46251)
7	Temperature (DQ 43513)
8	Pressure (DQ 43513)

#### Inverted Echo Sounder

IES pinged at 19.05.39 GMT on 11/11/1999.

The data were recovered and stored in the file dpn9899.ies.

Number of datafiles recorded to disk was 2705. The IES was fitted with a Hitachi 1.4Gb disk drive and stored three samples per datafile. One error was noted during the recovery of the data at datafile 870, block 3.

#### Old Batteries

Acoustic release 46481                      -            Red    13.13V

Acoustic release 47178	-	Orange 13.10V Red 13.55V Orange 13.52V
External lithium 46481	-	14.21V
External lithium 47178	-	14.24V
Release 46481	-	9.60V
Release 47178	-	9.60V
Logger	-	14.21V

## DRAKE PASSAGE MIDDLE (POL 9) BPR RECOVERY INFORMATION

<i>Location details</i>	-	<i>Latitude</i> 58°22.25' S <i>Longitude</i> 056°21.20' W <i>Depth</i> 3776m
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On station	-	08.09 GMT on 12/11/1999
Release command transmitted	-	08.14 GMT
Released from seabed	-	08.29 GMT
On the surface	-	10.17 GMT

### Equipment fitted:

Benthos TR7000 acoustic release (61217) with command codes,  
 ID 07, Tx 12.0 kHz, Rx 13.0 kHz, Enable A, Disable B, Release C, Pinger D.  
 Logger P1 with sensor DQ 68489  
 Benthos Radio Beacon 154.585 MHz

The recovery went very well. The Burnwire release activated first time and acoustic conditions were good enough that the four ping acknowledge signal, to indicate that the release command had been received successfully, was detected.

### Logger

Timebase scan

Expected	Actual
12.45.00 GMT on 15/11/1999	12.46.43 GMT on 15/11/1999

The timebase is 103 seconds slow.

Data were downloaded to dpc9899.raw.



## Data Arrangement

The raw data are made up of six columns

Column	Data
1	Scan number
2	Time
3	Pressure (DQ 68489)
4	Temperature (DQ 68489)
5	Blank
6	Blank

### Old Batteries

Acoustic release	-	Red 0.00V (One cell had failed) Orange 8.65V
Release battery	-	27.0V
Logger battery	-	14.21V
IES batteries	-	12.06V, 12.06V, 12.06V, 11.86V

## DRAKE PASSAGE MIDDLE (POL 9) BPR DEPLOYMENT INFORMATION

<i>Location details</i>	-	<i>Latitude</i> 58°22.21' S <i>Longitude</i> 056°21.15' W <i>Depth</i> 3862m
On station	-	10.48 GMT on 12/11/1999
Released into the water	-	10.53 GMT
On seabed	-	12.03 GMT

The deployment went very smoothly and it was possible to monitor the acoustic release to the seabed.

### Acoustic Information

Benthos TR7000 acoustic release (61198) with command codes

ID 03, Tx 12.0kHz, Rx 10.0kHz, Enable A, Disable B, Release C, Pinger D

Release type - Burnwire.

### Logger

Logger P3 with sensor DQ 68485

Temperature frequency 171.920kHz

Pressure frequency 33.210kHz

Timebase started at 23.00.00 GMT on 9/11/1999

First scan at 23.15.00 GMT

Recovery Equipment

Benthos radio beacon - 154.585MHz  
Channel A

New Battery Information

Acoustic battery - Red 14.37V  
Orange 14.38V  
Burnwire battery - 28.7V  
Logger battery - 14.73V

**DRAKE PASSAGE SOUTH BPR/IES (POL 6) RECOVERY INFORMATION**

*Location details* - *Latitude* 60° 51.03' S  
*Longitude* 054° 42.74' W

On station - 01.28 GMT on 13/11/1999  
Release command transmitted - 01.31 GMT  
On the surface - 01.52 GMT

Equipment fitted to frame

Benthos XT6000 acoustic releases, 58434(14.5/B) and 46421(14.0/D)  
Logger SSDL 3 with sensors DQ 44935, DQ 46267, DQ 52026  
Inverted Echo Sounder with POL ADC board and 1.4Gb disk drive  
Benthos Radio Beacon 154.585 MHz  
Benthos Flashing Light

The frame was released at dusk with the light fading. When the frame surfaced, the last remaining light had disappeared and it was very dark. Fortunately, the flashing light switched on when the frame surfaced and the frame was located. The frame was released in these light conditions because there was a storm approaching and if the ship had waited a few hours for dawn, it may not have been possible to recover the frame. During the recovery, the ship stayed on position instead of drifting with the tide. This meant that the ship was very close to the frame when it surfaced.

Logger

Timebase scan

Expected	Actual
18.15.00 GMT on 15/11/1999	18.15.28 GMT on 15/11/1999

Timebase was 28 seconds slow.

The data were downloaded to dps9899.raw.

## Data Arrangement

The raw data are made up of eight columns

Column	Data
1	Time
2	Date
3	Temperature (DQ 44935)
4	Pressure (DQ 44935)
5	Temperature (DQ 46267)
6	Pressure (DQ 46267)
7	Temperature (DQ 52026)
8	Pressure (DQ 52026)

## Inverted Echo Sounder

IES pinged at 16.25.32 GMT on 17/11/1999

The data were recovered and stored in the file dps9899.ies.

Number of datafiles recorded to disk is 2720. The IES is fitted with a Hitachi 1.4Gb disk and is storing three samples per datafile.

## Batteries

Acoustic release 46421	-	Red 12.18V
		Orange 12.16V
Acoustic release 58434	-	Red 12.56V
		Orange 12.54V
Release battery 46421	-	9.48V
Release battery 58434	-	9.60V
Logger battery	-	14.21V
IES batteries	-	12.06V, 12.06V, 12.06V, 11.86V

## DRAKE PASSAGE SOUTH DEPLOYMENT (POL 6) INFORMATION

<i>Location details</i>	-	<i>Latitude 60°51.01' S</i>
		<i>Longitude 054°42.85' W</i>
		<i>Depth 1080m</i>
On station	-	02.20 GMT on 13/11/1999
Release into the water	-	02.26 GMT
On the seabed	-	02.48 GMT

### Acoustic Information

Benthos XT6000 46481 - Rx 11.5kHz, Tx 12.0kHz, Release C  
Benthos XT6000 47178 - Rx 14.5kHz, Tx 12.0kHz, Release C  
Both acoustics fitted with pyro release system.

### Logger

Logger SSDL 2 with sensors QT 49187, DQ 46251 and DQ 43513  
Timebase started at 23.15.00 GMT on 11/11/1999  
First scan at 23.30.00 GMT on 11/11/1999

### Inverted Echo Sounder

IES fitted with POL ADC board and Hitachi 1.4Gb disk drive.  
IES started at 00.59.40 GMT on 12/11/1999  
First Chirp at 01.59.58 GMT on 12/11/1999

### Set-up parameters

Chirp interval	60 minutes
Samples per datafile	3
Lockout time (1/100 s)	0
Start file number	1
Serial number	8
Deployment number	9900
Comment	Drake South, deployed Nov '99

### Recovery Equipment

Benthos radio beacon - 154.585 MHz, Channel A.  
Benthos flashing light.

### New Battery Information

Acoustic release 46481	-	Red 14.36V Orange 14.36V
Acoustic release 47178	-	Red 14.34V Orange 14.34V
Release 46481	-	9.60V
Release 47178	-	9.60V
External lithium pack 46481	-	14.21V
External lithium pack 47178	-	14.24V
Logger	-	14.73V

The release batteries and external lithium batteries for the acoustic releases were not replaced with new packs since none were available. These packs should be capable of lasting another twelve months.

## ROTHERA SEA LEVEL RECORDER INFORMATION

The sea level recorder at Rothera consists of a sensor assembly installed in the sea water intake well for the reverse osmosis (RO) plant on the base. The logging electronics are housed in the nearby pump building. There are two independent loggers sited inside the pump building, each logging the sensor output signals.

### Timing Information

#### *Logger Number 1*

Timebase scan

Expected

20.45.00 GMT on 10/12/1999

Actual

20.39.36 GMT on 10/12/1999

The timebase of logger number 1 is 396 seconds fast.

The data were downloaded to rot1\_9899.cal for calibrated data and rot1\_9899.raw for raw data.

Timebase started 14.45.00 GMT on 11/12/1999

First scan at 15.00.00 GMT

#### *Logger Number 2*

Timebase scan

Expected

20.45.00 GMT on 10/12/1999

Actual

20.44.16 GMT on 10/12/1999

The timebase of logger number 2 is 44 seconds fast.

The data were downloaded to rot2\_9899.cal for calibrated data and rot2\_9899.raw for raw data.

Timebase started at 14.45.00 GMT on 11/12/1999

First scan at 15.00.00 GMT

During the download of data from Logger No1, it was noticed that towards the end of the data record there was corruption occurring. This corruption took the form of incorrect recording of the data signals. This feature was also noted on the record from Logger No2. The loss of data had started at about the same time that POL staff were travelling from the UK. Further investigation revealed that the signal from the full tide sensor was not reaching the loggers, and indeed was not present inside the junction box situated inside the well. The conclusion of this is that the full tide sensor has failed, probably due to a water leak. Further examination of the data records revealed that, for a period of time, both the half tide and barometric sensors had also failed. This was due to the power supply to the sensors being overloaded and the supply voltage dropping below the sensor operating level. All three of the sensors were being powered from the same supply and when the full tide sensor failed, it affected the power supply to the other two sensors. The power supply to the two other sensors were then changed

to be independent of each other and power to the full tide sensor was disabled.

## DRAKE PASSAGE NORTH BPR (POL 8) DEPLOYMENT INFORMATION

*Location details* - *Latitude* 54° 56.56' S  
*Longitude* 058° 21.50' W  
*Depth* 1203m

On station - 02.50 GMT on 28/12/1999  
Released into the water - 02.54 GMT

This CROCUS BPR was deployed by the Officers and Crew of RRS James Clark Ross on their return journey to Stanley, Falkland Islands. It was deployed after POL staff had disembarked at Palmer station and had returned to the UK.

### Acoustic Information

Benthos TR7000 acoustic release (61227) with command codes

ID 02, Tx 12.0kHz, Rx 11.0kHz, Enable A, Disable B, Release C, Pinger D

Release type - Burnwire.

### Logger

Logger C3 with sensor DQ 68484

Timebase started at 20.15.00 GMT on 8/12/1999

First scan at 20.30.00 GMT

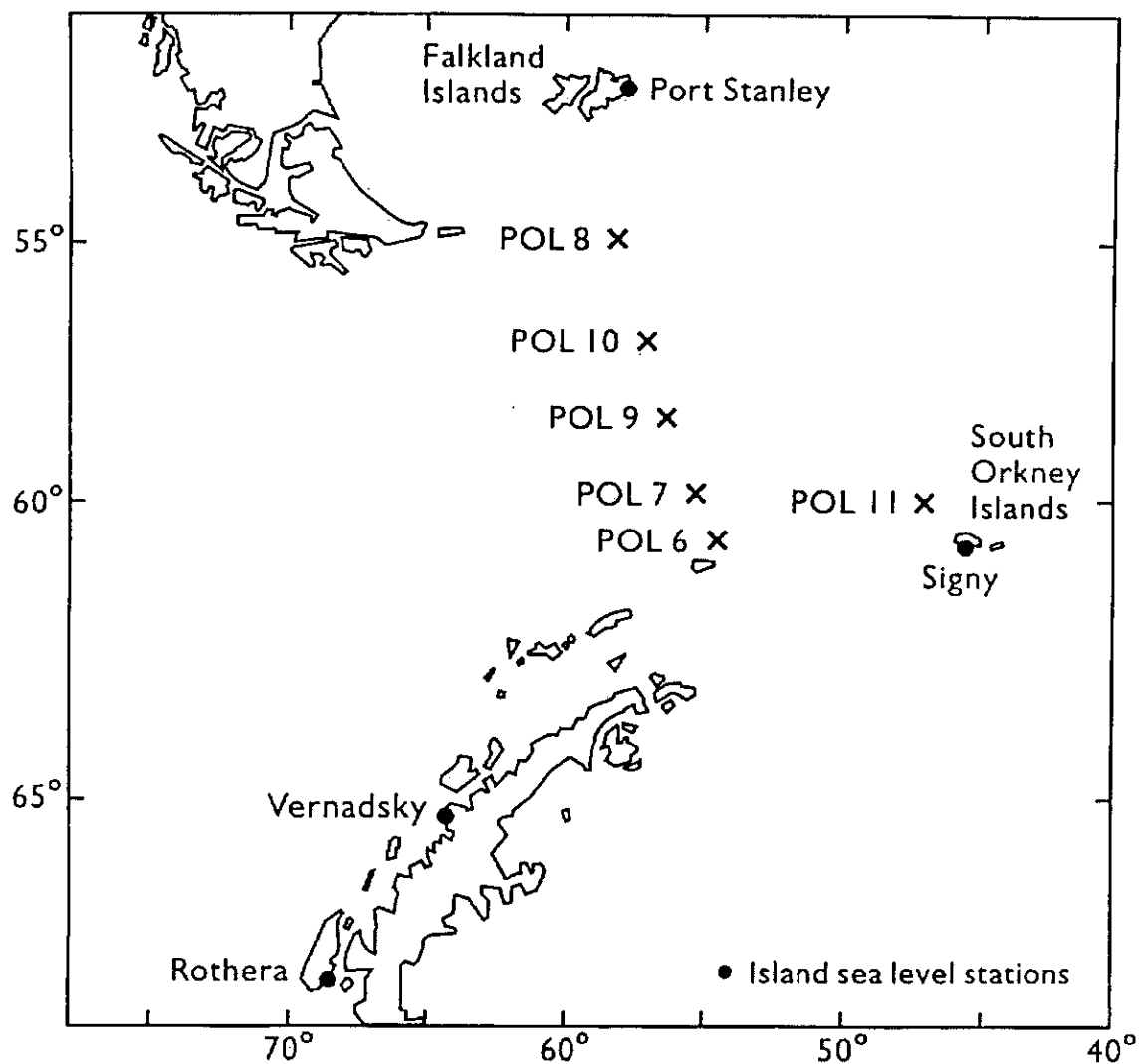
### Radio Beacon

Benthos radio beacon - 154.585MHz  
Channel A

### New Battery Information

Acoustic battery - Red 14.35V  
Orange 14.35V  
Burnwire battery - 28.7V  
Logger battery - 14.73V

# MAP OF DEPLOYMENT POSITIONS



## GLOSSARY

ACCLAIM	-	Antarctic Circumpolar Current levels from Altimeter and Island Measurements
ADC	-	Analogue to Digital Converter
BPR	-	Bottom Pressure Recorder
CROCUS	-	Capsule for the Recovery of Ocean Circulation Under the Sea
DCP	-	Data Collection Platform
EPROM	-	Erasable Programmable Memory
FIPASS	-	Falkland Islands Passenger and Sea Service
GMT	-	Greenwich Mean Time
IES	-	Inverted Echo Sounder
MYRTLE	-	Multi-Year Return Tidal Level Equipment
POL	-	Proudman Oceanographic Laboratory
SLR	-	Sea Level Recorder
SRAM	-	Static Random Access Memory
TDS	-	Triangle Digital Services
WOCE	-	World Ocean Circulation Experiment