



## **COVER PHOTOGRAPH AND FRONT MATTER: COOK INLET, ALASKA, U.S.A. The Grayling Oil Platform Surrounded by the Chigmit Mountains of the Aleutian Range**

Source: Journal of Coastal Research, 27(2)

Published By: Coastal Education and Research Foundation

URL: <https://doi.org/10.2112/1551-5036-27.2.fmii>

---

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.



## COVER PHOTOGRAPH



www.cerf-jcr.org



**COVER PHOTOGRAPH: COOK INLET, ALASKA, U.S.A.**

### **The Grayling Oil Platform Surrounded by the Chigmit Mountains of the Aleutian Range**

The Grayling Platform, which was built in 1967, is owned and operated by UNOCAL as a development platform of the Alaska's Cook Inlet McArthur River field. The platform was built in response to the extensive oil and gas discoveries in the Cook Inlet by Standard Oil, Pan American, and Ohio Oil Companies in 1960's. Following the discovery, further field development led to over 35 exploration wells being drilled in the Cook Inlet by various operators on other platforms.

Behind the Grayling Platform is Mount Redoubt, also known as Redoubt Volcano. An active volcano located on the west bank of the Cook Inlet, and part of the Chigmit Mountains of the Aleutian Range in the state of Alaska, Mount Redoubt is located approximately 180 km southwest of Anchorage and is the third highest mountain within the range, standing at 2750 m. Mount Redoubt is known to have been active for almost 1000 years and has recorded eruptions in 1902, 1922, 1966, 1989, and 2009. The mountain is made up of pyroclastic flows, which produce large deposits of andesite, basalt, and dacite. The foundation rocks that the volcano sits atop are granites of the Mesozoic Era, derived from the Alaska-Aleutian Range batholith.

(Photograph taken on 15 November 2010 by Zachary Mester, Department of Geosciences, Florida Atlantic University, Boca Raton, Florida, USA).

# JOURNAL OF COASTAL RESEARCH

An International Forum for the Littoral Sciences

CHEF-HERAUSGEBER

EDITOR-IN-CHIEF

RÉDACTEUR-EN-CHEF

**Charles W. Finkl**

Coastal Education and Research Foundation, Inc. [CERF]

Editorial Offices:

1656 Cypress Row Drive  
West Palm Beach, FL  
33411, U.S.A.

e-mail: CFinkl@CERF-JCR.com

(Editorial Office, West Palm Beach)

CERF/JCR Website: <http://www.CERF-JCR.org>

**BOOK REVIEW EDITOR**

J.A.G. Cooper  
University of Ulster  
Coleraine, N. Ireland

**MANAGING EDITOR**

Tracy Candelaria  
Allen Press Publishing Services  
810 E. 10th Street  
Lawrence, KS 66044, U.S.A.  
tcandelaria@allenpress.com

**PUBLISHING MANAGER**

Christopher Makowski  
CERF  
1656 Cypress Row Drive  
West Palm Beach, FL 33411, U.S.A.  
CMakowski@CERF-JCR.com

**EDITORIAL ASSISTANT**

Barbara Russell  
CERF  
1656 Cypress Row Drive  
West Palm Beach, FL 33411, U.S.A.  
Barbara@CERF-JCR.com

**MITHERAUSGEBER**

**Carl L. Amos**  
*Southampton, United Kingdom*  
**Edward J. Anthony**  
*Dunkerque, France*  
**Cecile Baeteman**  
*Brussels, Belgium*  
**Kenneth Banks**  
*Plantation, Florida*  
**Patrick Barnard**  
*Santa Cruz, California*  
**Lindino Benedet**  
*Florianopolis, Santa Caterina, Brazil*  
**Kerry Black**  
*Hamilton, New Zealand*  
**Tjeerd J. Bouma**  
*Yerseke, The Netherlands*  
**David M. Bush**  
*Carrollton, Georgia*  
**Ilya V. Buynevich**  
*Philadelphia, Pennsylvania*  
**Lauro Calliari**  
*Rio Grande, Brazil*  
**Bijan Cargahi**  
*Stockholm, Sweden*  
**Javier A. Carrió**  
*Valencia, Spain*  
**Roger Charlier**  
*Brussels, Belgium*  
**Paolo Ciavola**  
*Ferrara, Italy*  
**Pablo Clemente-Colón**  
*Washington, D.C.*  
**Mark Crowell**  
*McLean, Virginia*  
**Robert Dean**  
*Gainesville, Florida*  
**Omar Defeo**  
*Montevideo, Uruguay*  
**Ron DeLaune**  
*Baton Rouge, Louisiana*  
**Joao M. Alveirinho Dias**  
*Faro, Portugal*  
**Reinhard Dieckmann**  
*Bremerhaven, Germany*  
**Jean-Claude Dionne**  
*Québec, Canada*  
**Joseph F. Donoghue**  
*Tallahassee, Florida*  
**Ken Dunton**  
*Port Aransas, Texas*  
**Michael S. Fenster**  
*Richmond, Virginia*

**ASSOCIATE EDITORS**

**Oscar Ferreira**  
*Faro, Portugal*  
**Duncan M. Fitzgerald**  
*Boston, Massachusetts*  
**Chip Fletcher**  
*Honolulu, Hawaii*  
**Donald L. Forbes**  
*Dartmouth, Canada*  
**H.K. Furmanczyk**  
*Szczecin, Poland*  
**Mal Green**  
*Hamilton, New Zealand*  
**Gary B. Griggs**  
*Santa Cruz, California*  
**Pramod Hanamgond**  
*Belgaum, India*  
**Hans Hanson**  
*Lund, Sweden*  
**Simon Haslett**  
*Wales, United Kingdom*  
**Patrick Hesp**  
*Baton Rouge, Louisiana*  
**Michael Hilton**  
*Dunedin, New Zealand*  
**Carl H. Hobbs, III**  
*Gloucester Point, Virginia*  
**David Hopley**  
*Townsville, Qld., Australia*  
**John R.C. Hsu**  
*Kaohsiung City, Taiwan*  
**Wenrui Huang**  
*Tallahassee, Florida*  
**Michael G. Hughes**  
*Canberra, ACT, Australia*  
**Federico I. Isla**  
*Mar del Plata, Argentina*  
**Derek W.T. Jackson**  
*Coleraine, Ireland*  
**Nancy L. Jackson**  
*Newark, New Jersey*  
**Markes E. Johnson**  
*Williamstown, Massachusetts*  
**Timothy R. Keen**  
*Stennis Space Center, Mississippi*  
**Dieter Kelletat**  
*Essen, Germany*  
**Joseph T. Kelley**  
*Orono, Maine*  
**Syed Khalil**  
*Baton Rouge, Louisiana*  
**Jack Kindinger**  
*St. Petersburg, Florida*

**Antonio H. F. Klein**  
*Itajaí, SC, Brazil*  
**Vic Klemas**  
*Newark, Delaware*  
**Nobuhisa Kobayashi**  
*Newark, Delaware*  
**Vladimir N. Kosmyrin**  
*Tallahassee, Florida*  
**Joseph L. Kowalski**  
*Edinburg, Texas*  
**P.K. Dinesh Kumar**  
*Cochin, India*  
**Michael J. Lace**  
*West Branch, Iowa*  
**Pierre Lasserre**  
*Paris, France*  
**S.P. Leatherman**  
*Miami, Florida*  
**Charles Lemkert**  
*Queensland, Australia*  
**Ioannis Liritzis**  
*Rhodes, Greece*  
**Jeffrey H. List**  
*Woods Hole, Massachusetts*  
**J. Paul Liu**  
*Raleigh, North Carolina*  
**Michel M. de Mahiques**  
*São Paulo, Brazil*  
**Christopher Makowski**  
*West Palm Beach, Florida*  
**Gerd Masselink**  
*Devon, United Kingdom*  
**Ashish Mehta**  
*Gainesville, Florida*  
**Nobuo Mimura**  
*Ibaraki, Japan*  
**Robert A. Morton**  
*St. Petersburg, Florida*  
**Robert Nicholls**  
*Southampton, United Kingdom*  
**P. Nielsen**  
*Brisbane, Qlds., Australia*  
**Karl F. Nordstrom**  
*New Brunswick, New Jersey*  
**Julian Orford**  
*Belfast, Northern Ireland*  
**Phil Osborne**  
*Edmonds, Washington*  
**Brian Parsons**  
*Easton, Maryland*  
**Charitha Pattiaratchi**  
*Perth, Western Australia*

**COMITÉ DE REDACTION**

**Paulo Ricardo Pezzuto**  
*Itajaí, SC, Brazil*  
**Michael Phillips**  
*Swansea, Wales, United Kingdom*  
**Orrin H. Pilkey, Jr.**  
*Durham, N. Carolina*  
**Paolo A. Pirazzoli**  
*Paris, France*  
**Norbert P. Psuty**  
*New Brunswick, New Jersey*  
**Ulrich Radtke**  
*Köln, Germany*  
**Elijah W. Ramsey III**  
*Lafayette, Louisiana*  
**Denise Reed**  
*New Orleans, Louisiana*  
**Kirt Rusenko**  
*Boca Raton, Florida*  
**John Shaw**  
*Dartmouth, Nova Scotia, Canada*  
**Douglas Sherman**  
*College Station, Texas*  
**Andrew D. Short**  
*Sydney, NSW, Australia*  
**Pravi Shrestha**  
*Irvine, California*  
**Tom Spencer**  
*Cambridge, United Kingdom*  
**Marcel J.F. Stive**  
*Delft, The Netherlands*  
**Vallam Sundar**  
*Madras, India*  
**E. Robert Thieler**  
*Woods Hole, Massachusetts*  
**F. van der Meulen**  
*The Hague, The Netherlands*  
**Henk Jan Verhagen**  
*Delft, The Netherlands*  
**Ian J. Walker**  
*Victoria, British Columbia, Canada*  
**Ping Wang**  
*St. Petersburg, Florida*  
**John T. Wells**  
*Chapel Hill, N. Carolina*  
**Eric Wolanski**  
*Townsville, Qlds., Australia*  
**Colin D. Woodroffe**  
*Wollongong, Australia*  
**P.L. Woodworth**  
*Merseyside, England*  
**Donald R. Young**  
*Richmond, Virginia*  
**Robert S. Young**  
*Stillwell, North Carolina*

The *JOURNAL OF COASTAL RESEARCH* (ISSN 0749-0208) is the official peer-reviewed publication of The Coastal Education and Research Foundation [CERF] and is published bimonthly in January, March, May, July, September, and November. The journal is available online at [www.jronline.org](http://www.jronline.org) and subscriptions can be placed through [www.CERF-JCR.org](http://www.CERF-JCR.org). Publishing services are currently available through CERF, 1656 Cypress Row Drive, West Palm Beach, FL 33441. Calendar-year (2011) 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 subscription information, please go to [www.CERF-JCR.org](http://www.CERF-JCR.org). Subscriptions, changes of address, and requests for missing issues should be sent to the JCR Subscriptions Office, Allen Press, P.O. Box 7065, Lawrence, Kansas 66044 or CERF@allenpress.com. Claims for copies lost in the mail must be received within 90 days (180 days foreign) of the issue date to insure replacement at no charge. Access to the archived JCR is available through JSTOR at <http://www.jstor.org/>.

Periodicals postage paid at Lawrence, KS, and additional mailing offices. POSTMASTER: Send address changes to *Journal of Coastal Research*, Allen Press Association Management, P.O. Box 1897, Lawrence, KS 66044.

© 2011 The Coastal Education & Research Foundation [CERF].

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



# THE COASTAL EDUCATION AND RESEARCH FOUNDATION

1656 Cypress Row Drive  
West Palm Beach, FL 33411, U.S.A.

## Officers of the Foundation

Founded in 1983 by: Charles W. Finkl, Sr.,  
Charles W. Finkl, Jnr., Rhodes W. Fairbridge,  
and Maurice L. Schwartz

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

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

**Secretary:**  
Heather M. Vollmer

**Executive Assistant:**  
Barbara Russell

## Board of Directors (Trustees)

Jean-Claude Dionne	Elijah W. Ramsay
Robert Dolan	Maurice L. Schwartz
David Hopley	Ian Shennan
Robert Huff	Andrew D. Short
Victor Klemas	Daniel J. Stanley

## Patron Members

Nicholas K. Coch	Joan Oltman-Shay
Mark Crowell	Norbert P. Psuty
Bijan Dargahi	Giovanni Randazzo
Carl H. Hobbs, III	Robert S. Young

The Coastal Education and Research Foundation [CERF] is a nonprofit corporation 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 is associated with the Department of Geosciences at Florida Atlantic University (FAU) in Boca Raton, Florida, and one of the main editorial offices for the *Journal of Coastal Research* (JCR) is located at the University. This partnership provides a basis for cooperative investigation, in private and public sectors, of biophysical resources found in open and naturally protected coastal regions, estuaries, large inland bodies of water bounded by shorelines, wetlands, and other coastal environments. Multidisciplinary studies at FAU's Department of Geosciences brings together experts from various fields in remote sensing, geographic information science, spatial ecology, environmental studies, marine biology, coastal geology, geography, and coastal engineering. Scientific investigative efforts by faculty, students, and staff span a wide and diversified range of interrelated topics that are relevant to solutions of today's dynamic problems. It is hoped that these combined attempts to better understand the nature of coastal processes will help forestall what may become contentious issues of tomorrow.

□ 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

Dr. Charles W. Finkl is President and Executive Director of the Coastal Education & 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 27 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.

## Foundation Meetings

### International Coastal Symposia (ICS)

The International Coastal Symposium (ICS) was set up by Per Bruun (deceased) and Charlie Finkl, the first meeting being held in Hilton Head, South Carolina, in 1993. Since then these CERF meetings were held a second time in Hilton Head and then in Palm Beach, Florida. With the success of these meetings, CERF moved the ICS to the international scene holding meetings in conjunction with local sponsors in Australia, Brazil, Iceland, New Zealand, Northern Ireland, and Portugal. Forthcoming meetings will be held in Szczecin, Poland (11th ICS hosted by Dr. Kazimierz Furmanczyk at the University of Szczecin), and Plymouth, United Kingdom (12th ICS hosted by Dr. Gerd Masselink at the University of Plymouth). The ICS deals with all aspects of the coastal zone and attracted more than 600 delegates to the 10th ICS, organized by the Faculdade de Ciências Sociais e Humanas – UNL in Lisbon, Portugal. For more information, please visit [www.cerf-jcr.org](http://www.cerf-jcr.org)



# JOURNAL OF COASTAL RESEARCH

## An International Forum for the Littoral Sciences



### Supporting Scientific Organizations

- AZTI - Tecnalia [Pasaia, Spain; [www.azti.es/](http://www.azti.es/)]
- Coastal and Hydraulics Laboratory (CHL), US Army Corps of Engineers® [Vicksburg, Mississippi, U.S.A.; <http://chl.erdc.usace.army.mil/>]
- Coastal and Marine Geology Program (CMGP), U.S. Geologic Survey (USGS) [Reston, Virginia, U.S.A.; <http://marine.usgs.gov/>]
- Coastal Research Laboratory (CRL), University of South Florida [Tampa, Florida, U.S.A.; <http://crl.usf.edu/>]
- Consorzio Nazionale Interuniversitario per le Scienze del Mare (Co.N.I.S.Ma.) [Rome, Italy; [www.conisma.it/](http://www.conisma.it/)]
- Deltares Institute [Delft, The Netherlands; <http://www.deltares.nl/en/coast-sea>]
- Department of Geosciences, Florida Atlantic University (FAU) [Boca Raton, Florida, U.S.A.; <http://www.geosciences.fau.edu/>]
- e-Geo Center for Geographical and Regional Planning Studies [Lisbon, Portugal; <http://e-geo.fcsh.unl.pt/>]
- Institute of Marine and Coastal Sciences (IMCS), Rutgers University [New Brunswick, New Jersey, U.S.A.; <http://marine.rutgers.edu/main/>]
- Louisiana Office of Coastal Protection and Restoration (OCPR) [Baton Rouge, Louisiana, U.S.A.; [www.ocpr.louisiana.gov/](http://www.ocpr.louisiana.gov/)]
- Royal Belgian Institute of Natural Sciences: Management Unit of the North Sea Mathematical Models (MUMM) [Brussels, Belgium; [www.mumm.ac.be/](http://www.mumm.ac.be/)]

### 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*, 1656 Cypress Row Drive, West Palm Beach, FL 33411, U.S.A. PHONE: 561.313.0926. E-MAIL: [CFinkl@CERF-JCR.com](mailto:CFinkl@CERF-JCR.com).

**Subscription Information:** The *Journal of Coastal Research* is a bimonthly publication. Calendar-year (2011) 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; GEOBASE] (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)*.