

M. I. A. S.

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I.O.S.

R V Sarsia CRUISE 2/77

1 - 13 March 1977

Current velocity and sand transport measurements  
carried out in Start Bay, South West England

Cruise Report No. 63  
1977

NATURAL ENVIRONMENT  
INSTITUTE OF OCEANOGRAPHIC SCIENCES  
RESEARCH COUNCIL

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RV SARSIA CRUISE 2/77

1 - 13 March 1977

Current velocity and sand transport measurements  
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CRUISE REPORT NO 63

1977

Institute of Oceanographic Sciences  
Crossway  
Taunton  
Somerset

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SCIENTIFIC STAFF

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G Le Good	"	
Dr A P Salkield	1 March - 7 March	
M R Lees	"	
A J Marks	7 March - 13 March	
P Arrigoni	"	
D N Langhorne	8 March	
J O Malcolm	"	
E J Moore	"	
P Hardcastle	"	

SHIP'S OFFICERS

E Dowell	Master
N Bryant	1st Mate
I Jude	Fishing Mate

## OBJECTIVES

The cruise was intended to be part of a programme investigating the turbulence characteristics and velocity profiles in the boundary layer and the threshold and transport of sand. Previous experiments have been reported in IOS Cruise Reports 30, 38, 44. The objectives of this cruise were:

1. Comparative measurements of sand transport between sand impact probe, self-generated noise, underwater TV observations, pumped sampling and an optical siltmeter.
2. Velocity profile measurements concentrating on (a) measurements on the accelerating part of the tidal cycle, (b) measurements at 8 levels throughout the water depth to examine the boundary layer thickness.
3. Deployment of a Marconi current meter system in the trough of sand wave on the Skerries Bank for D N Langhorne.

## RESULTS

The cruise can be considered only a partial success as effectively five days were lost because of bad weather. However the first week was fairly calm weather and measurements over several tidal cycles were successfully made at Position 1 in Start Bay. The beginning of the cruise coincided with Neap tides. At that time little sediment movement was seen, but later in the week as the Spring tides were approached, more sediment movement was measured. The comparative measurements between the different methods of measuring sand transport will be useful in providing qualitative information for further instrument development. Though quantitative measurements were obtained from the pumped sampling system, these will be of most use in conjunction with the velocity profile measurements. Velocity profiles were successfully measured at seven levels in the water column. The bottom four rotors were attached to a bottom mounted rig. The other three rotors were suspended from the ship. Because of the interference of the ship with the flow, no measurements were completed within 5m of the water surface. In future, however, the heights of the suspended current meters must be determined more accurately than was possible using the echo sounder depth. The velocity profile measurements will provide useful additional data on the hysteresis in the drag coefficients during a tidal cycle, and, by comparison with the videotaped television pictures, the threshold of sand movement.

Because of the bad weather the Marconi current meter system could not be laid. However two Plessey current meter moorings were recovered, one being repositioned

as a marker in an area of diver transponders. The Marconi system was laid subsequently. A synopsis of the itinerary is included in Appendix I.

#### INSTRUMENTATION

The bottom mounted rig was the same one used on previous cruises. Four Braystoke rotors were mounted at heights of 15, 40, 100 and 180 cm and four pumped sampling nozzles at heights of 10, 15, 40 and 60 cm., though only the bottom one was used.

Originally four and later three Braystoke DRCM's were suspended from the ship. For all except the first run, the depths were 5m, 9m and 12m beneath the water surface.

On the bottom rig there was also a Plessey hydrophone in a hemispherical reflector for measuring the noise created by the moving sediment, an impact probe for measuring the sand grains in suspension, an Instanter optical siltmeter and the Hydro Products underwater television.

#### INSTRUMENT PERFORMANCE

The Braystoke current meters worked satisfactorily throughout apart from occasional weed and handling damage to those mounted on the bottom rig. Some trouble was experienced in handling four DRCM's over the side and the number was consequently reduced to three which could be handled relatively easily. One channel of the Braystoke interface created occasional additional counts on all the channels. The reason for this was never satisfactorily explained.

Flow noise gave considerable interference on both the impact probe and the hydrophone. The noise was considerably reduced on the latter by enclosing the sensor in a perforated plastic bag, but a more streamlined system will be necessary in future. The spectrum of noise obtained in relation to the size of the mobile sand compared well with laboratory measurements.

Vibration caused considerable noise on the impact probe. However, there was a good qualitative comparison between the sand movement observed on the television and that recorded by the impact probe.

The optical siltmeter sensor flooded with water and was never working satisfactorily.

The videotape recorder produced rather unsatisfactory recordings because of changes in the frequency of the ship's electrical supply despite installation of a new scientific generator. In future a convertor will be required to provide a constant frequency supply.

## SHIP'S PERFORMANCE

RV Sarsia performed extremely well in the fore and aft anchored experiments. On one occasion the rig and the DRCM array became entangled, and on another the rig fouled the stern anchor. Also all three anchors became crossed but were freed without difficulty. In general, provided special care was taken as the tide changed, no trouble was experienced.

The manifold on the bow-thruster cracked and had to be re-welded. This, however, happened on a day when the weather was too bad for the ship to put out of port anyway and no delay occurred.

## ACKNOWLEDGEMENTS

We are extremely grateful to Captain E Dowell, the Officers and Crew of RV Sarsia for their help and unstinted co-operation in making the cruise a success. We are also grateful to Dr E Denton, Director of the Marine Biological Laboratory, for permission to carry out this work on RV Sarsia.

## APPENDIX I

### Synopsis

Tuesday 1 March	Personnel arrived at Millbay Docks, Plymouth and loaded RV Sarsia. 1430 Ship moved to a berth in the outer basin.
Wednesday 2 March	Calm. 0830 Sailed for Start Bay. 1230 Anchored Start Bay Position 1 (Decca Red B4.35, Freen A75.2) in 16 $\frac{1}{2}$ m water depth. Tested equipment. Braystoke interface not working properly. Overnight at anchor Position 1.
Thursday 3 March	Calm. 1000 Sailed for Dartmouth to collect electronics spares. 1100 Anchored off Dartmouth. 1345 Sailed for Position 1. Started experiments. Overnight at anchor Position 1.
Friday 4 March	Westerly 3 - 4. Experiments continued. Overnight at anchor at Position 1.
Saturday 5 March	Westerly 2 - 3. Experiments continued. Overnight anchor at Position 1.

Sunday  
6 March South easterly 2 - 3. Low Swell. Experiments continued.  
1615 Sailed for Dartmouth.  
1800 Berthed Kingswear.

Monday  
7 March Crew leave day and scientist changeover.

Tuesday  
8 March Southerly 7. 1015 Sailed Kingswear. Recovered two current  
meter frames and moorings. . Relaid one on transponder range.  
1600 Berthed Kingswear. Cracked bow thruster manifold taken  
to Shipyard.

Wednesday  
9 March Southerly 8.  
2100 Repaired manifold delivered and fitted.

Thursday  
10 March Southerly 8.  
Storm-bound in Kingswear.

Friday  
11 March SSW 7.  
0900 Sailed from Kingswear for Position 1. Conditions bad.  
1100 Berthed at Kingswear  
1500 On improved weather forecast sailed from Kingswear.  
1630 Anchored close to Hallsands. Heavy swell.

Saturday  
12 March South Westerly 3 - 4.  
0900 Anchored Position 1. Started experiments. Moderate swell  
running. Wind Southerly 6. Bad forecast.  
1600 Up anchor. Echo sounding over Position 1. Sailed for  
Plymouth.  
2400 Berthed Plymouth.

Sunday  
13 March Dismantled equipment. Returned to Taunton 1400.

CRUISE REPORTS

RRS DISCOVERY

CRUISE NO

REPORT NO

1 JUN - AUG 1963  
 2 AUG - DEC 1963  
 3 DEC 1963 - SEP 1964

1\*  
 2\*  
 3\*

NIO CR\*\*

4 FEB - MAR 1965  
 10 TO  
 37 NOV - DEC 1970  
 38 JAN - APR 1971  
 39 APR - JUN 1971  
 40 JUN - JUL 1971  
 41 AUG - SEP 1971  
 42 SEP 1971  
 43 OCT - NOV 1971  
 44 DEC 1971  
 45 FEB - APR 1972  
 46 APR - MAY 1972  
 47 JUN - JUL 1972  
 48 JUL - AUG 1972  
 49 AUG - OCT 1972  
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54 JUN - AUG 1973  
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 57 NOV - DEC 1973  
 58 DEC 1973  
 59 FEB 1974  
 60 FEB - MAR 1974  
 61 MAR - MAY 1974  
 62 MAY - JUN 1974  
 63 JUN - JUL 1974  
 64 JUL - AUG 1974  
 65 AUG 1974  
 66 AUG - SEP 1974  
 68 NOV - DEC 1974  
 69 JAN - MAR 1975  
 73 JUL - AUG 1975  
 74/1+3 SEP - OCT 1975  
 74/2  
 75 OCT - NOV 1975  
 77 JUL - AUG 1976  
 78 SEP - OCT 1976  
 79 OCT - NOV 1976  
 82 MAR - MAY 1977  
 83 MAY - JUN 1977  
 84 JUN - JUL 1977  
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 87 OCT 1977  
 88 OCT - NOV 1977  
 89 NOV - DEC 1977  
 90 JAN - MAR 1978  
 91 MAR 1978

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\* REPORTS 1 TO 3 WERE PUBLISHED AND DISTRIBUTED BY THE ROYAL SOCIETY FOLLOWING THE INTERNATIONAL INDIAN OCEAN EXPEDITION

\*\* NIO CR: NATIONAL INSTITUTE OF OCEANOGRAPHY, CRUISE REPORT

\*\*\* IOS CR: INSTITUTE OF OCEANOGRAPHIC SCIENCES, CRUISE REPORT

CRUISE REPORTS  
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CRUISE DATES

REPORT NO

RRS "CHALLENGER"

AUG - SEP 1974  
MAR - APR 1976

IOS CR 22  
IOS CR 47

RV "EDWARD FORRES"

OCT 1974  
JAN - FEB 1975  
APR 1975  
MAY 1975  
MAY - JUN 1975  
JUL 1975  
JUL - AUG 1975  
AUG - SEP 1975  
AUG - SEP 1975  
FEB - APR 1976  
APR - JUN 1976  
MAY 1976

IOS CR 15 X  
IOS CR 19  
IOS CR 23  
IOS CR 32  
IOS CR 28  
IOS CR 31  
IOS CR 36  
IOS CR 41  
IOS CR 44  
IOS CR 48  
IOS CR 50  
IOS CR 53

RRS "JOHN MURRAY"

APP - MAY 1972  
SEP 1973  
MAY - APR 1974  
OCT - NOV  
R DEC 1974  
APR - MAY 1975  
APR 1975  
OCT - NOV 1975  
AUG - OCT 1975  
OCT - NOV 1976  
MAR - APR 1977

NIO CR 51  
IOS CR 7  
IOS CR 9  
  
IOS CR 21  
IOS CR 25  
IOS CR 39  
IOS CR 40  
IOS CR 42  
IOS CR 53  
IOS CR 66

NC "MARCEL BAYARD"

FEB - APR 1971

NIO CR 44

MV "RESEARCHER"

AUG - SEP 1972

NIO CR 60

RV "SARSIA"

MAY - JUN 1975  
AUG - SEP 1975  
MAR - APR 1976

IOS CR 30  
IOS CR 38  
IOS CR 44

RRS "SHACKLETON"

AUG - SEP 1973  
JAN - FEB 1975  
MAR - MAY 1975  
FEB - MAR 1975  
JUL - AUG 1975  
JUN - JUL 1976  
OCT - NOV 1976  
JUL 1977

IOS CR 3  
IOS CR 18  
IOS CR 24  
IOS CR 29  
IOS CR 37  
IOS CR 45  
IOS CR 49  
IOS CR 62

MV "SURVEYOR"

FEB - APR 1971  
JUN 1971  
AUG 1971

NIO CR 38  
NIO CR 39 X  
NIO CR 42 X

DE "VICKERS VOYAGER" AND "PISCES III"

JUN - JUL 1973

IOS CR 1