"SQUILLA" CRUISE 15, 16 JUNE 1981. SAR-580, EDDYSTONE PROJECT.

Data Report for Experiment 32GB at Site GB-26, Eddystone

Introduction

This experiment is concerned with the imaging of ocean waves by SAR and was carried out in the Western English Channel in the vicinity of the Eddystone Lighthouse on 15 June 1981.

SAR-data

The SAR-580 programme consisted of a number of passes along the three swaths shown in Figure 1. The swaths were imaged by flying along the long axis of the rectangular swaths in both directions. Imagery was made in X and C-bands, the radar being optimised for C-band operation, using both VV and HH modes.

It was originally planned to start the imaging passes at 1130 BST and continue until about 1700 BST. However, due to operational problems the aircraft did not arrive until about 1730 BST. Flying continued until about 2030 BST.

Surface-truth data

The essential requirements were for information about the height, direction and wavelength of the waves and also the wind-speed and direction.

Directional Wave Measurements

The main wave measuring system used was the Institute of Oceanographic Sciences "Cloverleaf" buoy which was deployed from the Research Vessel "Squilla". RV Squilla is a 22 m motor fishing vessel operated by the Marine Biological Association of the United Kingdom.

The Cloverleaf buoy is a surface following buoy of about 2.2 m diameter which measures the height, the two components of the surface slope and the three components of the surface curvature.

From these measurements it is possible to estimate a number of useful properties of the directional spectrum of the surface wave field. In particular one can estimate the first 4 complex harmonics of the Fourier series representation of the directional spectrum, ie if the directional spectrum $S_2(f, \theta)$ can be expressed as:-

$$S_2(f, \theta) = a_o(f) + \sum_{n=1}^{\infty} a_n(f) \cos n\theta + b_n(f) \sin n\theta$$

One can estimate:-

$a_o(f)$ - the one-dimensional or temporal spectrum.

$a_1(f)$; $b_1(f)$

$a_2(f)$; $b_2(f)$

$a_3(f)$; $b_3(f)$

$a_4(f)$; $b_4(f)$

During the measurements the buoy was attached to the ship by a buoyant cable and the data were recorded on-board on magnetic tape.

The directional wave recordings were of either 140, 70 minutes or 35 minutes duration. Owing to the late arrival of the aircraft the surface wave measurements were not syncronous with the aircraft measurements. However an overlap in time was obtained and it is felt that this will allow satisfactory interpretation.

Wind speed and direction measurements aboard RV Squilla

Wind speed and direction were measured on-board RV Squilla by an anemometer and wind vane mounted on a mast above the ~~poop~~ fore-deck. The wind measurements were recorded on a chart-recorder throughout the period of each directional wave measurement. The instruments were mounted 6 m above the water line.

Waverider buoy measurements

Non-directional wave measurements were made at a fixed position using a Waverider buoy which was moored just to the south of the Eddystone reef. The wave height signal from the Waverider was received at Wembury and recorded on magnetic tape almost continuously: a recording of duration 34.8/13 minutes was started at intervals of 40 minutes.

Wind Speed and Direction Measurements on the Eddystone Lighthouse

In addition to the wind speed and direction measurements made on-board RV Squilla, fixed-location measurements were made on the Eddystone Lighthouse. The anemometer and wind vane were mounted on a rectractable mast which was installed on the helideck at the top of the light-tower. Recording (using a chart/recorder) was continuous throughout the day.

1. Measurements from RV Squilla

Station	Position	Time of start (BST)	Duration (min)
1	50° 8'N 4° 14'W	1133	70
2	49° 59'N 4° 19'W	1420	70
3	50° 3'N 4° 15'W	1625	140
4	50° 9'N 4° 14'W	1904	39

2. Fixed location measurements

Wave measurements

Instrument: Datawell Waverider

Position: 50° 10.6'N
4° 15.6'W

Water depth: 41 m

Period of measurements: 1140 BST on 15 June 1981 to
1100 BST on 16 June 1981

Sampling scheme: 34.13 minute records whose start-times are separated by 40 minutes.

Data available: Digital time histories, spectra.

Wind measurements

Instrument: Vector Instruments anemometer and wind vane.

Position: Top of Eddystone light-tower.

Height: To helideck - 46 m, extendable mast - 9 m.
Total height 55 m.

Period of measurements: 0730 - 2000 BST, 15 June 1981.

Recording

Continuous of paper chart.

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Fig.1