# Nineteenth Coastal ngineering onference

Proceedings of the International Conference VOLUME I

September 3-7, 1984 Houston, Texas

BOOKS ARE ACCOUNTABLE PROPERTY CHARGED TO AN INDIVIDUAL BY NAME. PLEASE DO Conference held under the auspices oNGE LEND TO OTHERS WITHOUT CLEARING Coastal Engineering Research Counci**YOURSELF.** 

of the American Society of Civil Engineers

and cosponsored by the International Association for Hydraulic Research Institute for Storm Research Marine Technology Society University of Houston Texas A&M University

## Edited by Billy L. Edge

AMERICAN SOCIETY OF CIVIL

5.2

Published by the American Society of Civil Engineers 345 East 47th Street New York, New York 10017-2398

## 

## The Society is not responsible for any statements made or opinions expressed in its publications.

1 1

Copyright <sup>©</sup> 1985 by the American Society of Civil Engineers. All Rights Reserved. Library of Condress Catalog Card No.: 84-73359 ISBN 0-87262-438-2 Manufactured in the United States of America.

. ¥

. . . . . .

Station (

#### FOREWORD

The 19th International Conference on Coastal Engineering was the first to be held in the Continental United States since 1970. This exemplifies the truly international scope and character of this conference series. The 19th ICCE, like the ones before it, was well organized with the primary objective being to share information and provide a forum for interaction with other engineers and scientists working on similar problems. The time and efforts contributed to that objective was extensive and the results have proven that the planning is a very vital part of each conference. All who attended the 19th ICCE will agree that it was a success in many ways.

At the beginning of the Conference a message was received from the President of the United States welcoming the attendees. His message is reproduced below:

TWX WHITEHOUSE WSH DLY PD 260 GOVT DLY WHITE HOUSE DC AUG 31 PMS MR. JOHN C. FREEMAN, //DLR DONT DWE// President, Institute For Storm Research University Of St. Thomas 3600 Mt. Vernon Houston TX 77006

I am pleased to greet all participants in the Nineteenth International Conference on Coastal Engineering and to extend a special welcome to those from other countries.

Solving engineering problems associated with coastal and offshore areas is one of the most important environmental challenges we face. The many natural resources in these regions require careful management based on sound scientific and technical information. For example, our Commerce Departments National Ocean and Atmospheric Administration has storm surge problems underway that can serve as models for developing comprehensive hurricane preparedness plans.

I am confident that your conference will make an important contribution to the wise management of coastal resources and to the protection of the people who live, work and play in these areas.

You have my best wishes for every success in these deliberations.

RONALD REAGAN

92331

The papers in this Proceedings have been prepared by the authors who made presentations at the 19th International Conference on Coastal Engineering. The authors were asked to make their presentations and submit final papers based on review of the abstracts which were submitted well in advance of the conference. These abstracts were reviewed by a committee of four professionals including representation from the local organizing committee. All papers are eligible for discussion in the *Journal of Waterway, Port, Coastal and Ocean Engineering* and all papers are eligible for ASCE awards.

Venues for the 20th and 21st conferences are Taipei, Taiwan and Spain, respectively. Countries desiring to host a future conference should contact the Secretary of the Coastal Engineering Research Council to receive information on submitting a proposal.

Billy L. Edge, Secretary Coastal Engineering Research Council American Society of Civil Engineers

#### ACKNOWLEDGEMENTS

f

#### **ORGANIZING COMMITTEE**

Dr. John C. Freeman, Co-chairman Institute for Storm Research

Dr. Wayne Ingram, Co-chairman Sea Floor Engineering

Professor Robert Reid Texas A & M University

Mrs. Jill F. Hasling Institute for Storm Research

The Honorable Marla Forristall City of West University

Mr. David P. Hasling Institute for Storm Research

Mrs. Marjorie Freeman Houston, Texas

Dr. John B. Herbich Texas A & M University

Dr. William J. Graff University of Houston

Mr. Robert E. Haring Exxon Production Research Company

Dr. Herbert Beckman Rice University

#### SPONSORSHIP

Ameerican Society of Civil Engineers Institute For Storm Research Marine Technology Society University Of Houston Texas A & M International Association For Hydraulic Research

### **CONTENTS**

Keynote Address	1
PART I THEORETICAL AND OBSERVED WAVE CHARACTERISTIC	S
Chapter 1 THE EXPERIMENTAL VERIFICATION OF NUMERICAL MODELS OF PLUNGING BREAKERS S.P. Kjeldsen	15
Chapter 2 BREAKING WAVE DESIGN CRITERIA E.B. Thornton, C.S. Wu, and R.T. Guza	31
Chapter 3 REYNOLDS STRESS IN SURF ZONE T. Sakai, I. Sandanbata, and M. Uchida	42
Chapter 4 WAVE ATTENUATION AND SET-UP ON A BEACH <i>I.A. Svendsen</i>	54
Chapter 5 WAVE KINEMATICS AND DIRECTIONALITY IN THE SURF ZONE J. van Heteren and M.J.F. Stive	70
Chapter 6 A MODEL FOR BREAKER DECAY ON BEACHES W.R. Dally, R.G. Dean, and R.A. Dalrymple	82
Chapter 7 MODELING TURBULENT BORE PROPAGATION IN THE SURF ZONE D.R. Basco and I.A. Svendsen	99
Chapter 8 EXTREMAL STATISTICS OF STORM SURGES BY TYPHOON. Y. Tsuchiya and Y. Kawata	115
Chapter 9 BAYWATER RESPONSE TO TSUNAMIS <i>T. Abe</i>	132
Chapter 10 A RANKIN VORTEX NUMBER AS A GUIDE TO THE SELECTION OF A MODEL HURRICANE C.L. Bretschneider and J.M. Lo	147

Chapter 11 ESTIMATING ERROR OF COASTAL STAGE FREQUENCY CURVES	162
Chapter 12 NUMERICAL SIMULATION OF STORM SURGES BY THE MULTI-LEVEL MODELS T. Yamashita and Y. Tsuchiya	174
Chapter 13 NUMERICAL SIMULATION OF STORM SURGES INDUCED BY TROPICAL STORMS IMPINGING ON THE BANGLADESH COAST	190
Chapter 14 FREQUENCY OF OCCURRENCE OF STORM SURGES IN AN ESTUARY: A STOCHASTIC APPROACH	199
Chapter 15 UPDATE: THE NATIONAL FLOOD INSURANCE PROGRAM AND THE COAST	217
Chapter 16 SIMULATION OF TIDES AND STORM SURGES IN THE GREAT BARRIER REEF REGION	226
Chapter 17 HURRICANE SURGE PROTOTYPE DATA COLLECTION T.H. Flor and S.C. Scott	243
Chapter 18 HURRICANE ALICIA-STORM SURGES AND SHORE PROCESSES	257
Chapter 19 MEASUREMENT OF SURFACE WAVES FROM SUBSURFACE GAGE D.Y. Lee and H. Wang	271
Chapter 20 A SHALLOW WATER DIRECTIONAL WATER RECORDER S.J. Buchan, R.K. Steedman, S.A. Stroud, and D.G. Provis	287
Chapter 21 US ARMY CORPS OF ENGINEERS FIELD WAVE GAGING PROGRAM	304

Chapter 22 IRREGULAR WAVE OVERTOPPING RATES	316
Chapter 23 RUN-UP OF PERIODIC WAVES ON BEACHES OF NON-UNIFORM SLOPE	328
Chapter 24 EFFECTS OF MEASUREMENT ERROR ON LONG-TERM WAVE STATISTICS	345
Chapter 25 ON A DESIGN WAVE SPECTRUM 3 <i>P.C. Liu</i>	362
Chapter 26 SHALLOW WATER WAVES: A SPECTRAL APPROACH 3 C.L. Vincent	370
Chapter 27 WAVE COHERENCE IN COASTAL WATERS 3 S.A. Hughes	383
Chapter 28 FIELD STUDIES OF RUN-UP ON DISSIPATIVE BEACHES 3 C.T. Carlson	399
Chapter 29 A NONLINEAR MODEL OF IRREGULAR WAVE RUN-UP HEIGHT AND PERIOD DISTRIBUTIONS ON GENTLE SLOPES	415
Chapter 30 A DYNAMICAL EXPRESSION OF WAVES IN SHALLOW WATER	435
Chapter 31 PREDICTION METHOD FOR THE WAVE HEIGHT DISTRIBUTION OFF THE WESTERN COAST OF TAIWAN 4 F.L.W. Tang and J.T. Juang	452
Chapter 32 METHOD FOR ESTIMATING DIRECTIONAL WAVE SPECTRUM IN INCIDENT AND REFLECTED WAVE FIELD 4 M. Isobe and K. Kondo	467
Chapter 33 CALCULATION OF DIRECTIONAL WAVE SPECTRA BY THE MAXIMUM ENTROPY METHOD OF SPECTRAL ANALYSIS 4 <i>M.J. Briggs</i>	484

Chapter 34 NATURAL SEA STATES: THE COASTAL ENGINEER'S REQUIREMENTS TO THE REPRODUCTION IN MODELS H. Lundgren and Elias Davidsen	501
Chapter 35 NON-GAUSSIAN CHARACTERISTICS OF COASTAL WAVES M.K. Ochi and W.C. Wang	516
Chapter 36 STATISTICAL PROPERTIES OF SHORT-TERM OVERTOPPING A. Kimura and A. Seyama	532
Chapter 37 SHALLOW-WATER SPECTRAL WAVE MODELING <i>R.E. Jensen</i>	547
Chapter 38 A TYPHOON WAVE HINDCASTING TECHNIQUE N.K. Liang and C.C. Chien	561
Chapter 39 INFLUENCE OF EL NINOS ON CALIFORNIA'S WAVE CLIMATE	577
Chapter 40 RUN-UP OF RANDOM WAVES ON GENTLE SLOPES H. Mase and Y. Iwagaki	593
Chapter 41 ON THE SEQUENTIAL BEHAVIOUR OF SEA-STATES A.S. Arcilla	610
Chapter 42 LOW FREQUENCY OSCILLATIONS ON THE DUTCH COAST. F. Gerritsen and J. van Heteren	625
Chapter 43 VERIFICATION OF KIMURA'S THEORY FOR WAVE GROUP STATISTICS	642
Chapter 44 CALIBRATION AND VERIFICATION OF A DISSIPATION MODEL FOR RANDOM BREAKING WAVES J.A. Battjes and M.J.F. Stive	649
Chapter 45 WAVE GROUP ANATOMY OF OCEAN WAVE SPECTRA W.C. Thompson, A.R. Nelson and D.G. Sedivy	661

Chapter 46 SWASH ON A NATURAL BEACH M. Mizuguchi	678
Chapter 47 WAVE GROUPS IN THE FREQUENCY AND TIME DOMAINS. R.J. Sobey and W.W. Read	695
Chapter 48 SWASH ON STEEP AND SHALLOW BEACHES <i>R.T. Guza, E.B. Thornton, and R.A. Holman</i>	708
Chapter 49 MEASUREMENTS OF SURF BEAT AND SET-DOWN BENEATH WAVE GROUPS J.K. Kostense	724
Chapter 50 THE PROBABILITY CHARACTERISTICS OF WAVE AND WAVE PRESSURES AT A VERTICAL BREAKWATER H. Peiji and Z. Binglai	741
Chapter 51 WAVE MEASUREMENT WITH DIFFERENTIAL PRESSURE GAUGES	755
Chapter 52 PREDICTION OF WAVE GROUP STATISTICS S. Elgar, R.T. Guza, and R.J. Seymour	770
Chapter 53 ESTIMATES OF LONG WAVES IN THE WESER ESTUARY V. Barthel and E.R. Funke	782
Chapter 54 SHOALING PROPERTIES OF BOUNDED LONG WAVES E.P.D. Mansard and V. Barthel	798
Chapter 55 NUMERICAL SIMULATIONS OF THE 1964 ALASKAN TSUNAMI	815
Chapter 56 A THREE-DIMENSIONAL MODEL OF THE BEAUFORT SEA . S.K. Liu and J.J. Leendertse	831
Chapter 57 MODEL HARBOUR SEICHING COMPARED TO PROTOTYPE DATA W.A.M. Botes, K.S. Russell, and P. Huizinga	846