NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF GEOLOGICAL SCIENCES

CONTINENTAL SHELF DIVISION

Report No. 126

The MOIST Seismic Data Package

by

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1. INTRODUCTION

The British Institutions' Reflection Profiling Syndicate (BIRPS) was initiated at a meeting of the Royal Society's Explosion Seismology Working Group in February 1980. An ad hoc committee was set up to prepare a research programme for consideration by the Natural Environment Research Council (NERC) Deep Geology Committee. The NERC Council agreed in February 1981 to support the BIRPS programme in principle. Funds were made available during 1981 for data acquisition and processing of a seismic reflection profile along a line off the north coast of Scotland from the Pentland Firth westwards to north of the Hebrides (see Figure 1).

The aim of the project was to study the geometry of the deep sections of the Moine and Outer Isles Thrusts (hence the acronym MOIST) as well as the nature of the moho. The position of the line was defined following a study of seismic, gravity and magnetic data in the area. A specification for the project was drawn up and submitted to commercial seismic contracting companies along with an invitation to tender for the work. Following a review of tenders received a contract was awarded to Western Geophysical to conduct the survey and process the data using the acquisition and processing parameters described below.

The work of BIRPS is funded through the Deep Geology Committee of the NERC. An advisory committee (BIRPSAC) reviews the annual programme of work in terms of the scientific merit of projects proposed by universities and institutions. A BIRPS core group has now been set up at Cambridge (Director: Dr D H Matthews) to co-ordinate the work of the Syndicate. All data acquired as part of the BIRPS programme are retained for processing by the BIRPS Core Group and their associates for a period of up to 12 months from the date of acquisition. The processed data are then archived with the Marine Geophysics Unit of the Institute of Geological Sciences with whom the responsibility rests to make them generally available subject to the cost of reproduction and handling where appropriate. The data now released is the first such package.

2. SURVEY SUMMARY

2.1 Operational details

The survey consisted of one line running from the Pentland Firth to 30km NW of the Butt of Lewis, a total of 181km. The line comprised three straight line segments to allow the line to be run close to and parallel to the coast to improve correlation with the known land geology. It was run, however, sufficiently far offshore to minimise side swipe interference from charted coastal features. The line segments were planned such that the angles were small enough to allow the profile to be shot as one continuous line.

The survey was conducted by Western Geophysical Company of America who also carried out the data processing. The line was shot by the m.v. Western Arctic between 23rd and 25th March 1981, but had to be completed in three sections owing to failures of the seismic source.

Position fixing was achieved using an integrated satellite navigation system incorporating a bottom tracking doppler sonar. This was interfaced to the airgun firing synchroniser via the navigation computer to control the shot interval.

2.2 Acquisition parameters

Energy source : 16 gun tuned array of 905 cubic inches capacity operating at 4500 psi pressure towed at a depth of 12m.

Coverage : 30 fold.

Shot interval : 50m.

Cable : 60 sections of 50m groups with a 50m group interval of total length 3000m towed at a depth of 15 ± 2m.

Recording system: 60 channel recording on DFS V IFP in SEG B Format at 1600 bpi.

Record length : 15 seconds.

Sample rate : 4 ms.

Recording filters: Lo Cut 5.3Hz/18dB/Octave
Hi Cut 90Hz/72dB/Octave.

2.3 Processing parameters

Processing sample rate: 4 ms.

Receiver array simulation	: 3 Group mix weighted 1·1·1.
Deconvolution before stack	: Minimum predictive lag 32 ms, operator length 200 ms, window length 9000 ms. Trace balance on output.
Velocity analysis	: Matrix VELAN at 3km interval using 4 CDP families per analysis.
Source array simulation	: 5 Shot mix weighted 1·2·2·2·1.
Stack	: 30 fold NMO stack with far trace mute.
CDP interval	: 25m.
Deconvolution after stack	: Minimum predictive lag 80 ms, operator length 200 ms, window length 3000-9000 ms. Trace balance on output.
Time variant filter	: At 0 s 10-40Hz; at 3 s 6-32Hz; at 11 s 5-25Hz, interpolation applied between control points; between 11 and 15 s, 5-25Hz unvaried.
Scaling	: RMS gain by increasing zones of 64-1024 ms. Only applied to equalised display.
Display	: Variable area/wiggle trace mode. Compression pulses plot as troughs (white).

3. AVAILABLE DATA FROM MOIST PROJECT

Seismic Sections

Equalised stacked sections at the following scales:

10cm/s	vertical scale	1:25 000 horizontal scale.
5 cm/s	vertical scale	1:50 000 horizontal scale.
2.5cm/s	vertical scale	1:100 000 horizontal scale.

True amplitude stacked sections at the following scales:

10cm/s	vertical scale	1:25 000 horizontal scale.
5 cm/s	vertical scale	1:50 000 horizontal scale.
2.5cm/s	vertical scale	1:100 000 horizontal scale.

Time migrated stacked section at 3.5cm/s vertical scale. 1:100 000 horizontal scale.

The migrated section was produced by Shell Expro London. We gratefully acknowledge their permission to include it in the data set.

Shot point maps

Maps are available produced on UTM Projection, International Spheroid at the following scales:

1:100 000
1:250 000

Reports

Contractor's acquisition report.
Contractor's processing report.
Operations report - MGU report No. 123.

Magnetic Tapes

Field tapes in SEG B format 1600 bpi.
Final equalised stack tapes in SEG Y format 1600 bpi.
Intermediate processing tapes in Code 4 format.
Shot point positioning tape in UKOOA format 1600 bpi.

Other Data

VELAN velocity analyses at 3km intervals.

Shot monitor records produced on a 30-channel camera at ½km intervals.

Observers logs.

Depth corrected line drawing of interpreted reflectors at a 1:250 000 scale.

4. SCHEDULE OF CHARGES

The data from this project are available in two basic packages:

Package A

One dyeline paper copy of each of the following:-

Equalised stacked section at 5cm/s vertical scale.
1:50 000 horizontal scale.

Equalised stacked section at 2.5cm/s vertical scale.
1:100 000 horizontal scale.

True amplitude stacked section at 5cm/s vertical scale.
1:50 000 horizontal scale.

True amplitude stacked section at 2.5cm/s vertical scale.
1:100 000 horizontal scale.

Migrated stacked section at 3.5cm/s vertical scale.
1:100 000 horizontal scale.

Depth corrected line drawing of interpreted reflectors at a 1:250 000 scale.

Shot point location maps on UTM projection at 1:250 000 scale.

One bound copy of the Summary Survey Report

Total cost....£25

Package B

One dyeline copy on transparent material of the seismic sections and shot point location maps of Package A plus one transparent copy set of the shot point location maps on UTM projection at 1:100 000 scale.

One bound copy of the Summary Survey Report.

Total cost...£100

Additional data

Copies of data not included in the above packages can be made available upon request. Such requests should be sent to IGS at the address below and these will be individually costed depending upon the specific requirement.

Requests for supply of these data should be submitted to:-

Head of Marine Geophysics Unit
Institute of Geological Sciences
Murchison House
West Mains Road
Edinburgh EH9 3LA

Telex: 727343.

Payment should be made out to NERC and should be sent with the order to Marine Geophysics Unit, IGS at the above address.

Accompanying each data set will be a list of all previous purchases of MOIST data. Research groups are advised to contact the BIRPS Core Group before embarking on a research programme based on these data for information on whether similar work is already being carried out by another organisation.

BIRPS Core Group
Department of Earth Sciences
University of Cambridge
Bullard Laboratories
Madingley Rise
Madingley Road
Cambridge CB3 OEZ

Telephone: (0223) 51686

Director: Dr D H Matthews.

5. CONDITIONS OF SALE

1. These data will remain subject to NERC Copyright. The Council reserves all rights to future sales of the data.

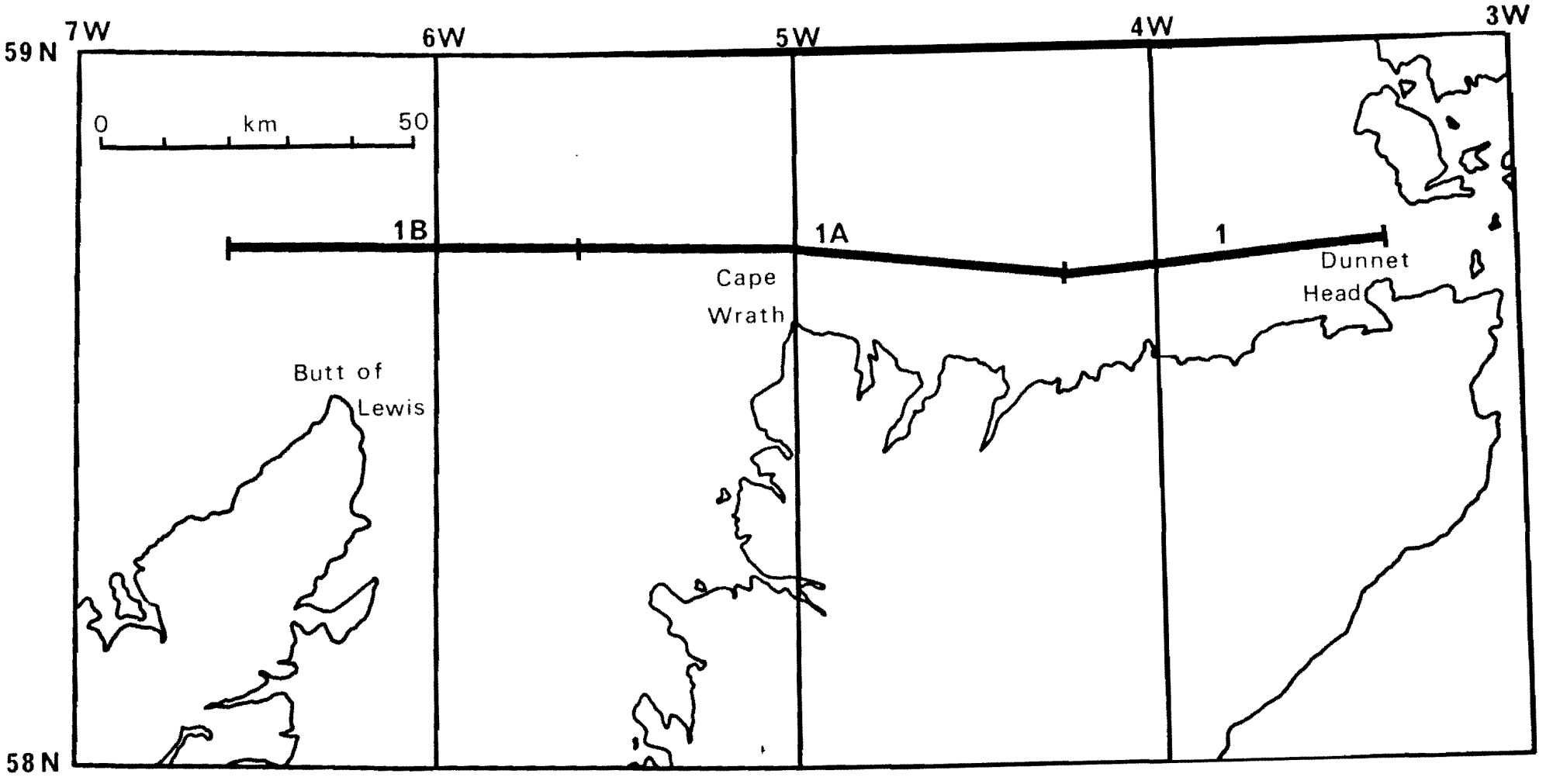
2. No data shall be incorporated into any publication or open-file report without informing the British Institutions' Reflection Profiling Syndicate Advisory Committee (BIRPSAC).

   Before submission to the publisher a copy of the paper should be sent either to the Director of BIRPS Core Group, Dr D H Matthews in Cambridge, or to the Chairman of BIRPSAC, Professor D J Blundell at the following address:-

   Professor D J Blundell
   Chelsea College
   University of London
   Department of Geology
   552 King's Road
   London SW10 OUA.

3. Full acknowledgement should be given to the source of the data used, in any publication or report. The form of acknowledgement should be as follows:-

   'Seismic reflection data along the MOIST line were provided by the British Institutions' Reflection Profiling Syndicate (BIRPS) under the authority of the Deep Geology Committee of the Natural Environment Research Council'.



Map showing location of the MOIST profile