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 RESEARCH COUNCIL
INSTITUTE OF OCEANOGRAPHIC SCIENCES

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Institute of Oceanographic Sciences
Crossway
Taunton
Somerset

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SCIENTIFIC STAFF

Dr K R Dyer	1 March - 13 March	(Principal Scientist)
R L Soulsby	"	
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	Personnel arrived at Millbay Docks, Plymouth and loaded
1 March	RV Sarsia.
	1430 Ship moved to a berth in the outer basin.
Wednesday	Calm. 0830 Sailed for Start Bay.
2 March	1230 Anchored Start Bay Position 1 (Decca Red B4.35, Freen A75.2) in 16½m water depth.
	Tested equipment. Braystoke interface not working properly.
	Overnight at anchor Position 1.
Thursday	Calm. 1000 Sailed for Dartmouth to collect electronics spares.
3 March	1100 Anchored off Dartmouth.
	1345 Sailed for Position 1.
	Started experiments. Overnight at anchor Position 1.
Friday	Westerly 3 - 4.
4 March	Experiments continued. Overnight at anchor at Position 1.
Saturday	Westerly 2 - 3.
5 March	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	1*
2	AUG - DEC 1963	2*
3	DEC 1963 - SEP 1964	3*
		NIO CR**
4	FEB - MAR 1965	4
TO	TO	TO
37	NOV - DEC 1970	37
38	JAN - APR 1971	41
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55	SEP - OCT 1973	5
56	OCT - NOV 1973	4
57	NOV - DEC 1973	6
58	DEC 1973	4
59	FEB 1974	14
60	FEB - MAR 1974	8
61	MAR - MAY 1974	10
62	MAY - JUN 1974	11
63	JUN - JUL 1974	12
64	JUL - AUG 1974	13
65	AUG 1974	17
66	AUG - SEP 1974	20
68	NOV - DEC 1974	16
69	JAN - MAR 1975	51
73	JUL - AUG 1975	34
74/1+3	SEP - OCT 1975	35
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91	MAR 1978	69

* 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

CRUISE DATES	REPORT NO
RRS "CHALLENGER"	
AUG - SEP 1974	IOS CR 22
MAR - APR 1976	IOS CR 47
RV "EDWARD FORBES"	
OCT 1974	IOS CR 15 X
JAN - FEB 1975	IOS CR 19
APR 1975	IOS CR 23
MAY 1975	IOS CR 32
MAY - JUN 1975	IOS CR 28
JUL 1975	IOS CR 31
JUL - AUG 1975	IOS CR 36
AUG - SEP 1975	IOS CR 41
AUG - SEP 1975	IOS CR 44
FEB - APR 1976	IOS CR 48
APR - JUN 1976	IOS CR 50
MAY 1976	IOS CR 53
RRS "JOHN MURRAY"	
APR - MAY 1972	NIO CR 51
SEP 1973	IOS CR 7
MAY - APR 1974	IOS CR 9
OCT - NOV & DEC 1974	IOS CR 21
APR - MAY 1975	IOS CR 25
APR 1975	IOS CR 39
OCT - NOV 1975	IOS CR 40
AUG - OCT 1975	IOS CR 42
OCT - NOV 1976	IOS CR 53
MAR - APR 1977	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	IOS CR 30
AUG - SEP 1975	IOS CR 38
MAR - APR 1976	IOS CR 44
RRS "SHACKLETON"	
AUG - SEP 1973	IOS CR 3
JAN - FEB 1975	IOS CR 18
MAR - MAY 1975	IOS CR 24
FEB - MAR 1975	IOS CR 29
JUL - AUG 1975	IOS CR 37
JUN - JUL 1976	IOS CR 45
OCT - NOV 1976	IOS CR 49
JUL 1977	IOS CR 62
MV "SURVEYOR"	
FEB - APR 1971	NIO CR 38
JUN 1971	NIO CR 39 X
AUG 1971	NIO CR 42 X
DE "VICKERS VOYAGER" AND "PISCES III"	
JUN - JUL 1973	IOS CR 1