



The Prediction of Sea Waves
in Transitional Depth Water.

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CONTENTS

	<u>Page</u>
List of Figures	iv
List of Plates	iv
Synopsis	v
Declaration	vii
Acknowledgements	viii
1. Introduction	1
2. Literature Review	3
2.1 Introduction	3
2.2 The Early Work on Wave Generation	3
2.3 The Early Work on Wave Prediction	4
2.4 The Equation of Radiative Transfer of Energy	5
2.5 Recent Work on Wave Generation	6
2.5.1 The Phillips Theory of Linear Growth	6
2.5.2 The Miles Theory of Exponential Growth	7
2.5.3 Non Linear Wave-Wave Interactions	7
2.5.4 Energy Dissipation by Bottom Friction	8
2.6 Recent Wave Prediction Studies	9
2.6.1 Early Numerical Models	9
2.6.2 The Barnett Model	10
2.6.3 The Ewing Model	12
2.6.4 The DHI Model	14
2.7 Parametric Wave Prediction Models	15
3. The Prototype Experiment	17
3.1 Introduction	17
3.2 Gulf St Vincent	17
3.3 The Wave Recorder	19
3.4 Computer Monitoring	21
3.5 The Computer Interface	23
3.5.1 Instrument Housing	23
3.5.2 Electronic Hardware	23
3.5.3 Signal Synchronization	26
3.6 Data Collection Computer Programmes	29
3.6.1 The "WAVES" Programme	32

	<u>Page</u>
3.7 Special Data Processing Arrangements	35
3.7.1 Editing the Data	35
3.7.2 Spectral Analysis	37
3.7.2.1 Programme SPECT	39
3.7.2.2 Programme SPECPLT	39
4. The Numerical Model	43
4.1 The Basic Equation	43
4.2 The Source Function Terms	44
4.2.1 Phillips' Growth Term	44
4.2.2 Miles' Growth Term	44
4.2.3 Wave Breaking Term	45
4.2.4 Bottom Friction Decay Term	45
4.2.5 Opposing Wind, No Wind Dissipation Terms	45
4.2.6 Wave-Wave Interactions	46
4.3 The General Solution Technique	46
4.3.1 Introduction	46
4.3.2 The Finite Difference Operator	48
4.3.3 Boundary Conditions	48
4.3.4 The Lax-Wendroff Scheme	49
4.3.5 Scheme Stability	50
4.4 Wind Data	50
4.5 The Computer Programmes - SEA2, SEA2D	51
5. Results and Discussion	56
5.1 Introduction	56
5.2 Results	56
5.2.1 Proving Run 1	56
5.2.1.1 Significant Wave Height - Run 1	56
5.2.1.2 Spectral Energy Distribution - Run 1	58
5.2.2 Proving Run 2	58
5.2.2.1 Significant Wave Heights - Run 2	58
5.2.2.2 Spectral Energy Distribution - Run 2	58
5.2.3 Proving Run 3	63
5.2.3.1 Significant Wave Height - Run 3	63
5.2.3.2 Spectral Energy Distribution - Run 3	63
5.3 Discussion	63
6. Future Work	70
Appendix A	71
Bibliography	79

LIST OF FIGURES

	<u>Page</u>
1. Gulf St Vincent	18
2. Wave Data Collection Equipment	25
3. Data Signal Processing	27
4. Synchronization Circuit	28
5. Synchronization Logic	30
6. Flow Chart - Programme WAVES	33
7. Draper-Tucker Analysis Results	36
8. Programme SPECT Output	40
9. Numerical Model Grid	47
10. Flow Chart - Programme SEA2	52
11. Programme SEA2 Output	54
12. Input Data for Programme SEA2D	55
13. Plots of Significant Wave Height	57
14. Spectral Energy Plots - Run 1	59
15. Spectral Energy Plots - Run 2	61
16. Spectral Energy Plots - Run 3	64
17. Wind Data - Run 1	67
18. Wind Data - Run 2	68
19. Wind Data - Run 3	69

LIST OF PLATES

1. Wave Recording Beacon	20
2. DEC PDP 11/34 Computer	22
3. Instrument Rack	24
4. Synchronization Unit	31
5. Editing of Wave Data	38
6. Spectral Energy Plotting	42

SYNOPSIS

A research programme has been undertaken investigating the generation of sea waves in Gulf St Vincent, South Australia. The Gulf is a partially enclosed body of water of transitional depth for the waves generated over its fetches.

A computer based data collection system was initiated where wave data from a wave recording beacon was transmitted under computer control via VHF radio link to a receiver in the University of Adelaide which in turn was connected through an interface, to a PDP-11/34 computer with facilities for analog and digital input and output. The computer was programmed to manage the whole data collection programme from initiating the data transmission to the collection and storage of the data. By writing the data onto magnetic tape it was readily available for further processing and analysis which was carried out on the same machine. The interactive graphics capabilities of the computer were utilized to allow the ready plotting of the data in graphical form, editing (if necessary) and the display of the spectral analysis results.

The data collected was used to test a numerical simulation technique which has received much attention from numerous researchers. The technique, although having a broad theoretical base, has been used mainly in the open ocean situation and there was some doubt about how it would perform in the Gulf conditions of limited fetch, relatively shallow depth and, by comparison, slight seas.

The model gave acceptable results although it did tend to overestimate the predicted wave energy. This indicated that some allowance should be made for the energy dissipation caused by bottom friction. A simple energy dissipation term was added to the numerical model. However it overestimated the energy dissipation and the measured wave energy was often between the bounds set by the model running

with and without the energy dissipation term. Further refinement of the dissipation parameters is required in future work.

DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university, and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text.

30/6/80.

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LIST OF SYMBOLS

A	wave energy growth term
a_j	fourier component
B	wave energy growth term
b_j	fourier component
C	phase velocity
c_g	group velocity
c_j	wave data point
E	wave energy function
$e_{i,j}$	energy term
D_k	energy component
E_∞	fully developed energy spectrum
F	wave energy dissipation term
f	frequency
f_N	Nyquist frequency
F_1	dissipation function
g	gravitational acceleration
H	equivalent wave height
h	water depth
H_s	significant wave height
H_{sig}	significant wave height
i	$\sqrt{-1}$
k	wave number
k_1, k_2	wave number components
N	number of data points
$S_{i,j}$	source term
t	time
U	wind velocity function
u^*	friction velocity