



Beach near the fisherman's village of Katwijk, North Sea coast, The Netherlands.

Source: Journal of Coastal Research, 34(2)

Published By: Coastal Education and Research Foundation

URL: <https://doi.org/10.2112/1551-5036-34.2.ii>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Journal of

Coastal Research

VOL. 34, NO. 2 • CERF • March 2018



Published by

An International Forum for the Littoral Sciences

Charles W. Finkl
Editor-in-Chief



Year of Service

JOURNAL OF COASTAL RESEARCH

An International Forum for the Littoral Sciences

CHEF-HERAUSGEBER

25 Jake Ridge Trail
Fletcher, NC
28732, U.S.A.

BOOK REVIEW EDITOR

Luciana S. Esteves
Faculty of Science and Technology
Bournemouth University
Dorset, England, U.K.
lesteves@bournemouth.ac.uk

MITHERAUSGEBER

Edward J. Anthony
Coastal Geomorphology
Dunkerque, France

Kenneth Banks
Coral Reef Geomorphology
Plantation, Florida

Patrick Barnard
Coastal Geomorphology
Santa Cruz, California

Lindino Benedet
Oceanography, Modeling
Florianopolis, SC, Brazil

David M. Bush
Coastal Geology & Hazards
Carrllton, Georgia

Ilya V. Buynovich
Coastal Geology
Philadelphia, Pennsylvania

Javier A. Carrió
Sediment Processes
Valencia, Spain

Vanda Claudino-Sales
Coastal Dynamics, Dunes
Ceard, Brazil

Mark Crowell
Coastal Zone Management
McLean, Virginia

Omar Defeo
Sandy Beach Ecology
Montevideo, Uruguay

J. Javier Diez
Coastal Geomorphology
Madrid, Spain

Joseph F. Donoghue
Coastal Morphology & Hazards
Orlando, Florida

Jean Ellis
Aeolian Sediment Transport
Columbia, South Carolina

Luciana Esteves
Coastal Flooding & Erosion
Bournemouth, England, UK

Niki Evelpidou
Sea-Level Change,
Palaeogeography
Athens, Greece

Oscar Manuel Ferreira
Storm Impacts
Faro, Portugal

Duncan M. FitzGerald
Sediment Transport
Boston, Massachusetts

EDITOR-IN-CHIEF
Charles W. Finkl
Coastal Education and Research Foundation, Inc. [CERF]

Editorial Offices:
5130 NW 54th Street
Coconut Creek, FL 33073, U.S.A.

(Editorial Office, Coconut Creek)
CERF/JCR Website: <http://www.CERF-JCR.org>
e-mail: cfinkl@cerf-jcr.com

RÉDACTEUR-EN-CHEF

DEPUTY EDITOR-IN-CHIEF

Christopher Makowski
Coastal Education and Research
Foundation, Inc. [CERF]
5130 NW 54th Street
Coconut Creek, FL 33073, U.S.A.
cmakowski@cerf-jcr.com

EDITORIAL ASSISTANT

Barbara Russell
Coastal Education and Research
Foundation, Inc. [CERF]
5130 NW 54th Street
Coconut Creek, FL 33073, U.S.A.
barbara@cerf-jcr.com

WEB DESIGN & DEVELOPMENT

Jon Finkl
Media Mine
17600 River Ford Drive
Davidson, NC 28036, U.S.A.
jon@mediamine.net

ASSOCIATE EDITORS

Chip Fletcher
Coastal Geology
Honolulu, Hawaii

Kazimierz K. Furmańczyk
Marine Cartography
Szczecin, Poland

Allen Gontz
Geophysics, Stratigraphy
San Diego, California

Gary B. Griggs
Coastal Engineering & Hazards
Santa Cruz, California

Pramod Hanamgond
Coastal Geomorphology
Belgaum, India

Hans Hanson
Coastal Protection
Lund, Sweden

Simon Haslett
Paleoceanography
Swansea, Wales, UK

David Hill
Nearshore Hydrodynamics
Corvallis, Oregon

Michael Hilton
Dune Geomorphology & Ecology
Dunedin, New Zealand

Carl H. Hobbs, III
Coastal Geology, Sand Mining
Gloucester Point, Virginia

James R. Houston
Sea-Level Change
Vicksburg, Mississippi

Wenrui Huang
Coastal Hydrodynamics
Tallahassee, Florida

Michael G. Hughes
Coastal Morphodynamics
Canberra, ACT, Australia

Federico I. Isla
Sea-Level Change
Mar Del Plata, Argentina

Nancy L. Jackson
Coastal Morphology
Newark, New Jersey

Markes E. Johnson
Paleoshores, Coastal Sand Dunes
Williamstown, Massachusetts

Timothy R. Keen
Waves & Circulation
Stennis Space Center, Mississippi

Dieter H. Kelletat
Coastal Geomorphology
Essen / Cologne, Germany

Joseph T. Kelley
Sea-Level Change
Orono, Maine

Vic Klemas
Remote Sensing
Newark, Delaware

Nobuhisa Kobayashi
Coastal Engineering
Newark, Delaware

Vladimir N. Kosmynin
Coral Reefs, Coastal Ecology
Tallahassee, Florida

Joseph L. Kowalski
Estuarine Plant Ecology
Edinburg, Texas

Michael J. Lace
Coastal Landforms & Processes
West Branch, Iowa

Stephen P. Leatherman
Barrier Islands, Beach Erosion
Miami, Florida

Charles Lemckert
Environmental Fluid Dynamics
Bruce, ACT, Australia

Ioannis Liritzis
Geophysical Proxy Data
Rhodes, Greece

Michel M. de Mahiques
Sediment Processes
São Paulo, Brazil

Gonzalo C. Malvárez-García
Beach Morphodynamics
Seville, Spain

Ashish J. Mehta
Coastal Engineering
Gainesville, Florida

Nobuo Mimura
Environmental Engineering
Ibaraki, Japan

Fatima Navas
Coastal Morphodynamics
Seville, Spain

Robert Nicholls
Global Climate Change
Southampton, England, UK

Karl F. Nordstrom
Coastal Geomorphology
New Brunswick, New Jersey

Julian Orford
Gravel Beaches, Storm Events
Belfast, Northern Ireland, UK

Phil D. Osborne
Sediment Dynamics
Shoreline, Washington

Hugh Parker
Airborne Lidar Bathymetry
Adelaide, SA, Australia

Charitha B. Pattiaratchi
Physical Oceanography
Crawley, WA, Australia

Carlos Pereira da Silva
Coastal Zone Management
Lisbon, Portugal

Michael Phillips
Coastal Geomorphology
Swansea, Wales, UK

Orrin H. Pilkey, Jr.
Coastal Geology
Durham, North Carolina

Nobert P. Psuty
Coastal Geomorphology
New Brunswick, New Jersey

Ulrich Radtke
Coastal Geomorphology
Duisburg-Essen, Germany

Elijah W. Ramsey, III
Coastal Image Processing
Lafayette, Louisiana

Kirt Rusenko
Sea Turtles, Dune Restoration
Boca Raton, Florida

Daniele Scarponi
Marine Paleoecology
Bologna, Italy

Anja Scheffers
Coastal Hazards,
Palaeoclimatology
Lismore, NSW, Australia

Vic Semeniuk
Mangroves
Perth, WA, Australia

Douglas J. Sherman
Coastal & Aeolian Geomorphology
Tuscaloosa, Alabama

Andrew D. Short
Coastal Geomorphology
Sydney, NSW, Australia

Pravi Shrestha
Coastal Engineering
Irvine, California

COMITÉ DE REDACTION

Alejandro J. Souza
Coastal & Sediment Processes
Liverpool, England, UK

Tom Spencer
Biogeomorphology
Cambridge, England, UK

Marcel Stive
Coastal Hydrodynamics
Delft, The Netherlands

Vallam Sundar
Coastal Engineering
Chennai, India

E. Robert Thieler
Marine Geology
Woods Hole, Massachusetts

Arthur C. Trembanis
Coastal Morphodynamics
Newark, Delaware

Frank Van Der Meulen
Coastal Zone Management
Delft, The Netherlands

Ana Vila Concejo
Coastal Morphodynamics
Sydney, NSW, Australia

Ian J. Walker
Coastal Geology & Sediments
Tempe, Arizona

Ping Wang
Beach Morphodynamics
Tampa, Florida

Phil Watson
Sea-Level Change
Gosford, NSW, Australia

Allan Williams
Coastal Geology
Swansea, Wales, UK

Harry F. Williams
Paleotempestology
Denton, Texas

Colin D. Woodroffe
Coastal Geomorphology
Wollongong, NSW, Australia

Zhaoqing Yang
Hydrodynamic Modeling
Seattle, Washington

Robert S. Young
Coastal Processes
Cullowhee, North Carolina

Guoliang Yu
Sediment Transport
Shanghai, China



THE JOURNAL OF COASTAL RESEARCH (JCR) (ISSN 0749-0208) IS PUBLISHED BIMONTHLY FOR \$115.00 FOR INDIVIDUAL US CERF MEMBERS, \$125.00 FOR INDIVIDUAL INTERNATIONAL CERF MEMBERS, \$519.00 FOR US INSTITUTIONS, AND \$541.00 FOR INTERNATIONAL INSTITUTIONS BY THE COASTAL EDUCATION AND RESEARCH FOUNDATION, INC. (CERF), 5130 NW 54TH STREET, COCONUT CREEK, FL 33073-8713. PERIODICALS POSTAGE PAID AT FORT LAUDERDALE, FL AND ADDITIONAL MAILING OFFICES. **POSTMASTER:** SEND ADDRESS CHANGES TO JOURNAL OF COASTAL RESEARCH, ALLEN PRESS ASSOCIATION MANAGEMENT, P.O. BOX 1897, LAWRENCE, KS 66044-3018.

© 2018 Coastal Education and Research Foundation, Inc. [CERF].

Ⓢ This paper meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).



JOURNAL OF COASTAL RESEARCH

An International Forum for the Littoral Sciences

Supporting Scientific Institutions



- Consorzio Nazionale Interuniversitario per le Scienze del Mare (Co.N.I.S.Ma.) [Rome, Italy; www.conisma.it/]
- Delft University of Technology [Department of Hydraulic Engineering, Delft, The Netherlands; <http://www.citg.tudelft.nl/over-faculteit/afdelingen/hydraulic-engineering/>]
- Duke University [Earth and Ocean Sciences Division, Durham, North Carolina, U.S.A.; <https://nicholas.duke.edu/marinelab>]
- Griffith University [Center for Infrastructure Engineering and Management, Southport, Queensland, Australia; <https://www.griffith.edu.au/>]
- Ibaraki University [Center for Water Environmental Studies, Mito, Japan; <http://www.cwes.ibaraki.ac.jp/>]
- International Geographical Union (IGU) [Commission on Coastal System (CCS); <http://www.igu-ccs.org/>]
- Royal Belgian Institute of Natural Sciences [Management Unit of the North Sea Mathematical Models (MUMM), Brussels, Belgium; <http://www.mumm.ac.be/EN/index.php>]
- Rutgers University [Institute of Marine and Coastal Sciences (IMCS), New Brunswick, New Jersey, U.S.A.; <http://marine.rutgers.edu/main/>]
- Universidad de la República [Marine Science Unit, Montevideo, Uruguay; <http://www.imber.info/Science/National-Network/URUGUAY/>]
- Universidade Nova de Lisboa [e-Geo Center for Geographical and Regional Planning Studies, Lisbon, Portugal; <http://e-geo.fcsh.unl.pt/>]
- University of California, Santa Cruz [Institute of Marine Sciences, Santa Cruz, California, U.S.A.; <http://ims.ucsc.edu/>]
- University of Delaware [School of Marine Science and Policy, Newark, Delaware, U.S.A.; <http://www.ocean.udel.edu>]
- University of Maine [Climate Change Institute, Orono, Maine, U.S.A.; <http://climatechange.umaine.edu/>]
- University of Sydney [Coastal Studies Unit, Sydney, New South Wales, Australia; <http://sydney.edu.au/>]
- University of Szczecin [Institute of Marine and Coastal Science, Szczecin, Poland; <http://www.wnoz.ztikm.szczecin.pl/en/1/inom/structure/>]
- University of Ulster [Environmental Sciences Research Institute, Coleraine, Northern Ireland; <http://www.ulster.ac.uk/es/research/>]
- University of Wales, Trinity Saint David [Swansea Metropolitan University, Mount Pleasant, Swansea, South Wales, U.K.; <http://www.uwtsd.ac.uk/>]
- U.S. Army Corps of Engineers [Coastal and Hydraulics Laboratory (CHL), Vicksburg, Mississippi, U.S.A.; <http://chl.erdc.usace.army.mil/>]
- U.S. Geological Survey [National Wetlands Research Center, Lafayette, Louisiana, U.S.A.; <http://www.nwrc.usgs.gov/>]

Aims and Scope of the Journal

Journal of Coastal Research, an International Forum for the Littoral Sciences, is dedicated to all aspects of coastal research. These include geology, biology, geomorphology (physical geography), climate, littoral oceanography, hydrography, coastal hydraulics, environmental (resource) management, engineering, and remote sensing. Although each field functions effectively within its own purview, the cross-disciplinary nature of coastal studies requires familiarity with other fields as well. Hence, the scope of topics is necessarily broad in order to address the complexity of coastal biophysical and socio-economic interactions. Because of the wide range of interrelated topics, the journal invites original contributions and manuscripts dealing with theory, methodology, techniques, and field or applied topic studies on interdisciplinary coastal issues.

The journal encourages the dissemination of knowledge and understanding of the coastal zone by promoting cooperation and communication between specialists in different disciplines. Natural scientists, for example, are encouraged to collaborate with professionals in other fields to prepare contributions relating to the coastal zone that foster increased appreciation of coastal environments and processes. By means of this journal, with its scholarly and professional papers, systematic review articles, book and symposia reviews, communications and news, and special topical issues, an international forum for the development of integrated coastal research is provided.

Advertising, Editorial, and Subscription Information

Advertising and Editorial Office: All advertising and editorial correspondence should be sent to Dr. Charles W. Finkl, Editor-in-Chief, Journal of Coastal Research, 5130 NW 54th Street, Coconut Creek, FL 33073, U.S.A. PHONE: 954-899-8416. E-MAIL: cfinkl@cerf-jcr.com

Subscription Information: The *Journal of Coastal Research* is a bimonthly publication. Calendar-year (2018) print and online subscription prices for the JCR are: \$115.00 for US CERF members / \$125.00 for International CERF members (\$95.00 for online only), and \$519.00 for US institutions / \$541.00 for International institutions (\$437.00 for online only). Additional surface charges may apply to subscribers located outside of the USA. For additional membership and subscription forms and information, please go to www.CERF-JCR.org. To obtain a membership or subscription form by mail, please send request to Journal of Coastal Research, P.O. Box 7065, Lawrence, KS 66044. Back Issues and Special Issues of the JCR, when available, can be directly purchased at www.CERF-JCR.org.

The *Journal of Coastal Research* is currently surveyed in *Applied Science & Technology Abstracts*; *Applied Science & Technology Index (H.W. Wilson)*; *Aquatic Sciences & Fisheries Abstracts*; *BIOBASE*; *Biological Abstracts*; *BIOSIS Previews (Thomson)*; *CAB International Abstracts (CABI)*; *CSA Civil Engineering Abstracts (ProQuest)*; *Current Awareness in Biological Sciences (Elsevier)*; *Current Contents/Agriculture, Biology, & Environmental Sciences (Thomson)*; *Ecology Abstracts (ProQuest)*; *Environmental Sciences & Pollution Management*; *GeoAbstracts [Geographical Abstracts: Physical Geography; Ecological Abstracts; Geological Abstracts; GEODATA] (Elsevier)*; *GeoRef*; *Meteorological & Geostrophical Abstracts (ProQuest)*; *Oceanic Abstracts (ProQuest)*; *Oceanographic Literature Review (Elsevier)*; *Physical Sciences Digest (CSA, Ebsco)*; *Pollution Abstracts (ProQuest)*; *Referativnyi Zhurnal*; *Science Citation Index; SciSearch (Thomson)*; *SCOPUS*; *Water Resources Abstracts (Bethesda)*; *Zoological Record (Thomson)*.



Beach near the fisherman's village of Katwijk, North Sea coast, The Netherlands. Using sediment from the bottom of the North Sea about 10-15 km offshore, this segment of the coast was nourished from 2013-2014. The fore dunes, beach, and nearshore area were reinforced as part of a coastal defense strategy to meet the newest national safety standards. After the nourishment was completed, the village of Katwijk and its low-lying hinterland are now better protected against storm surge, sea-level rise, and other suspected impacts of climate change.

Average grain size of the nourished beach sand was measured to be about 300 μ . With a very low slope of approximately 10-15 degrees, this is a good example of a dissipative beach, where most of the wave energy is released through the process of wave breaking. Most prominent amongst the seashells in the foreground are the slim and long *Ensis ensis*, a common species in the North Sea waters. Also known as the sword razor or razor clam, *E. ensis* is a marine bivalve mollusc in the family Pharidae. It lives buried in the sand and can be found along the coasts of northwest Europe. (Photograph taken November 2017 by Frank van der Meulen, UNESCO IHE-Delft Institute for Water Education and Deltares, Delft, The Netherlands.)

COASTAL EDUCATION AND RESEARCH FOUNDATION

5130 NW 54th Street
Coconut Creek, FL 33073, U.S.A.

Officers of the Foundation

Founded in 1983 by: Charles W. Finkl, Sr. (Deceased),
Charles W. Finkl, Jr., Rhodes W. Fairbridge (Deceased),
and Maurice L. Schwartz (Deceased)



**President &
Executive Director:**
Charles W. Finkl

**Senior Vice President &
Assistant Director:**
Christopher Makowski

Secretary:
Heather M. Vollmer

Executive Assistant:
Barbara Russell

Regional Vice Presidents

North America

James R. Houston
Victor V. Klemas
Orrin H. Pilkey, Jr.

South America

Vanda Claudino-Sales
Omar Defeo

Oceania

Charles Lemckert
Anja Scheffers
Vic Semeniuk
Andrew D. Short

Western Europe

Luciana Esteves
Carlos Pereira da Silva
Michael Phillips
Marcel J.F. Stive

Eastern Europe

Niki Evelpidou
Kazimierz K. Furmanczyk

Southeast Asia

Nobuo Mimura

CERF MEMBERSHIP

Members are individuals that support the aims of the foundation through personal and group efforts or by donations. Memberships are available in different categories with privileges.

Subscription information is available online at www.cerf-jcr.org. Subscriptions office: Allen Press, Inc., P.O. Box 1897, Lawrence, KS 66044, U.S.A. CERF@allenpress.com

Editor-in-Chief

Charles W. Finkl Ph.D., CSci, CMarSci, FIMarEST, CPGS, CPSSc, PWS, M.ASCE

Dr. Charles W. Finkl is President and Executive Director of the Coastal Education and Research Foundation [CERF], publisher of the JCR. Charlie, a founding editor of the *Journal of Coastal Research*, has served as Editor-in-Chief for the past 34 years. He is a Research Professor in the Department of Geosciences at Florida Atlantic University in Boca Raton, Florida. He received his Bachelor and Master of Science degrees from Oregon State University and the Ph.D. from the University of Western Australia. He is a member of more than 20 professional societies and has published more than 200 professional papers, books, and reports. He is a Chartered Marine Scientist (CMarSci) [Institute of Marine Engineering, Science and Technology], Certified Professional Geological Scientist (CPGS) [American Institute of Professional Geologists (AIPG)], Certified Professional Soil Scientist (CPSSc) [American Registry of Certified Professionals in Agronomy, Crops, and Soils], and a Professional Wetland Scientist (PWS) [Society of Wetland Scientists]. Charlie has field experience in parts of the USA, Caribbean area, Brazil, Honduras, Russia, South Africa, Western Europe, Australasia, and South Pacific islands. He is also the Series Editor of the Encyclopedia of Earth Sciences Series that is published by Springer (Germany). There are more than twenty-eight volumes in the Series and about twenty-five are available online. Charlie also serves on the Editorial Board of the *International Journal of Environmental Studies* (Routledge) and is an occasional peer reviewer for many other professional journals.

Charlie has interests and expertise in the general areas of surficial geology, coastal and marine geomorphology (including coastal classification), coastal/marine biophysical environments, exploration geochemistry, soils and weathering (regolith geology), coastal zone management and engineering applications or impacts on natural systems (including erosion control and shore protection), coastal hydrology including submarine freshwater and mineralized seeps, subaerial and marine structural geology, natural hazard mitigation in coastal zones, marine environments and coastal wetland protection and restoration, and remote sensing (e.g., land cover classification in coastal wetlands, advection-diffusion turbidity plumes in coastal waters, delineation of bottom types and sand resources), effluent disposal and pollution of wetlands and estuaries, water resources mapping and conservation, time series studies of wetland hydroperiod and soil moisture.

International Coastal Symposium (ICS) Official Meeting of CERF

The International Coastal Symposium (ICS) was originally set up by Per Bruun (deceased) and Charlie Finkl as the official meeting of the Coastal Education and Research Foundation (CERF), with one of the first meetings being held in Hilton Head, South Carolina, in 1993. After the repeated success of these meetings, CERF moved the ICS to the international scene holding these conferences in conjunction with local sponsors in Australia, Brazil, Iceland, New Zealand, Northern Ireland, Poland, and Portugal. The ICS brings together delegates from all over the world to collaborate and discuss the most current coastal research studies and projects. During the ICS 2014, which was held in Durban, South Africa, a grand celebration took place to mark the 30th Anniversary of CERF and the JCR. Our next ICS meeting is scheduled for May of 2018 in Busan, South Korea. For more information, please visit www.cerf-jcr.org.

Board of Directors (Trustees)

J. Andrew G. Cooper	Victor V. Klemas	Elijah W. Ramsey, III
Charles W. Finkl	Charles Lemckert	Vic Semeniuk
Erlend J. Frederickson	Christopher Makowski	Andrew D. Short
Gary B. Griggs	Carlos Pereira da Silva	Daniel J. Stanley
James R. Houston	Michael Phillips	Marcel J.F. Stive
Robert Huff	Orrin H. Pilkey, Jr.	Allan Williams
Joseph T. Kelley	Norbert P. Psuty	

Lifetime Members

Frédéric Bouchette	Björn Kjerfve	Fatima Navas
Yong-Sik Cho	Tetsuya Kusuda	Philip D. Osborne
Nicholas K. Coch	Stephen P.	Yoshiki Saito
Hany Elwany	Leatherman	Charles Thibault
Kazimierz K. Furmanczyk	Charles Lemckert	Erik van Wellen
Paul S. Kench	Gonzalo C.	Ya Ping Wang
	Malvárez-García	Wei Zhang

Patron Members

Lindino Benedit	Carl H. Hobbs, III	Norbert P. Psuty
Georges Chapalain	Timothy W. Kana	Robert S. Young
John B. Gallagher		

CERF Society Information

The Coastal Education and Research Foundation [CERF] is a nonprofit society dedicated to the advancement of the coastal sciences. The Foundation is devoted to the multi-disciplinary study of the complex problems of the coastal zone. The purpose of CERF is to help translate and interpret coastal issues for the public and to assist professional research and public information programs. The Foundation specifically supports and encourages field and laboratory studies on a local, national, and international basis. Through the medium of scientific publications, television, and radio CERF brings accurate information to the public and coastal specialists on all aspects of coastal issues in an effort to maintain or improve the quality of shoreline resources.

Because CERF is concerned with broad environmental issues, our efforts concentrate on significant problems such as maintenance of good quality (potable) water with adequate supply, and hazards associated with potential beach erosion, flooding, and susceptibility of developed shorelines to storm surge and wave attack. By focusing attention on these potential man-made and natural hazards, it is hoped that our research efforts will help others improve the quality of life in diverse coastal areas. CERF thus aims to stimulate awareness of coastal (marine and freshwater shorelines) land and water problems; initiate and foster research and innovation to promote long-term coastal productivity; establish an educational forum for the debate of contentious coastal issues; and develop new principles and approaches for enlightened coastal management, and encourage their adoption and use.

Journal of Coastal Research

VOL. 34, NO. 2 (pages 255–502)

March 2018

ISSN 0749-0208

CONTENTS

RESEARCH ARTICLES

- Millennial Scale Development of a Southeastern United States Spit..... **E. Wright, S. Kruse, S.L. Forman, and M.S. Harris** 255
- Efficiency of the Chinese Ocean Economy within a Governance Framework Using an Improved Malmquist-Luenberger Index..... **Lili Ding, Haihong Zheng, and Xin Zhao** 272
- A Geospatial Approach to Managing Coastal Access in KwaZulu-Natal, South Africa **Mariné Willemse and Bronwyn J. Goble** 282
- Stability of Seabed Sediments in the Embayments of North Rustico, Prince Edward Island, Canada **Carl L. Amos, M. Brylinsky, D.L. Forbes, A. Robertson, C.E.L. Thompson, and H. Kassem** 293
- Coherence Between Coastal and River Flooding along the California Coast... **Kingsley O. Odigie and Jonathan A. Warrick** 308
- Community Structure and Spatial Zonation of Benthic Macrofauna in Mudflats of the Bahía Blanca Estuary, Argentina **Georgina Zapperi, María J. Piován, and Paula Pralongo** 318
- Recording Tropical Cyclone Activity from 1909 to 2014 along the Northern Gulf of Mexico using Maritime Slash Pine Trees (*Pinus elliottii* var. *elliottii* Engelm.) **Clay S. Tucker, Jill C. Trepanier, Grant L. Harley, and Kristine L. DeLong** 328
- Hydrosedimentological Modelling of a Small, Trained Tidal Inlet System, Currumbin Creek, Southeast Queensland, Australia..... **Saeed Shaeri, Darrell Strauss, Amir Etemad-Shahidi, and Rodger Tomlinson** 341
- The Current Extent and Historical Expansion of Mangroves in the Kuantu Nature Reserve, North Taiwan..... **Li-Chih Hsu and Cheing-Tung Lee** 360
- Direct Observations and Modeling of Summertime Coastal Circulation Patterns in the Western Bohai Sea **Chuanxi Xing, Qian Zhao, Zhanming Hu, and Yongqing Liu** 373
- Asymptotic Solution for the Reflection of Long Water Waves by Asymmetric Convergent/Divergent Harbours **A. Mora, E. Bautista, F. Méndez, and M. Barbosa** 383
- Characteristics and Meteorology of Atlantic Swells Reaching the Caribbean **Mark R. Jury** 400
- Interactions between Various Headlands, Beaches, and Dunes along the Coast of Ceará State, Northeast Brazil **Vanda Claudino-Sales, Ping Wang, and Alexandre Medeiros Carvalho** 413
- Trace Fossils in Clastic Beachrocks at the Yallahs Salt Ponds, Jamaica: Implications for Beachrock Cementation **Taneisha C.P. Edwards and Simon F. Mitchell** 429
- Distribution Pattern and Influencing Factors for Soil Organic Carbon (SOC) in Mangrove Communities at Dongzhaigang, China **Xing Huang, Xueping Wang, Xiuzhen Li, Kun Xin, Zhongzheng Yan, and Richard Bellerby** 434
- Shifts of Sediment Microbial Community Structure along a Salinized and Degraded River Continuum..... **Yidong Wang and Zhong-Liang Wang** 443
- Using Satellite Sensors and *In Situ* Observations to Monitor Phytoplankton Blooms in the Pearl River Estuary **Tonghui Zhang, Shilin Tang, and Haigang Zhan** 451
- An Experimental Investigation of Tsunami Bore Impacts on a Coastal Bridge Model with Different Contraction Ratios... **Cheng Chen, Bruce W. Melville, N.A.K. Nandasena, and Farzad Farvizi** 460

TECHNICAL COMMUNICATIONS

- Sea-Level Rise Tipping Point of Delta Survival..... **R. Eugene Turner, Michael S. Kearney, and Randall W. Parkinson** 470
- A Meta-Modelling Approach for Estimating Long-Term Wave Run-Up and Total Water Level on Beaches..... **June Gainza, Ana Rueda, Paula Camus, Antonio Tomás, Fernando J. Méndez, Marcello Sano, and Rodger Tomlinson** 475
- SE Saline Everglades Transgressive Sedimentation in Response to Historic Acceleration in Sea-Level Rise: A Viable Marker for the Base of the Anthropocene? **John F. Meeder and Randall W. Parkinson** 490

DEPARTMENTS

- JCR External Peer Reviewers 2017..... 498



VOL. 34, NO. 2, March 2018

Journal of Coastal Research

CERF