

**PROUDMAN OCEANOGRAPHIC LABORATORY**

**CRUISE REPORT NO. 37**

**VEINS:  
Inverted Echo Sounders in the Denmark Strait**

**As part of**

**FS POSEIDON 263**

**AUGUST 3, 2000 – AUGUST 22, 2000**

**G.W. Hargreaves**

**2000**

## DOCUMENT DATA SHEET

AUTHOR G.W. HARGREAVES	PUBLICATION DATE 2000
TITLE VEINS: Inverted Echo Sounders in the Denmark Strait, as part of, FS Poseidon 263, August 3, 2000 – August 22, 2000	
REFERENCE Proudman Oceanographic Laboratory, Cruise Report, No 37, 9pp	
ABSTRACT <p>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 at longer time scales.</p> <p>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.</p> <p>A combined Inverted Echo Sounder and Bottom Pressure Recorder was successfully recovered and re-deployed in the Denmark Strait to measure the thickness of this cold dense water and thus determine transport.</p>	
ISSUING ORGANISATION <b>Proudman Oceanographic Laboratory</b> <b>Bidston Observatory</b> <b>Birkenhead</b> <b>Merseyside</b> <b>L43 7RA</b> <b>UK</b> <b>Director: Dr A.E Hill</b>	TELEPHONE: <b>(0151) 653 8633</b>  FAX: <b>(0151) 653 6269</b>  TELEX: <b>628591 OCEAN BG</b>
KEYWORDS Bottom Pressure Recorder Denmark Strait Inverted Echo Sounder VEINS Sea Level Bottom Water North Atlantic	CONTRACT PROJECT 3310 M02001 PRICE £10.00

Copies of this report are available from:  
**The Library, Proudman Oceanographic Laboratory.**

# CONTENTS

CRUISE PERSONNEL .....	1
ACKNOWLEDGEMENTS.....	1
OVERVIEW .....	1
POL CRUISE OBJECTIVES .....	2
IES/BPR DEPLOYMENTS .....	2
Ship Preparation.....	2
RECOVERY OF IES/BPR (UK1/IES) 6/8/2000.....	2
IES/BPR (UK1/IES) Recovery Summary .....	2
DEPLOYMENT OF IES/BPR (UK1/IES) 9/8/2000.....	3
IES/BPR (UK1/IES) Deployment Information .....	3
CONCLUSIONS .....	3
APPENDIX 1 - BPR TECHNICAL INFORMATION.....	4
IES/BPR (UK1/IES) RECOVERY INFORMATION.....	4
Inverted Echo Sounder.....	5
IES/BPR (UK1/IES) DEPLOYMENT INFORMATION.....	6
MAP OF IES/BPR DEPLOYMENT POSITION.....	8
GLOSSARY .....	9

## **CRUISE PERSONNEL**

### **POL Personnel**

Scientific Officer

Geoff Hargreaves

### **CEFAS Personnel**

Senior Scientific Officer

John Read

### **IfMH Personnel**

Principal Scientific Officer

Udo Hübner

Norbert Verch

Klaus Schulze

Berit Rabe

Juliane Pestel

Hubertus Gass

Helmut Wüllner

### **FiMR Personnel**

Bert Rudels

## **ACKNOWLEDGEMENTS**

The author would like to thank the Captain, Officers and ship's company of FS Poseidon for their help in the deployment of sea level equipment in the Denmark Strait.

## **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 at 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 involves 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 its thickness, and hence get a value for transport for the DSOW, an Inverted Echo Sounder was deployed in 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 one Inverted Echo Sounders in the Denmark Strait.
- 2) To re-deploy one Inverted Echo Sounders in the Denmark Strait.

## **IES/BPR DEPLOYMENTS**

### **Ship Preparation**

POL personnel joined FS Poseidon at Reykjavik, Iceland on August 2, 2000. The equipment was loaded aboard the ship, unpacked and stowed safely.

## **RECOVERY OF IES/BPR (UK1/IES) 6/8/2000**

### **EVENTS**

10.54 GMT	Vessel on station.
10.56 GMT	Release command transmitted.
11.25 GMT	Released from the seabed.
12.07 GMT	On the surface.

Total time on station: 1 hour 13 minutes.

### IES/BPR (UK1/IES) Recovery Summary

Acoustic conditions were very good since the ship shut down the echo sounder and the propellers as soon as it was on station. Communication with both acoustic releases was definite and immediate. The release signal was transmitted to both burnwire release systems and the ship drifted whilst range readings were made to monitor for the moment of release. During ranging, it was clear that the burnwire releases had activated since for every single acoustic ping from the ship, five replies were received. The first reply indicated the range whilst the following four pings verified release activation. Even though the ship was drifting off station at between 0.5 -1.0 knots, indication of release from the ballast weight was clearly shown.

## **DEPLOYMENT OF IES/BPR (UK1/IES) 9/8/2000**

### **EVENTS**

16.43 GMT            Vessel on station.

16.45 GMT            Release into the water.

17.26 GMT            On the seabed.

Total time on station: 43 minutes.

### IES/BPR (UK1/IES) Deployment Information

The ship was acoustically very quiet, so it was possible to achieve excellent communication with both acoustic releases to the seabed.

### **CONCLUSIONS**

All of POL cruise objectives were achieved.

## APPENDIX 1 - BPR TECHNICAL INFORMATION

### IES/BPR (UK1/IES) RECOVERY INFORMATION

<i>Location details</i>	-	<i>Latitude</i>	<i>63 °28.58' N</i>
		<i>Longitude</i>	<i>036 °17.31' W</i>
		<i>Depth</i>	<i>2002m</i>
On station	-		10.54 GMT on 6/8/2000
Release command transmitted	-		10.56 GMT
Released from seabed	-		11.25 GMT
On surface	-		12.07 GMT

Acoustics fitted were 46457 (Rx 15.0 kHz, Tx 12.0 kHz, Release B) and 46428 (Rx 14.5 kHz, Tx 12.0 kHz, Release D). The release command was transmitted to both Burnwires. Both acoustic units had activated the release and this was indicated by five pings from the acoustic release every time a range reading was taken. After approximately half an hour, an indication was given that the frame had released from the seabed. Upon recovery of the frame onto the ship, it was discovered that the cathode lead of both burnwire mechanisms had corroded from its mounting and was being held in proximity to the Burnwire by silicon rubber and tape.

#### Logger

Timebase

Expected Scan

08.45.00 GMT on 8/8/2000

Actual Scan

08.45.47 GMT on 8/8/2000

Timebase is 47 seconds slow.

Data were downloaded to UK1BPR9900.RAW

#### Data Arrangement

The raw data are made up of six columns

<b>Column</b>	<b>Data</b>
1	Scan count
2	Time
3	Pressure (DQ 68486)
4	Temperature
5	Blank
6	Blank

## Inverted Echo Sounder

IES pinged at 08.08.28 on 7/8/2000.

The data were downloaded to UK1IES9900.IES.

Number of data files stored to disk was 4221. The IES was fitted with a Hitachi 1.4Gb disk drive and stored one sample per datafile. Sampling interval was 120 minutes and the sample length was 5409 milliseconds.

### Old Batteries

Acoustic release 46457	-	Orange 12.54V
		Red 12.57V
Acoustic release 46428	-	Orange 12.42V
		Red 12.43V
Burnwire 46457	-	26.6V
Burnwire 46428	-	26.7V
IES logger battery (pack 1)	-	Orange 12.96V
		Red 12.94V
IES logger battery (pack 2)	-	Orange 12.95V
		Red 12.95V
IES logger battery (pack 3)	-	Orange 12.47V
		Red 12.48V
IES transponder battery (pack 4)	-	Orange 12.22V
		Red 12.22V

## IES/BPR (UK1/IES) DEPLOYMENT INFORMATION

*Location details* - *Latitude* 63 °28.54' N  
*Longitude* 036 °17.28' W  
*Depth* 1998m

On station - 16.43 GMT on 9/8/2000  
Released into the water - 16.45 GMT  
On seabed - 17.26 GMT

### Acoustic Information

Benthos XT6000 46428 - Rx 14.5 kHz, Tx 12.0 kHz, Release D  
Benthos XT6000 46457 - Rx 15.0 kHz, Tx 12.0 kHz, Release B  
Both of the acoustic units are using a burnwire release mechanism.

### Logger

Logger SSDL 5 with sensors DQ 36573 and DQ 38175  
Timebase started 13.45.00 GMT on 4/8/2000  
First scan at 14.00.00 GMT on 4/8/2000

### Inverted Echo Sounder

IES fitted with POL ADC board and Hitachi 1.4GB disk drive.  
IES started at 13.59.40 GMT on 7/8/2000.  
First chirp at 15.59.58 GMT on 7/8/2000.

### Set-up parameters

Chirp interval - 120 minutes  
Sample rate - fast  
Samples per datafile - 1  
Lockout (1/100s) - 0  
Start file number - 1  
Serial number - 5  
Deployment number - 6  
Comment - UK1/IES Denmark Strait 2000 - 2001

### Important Timing Information

There is a measure of uncertainty as to the absolute timings of the logger and the Inverted Echo Sounder. Both the logger and the IES were started using a wristwatch that had been set to the ship's GPS clock. The watch was reset to the ship's clock on 7/8/2000 in order to start the IES. The next day, the watch and the ship's clock were compared and found to differ by 26 seconds. The error was not caused by a severe drift in the wristwatch since the IES chirp maintained time with the watch, but was 26 seconds behind the ship's clock.

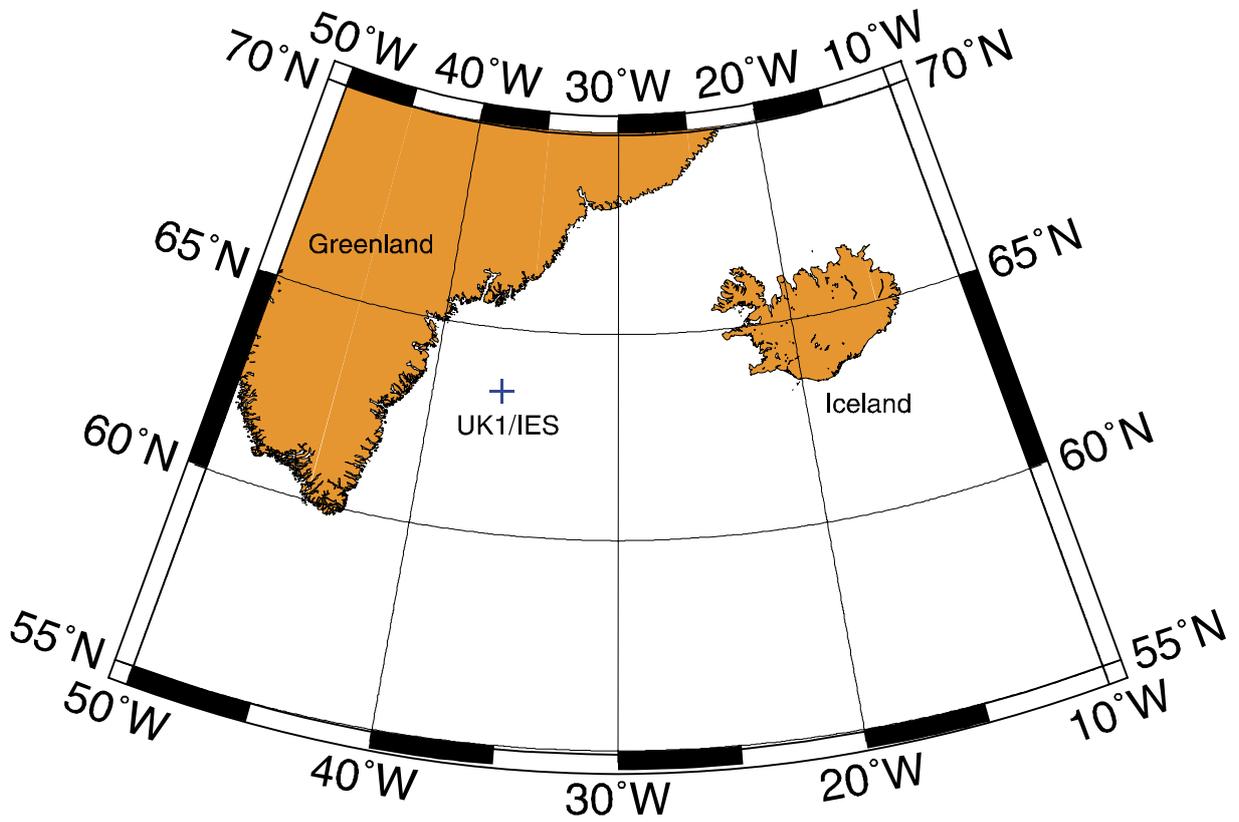
### Recovery Equipment

Benthos Radio Beacon - 154.585 MHz, Channel A

New Battery Information

Acoustic release 46457	-	Orange 14.54V
		Red 14.52V
Acoustic release 46428	-	Orange 14.53V
		Red 14.53V
Burnwire 46457	-	28.6V
Burnwire 46428	-	28.5V
IES logger battery (pack 1)	-	Orange 14.14V
	-	Red 14.17V
IES logger battery (pack 2)	-	Orange 14.17V
	-	Red 14.15V
IES logger battery (pack 3)	-	Orange 14.16V
	-	Red 14.10V
IES transponder battery (pack 4)	-	Orange 14.17V
	-	Red 14.17V

# MAP OF IES/BPR DEPLOYMENT POSITION



## GLOSSARY

ADC	-	Analogue to Digital Converter
BPR	-	Bottom Pressure Recorder
CEFAS	-	Centre for the Environment, Fisheries and Aquaculture Science
CTD	-	Conductivity, Temperature and Depth Profiler
DSOW	-	Denmark Strait Overflow Water
EPROM	-	Erasable Programmable Memory
FiMR	-	Finnish Institute of Marine Research
GMT	-	Greenwich Mean Time
IES	-	Inverted Echo Sounder
IfMH	-	Institut für Meereskunde, Hamburg University
POL	-	Proudman Oceanographic Laboratory
VEINS	-	Variability of Exchanges in Northern Seas