PROUDMAN OCEANOGRAPHIC LABORATORY

CRUISE REPORT NO. 31

VEINS:
Inverted Echo Sounders in the Denmark Strait

As part of

FS METEOR CRUISE 39/5

AUGUST 13, 1997 - SEPTEMBER 10, 1997

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1999

DOCUMENT DATA SHEET

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TITLE

VEINS: Inverted Echo Sounders in the Denmark Strait, as part of, FS Meteor Cruise 39/5, August 13, 1997 – September 10, 1997

REFERENCE

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ABSTRACT

The overflow of cold dense water from the Denmark Strait is one of the key elements of the north Atlantic thermohaline circulation and has important consequences for global climate change. It is important to measure the transport of this water and to understand it's variability on seasonal and at longer time scales.

The European funded project "Variability of Exchanges in Northern Seas" (VEINS MAS3CT960070) is an attempt to measure variations in the Arctic circulation using modern oceanographic instrumentation.

A combined Inverted Echo Sounder and Bottom Pressure Recorder was successfully recovered and re-deployed.

An additional Inverted Echo Sounder and Bottom Pressure Recorder was deployed in the Denmark Strait to measure the thickness of this cold dense water and thus determine transport.

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CONTRACT

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The Library, Proudman Oceanographic Laboratory.

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CRUISE PERSONNEL

POL Personnel

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OVERVIEW

The overflow of cold dense water from the Denmark Strait is one of the key elements of the north Atlantic thermohaline circulation and has important consequences for global climate change. It is important to measure the transport of this water and to understand its variability on seasonal and longer time scales.

The European funded project "Variability of Exchanges in Northern Seas" (VEINS) is an attempt to measure the decadal variations in the Arctic circulation using modern oceanographic instrumentation. Part of this work is in the Denmark Strait where an array of current meters is in place to measure the strength of the Overflow Water (DSOW). CTD surveys provide knowledge of the physical properties.

To measure the thickness of the DSOW, and hence get a value for transport, Inverted Echo Sounders (IES) were deployed at the core of the current with a view to detecting the echo from the interface between the cold bottom water and the overlying intermediate layer.

POL CRUISE OBJECTIVES

1) To recover an Inverted Echo Sounder in the Denmark Strait

2) To deploy two Inverted Echo Sounders in the Denmark Strait

IES/BPR DEPLOYMENTS

Ship Preparation

POL personnel joined FS Meteor at Reykjavik, Iceland on August 13, 1997. The equipment was loaded aboard the ship, unpacked and stowed safely. The Bottom Pressure Recorder was assembled, tested and set running. The Inverted Echo Sounder was opened, started and the re-sealed. The frame was prepared the ballast weight assembled and then the BPR and IES installed.

RECOVERY OF IES/BPR (ICE1) 18/8/1997

EVENTS

10.08 GMT	Arrive on station.
10.12 GMT	Released from the seabed.
11.07 GMT	On the surface.

Total time on station: 59 minutes.

IES/BPR Recovery Summary

Acoustic conditions were good, and the sea was calm. The IES/BPR was monitored to the surface using both sets of acoustics. Only one pyrolease was fired in order to allow the other to be reused.

Modifications

The recovered Inverted Echo Sounder needed modifying before it could be re-deployed. Modifications were carried out to the IES once the data had been successfully recovered. All of the equipment was fitted with new batteries and one of the acoustic release units was converted from a pyrolease release mechanism to a burnwire mechanism.

DEPLOYMENT OF IES/BPR (UK1/IES) 19/8/1997

EVENTS

09.15 GMT	Arrive on station.
09.29 GMT	Released into the water.
10.12 GMT	On the seabed.

Total time on station: 57 minutes

IES/BPR (UK1) Deployment Summary

Both acoustic units are fitted with burnwire release mechanisms and communicated well to the seabed. No radio beacon is fitted to this unit, however a flashing light is fitted.

DEPLOYMENT OF IES/BPR (G1/IES) 19/8/1997

EVENTS

11.30 GMT	Arrive on station.
11.46 GMT	Released into the water.
12.34 GMT	On the seabed.

Total time on station: 1 hour 4 minutes

IES/BPR (G1) Deployment Summary

One of the acoustic units is fitted with a pyrolease unit and the other unit is fitted with a burnwire mechanism. Both acoustics were successfully monitored to the seabed.

CONCLUSIONS

All of the cruise objectives were fully achieved despite the tight time schedule between the recovery and re-deployment of the Inverted Echo Sounder.

APPENDIX 1 – IES/BPR TECHNICAL INFORMATION

IES/BPR (ICE1) RECOVERY INFORMATION

Location details	*Latitude*	*63°22.042' N*
	Longitude	*036°04.369' W*
	Depth	*2180m*

On station	-	10.08 GMT on 18/8/1997
Released from the seabed	-	10.12 GMT
On the surface	-	11.07 GMT
Sea Temperature	-	10.4°C
Air Temperature	-	9.5°C
Barometric Pressure	-	1002.2 mbar

Acoustics fitted were 46428 (Rx 14.5 kHz, Tx 12.0 kHz, Release D) and 46457 (Rx 15.0 kHz, Tx 12.0 kHz, Release B). The release command was transmitted to acoustic 46428. The release command was not transmitted to the other unit since the pyrolease is to be re-used.

Logger Information

Timebase scan	
Expected scan	Actual scan
21.30.00 GMT on 18/8/1997	21.29.00 GMT

Timebase is 60 seconds fast.

Data downloaded to Iceland.raw.

Data Arrangement

The raw data are made up of six data columns.

Column	Data
1	Time
2	Date
3	Temperature (DQ36573)
4	Pressure (DQ36753)
5	Temperature (DQ38175)
6	Pressure (DQ38175)

Inverted Echo Sounder

The IES was not pinging due to the hard disk being full of data.

IES Real Time Clock	Actual Time
17.03.07	17.12.15 GMT

IES/BPR (UK1/IES) DEPLOYMENT INFORMATION

Location details	-	*Latitude*	*63°28.730' N*
		Longitude	*036°17.870' W*
		Depth	*1991m*

On station	-	09.15 GMT on 18/1/98
Released into the water	-	09.29 GMT
On seabed	-	10.12 GMT

The deployment went very smoothly with a calm sea. The IES was monitored to the seabed using both sets of acoustics and communication was excellent.

Acoustic Information	-	XT 6000 Acoustics, S/N 47166 Rx 13.5 kHz, Tx 12.0 kHz, Release B
	-	XT6000 Acoustics, S/N 58172 Rx 14.0 kHz, Tx 12.0 kHz, Release A
Radio Beacon	-	N/A

No radio beacon is fitted to this frame, however there is a Benthos flashing light.

Logger	-	SSDL 4
<u>Logger Information</u> Sensors	-	QT 119016 DQ 38173 DQ 46279

Timebase Channels			
1	-	Temperature	QT 119016
2	-	Pressure	
3	-	Temperature	DQ 38173
4	-	Pressure	
5	-	Temperature	DQ 46279
6	-	Pressure	

Sensor Frequencies			
QT 119016	-	Temperature	- 45.096 kHz
	-	Pressure	- 21.561 kHz
DQ 38173	-	Temperature	- 169.961 kHz
	-	Pressure	- 33.357 kHz
DQ 46279	-	Temperature	- 172.430 kHz

- Pressure - 32.851 kHz

SSDL 4 timebase started at 16.15.00 GMT on 13/8/1997
First scan at 16.30.00 GMT on 13/8/1997

Battery Voltages
Logger - 13.54 V

Inverted Echo Sounder Information
IES - Chirp IES with POL ADC Board
Hard disk size 540Mb

The IES was powered up and the time set to 16.00.00 GMT on 14/8/1997

IES parameters -

Chirp Interval	240 minutes
Samples / Datafile	1
Sampling Rate	Fast
Lockout Time	0
Start File	1
Serial Number	5
Deployment Number	3

First Chirp at 20.00.00 GMT on 14/8/1997

IES/BPR (G1/IES) DEPLOYMENT INFORMATION

Location details	-	*Latitude*	*63°21.970' N*
		Longitude	*036°03.880' W*
		Depth	*2209m*

On station	-	11.35 GMT on 18/1/98
Released into the water	-	11.46 GMT
On seabed	-	12.34 GMT

The deployment went very smoothly with a calm sea. The IES was monitored to the seabed using both sets of acoustics and communication was excellent.

Acoustic Servicing

S/N 46457 was converted from a pyro release to a Burnwire release.

Old battery voltage	-	Red	12.50V
		Orange	12.53V
New battery voltage	-	Red	14.36V
		Orange	14.36V
Burnwire release voltage	-	28.60V	

S/N 46428			
Old battery voltage	-	Red	12.35V
		Orange	12.33V
New battery voltage	-	Red	14.29V
		Orange	14.29V

Acoustic Information	-	XT 6000 Acoustics, S/N 46457 Rx 15.0 kHz,.Tx 12.0 kHz, Release B
	-	XT6000 Acoustics, S/N 46428 Rx 14.5kHz, Tx 12.0 kHz, Release D

Acoustic 46457 is fitted with a Burnwire release and 46428 is fitted with a pyrolease mechanism.

Radio Beacon	-	Novatek 154.585 MHz
Logger	-	SSDL 5
Logger Information		
Sensors	-	DQ 36573 DQ 38175

Timebase Channels			
1	-	Temperature	DQ 36573
2	-	Pressure	
3	-	Temperature	DQ 38175
4	-	Pressure	

Sensor Frequencies			
DQ 36573	-	Temperature	- 170.8 kHz
	-	Pressure	- 32.7 kHz
DQ 38175	-	Temperature	- 170.45 kHz
	-	Pressure	- 33.3 kHz

SSDL 5 timebase started at 01.30.00 GMT on 19/8/1997
First scan at 01.45.00 GMT on 19/8/1997

Battery Voltages		
Logger	-	14.23 V

<u>Inverted Echo Sounder Information</u>		
IES	-	Chirp IES with LDEO ADC Board Hard disk size 540Mb

The IES was powered up and the time set to 00.00.00 GMT on 19/8/1997

IES parameters	-	Chirp Interval	240 minutes
		Samples / Datafile	1
		Sampling Rate	Fast
		Lockout Time	0
		Start File	1
		Serial Number	10
		Deployment Number	3

First Chirp at 04.00.00 GMT on 19/8/1997

MAP OF IES/BPR DEPLOYMENT POSITIONS

GLOSSARY

ADC	-	Analogue to Digital Converter
BPR	-	Bottom Pressure Recorder
CTD	-	Conductivity, Temperature and Depth Profiler
DSOW	-	Denmark Strait Overflow Water
EPROM	-	Erasable Programmable Memory
IES	-	Inverted Echo Sounder
LDEO	-	Lamont Doherty Earth Observation Unit
MAFF	-	Ministry of Agriculture, Fisheries and Food
POL	-	Proudman Oceanographic Laboratory
VEINS	-	Variability of Exchanges in Northern Seas