The Prediction of Sea Waves in Transitional Depth Water.

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Thesis presented for the degree of
Master of Engineering Science
at the University of Adelaide,
June 1980.

This thesis embodies the results of supervised project work making up all of the work for the degree.

CONTENTS

LIST OF FIGURES

LIST OF PLATES

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.

ACKNOWLEDGEMENTS

The author wishes to thank all those who helped to make this thesis possible. The Department of Marine and Harbours for the use of the wave recording beacon and for help in updating the recording system, especially by Jim Biggs and George Slow. The Civil Engineering Department, Instrumentation Laboratory staff, Lionel Badenock and Robert Battaglia for all their assistance and advice. Mr R. Culver without whose supervision, inspiration and persistance none of this would have been possible and last, but not least, his parents for their support.

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