COMPUTERIZED DISTRIBUTION OF ELEVATION AND CURRENT FOR THE MAJOR IRISH SEA STORM SURGES OF NOVEMBER 1977

by

J.E. JONES

REPORT NO 101
1980

INSTITUTE OF OCEANOGRAPHIC SCIENCES
INSTITUTE OF OCEANOGRAPHIC SCIENCES

Wormley, Godalming,
Surrey, GU8 5UB.
(0428 - 79 - 4141)
(Director: Dr. A.S. Laughton)

Bidston Observatory,
Birkenhead,
Merseyside, L43 7RA.
(051 - 653 - 8633)
(Assistant Director: Dr. D.E. Cartwright)

Crossway,
Taunton,
Somerset, TA1 2DW.
(0823 - 86211)
(Assistant Director: M.J. Tucker)

On citing this report in a bibliography the reference should be followed by the words UNPUBLISHED MANUSCRIPT.
ERROR

The correct title of this report is that which appears on the title page. The cover title is incorrect.

REPORT No. 101

1980

Institute of Oceanographic Sciences
Bidston Observatory
Birkenhead
Merseyside L43 7RA
CONTENTS

Summary

1. Introduction

2. Comments

3. Reference

4. 154 Computer Plots
SUMMARY

A two-dimensional numerical model of the Irish Sea has been used to investigate
the dynamics of two major storm surges during November 1977. Detailed spatial
plots of sea-surface elevation and depth-mean current showing the computed hour-by-
hour development of the storm surges, have been prepared and are here presented.

1. INTRODUCTION

In November 1977 two major storm surges were generated in the Irish Sea; the
main peaks occurred at 01.00h on 12 November and at 19.00h on 14 November as
recorded at Liverpool. The first of these surges, 1.42m in height at Liverpool,
in combination with exceptionally high spring tides, caused serious coastal
flooding in the Eastern Irish Sea. The second surge peak was even higher at 1.47m
but as it occurred near low tide no flooding ensued.

These surges have been investigated dynamically using a two-dimensional numerical
model and the results of this study are described in detail in an earlier paper
(Heaps and Jones, 1979). However, the paper confined itself to discussing the
surge elevations at specific ports, comparing model simulations with observations.
Also computed bulk flows across a very limited number of Irish Sea cross sections
were studied.

It is of further interest to examine the changing two-dimensional distribution
of elevation and current throughout the Irish Sea during these two surge events.
Most conveniently this information, derived from the numerical model, may be
displayed in the form of elevation contour maps and current vector matrices.

In this report there are ½ maps of both elevation and current in the Irish Sea,
arranged in an hourly sequence from 00.00h on 10 November to 23.00h on 15 November,
a period which covers both surges.

Thus, this report gives an hour-by-hour time picture of the development of a
major storm surge as simulated by a two-dimensional numerical model. It would be
practically impossible to obtain such an overall detailed picture from observations.

2. COMMENTS

(1) The elevations and currents were obtained by taking the difference between
the results from two numerical model runs. One run simulated the tide plus surge
and the other simulated the tide only. This difference therefore not only includes
the direct surge but also any surge-tide interaction.

(2) The contours of elevation are drawn at 10 cm intervals and in certain cases
where the contours are crowded together, the numbering of various levels has been
omitted. However in these cases the value of the un-numbered contour levels should
easily be obtained by inspection.

(3) The current vectors fly with the currents from the small crosses which mark
the calculation points. For example in the main channel of the Irish Sea for the
plot showing the situation at 00.00h, 10 November, the flow is from south to north.

(4) The maps show the Irish Sea model coastline. The fit of this to the actual
coast is given in Heaps and Jones, 1979.

3. REFERENCE

Heaps, N.S. and Jones, J.E., 1979, Recent storm surges in the Irish Sea. In