



## **COVER PHOTOGRAPH AND FRONT MATTER: NORTHWEST ROCKY SHORE ON ILHA DO MAIO (CAPE VERDE ARCHIPELAGO)**

Source: Journal of Coastal Research, 32(4)

Published By: Coastal Education and Research Foundation

URL: <https://doi.org/10.2112/1551-5036-32.4.ii>

---

BioOne Complete ([complete.BioOne.org](https://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](https://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. 32, NO. 4 • CERF • July 2016



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

J. Andrew G. Cooper  
School of Environmental Sciences  
University of Ulster  
Coleraine, N. Ireland  
jag.cooper@ulster.ac.uk

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

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

RÉDACTEUR-EN-CHEF

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

WEB DESIGN & DEVELOPMENT

Jon Finkl  
Media Mine  
15014 Stonegreen Lane  
Huntersville, NC 28078, U.S.A.  
[jon@mediamine.net](mailto:jon@mediamine.net)

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  
Carrollton, Georgia

**Ilya V. Buynovich**  
Coastal Geology  
Philadelphia, Pennsylvania

**Javier A. Carrió**  
Sediment Processes  
Valencia, Spain

**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

**Oscar Manuel Ferreira**  
Storm Impacts  
Faro, Portugal

**Duncan M. FitzGerald**  
Sediment Transport  
Boston, Massachusetts

**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 Geomorphology  
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

ASSOCIATE EDITORS

**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  
Southport, Qld, Australia

**Ioannis Liritzis**  
Geophysical Proxy Data  
Rhodes, Greece

**Jeffrey H. List**  
Shoreline Change Processes  
Woods Hole, Massachusetts

**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

**Paolo A. Pirazzoli**  
Sea-Level Changes  
Paris, France

**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

**Anja Scheffers**  
Coastal Evolution  
Lismore, NSW, Australia

**Vic Semeniuk**  
Mangroves  
Perth, WA, Australia

**Andrew D. Short**  
Coastal Geomorphology  
Sydney, NSW, Australia

**Pravi Shrestha**  
Coastal Engineering  
Irvine, California

**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

**Adam D. Switzer**  
Coastal Hazards, Sea-Level  
Change  
NTU, Singapore

**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

**Ian J. Walker**  
Coastal Dunes & Sediments  
Tempe, Arizona

**Ping Wang**  
Beach Morphodynamics  
Tampa, Florida

**Allan Williams**  
Coastal Geology  
Swansea, Wales, UK

**Harry F. Williams**  
Paleotempestology  
Denton, Texas

**Colin D. Woodroffe**  
Coastal Geomorphology  
Wollongong, NSW, Australia

**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.

© 2016 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/](http://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: 828-333-2300. E-MAIL: [cfinkl@cerf-jcr.com](mailto:cfinkl@cerf-jcr.com)

**Subscription Information:** The *Journal of Coastal Research* is a bimonthly publication. Calendar-year (2016) 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](http://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](http://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)*.



**Northwest rocky shore on Ilha Do Maio (Cape Verde archipelago).** The northwest coast of Maio Island in the Cape Verde archipelago features strong surf against basaltic and limestone rocky shores due to wave refraction stimulated by strong and persistent northeast trade winds in the North Atlantic Ocean. The view above looks to the south towards a line of beaches dominated by carbonate sand derived mainly from the breakdown of mollusk shells. At the most sheltered SW end of the island, an extensive salt lagoon is well developed, which was the locus of a thriving salt trade during much of the seventeenth and eighteenth centuries. In the opposite direction located off the north end of the island, submarine banks are formed by rhodoliths (unattached, spherical growths of coralline red algae) subject to disturbance by major storms and removal to inter-tidal and supra-tidal settings as beach-rock and coastal over-wash deposits. A nascent island industry took root on the north coast, where limekilns were constructed for the production of lime used locally as mortar and as white wash. See the accompanying article in this issue of the JCR by Johnson *et al.*, which details the island's coastal geomorphology and rhodolith deposits. (Photograph and caption by Markes E. Johnson, Department of Geosciences, Williams College, Williamstown, Massachusetts, U.S.A.)

# 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.

**Western Europe**  
Carlos Pereira da Silva  
Michael Phillips  
Marcel J.F. Stive

**South America**  
Omar Defeo

**Eastern Europe**  
Kazimierz K. Furmanczyk

**Southeast Asia**  
Nobuo Mimura

**Oceania**  
Charles Lemckert  
Vic Semeniuk  
Andrew D. Short

## 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	Chris 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	Erik van Wellen
Yong-Sik Cho	Charles Lemckert	Ya Ping Wang
Nicholas K. Coch	Charles Thibault	Wei Zhang
Hany Elwany		

## Patron Members

Luis Antonio	Carl H. Hobbs, III	Norbert P. Psuty
Buenfil-Lopez	Timothy W. Kana	Robert S. Young
Georges Chapalain		

## 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.

## □ 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](http://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 30 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.

## Official Meeting of CERF International Coastal Symposium (ICS)

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](http://www.cerf-jcr.org).

# Journal of Coastal Research

VOL. 32, NO. 4 (pages 735–1004)

ISSN 0749-0208

July 2016

## CONTENTS

### RESEARCH ARTICLES

Recent Rhodolith Deposits Stranded on the Windward Shores of Maio (Cape Verde Islands): Historical Resource for the Local Economy .....	735
..... <b>Markes E. Johnson, B. Gudveig Baarli, Carlos M. da Silva, Mário Cachão, Ricardo S. Ramalho, Ana Santos, and Eduardo J. Mayoral</b>	
Nonlinear Sea-Level Trends and Long-Term Variability on Western European Coasts .....	744
..... <b>Tal Ezer, Ivan D. Haigh, and Philip L. Woodworth</b>	
Sediment Dynamics in the Upper and Lower Bays of New York Harbor .....	756
..... <b>Nicholas K. Coch</b>	
Phytoplankton Pigments in Maryland Coastal Bay Sediments as Biomarkers of Sources of Organic Matter to Benthic Community.....	
..... <b>Jennifer Chen, Ozuem Oseji, Madhumi Mitra, Yan Waguespack, and Nianhong Chen</b>	768
Sediment-Water Nitrogen Exchange along the Potomac River Estuarine Salinity Gradient .....	
..... <b>Jeffrey C. Cornwell, Michael S. Owens, Walter R. Boynton, and Lora A. Harris</b>	776
The Influence of Breakwaters on Nearshore Sedimentation Patterns in Chesapeake Bay, USA .....	
..... <b>Cindy M. Palinkas, Nicole Barth, Evamaria W. Koch, and Deborah J. Shafer</b>	788
Experimental and Numerical Investigation of the Hydrodynamic Characteristics of Submerged Breakwaters in Waves .....	
..... <b>Dezhi Ning, Lifeng Chen, Ming Zhao, and Bin Teng</b>	800
Comparison of the Calculated and Measured Wave Heights in Inland Lakes .....	814
..... <b>Hong-sheng Zhang, En-xian Zhou, Su Dai, and Yi Zhang</b>	
Linking Suspended Particulate Material Characteristics to the Plankton Distribution in Summer in the Yellow Sea and East China Sea.....	
..... <b>Renfu Fan, Hao Wei, and Liang Zhao</b>	829
Tectonic Processes along the South America Coastline Derived from Quaternary Marine Terraces.....	840
..... <b>Federico Ignacio Isla and Rodolfo José Angulo</b>	
Seasonal Heat and Salt Balance in the Upper Gulf of California .....	853
..... <b>Jorge M. Montes, Miguel F. Lavín, and Alejandro F. Parés-Sierra</b>	
Shoreline Change Analysis and Insight into the Sediment Transport Path along Santa Catarina Island North Shore, Brazil .....	
..... <b>Guilherme Vieira da Silva, Mariela Muler, Michel F.V. Prado, Andrew D. Short,</b>	
..... <b>Antonio Henrique da Fontoura Klein, and Elírio E. Toldo Jr.</b>	863
Physical and Biological Alterations Following Dredging in Two Beach Nourishment Borrow Areas in South Carolina's Coastal Zone.....	
..... <b>Stacie E. Crowe, Derk C. Bergquist, Denise M. Sanger, and Robert F. Van Dolah</b>	875
Hydrodynamic Pressure Field Caused by a Ship Sailing Near the Coast.....	890
..... <b>Hui Deng, Zhi-hong Zhang, Jian-nong Gu, and Ju-bin Liu</b>	
Wave-Induced Reynolds Stress in Three-Dimensional Nearshore Currents Model.....	898
..... <b>Hwusub Chun and Kyung-Duck Suh</b>	
Numerical Simulation of Viscous Flow Field around Ships in Ballast.....	911
..... <b>Wan-zhen Luo, Chun-yu Guo, Tie-cheng Wu, Sai-shuai Dai, and Yu-min Su</b>	
Significant Reduction of Fecal Bacteria and Suspended Solids Loading by Coastal Best Management Practices .....	
..... <b>Michael A. Mallin, Mary I.H. Turner, Matthew R. McIver, Byron R. Toothman, and Hunter C. Freeman</b>	923

### TECHNICAL COMMUNICATIONS

A Rapid, Low-Cost Approach to Coastal Vulnerability Assessment at a National Level.....	
..... <b>Mireia López Royo, Roshanka Ranasignhe, and José A. Jiménez</b>	932
The Uncertainty in the Prediction of the Distribution of Individual Wave Overtopping Volumes Using a Nonlinear Shallow Water Equation Solver .....	
..... <b>Hannah E. Williams, Riccardo Briganti, Tim Pullen, and Nicholas Dodd</b>	946
A Simplified Parametric Model for Fetch-Limited Peak Wave Frequency in Shallow Estuaries.....	
..... <b>Arash Karimpour and Qin Chen</b>	954
Tidal Estimation from TOPEX/Poseidon, Jason Primary, and Interleaved Missions in the Bohai, Yellow, and East China Seas.....	
..... <b>Yongcun Cheng, Qing Xu, and Yuan Zhang</b>	966
Propagating of Obliquely Incident, Weakly Viscous Waves over Variable Bathymetry .....	974
..... <b>Chia-Cheng Tsai, Yueh-Ting Lin, and Tai-Wen Hsu</b>	

### DISCUSSION AND REPLY

Discussion of: Boon, J.D. and Mitchell, M., 2015. Nonlinear Change in Sea Level Observed at North American Tide Stations. <i>Journal of Coastal Research</i> , 31(6), 1295–1305.....	
..... <b>J.R. Houston</b>	983
Reply to: Houston, J.R., 2016. Discussion of: Boon, J.D. and Mitchell, M., 2015. Nonlinear Change in Sea Level Observed at North American Tide Stations, <i>Journal of Coastal Research</i> , 31(6), 1295–1305. <i>Journal of Coastal Research</i> , 32(4), 983–987.....	
..... <b>John D. Boon and Molly Mitchell</b>	988

### COMMENTARIES

Commentary on 'Coastal Planning Should Be Based on Proven Sea Level Data' by A. Parker and C.D. Ollier ( <i>Ocean &amp; Coastal Management</i> , 124, 1–9, 2016) ..	
..... <b>S.D.P. Williams, P.L. Woodworth, and J.R. Hunter</b>	992

### BOOK REVIEWS

<i>Beach Renourishment</i> by Eric Bird and Nick Lewis .....	998
..... <b>Charles W. Finkl</b>	

### HONORS AND AWARDS

Professor Marcel Stive and Lindino Benedet at TU Delft, Delft, The Netherlands .....	999
--	-----

### IN MEMORIAM

Robert Dolan (1929–2016).....	1000
Orville Tyler Magoon (1928–2016) .....	1002



VOL. 32, NO. 4, July 2016

Journal of Coastal Research

CERF