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Geomorphological Changes along the Nile Delta Coastline between 1945 and 2015 Using Satellite Remote Sensing and GIS

IN THIS ISSUE

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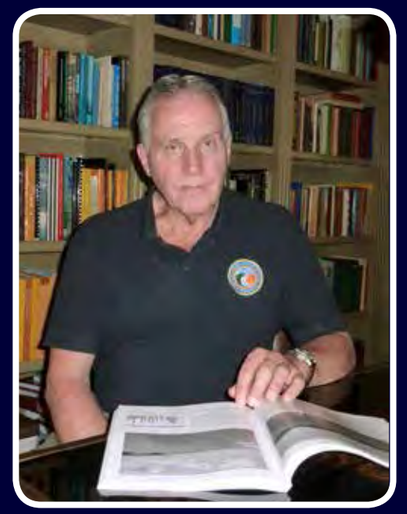

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Coastal Education and Research Foundation *[CERF]* is pleased to announce our newly appointed Regional Vice Presidents (RVP), who throughout the international scientific community continue to provide outstanding representation of our coastal research society. Please join us in honoring the following individuals for their tremendous service and support of CERF and the JCR.

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Nobuo Mimura, D.Eng.

Nobuo Mimura, D.Eng., is currently serving as the President of Ibaraki University. His academic areas of expertise are global environmental engineering, coastal engineering, and adaptation policy to climate change. Dr. Mimura has also been a member of the advisory committees for Ministry of Foreign Affairs, Ministry of Infrastructure, Land and Transportation, Ministry of the Environment and Ministry of Education, Culture, Sports, and Science and Technology.

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James R. Houston, Ph.D.

Jim Houston, Ph.D., is Director Emeritus of the U.S. Army Engineer Research and Development Center (ERDC), which includes all the research and development laboratories of the Corps of Engineers. He managed one of the most diverse research organizations in the world – seven laboratories at four geographical sites, with over 2,000 employees and an annual program budget of $1.3 billion. Dr. Houston has published over 130 technical reports and papers and has received several honors and awards including three Presidential Rank Awards and the National Beach Advocacy Award.

Vic Klemas, Ph.D.

Vic Klemas, Ph.D., is Professor Emeritus in the University of Delaware's College of Earth, Ocean, and Environment. He directed UD's Applied Ocean Science Program from 1981-98, and he has co-directed UD's Center for Remote Sensing for more than 30 years. Dr. Klemas has served on six scientific committees of the National Research Council and received a number of awards, including, in November 2010, the Science Prize of the Republic of Lithuania. The honor recognized his lifetime achievements in applying remote sensing and other advanced techniques to study coastal ecosystems.

Orrin H. Pilkey, Jr., Ph.D.

Orrin H. Pilkey, Ph.D., is a James B. Duke Professor Emeritus of Geology within the Division of Earth and Ocean Sciences and Director Emeritus of the Program for the Study of Developed Shorelines (PSDS) in the Nicholas School of the Environment and Earth Sciences at Duke University. Since 1965, Dr. Pilkey has been at Duke University with one-year breaks with the Department of Marine Science at the University of Puerto Rico, Mayaquez, and with the U.S. Geological Survey in Woods Hole, Massachusetts. His research career started with the study of shoreline/continental shelf sedimentation, progressed to the deep sea with emphasis on abyssal plain sediments, and back to the nearshore with emphasis on coastal management. Dr. Pilkey has published more than 250 technical publications and has authored, coauthored, or edited 39 books.

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CERF RVP (South America)

Omar Defeo, D.Sc.

Omar Defeo, D.Sc., is a professor in the Marine Science Unit at the Universidad de la República in Uruguay. He is also among a select group of ecologists worldwide working on sandy beach ecosystems and how they are threatened by climate change. For the past 15 years, Prof. Defeo has also been involved in artisanal shellfisheries, ecology, and conservation of coastal marine invertebrate biodiversity research in Latin America, primarily in Mexico and Chile.

CERF RVP (Western Europe)

Carlos Pereira da Silva, Ph.D.

Carlos Pereira da Silva, Ph.D., is the Director of e-GEO within the Research Centre for Geography and Regional Planning at the Universidade Nova de Lisboa, Portugal. Dr. Pereira da Silva's research interests are mainly focused on coastal zone management, with specific emphasis in beach management, public participation studies, and carrying capacity. A long time supporter of CERF and the JCR, in April 2009, he served as the local Chair and Co-organizer of the 10th International Coastal Symposium (ICS) that took place in Lisbon, Portugal.

Michael Phillips, Ph.D.

Professor Mike R. Phillips (BSc, PGCE, MSc, PhD, MIEnvSc, FRGS) serves as Pro Vice-Chancellor of Research, Innovation, Enterprise, and Commercialization at the University of Wales Trinity Saint David (Swansea Metropolian). Professor Phillips research expertise includes coastal processes, morphological change and adaptation to climate change and sea-level rise. Consultancy includes beach replenishment issues and developing techniques to monitor underwater sediment movement to inform beach management. He is widely published and recently organized a session on Coastal Tourism and Climate Change at UNESCO Headquarters in Paris as part of his role as a member of the Climate Change Working Group of the UNEP Global Forum on Oceans, Coasts, and Islands.

Marcel J.F. Stive, Ph.D.

Until 2010, Marcel Stive, Ph.D., was Scientific Director of the Water Research Centre Delft, which is now embedded in the Delft Research Initiative Environment. He currently holds the positions of: Chair of Coastal Engineering in the Section of Hydraulic Engineering and Department Head of Hydraulic Engineering at Delft University of Technology. Dr. Stive was recently appointed Knight in the Order of the Dutch Lion in theatre the Rijswijkse Schouwburg in Rijswijk. He was presented with this award for his outstanding record as a top researcher, much consulted expert, distinguished engineer, and inspiring teacher.

CERF RVP (Eastern Europe)

Kazimierz K. Furmańczyk, D.Sc.

Kaz Furmańczyk, D.Sc., is currently Full Professor at the University of Szczecin and the Head of the Remote Sensing and Marine Cartography Unit at the Institute of Marine and Coastal Sciences. Author and co-author of over 100 scientific publications including books (2) and chapters, journal articles, abstracts, and conference papers. Contributions are mainly in the disciplines of remote sensing, coastal sciences, hydrology, and oceanography. In May 2011, he served as the local Chair and Co-organizer of the 11th International Coastal Symposium (ICS) that took place in Szczecin, Poland.

CERF RVP (Oceania)

Charles Lemckert, Ph.D.

Charles Lemckert, Ph.D., is the Head of Discipline of Civil Engineering at Griffith University's School of Engineering. He has active research interests in the fields of physical limnology, coastal systems, environmental monitoring techniques, environmental fluid dynamics, coastal zone management, and engineering education. Along with his postgraduate students and research partners, Dr. Lemckert is undertaking research studies on water treatment pond design (for recycling purposes), the dynamics of drinking water reservoirs, the study of whale migration in southeast Queensland waters, and ocean mixing dynamics. In 2007, he served as the local Chair and Co-organizer of the 9th International Coastal Symposium (ICS) along the Gold Coast of Australia.

Vic Semeniuk, Ph.D.

Vic Semeniuk, Ph.D., is a natural history research scientist, specialising in coastal, estuarine and wetland environments, and mangrove and tidal flat environments. He has 45 years experience in scientific research in Australia, Europe, Canada, the USA, Ireland, the United Kingdom, and South Africa. Dr. Semeniuk is currently the Director of the Research & Development Firm, the V & C Semeniuk Research Group, and has over 130 publications in refereed scientific journals. He also has a proactive interest in conservation and coastal management, and has published multiple scientific works directly and indirectly leading to this objective.

Andrew D. Short, Ph.D.

Andy Short, Ph.D., served as the Director of the Coastal Studies Unit at The University of Sydney and has been the National Coordinator of the Australian Beach Safety and Management Program in cooperation with Surf Life Saving Australia. Dr. Short is mainly interested in the processes and morphology of coastal systems. His present research focuses on the beach and barrier systems of Australia, as it relates to the morphodynamics of representative systems in variable wave and tide environments, and in the nature, hazards, and usage of all Australia beach systems.

Geomorphological Changes along the Nile Delta Coastline between 1945 and 2015 Using Satellite Remote Sensing and GIS

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ABSTRACT

This study describes geomorphologic changes along the Nile Delta coastline between 1945 and 2015. The study used topographic maps produced by the Egyptian Geological Survey in 1945 and Landsat satellite imagery taken between 1973 and 2015. The study found that the coastline's geomorphology greatly changed during this time period, especially at Damietta and Rosetta promontories, which were highly eroded after construction of the Aswan High Dam. Other stretches of the coastline also eroded, while some accretion occurred along the coastline down-drift from the promontories. The trend has been erosion of the beaches along the Nile promontories and accretion within the embayments between the promontories, resulting in an overall smoothing of the coastline. A portion of the eroded material has accreted in the form of spits or shoals near the inlets. The principal causal factors of coastline change were the impacts of the Aswan High Dam, sea-level rise, land subsidence, storms, and coastal protection devices. Efforts to stop erosion have had mixed results. Seawalls built along the city of Alexandria have maintained the coastline, while other coastal protection devices have not impeded erosion. Areas of cultivated land are highly susceptible to saltwater intrusion due to sea-level rise and the fact that much of the delta is at or near sea level.

ADDITIONAL INDEX WORDS: *Shoreline changes, coastal morphology, coastal erosion hazard, DSAS, Aswan High Dam.*

INTRODUCTION

The purpose of this study was to document geomorphological changes along the Nile Delta coast between the years 1945 and 2016. It was carried out by comparing satellite imagery and topographic maps of the coast made during the period of study. State-of-the-art techniques were used to carry out the analysis. The significance of this research lies in the fact that nearly the entire population of Egypt live in the Nile Delta, which is at or slightly above sea level. The combined effects of sea-level rise, subsidence, and the Aswan High Dam leave the delta's coastline susceptible to erosion and the Egyptian population at risk.

The Nile Delta coast is one of the world's earliest recognized deltaic systems. The Greek historian Herodotus, in 450 BC, described its triangular shape as a delta since it resembled the inverted Greek letter Λ. It was formed by sedimentary processes between the upper Miocene and the present (Stanley and Warne, 1993) through alluvium brought by the original seven branches of the Nile (El Banna and Frihy, 2009). The delta is located along the Egyptian Mediterranean coast, as shown in Figure 1. It extends approximately 300 km from Alexandria to Port Said. The Nile Delta coast comprises approximately 22,000 km^2 and is situated in the NE margin of the African plate at the SE part of the Mediterranean Sea.

Two different types of sandy spits have formed along the outer margins of the Nile promontories at Rosetta and Damietta (Torab and Azab, 2007). Prior to

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the Aswan High Dam, water from Nile floods occurring between August and October passed to the Mediterranean Sea at Rosetta and Damietta. After the dam was built, water and its suspended alluvial sediments were trapped behind it. The sediment load was reduced from a range of 54,000,000 t (60,000,000 English tons [tn]) to 163,000,000 t (180,000,000 tn) to less than 14,000,000 t (15,000,000 tn) after the dam was built, which was the principal reason for erosion, especially on Rosetta and Damietta promontories.

Land subsidence rates in the Nile Delta coast were measured by Becker and Sultan (2009), Stanley and Goodfriend (1997), and Stanley and Toscano (2009). The results ranged from as low as 2.0 mm/y to as high as 8.0 mm/y. The range of subsidence ranged between 1 and 2.5 mm/y between Alexandria and the central delta. The annual rate was 5.0 mm between Port Said and the Manzala lagoon region (Stanley, 1990). The subsidence rate between El Mansûra and El Mahalla El Kubra ranged between 1.0 and 9.0 mm/y (Aly, Andrew, and Howard, 2012).

The Nile Delta is a wave-dominant delta. Coleman *et al.*(1981), Frihy, Essam, and Waleed (2003), and Said (1993) reported that the main wave direction along the Nile Delta coast is NW. This wave trend creates a NE longshore current parallel to the coast. The maximum wave height recorded at Rosetta was 5.4 m, which occurred in 1988 (Frihy, Shereet, and El Banna, 2008).

Studies of the wave refraction and longshore sediment transport rates along the Nile Delta coast were performed by Abdallah, Sharaf El Din, and Shereet (2006), Abo Zed (2007), Elbisy and Bassam (2011), and Isklander (2013). Each reported zones of wave convergence and divergence resulting in strong longshore gradients of wave heights and breaker angles and, therefore, of sand transport rates.

Isklander (2013) showed that the wave action along the coast is seasonal in nature, with storm waves occurring between October and March. On average, 16 storms occur annually, of which 7 are destructive. Statistical analysis of waves recorded in Abu Quir Bay between 1985 and 1990 showed that waves had an average significant wave height of 1.9 m, an average wave height of 1.1 m, and an average peak wave period of 6.0 seconds. In front of the Damietta harbor between 1997 and 2010, waves had an average significant wave height of 1.0 m, an average wave height of 0.6 m, and an average peak wave period of 6.3 seconds (Isklander, 2013).

The goal of this research was to document where there have been appreciable morphological changes along the Nile Delta coast between 1945 and 2015. The primary objective of this study was to map the coastline over several points in time and measure erosion or accretion. A secondary objective was to forecast changes that might occur in the future.

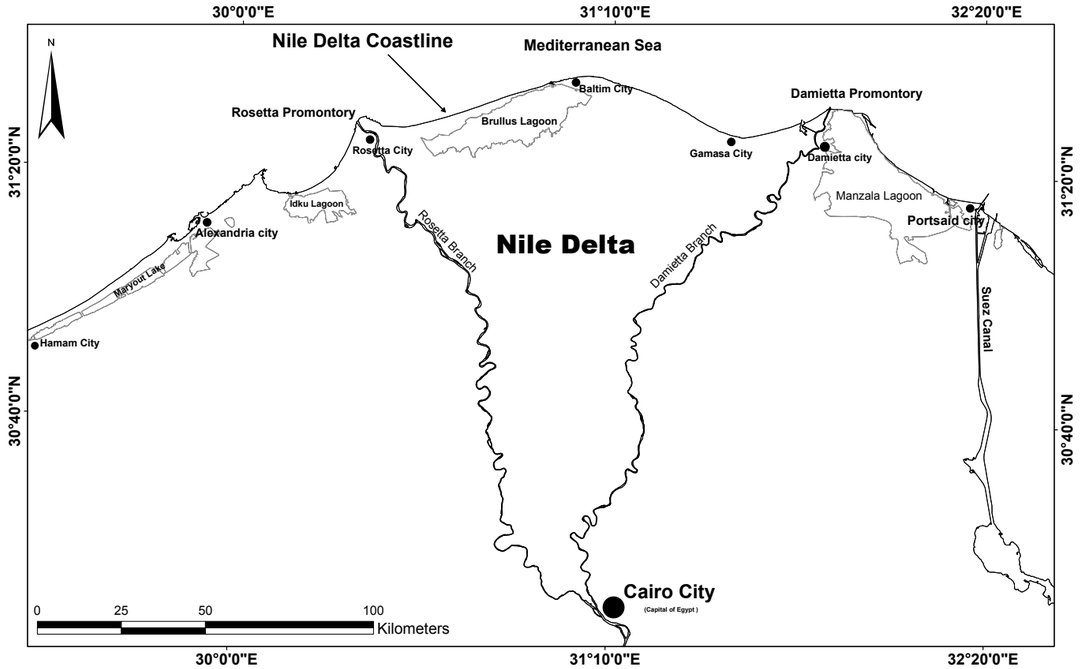

Figure 1. Study area. The study area consisted of approximately 300 km of coastline between Alexandria and Port Said. There are only two outlets to the Mediterranean Sea today (the Rosetta and Damietta). In ancient times, there were seven outlets to the sea.

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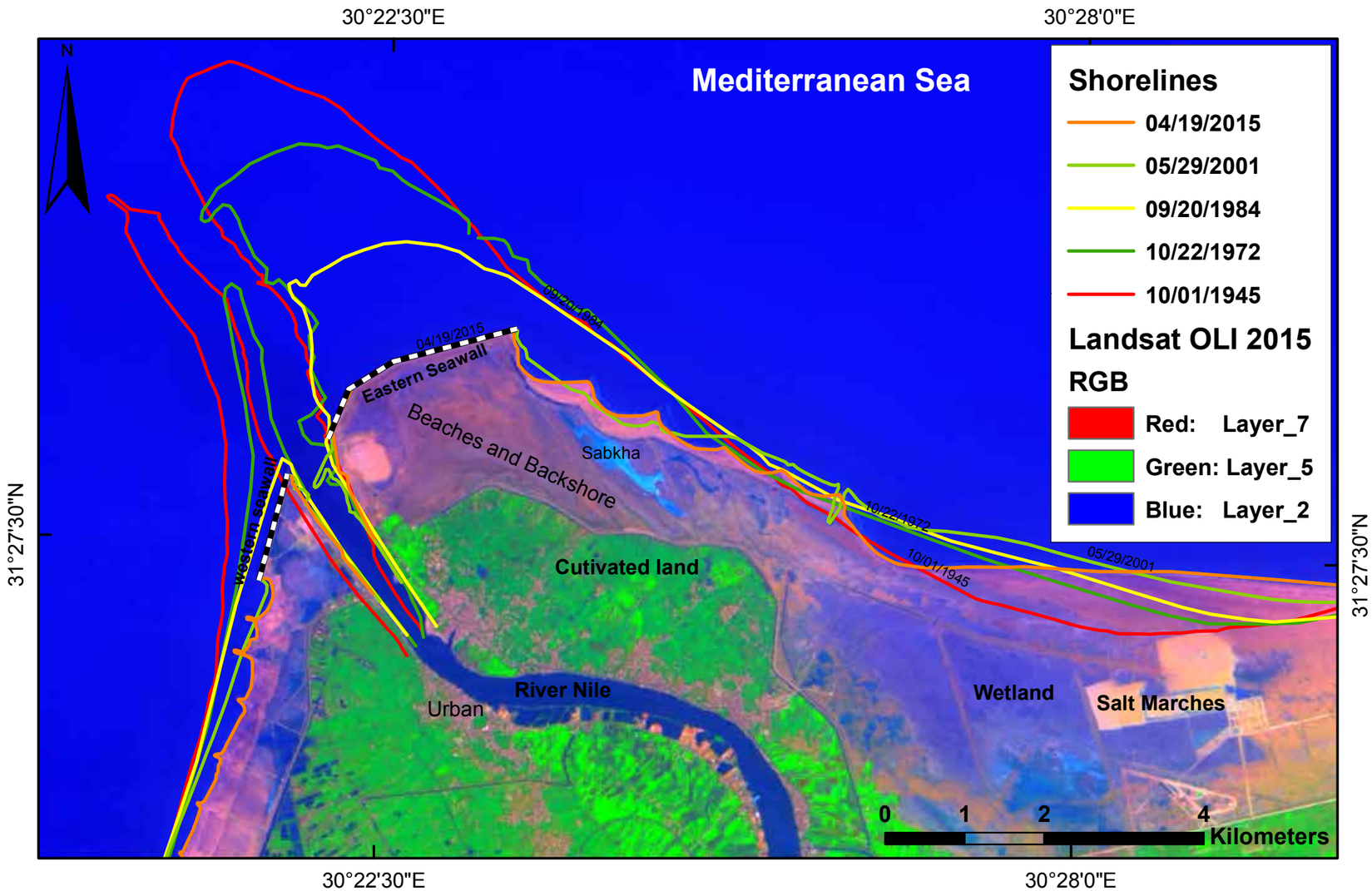

Figure 2. Rosetta Promontory coastline between 1945 and 2015. The map contains an overlay of GIS layers (shorelines from 1945 to 2015) with Landsat 8 images taken in 2015. The coastline along Rosetta Promontory is the most fragile segment of the Nile Delta coast. The highest erosion has occurred in front of the promontory and at the western side, while sedimentation occurred on the eastern side. A reverse of the erosion occurred after construction of the Rosetta seawall, when a new erosion zone formed on the eastern side of the promontory. West of the Rosetta's outlet to the sea there was breaching of seawater into the brackish-water lakes that fringe the Mediterranean Sea.

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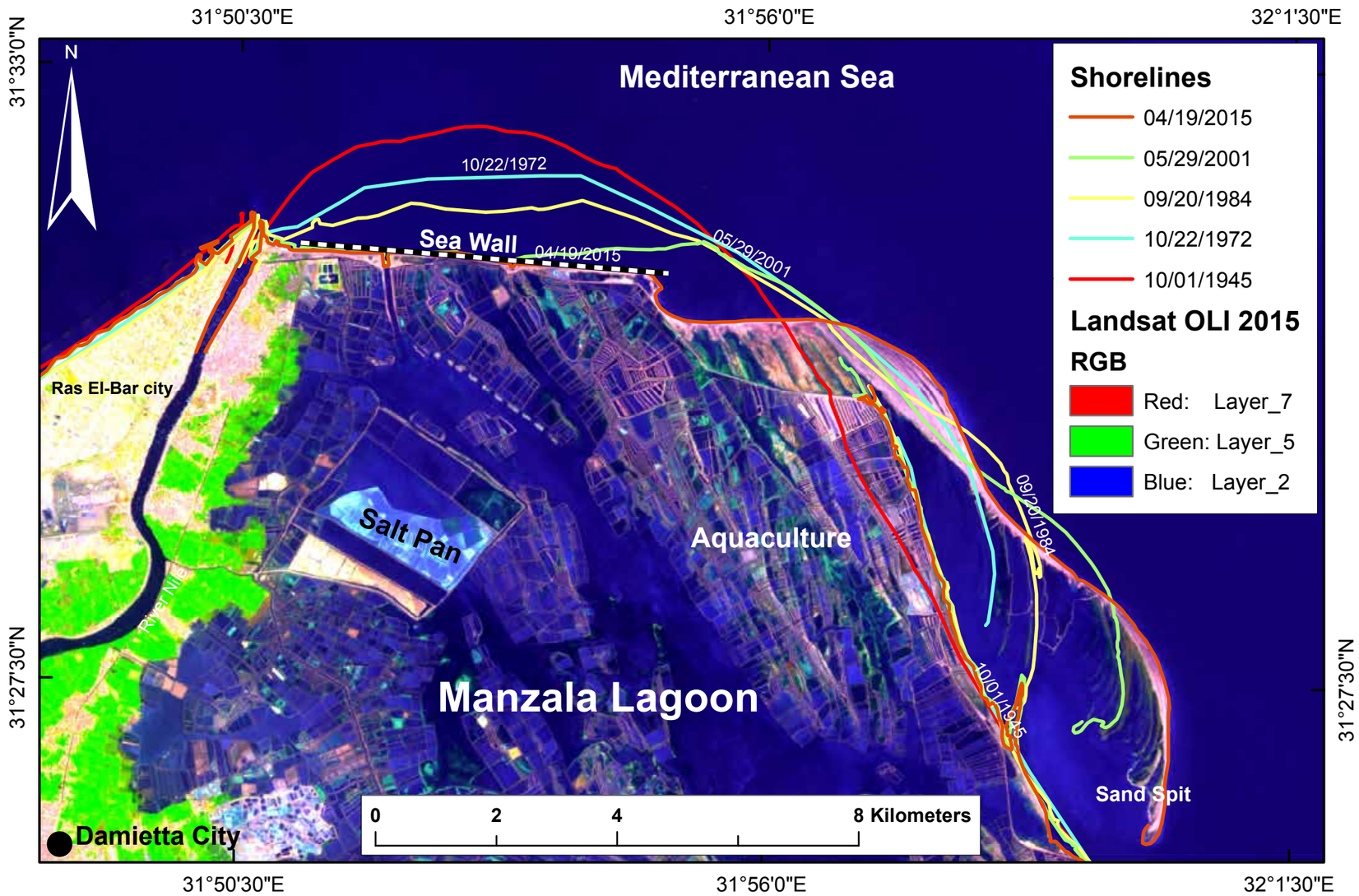

Figure 3. Damietta Promontory coastline between 1945 and 2015. The second-highest coastal erosion rates are at the eastern part of the Damietta outlet. East of the coastal erosion zone a sedimentation zone has formed a sand spit.

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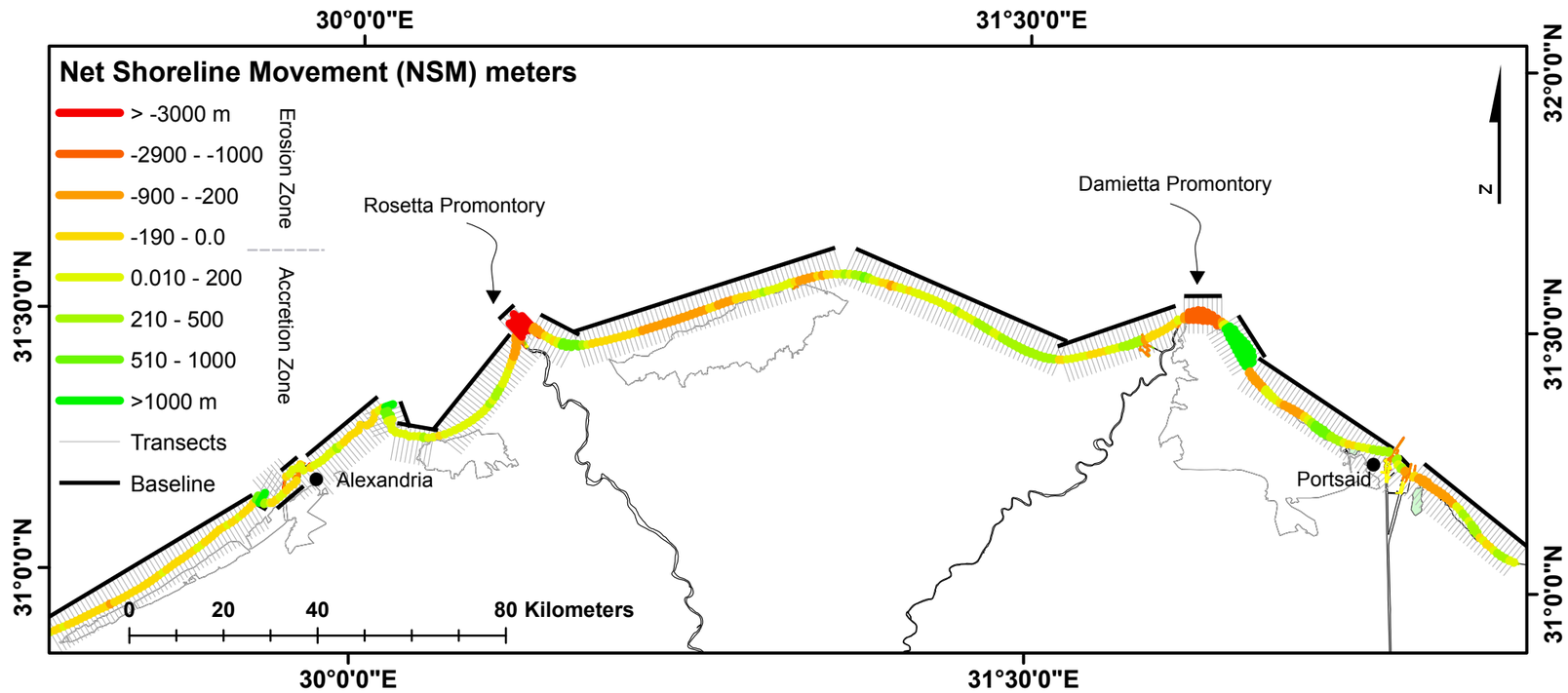

Figure 4. Net change in coastline between 1945 and 2015. The map shows 19 segments along the Nile Delta coast according to direction angles of the coastline. Transects came from segments crossing the shorelines at specific stations. Automatic calculations using the DSAS of the net shoreline movement represents the total distance between the oldest and newest shoreline. The highest coastal erosion zones (dark gray) are distributed spatially along the Nile Delta promontories (-5328.7 m), while the highest coastal sedimentation zones (light gray) are located at the eastern side of Rosetta Promontory (+3000 m).

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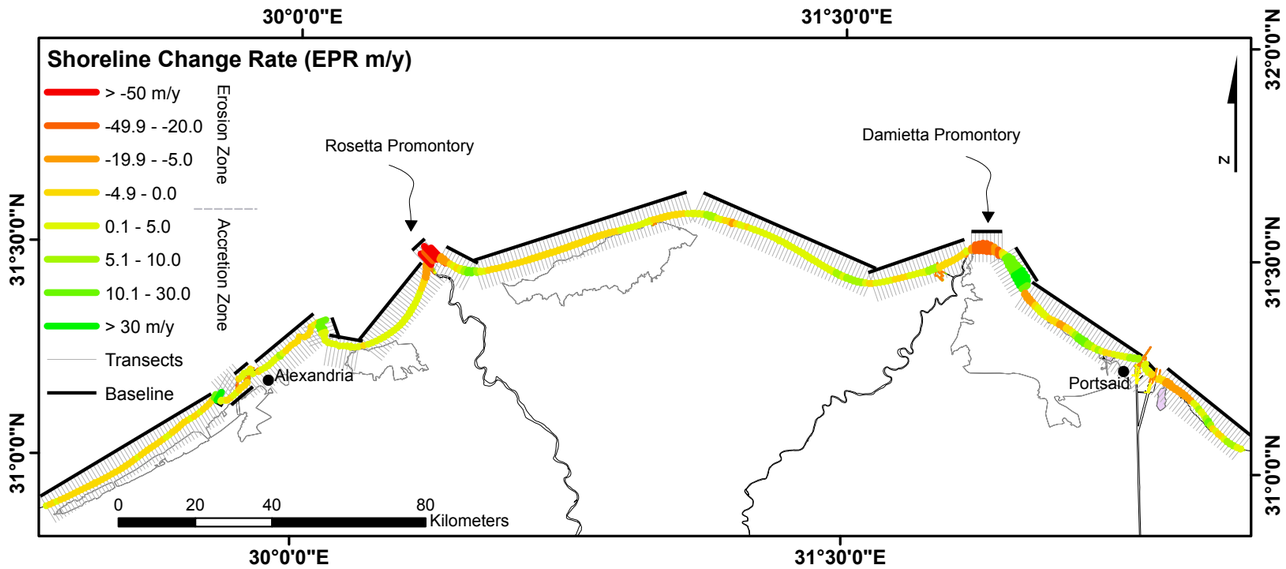

Figure 6. End-point rate of erosion and depositional zones along the Nile Delta coast between 1945 and 2015. It appears that the highest rates were along the Nile Delta promontories and in the artificial ports.

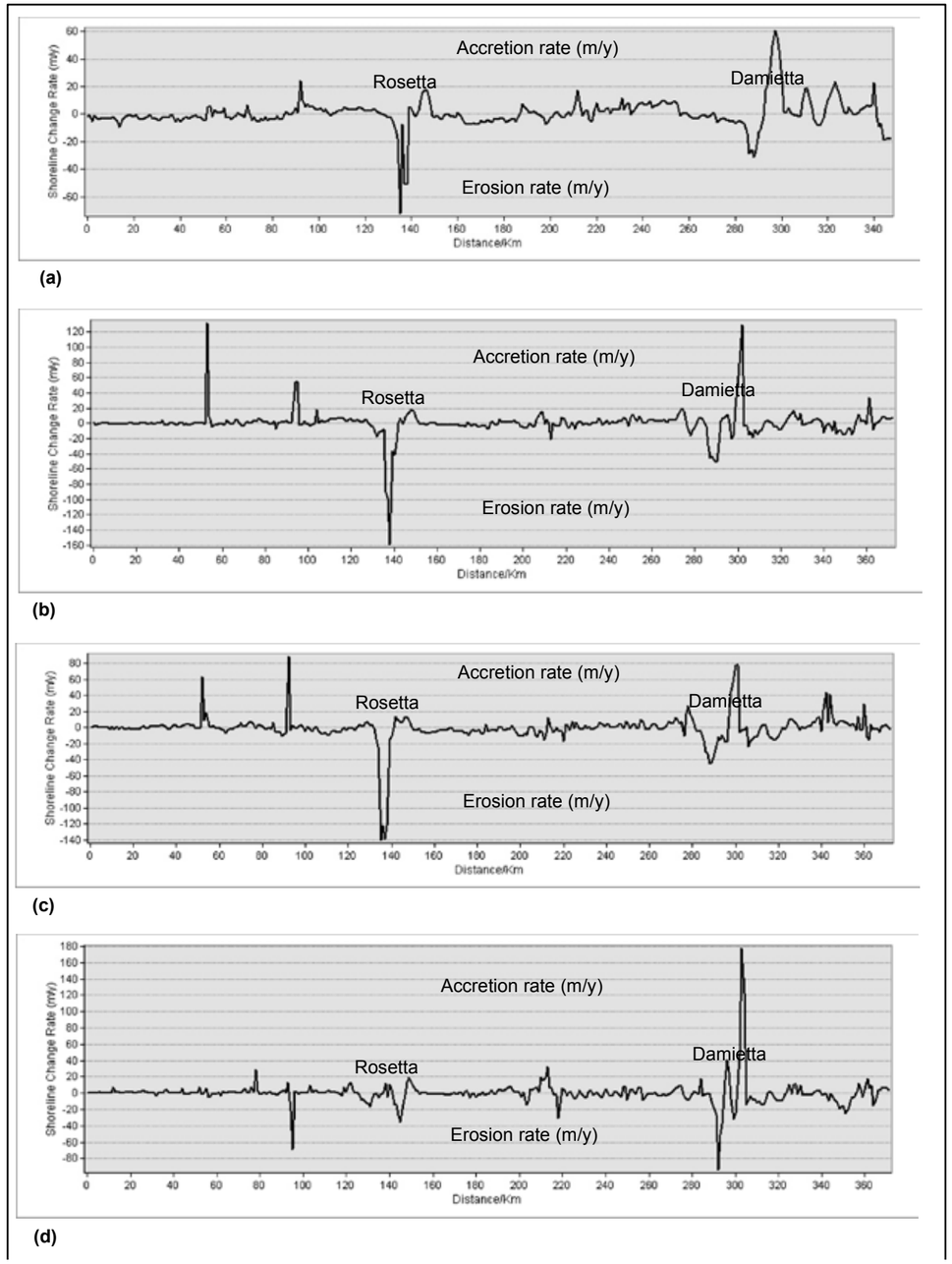

Figure 7. Coastline change rate between 1945 and 2015. This graph shows the EPR of erosion and depositional zones (in m/y) along the Nile Delta coast from 1945 to 1972 (before construction of the Aswan High Dam) and from 1984 to 2015 (after construction of the dam). The rates clearly increased after the Aswan High Dam was constructed due to trapping sediments behind the dam. A statistical graph shows the EPR of erosion and depositional zones (in m/y) along the Nile Delta coast from 1984 to 2001 (before construction of Nile Delta coastal protection seawalls) and from 2001 to 2015 (after construction of the seawalls). It is clearly seen that the rates have decreased suddenly at the areas in which the seawalls were constructed, while new coastal erosion and depositional zones have been formed in different locations along the Nile Delta coast.

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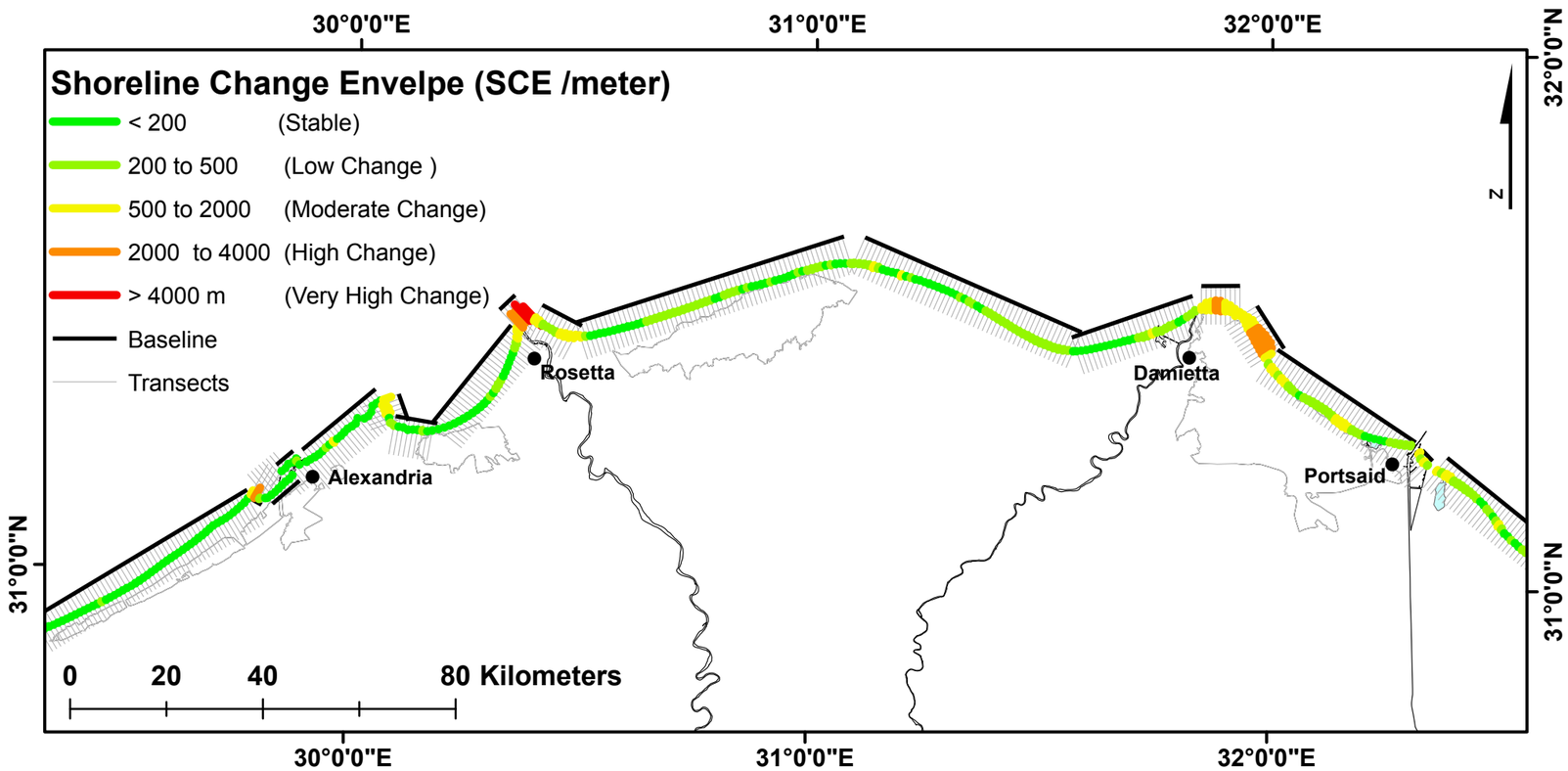

Figure 8. Net change in the Nile Delta coast between 1945 and 2015. Five relatively homogeneous coastal change zones were identified along the Nile Delta coast. Alexandria is the most stable zone; the Burullus and Manzala lagoon barriers are a low- to medium-change zones, and the artificial ports are also medium-change zones. The Nile Delta promontories had the highest change.

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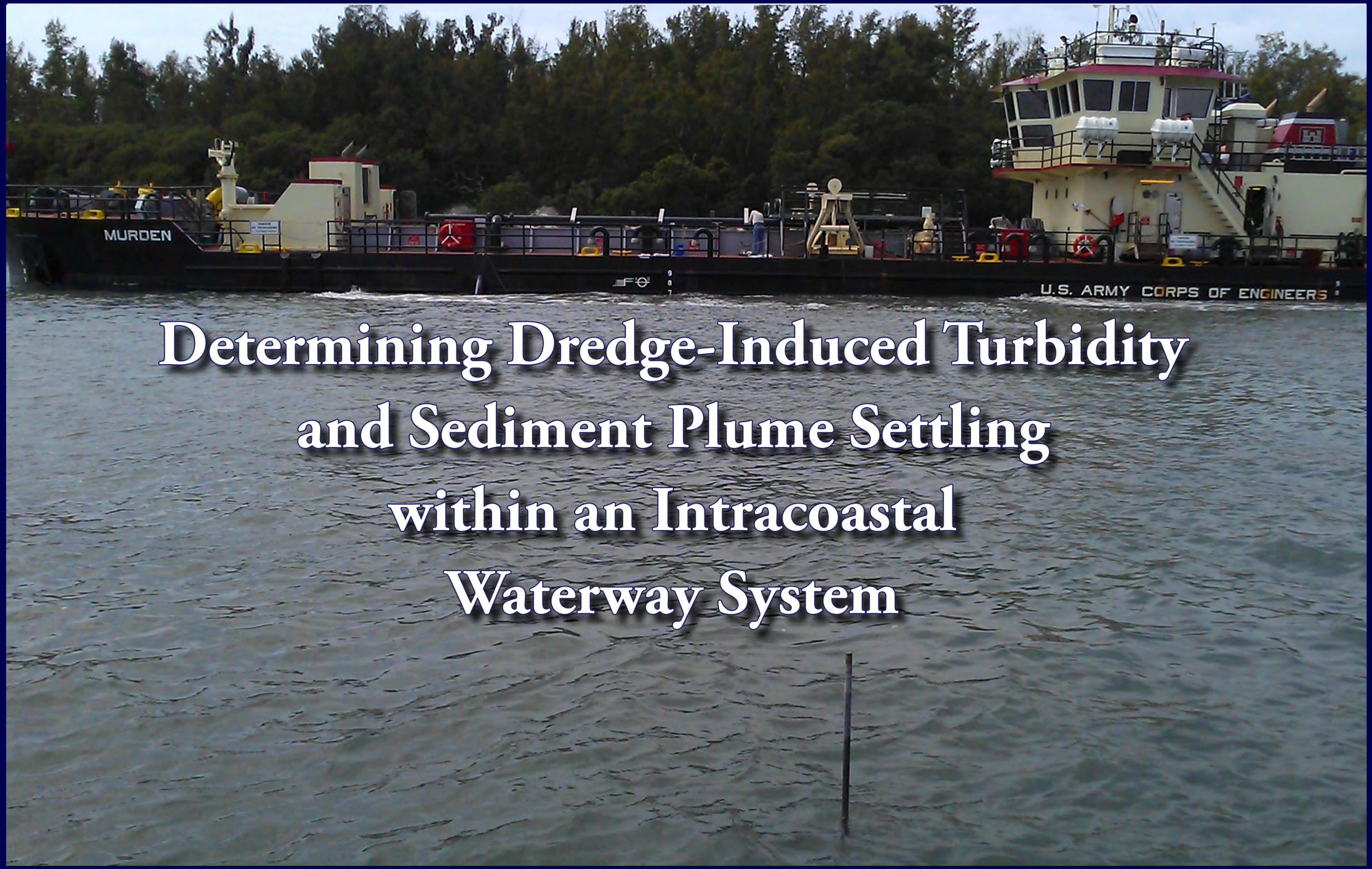

Determining Dredge-Induced Turbidity and Sediment Plume Settling within an Intracoastal Waterway System

Determining Dredge-Induced Turbidity and Sediment Plume Settling within an Intracoastal Waterway System

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ABSTRACT

The intracoastal waterway (IWW) is a continuous navigation channel that often extends across seagrass beds and other sensitive habitats throughout the Gulf and Atlantic Coast estuaries of the United States. Turbidity increase associated with an IWW dredging operation in west-central Florida and subsequent dredge plume subsidence were measured with optical backscatter sensors and acoustic Doppler velocimeters, which also measured in situ wave and current conditions. The field experiments were conducted over a dense seagrass bed. Sediment in the study area is dominantly composed of fine, well-sorted quartz sand, typical of Florida estuaries. The dredge plume temporally increased the turbidity to more than 400 mg/L around a midwater depth. The settling of the dredge plume and sediment resuspension were calculated with commonly used empirical formulas for noncohesive sediments and compared with field observations. The relatively energetic conditions generated by frequent boat wake did not result in significant resuspension and remixing of the suspended sediments and had minor influence on the settling time of the dredge plume. Findings from this study may provide information on understanding potential impacts of dredging on seagrass beds.

ADDITIONAL INDEX WORDS: *Channel dredging, estuaries, dredge plume, settling velocity, boat wake, sediment transport, seagrasses, submerged aquatic vegetation (SAV), Florida.*

INTRODUCTION

Dredging and placement of dredged material are often necessary to maintain and improve waterways for safe navigation. Dredging operations may result in a temporary increase in concentration of sediments within the water column (Schoellhamer, 1996, 2002a,b), which may have various impacts on the marine environments. The seagrass bed, a type of submerged aquatic vegetation (SAV), is one of the important marine habitats sensitive to sediment concentration variations (Moore, Wetzel, and Orth, 1997; Onuf, 1994; Ralph *et al.*, 2006). Major potential impacts on seagrass beds from dredging include physical removal or burial of seagrasses and temporary increases in suspended-sediment concentration (Erftemeijer and Lewis, 2006). The latter may result in increased light attenuation, which can negatively affect seagrasses' health (Koch, 2001; Robert, Matthew, and Graeme, 2006).

An increased suspended-sediment concentration associated with dredging, or dredge plumes, can be generated by two aspects of the operation: (1) extraction and agitation of sediment at the bottom substrate and (2) overflow from the dredge hopper bin or containment vessel (Pennekamp *et al.*, 1996; USACE Staff, 2015). In other words, an elevated sediment concentration in the water column can be introduced from both the bed and the water surface.

For cutterhead-suction hopper dredges, overflow from the hopper bin can be the dominant contributor to a dredge plume for mostly fine, sand-size sediment (USACE Staff, 2015). This type of suspended-sediment input is introduced by

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overflow at the water surface and is subsequently mixed into the water column. Three primary factors act upon the sediment mixing: advection–diffusion in the ambient environment, vessel-induced currents, and settling of the sediments. The suspended-sediment input from the extraction process is initiated at the bottom and is mixed upward through the water column by the turbulence associated with the dredge operation, in addition to the ambient currents and particle advection and diffusion (USACE Staff, 2015). Understanding of the mechanisms of transport and deposition of a dredge plume over SAV and their subsequent temporal impact is quite limited.

Seagrasses distribute broadly in the back-barrier estuaries along coastal Florida, United States. The intracoastal waterways (IWWs), extending hundreds of kilometers through the back-barrier bays of the Gulf and Atlantic Coasts of the United States, often cut through seagrass beds. Maintenance dredging of the IWW and associated dredge-induced sediment plumes may have significant influence on these submerged aquatic habitats. In this study, various field measurements were conducted during an IWW maintenance dredging project by the U.S. Army Corps of Engineers (USACE) to quantify sediment suspension and subsequent settling in the vicinity of the extraction location. Based on these field measurements, a dredge plume that settled over adjacent seagrass beds and the associated controlling factors on sediment settling and resuspension are examined. Time series of sediment concentrations were measured using three turbidity sensors. Hydrodynamic conditions were measured using an acoustic Doppler velocimeter (ADV). Underwater photos were taken every 10 seconds, in addition to videos, to visualize the sediment plume evolution.

The main goals of this study are to quantify the following: (1) increased sediment concentration over a seagrass bed associated with a nearby (within 100 m) hopper-dredging operation,(2) potential sediment concentration fluctuations associated with boat wakes, and (3) settling of the dredging plume. Spatial patterns of advection and diffusion of the plume are beyond the scope of this study. Observation, collection, and testing of seagrass species in the study area were also outside the scope of this research. Erftemeijer and Lewis (2006) summarized numerous potential environmental impacts of dredging on seagrasses. This study focuses on one of the factors, *i.e.* settling of dredging-induced turbidity plumes.

Study Area

The study area is located in west-central Florida, just south of the mouth of Tampa Bay, where the IWW extends along the back-barrier bay (Figure 1). The studied section of the IWW cuts across the flood tidal delta of Longboat Pass, a small mixed-energy tidal inlet just south of the mouth of Tampa Bay. This portion of the flood tidal delta consists of an emergent mangrove island surrounded by dense seagrass beds (Figure 1C) composed of predominantly manatee grass (*Syringodium filiforme*) with a mix of turtle grass (*Thalassia testudinum*). The dense seagrass canopy extends roughly 20 cm above the bottom. Overall, the study area is well sheltered with low wave energy. The greater study area is characteristic of a mixed tidal regime (Wang and Beck, 2012). The spring tide is typically diurnal with a range of roughly 0.8 to 1.2 m, while the neap tide is semidiurnal with a range of 0.4 to 0.5 m. Tidal currents at the study site are generally less than 0.2 m/s and typically 0.05 to 0.15 m/s based on the measurements by this study.

Two sets of field measurements were conducted. The first set, at Site 1 in Figure 1C, was conducted on March 15, 2013. No dredging activities occurred during that day. These data provide background information about ambient currents and turbidity during a day with low wind energy (.5 m/s based on a nearby National Oceanic and Atmospheric Administration measurement station) similar to the date with measurements of dredge-induced turbidity plumes. The second set of field measurements, at Site 2 in Figure 1C, was conducted on March 17, 2013, during and adjacent to the dredging operation (Figure 2). The USACE special operations vessel, the Murden, extracts bottom sediment through suction and pumps the slurry into the hopper container within the vessel. The overflow is discharged from the sides of the vessel during operation until the bin is filled with settled sediment. The water depth at the experiment site ranged from 0.5 to 1.5 m, because it is located on a shallow, flat bay area adjacent to the roughly 3-m-deep, artificial IWW channel.

The weather conditions during both the March 15 and the March 17, 2013, experiments were largely calm, with small wind-generated, choppy waves generally less than 0.1 m in height. The following discussions focus on the March 17 measurement, when dredging occurred. The experiment was conducted

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during a rising tide. The tidal-driven flow measured by the current meters used in this study was mostly less than 0.1 m/s. The only relatively energetic conditions experienced during the study were boat wakes generated by frequent passages of recreational vessels on a Sunday afternoon. The study area is not located within a no-wake zone of the IWW. The recreational vessels moving at normal operation speed generated boat-induced waves often exceeding 0.2 m in height.

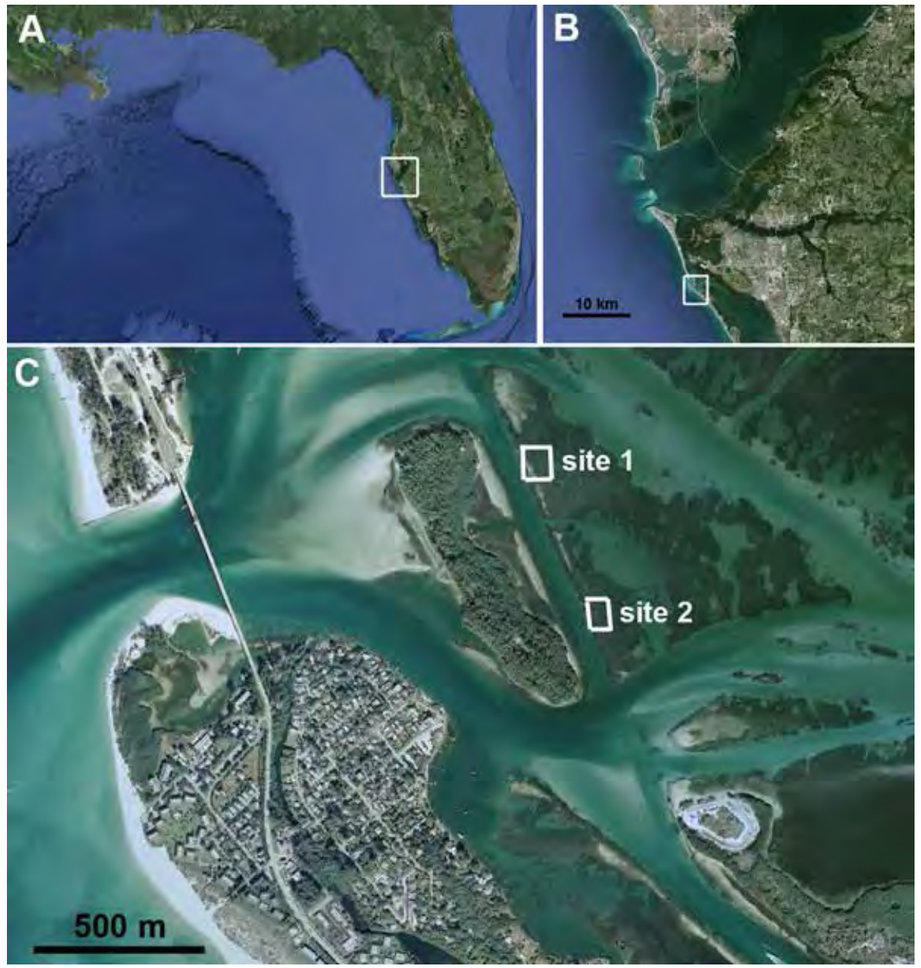

Figure 1. Study area map. (A) The NE Gulf of Mexico, (B) the mouth of Tampa Bay, and (C) a close-up of the study area, illustrating a stretch of the IWW extending (or previously dredged) through a seagrass bed. The measurement sites were located along the navigation channel over the seagrass bed.

Figure 2. The USACE special operations hopper dredge, Murden, passing in front of the measurement site (metal pole at the bottom of the picture). The slurry was pumped into the container of the dredge. The overflow is visible along the side of the vessel.

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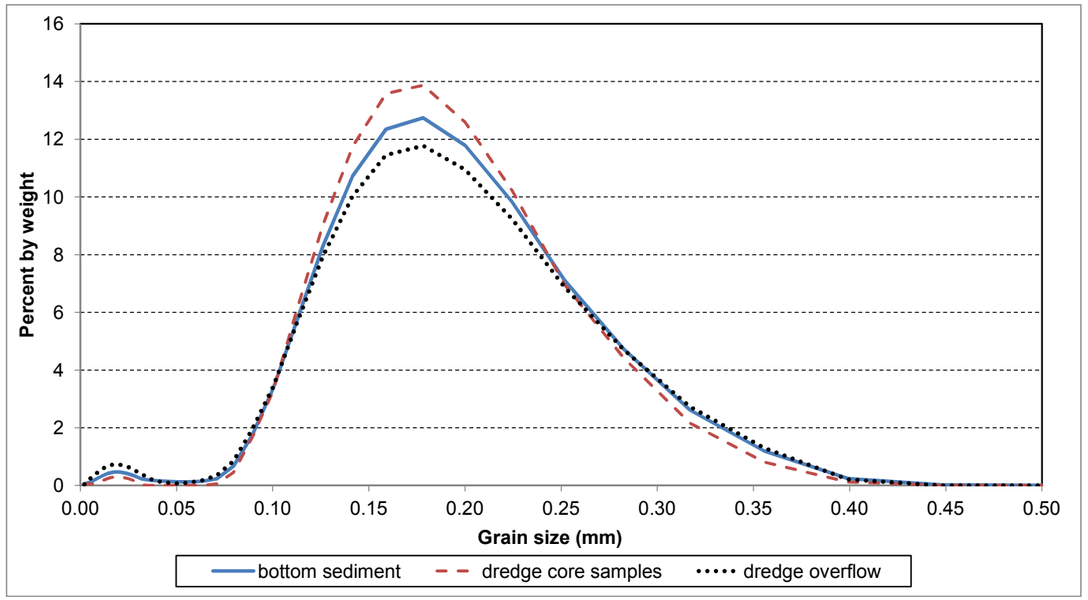

Figure 3. Averaged sediment grain-size distributions, comparing samples from the seabed, within the dredge container, and from the dredge overflow.

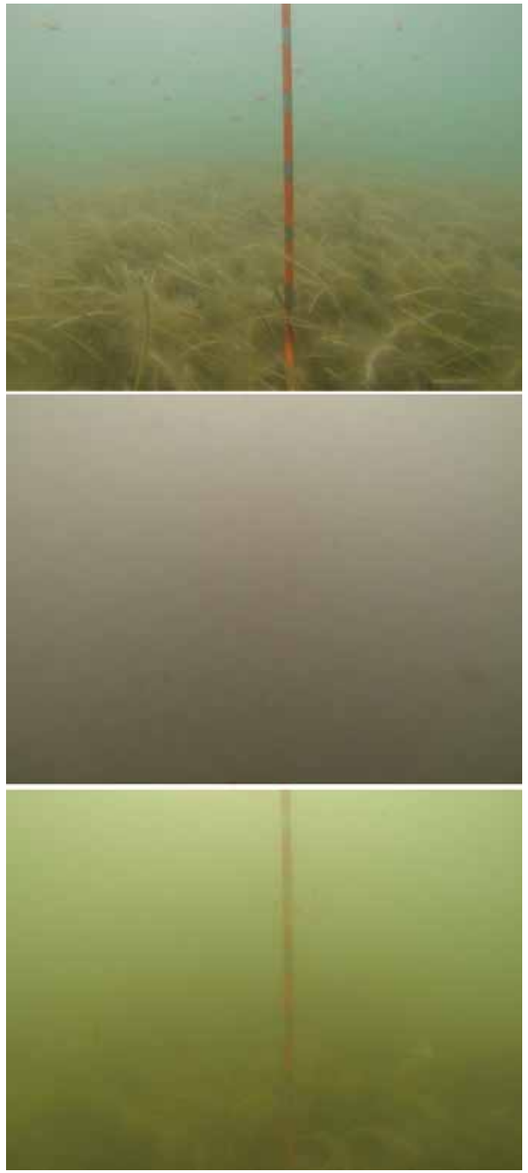

Figure 4. Underwater photos of turbidity increase and decrease during the dredging operation. Upper: Condition before the dredging operation; the dense seagrass extends about 20 cm from the seabed. Middle: Condition at the peak of the dredge turbidity plume; the reference rod about 0.5 m in front of the camera has become invisible. Lower: Condition 50 minutes after the turbidity peak; the visibility has recovered considerably.

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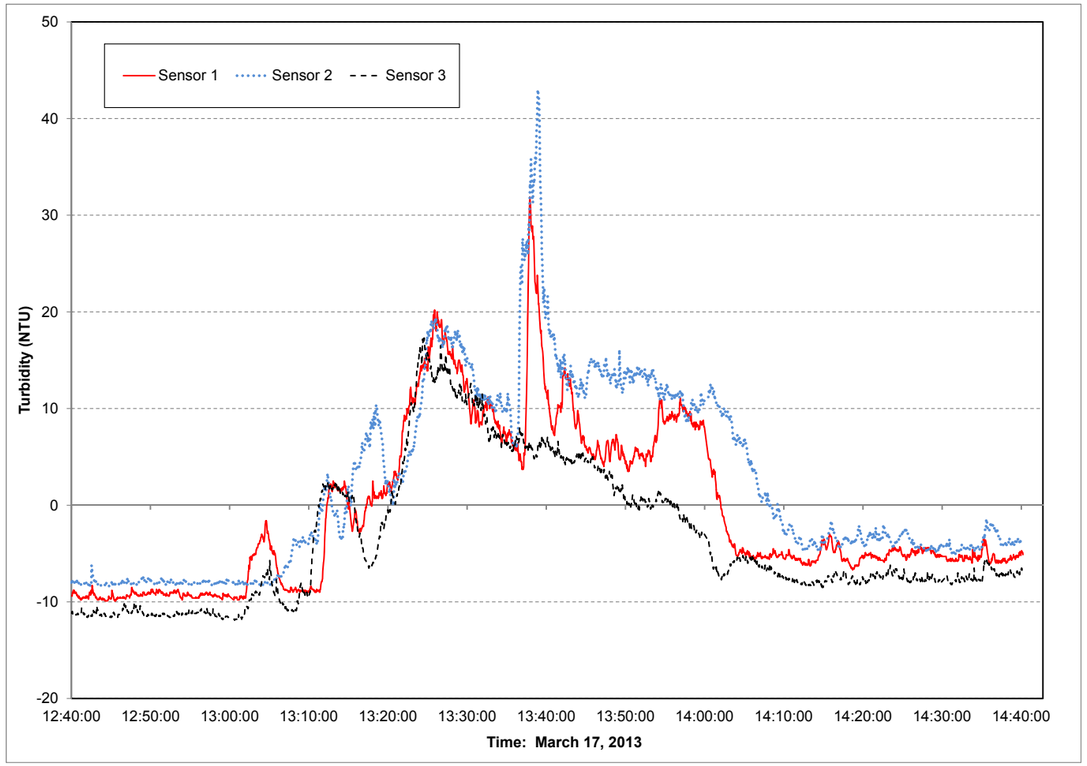

Figure 5. Temporal variations of turbidity (in nephelometric turbidity units) at the three measurement sites.

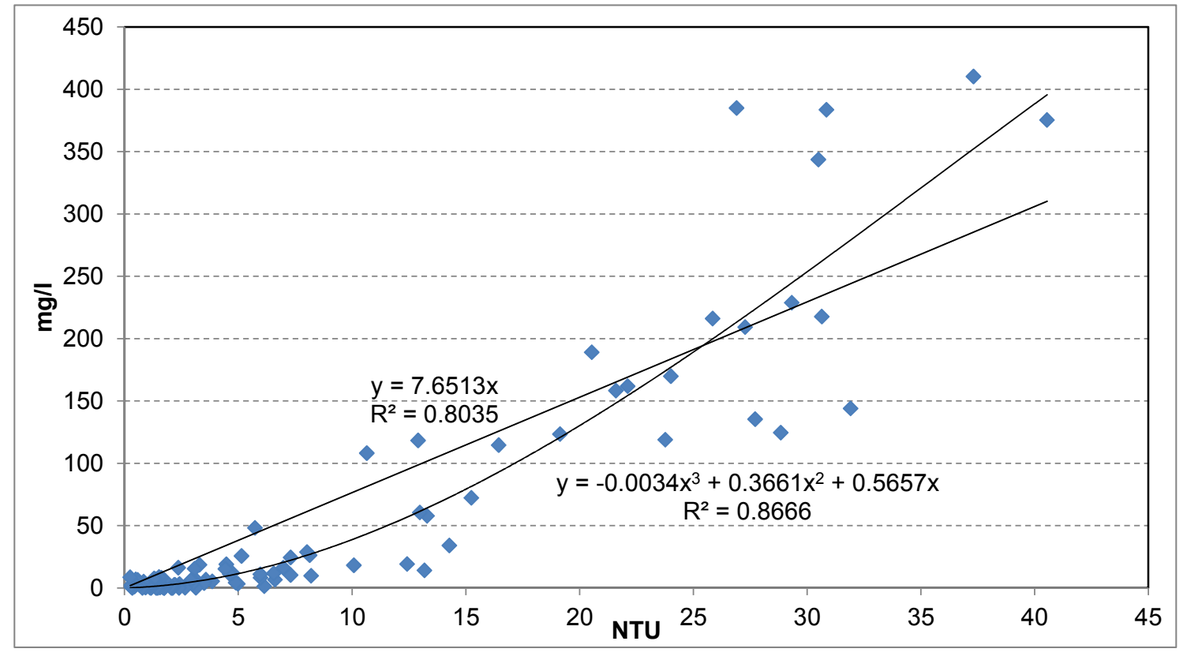

Figure 6. Calibration curves of the OMS turbidity sensors based on pump–suction measurements in the field. A third-order polynomial curve fits the measured data, with an R-squared value of 0.87.

Continued on Next Page

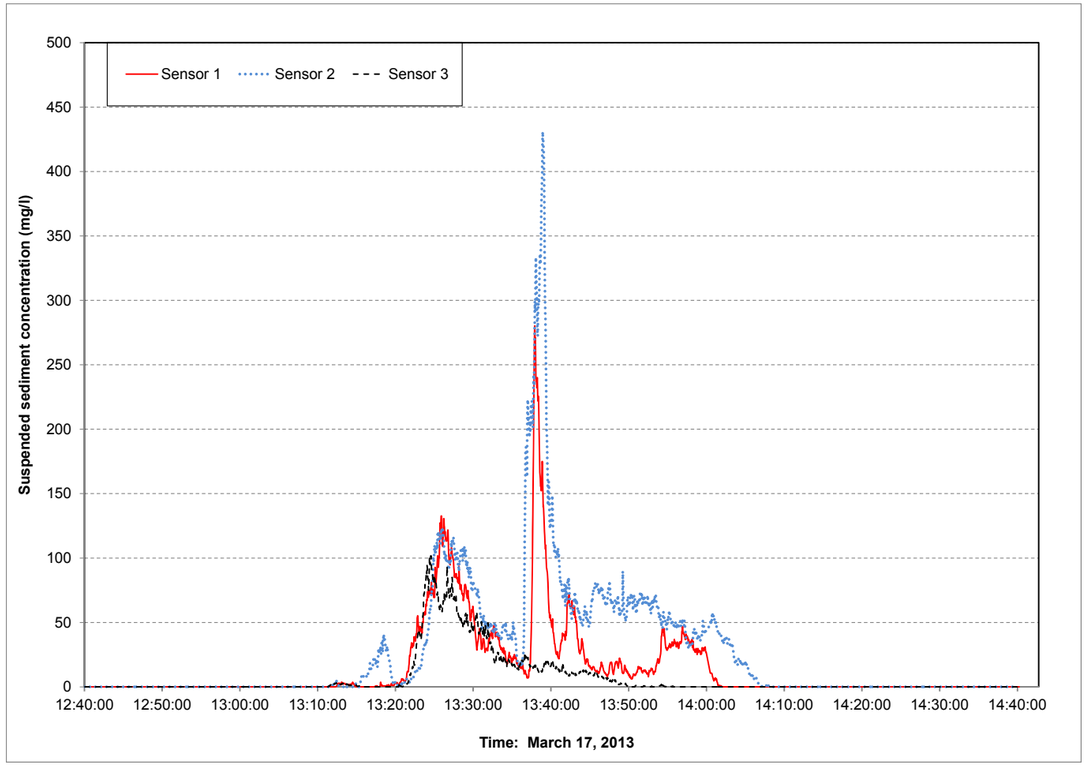

Figure 7. Temporal variations of turbidity in units of milligrams per liter at the three measurement sites.

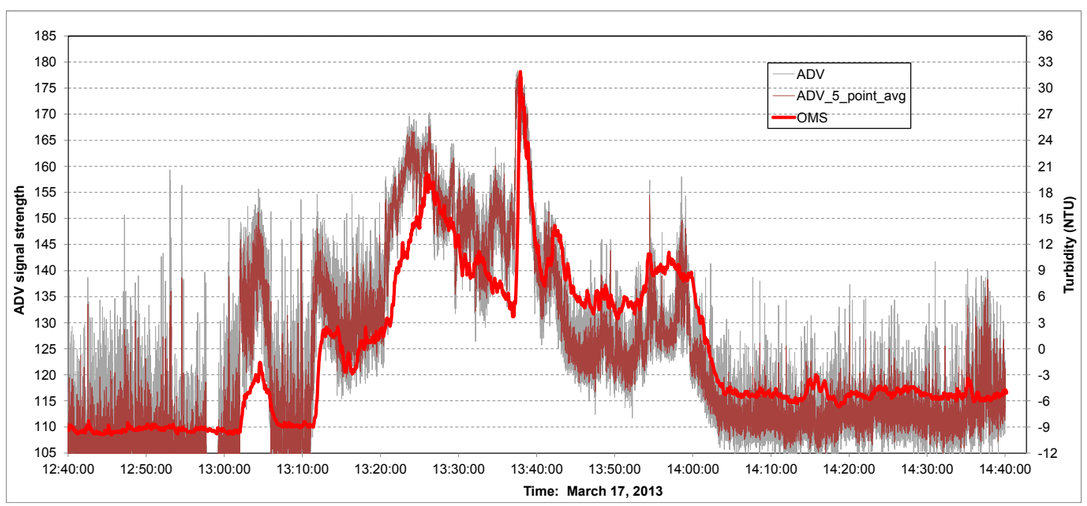

Figure 8. Comparison of the Nortek ADV acoustic signal strength (8-Hz data and 5-point moving averaged) with the 0.5-Hz YSI OMS 600 turbidity measurements. Note the similar overall patterns.

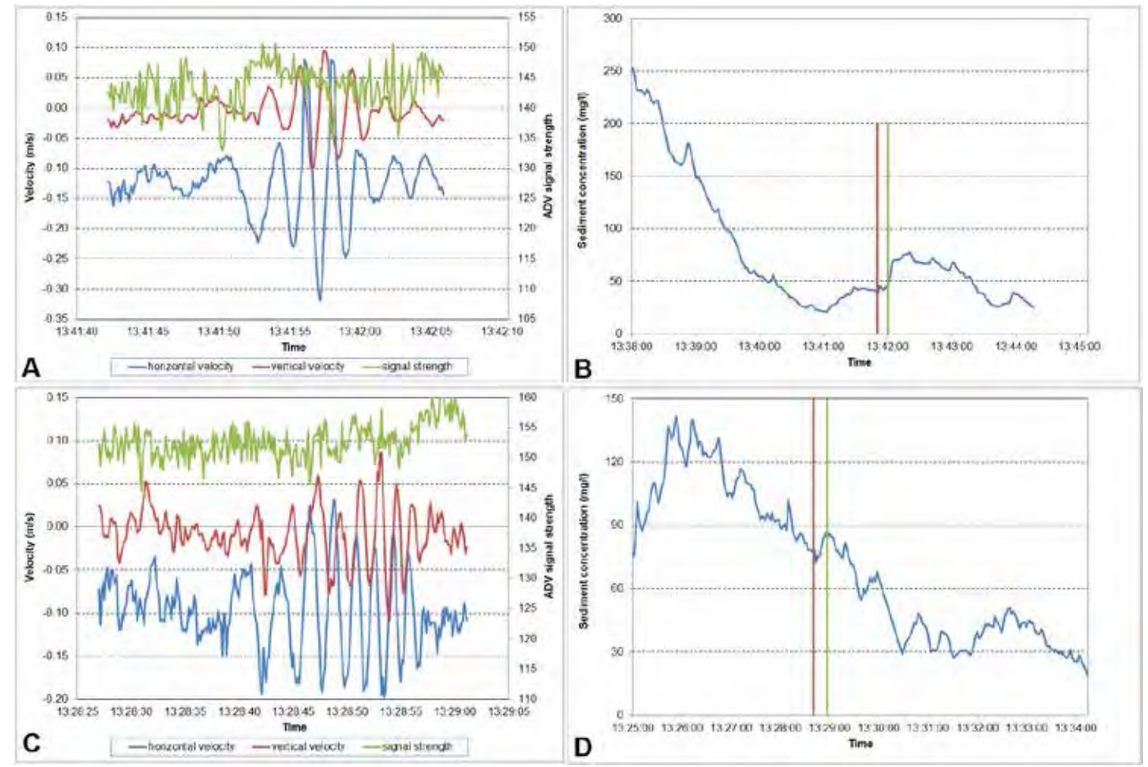

Figure 9. Boat wake–induced energetic conditions and associated turbidity change. (A) An example of boat wake–induced horizontal and vertical oscillatory velocities and corresponding acoustic signal strength, measured at 8 Hz. (B) Turbidity variations during the passage of the boat. The two vertical lines indicate the time of the boat wake passage. (C) Another example of boat wake–induced horizontal and vertical oscillatory velocities and corresponding acoustic signal strength, measured at 8 Hz. (D) Turbidity variations during the passage of the boat. The two vertical lines indicate the time of the boat wake passage. The measurements were conducted around 0.6 m below water surface.

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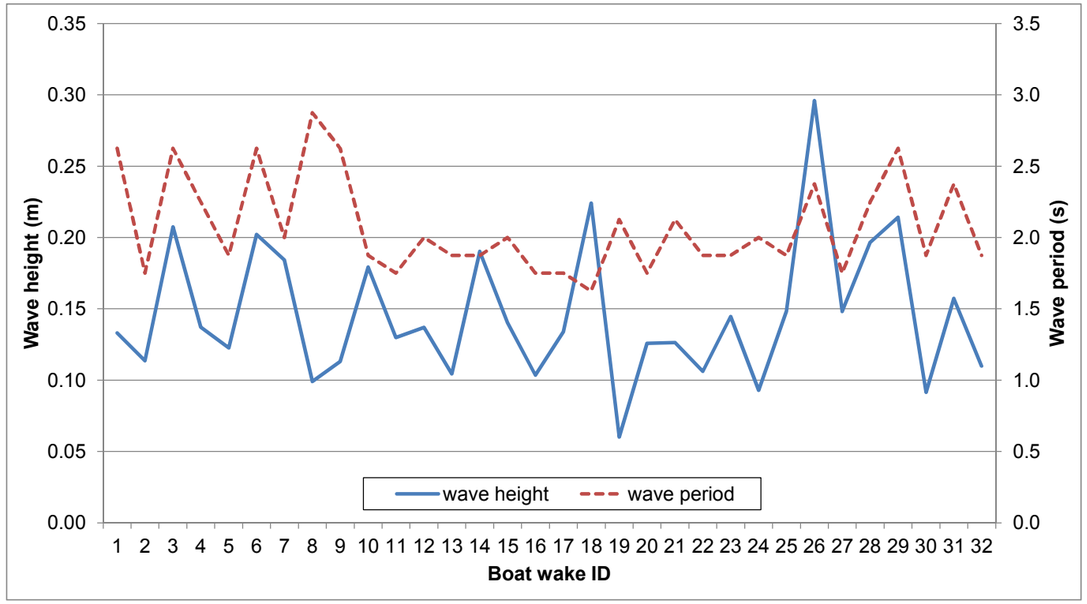

Figure 10. Maximum wave height and associated wave period generated by vessel passages during the 3 hours of data collection.

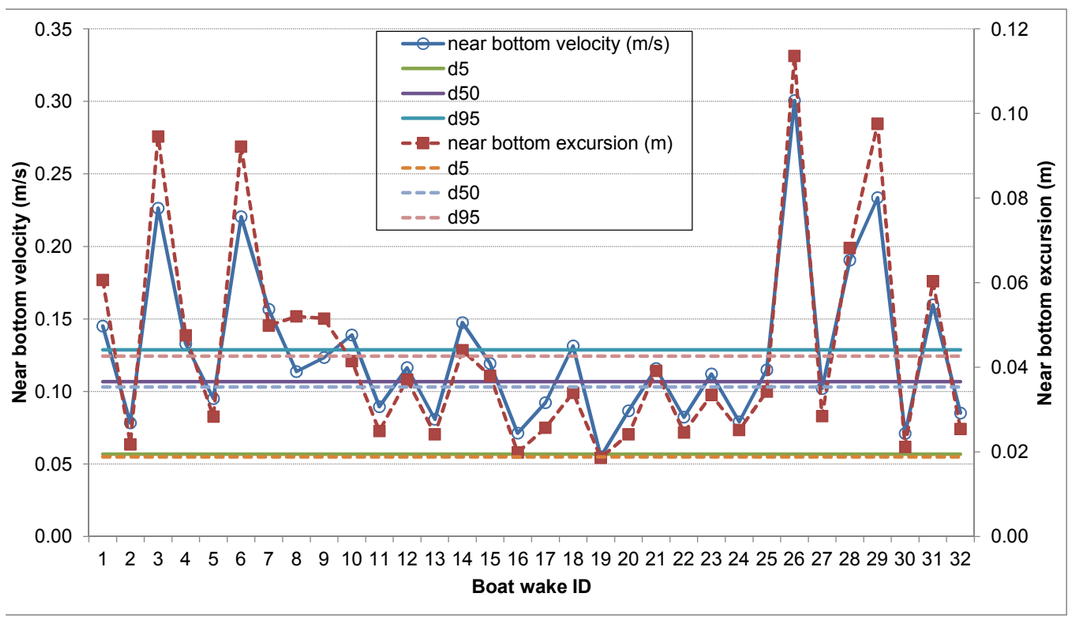

Figure 11. Calculated near-bottom maximum orbital velocity and excursion associated with boat-generated waves. Critical velocities and excursion for the entrainment of three grain-size fractions are also plotted.

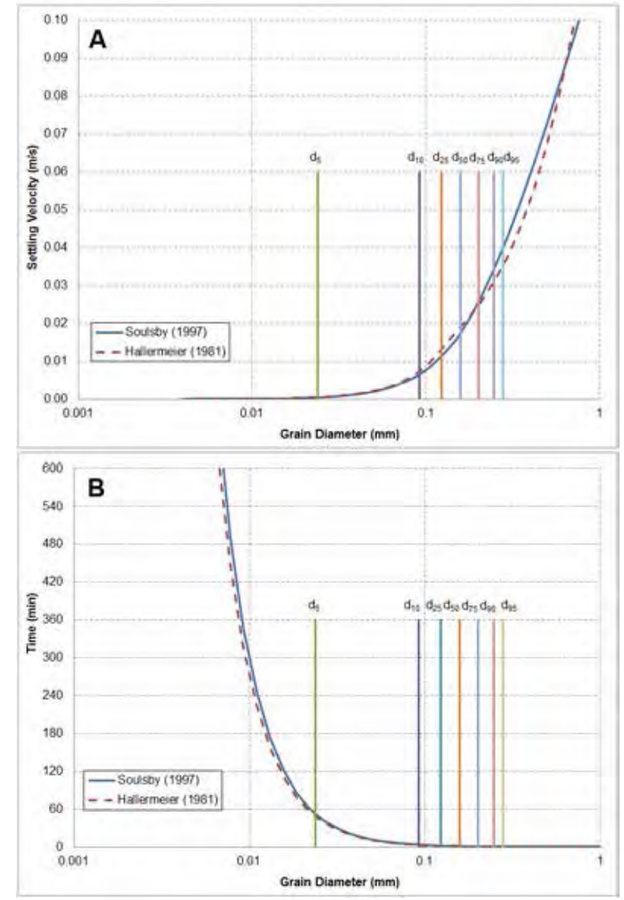

Figure 12. (A) Settling velocity *vs.* sediment grain size calculated based on Soulsby (1997) and Hallermeier (1981) formulas. (B) Time needed to settle through a 1.4-m water column for various sediment grain sizes.

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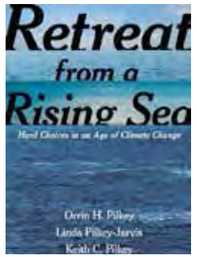
BOOK REVIEW

Pilkey, O.H.; Pilkey-Jarvis, L., and Pilkey, K.C., 2016. *Retreat from a Rising Sea: Hard Choices in an Age of Climate Change*. New York: Columbia University Press, 214p. $US 25.55, color illustrations.



This is an intriguing book as it deals with an obvious global problem (sea-level rise) and presents a logical solution (retreat from the shore) before major worldwide calamities occur. The stance of the book is politically correct and strongly opinionated, but that should not be regarded as detraction from the message. Positionalities of the authors are clear, and whether one agrees is not the point. Parsing 'the medium is the message' (a phrase coined by Marshall McLuhan), this book has plenty of content, the message of which intends to direct or influence human action. The message here is that too many people live too close to shores that are moving landward due to sea-level rise. Contextually, the implication is that humans build permanent structures on shores that are being transgressed by rising sea levels, and, given the perception that sea level will continue to rise, eventually a day of reckoning of Noachian proportions will occur.

The concept of cities lost at sea may not be something most coastal dwellers wish to think about, but it is something they must think about. In a very big sense,at least from the reviewer's point of view, the battle has already been lost. Nature always wins all battles because she has time on her side, whereas humanity is finite and civilizations are cyclical. Witness the remains of past civilizations (*e.g.*, Gobekli Tepe, Dwarka—sunken city of Cambay, the original Egypt, the Rama Empire; the Incas, Aztecs, Roman, Persian, Greek, Chinese, Mayan, and Mesopotamian civilizations) and one is prompted to consider what happened and why or how. Something must have gone wrong for the people to leave their cities, and there are many theories. Are coastal conurbations next on the list of failed civilizations? The authors try to warn of pending inundations that will cause great suffering, human migrations, and socioeconomic calamity. Let's see how they approach the problem.

The book is organized into 11 chapters: (1) Control + Alt + Retreat; (2) The Overflowing Ocean; (3) The Fate of Two Doomed Cities: Miami and New Orleans; (4) New and Old Amsterdam: New York City; (5) Cities on the Brink; (6) The Taxpayers and the Beach House; (7) Coastal Calamities: How Geology Affects the Fate of the Shoreline; (8) Drowning in Place: Infrastructure and Landmarks in the Age of Sea-Level Rise; (9) The Cruelest Wave: Climate Refugees; (10) Deny, Debate, and Delay; and (11) Ghosts of the Past, Promise of the Future. This is the layout or plan of attack, the purpose of which is to inculcate a sense of awareness or to inure a higher level of consciousness in the public arena. Perhaps these are impossible tasks, but the authors make a valiant effort to make known the dangers of sea-level rise to coastal conurbations. Perhaps most of the book can be summed with a poem by Bela Fleck and Abigail Washburn located on one of the book's frontice pages that asks, "What'cha gonna do. . .When the land goes under the water?" Clearly a takeoff from a popular theme song in a TV show about police and criminals ("What'cha gonna do when they come for you?"—Bob Marley, Bad Boys), the message and medium here are patently clear. What did some prior civilizations do when environmental changes were so great that human life could no longer be sustained or supported? They simply left, walked away, and today we see the vestiges of what were once great or powerful civilizations.

The book delves into the nature of the problem, initially looking at the causes of sea-level rise and then reviewing projections of future rise. No one knows for sure what will happen to coastal cities nor can they predict rates or extents of sea-level rise, no matter how fancy their models may be. Pilkey and Pilkey-Jarvis (2007) themselves admit that many modelers have recklessly employed fudge factors in their models to ensure a desired outcome that is politically correct. Disregarding politics, hubris, and perceptions of sea-level rise scenarios, it seems safe to admit that a problem with near-the-shore coastal construction exists, and the problem needs to be understood and comprehended forthwith. Potential solutions are few, as dikes and seawalls in most cases are not practical, as in the book's case examples of Miami and New Orleans. The slow rise in sea level lulls coastal populations into thinking they can manage shore erosion and inundation by engineering shore-protection structures. The mean or average rise in sea level is not the point, as most biologists know that life is not regulated by means but by extremes. The same is true in geology, where extreme events such as hurricanes and typhoons can produce monster storm surges that will do more damage in a few hours than many years of slow sea-level rise. Extreme events coupled with increasing water levels over time do not bode well for coastal dwellers.

On the penultimate page of the book, the authors offer a sliver of hope while at the same time recognizing that humanity will probably not act until forced by water up to their ankles. Although I agree in principle with the authors that by good planning, building density should not increase and that large buildings and infrastructure must be prohibited. Although optimistic, such actions are probably too little too late. So, we are left with the most obvious of solutions: retreat. Abandonment of coastal conurbations is inevitable, and it is just a matter of how societies decide to deal with the impending crises. In addition to what the authors suggest, it would seem that a proactive retreat in many critical (over populated) coastal areas would be appropriate.

This book is written in an easy to understand vernacular and avoids technical jargon as much as possible. The hard-cover version that I have is handsomely prepared and includes an informative color section. There is an extensive bibliography and index, making the book useful for researchers as well as the layperson. Although most coastal researchers are aware of the sea-level rise problem, the message of the medium (this book) needs to be more widely disseminated for broader public consumption. Whether humanity steps up to the plate to make hard choices in an age of climate change remains to be seen. For now, I recommend the book to young and old who are interested in making a better future by encouraging managed retreat from developed shores.

LITERATURE CITED

Pilkey, O.H. and Pilkey-Jarvis, L., 2007. *Useless Arithmetic: Why Environmental Scientists Can't Predict the Future.* New York: Columbia University Press, 248p.

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Fletcher, North Carolina, U.S.A.

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Effects of Mariculture and Solar-Salt Production on Sediment Microbial Community Structure in a Coastal Wetland

Effects of Mariculture and Solar-Salt Production on Sediment Microbial Community Structure in a Coastal Wetland

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ABSTRACT

Mariculture and solar-salt production are two pervasive anthropogenic activities in worldwide coastal areas; however, their effects on sediment microbial biomass, community composition, and diversity have received less attention. Here, this question was investigated using the phospholipid fatty acids (PLFAs) analysis and 16S rRNA gene sequencing in Bohai Rim, northern China. Both mariculture and salt production increased bacterial (+135% and +84%), fungal (+45% and +20%), and total PLFAs contents (+72% and +39%) compared with intertidal wetlands. Furthermore, mariculture and salt production shifted microbial PLFAs compositions. The ratio of fungi:bacteria-PLFAs decreased in mariculture ponds (–40%) and salt fields (–37%) relative to the undisturbed wetland, and the ratio of Gram-positive: Gram-negative bacteria decreased in the salt fields (–67%). Mariculture promoted the relative abundances of *Firmicutes and Gemmatimonadetes*, while salt production stimulated the relative abundances of *Actinobacteria, Spirochaetes, Tenericutes, and Chlamydiae*, as compared with the intertidal wetland. The changes in the microbial community composition were mainly attributed to sediment organic carbon, dissolved organic carbon, total nitrogen, and NH_4^+-N. The microbial and bacterial Shannon-Wiener indices, however, did not change under mariculture and salt production. In conclusion, mariculture and sea-salt production had a broad range of effects on sediment microbial biomass and community composition but had little effect on diversity.

ADDITIONAL INDEX WORDS: *Microbial biomass, community composition and diversity, phospholipid fatty acids (PLFAs), 16S rRNA, intertidal wetlands.*

INTRODUCTION

Intertidal coastal wetlands are essential transitive areas of the terrestrial and marine ecosystems, being characterized by complex organic matter and nutrient cycling, abundant natural resources, and high biodiversity (Beukema, 1979; Mcgenity, 2014). Anthropogenic activities, however, are pervasive and intensive for a long time in these kinds of areas (Coleman, Huh, and Braud, Jr., 2008; Lotze *et al.*, 2006), such as mariculture, solar-salt production (Xie, Xu, and Yan, 2010), and agricultural cultivation (Jin, Huang, and Zhou, 2012; Wang *et al.*, 2014). Microorganisms play fundamental roles in materials and energy cycling, supporting the functions and services of coastal wetlands (Li *et al.*, 2015; Zhou *et al.*, 2006). Sediment microorganisms rely on environmental conditions, including substrates, nutrients, salinity, and pH (Dale, 1974; Jackson and Vallaire, 2009; Phelps *et al.*, 1994); therefore, it is necessary to understand the potential effects of mariculture and solar-salt production on the changes of the sediment microbial community structure.

Mariculture expanded dramatically in China's coastal areas for decades. Mariculture production increased at an average rate of 5.5% between 2000 and 2012, making China the largest mariculture producer in the world (FAO, 2014). During mariculture development, residual feeds, fecal materials (Bouwman *et al.*, 2013), salinity increase, permanent flooding, and applications of drugs and antibiotics (Xi *et al.*, 2015) are major changes of the environmental conditions. To date, no study has focused on mariculture effects on the sediment microbial community structure. In other ecosystems, the result of similar environmental changes may provide a reference mechanism. In agricultural

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systems, an organic fertilizer addition increased microbial biomass and diversity (Zhong *et al.*, 2010). Furthermore, the increase of salinity changed the microbial properties (Yan and Marschner, 2012).

Solar-salt production inevitably increases the sediment salinity compared with the intertidal coastal wetlands; however, the effects of high salinity on sediment microbes are poorly understood. In other systems, a large number of studies showed that an increase in salinity depressed microbial biomass and diversity (*e.g.*, Batra and Manna, 1997; Min *et al.*, 2015; Rousk *et al.*, 2011) and even killed microorganisms (Wichern, Wichern, and Joergensen, 2006); however, a salinity increase was also reported to increase bacterial diversity and to shift the bacterial community structure in Louisiana wetland sediments (Jackson and Vallaire, 2009). Recently, Rousk *et al.* (2011) and Yan and Marschner (2012) found that the salt tolerance of the microbe is unrelated to salinity in a living environment. Moreover, during salt production, sediments were flooded by brine for a long period, which may affect their microbial community structure because of the high salinity.

In the Bohai Rim of northern China, natural coastal wetlands have shrunk greatly because of pervasive and intensive human activities. About 55% of the coastal wetlands in Tianjin, including mariculture ponds (MPs) and salt fields (SFs), have disappeared (Wang *et al.*, 2014) and transformed into other land types since the 1950s (Xie, Xu, and Yan, 2010); however, the way that mariculture and solar-salt production affect sediment microbial community structures (biomass, community composition, and diversity) in the intertidal coastal wetlands is still unclear. The objective of this study was to investigate this issue. The hypotheses were that (1) mariculture increased microbial biomass because of the residual feeds loading, but salt production decreased microbial biomass because of the high salinity stress; (2) mariculture and salt production both changed microbial community composition; and (3) mariculture and salt production decreased diversity because of the broad changes in sediment conditions.

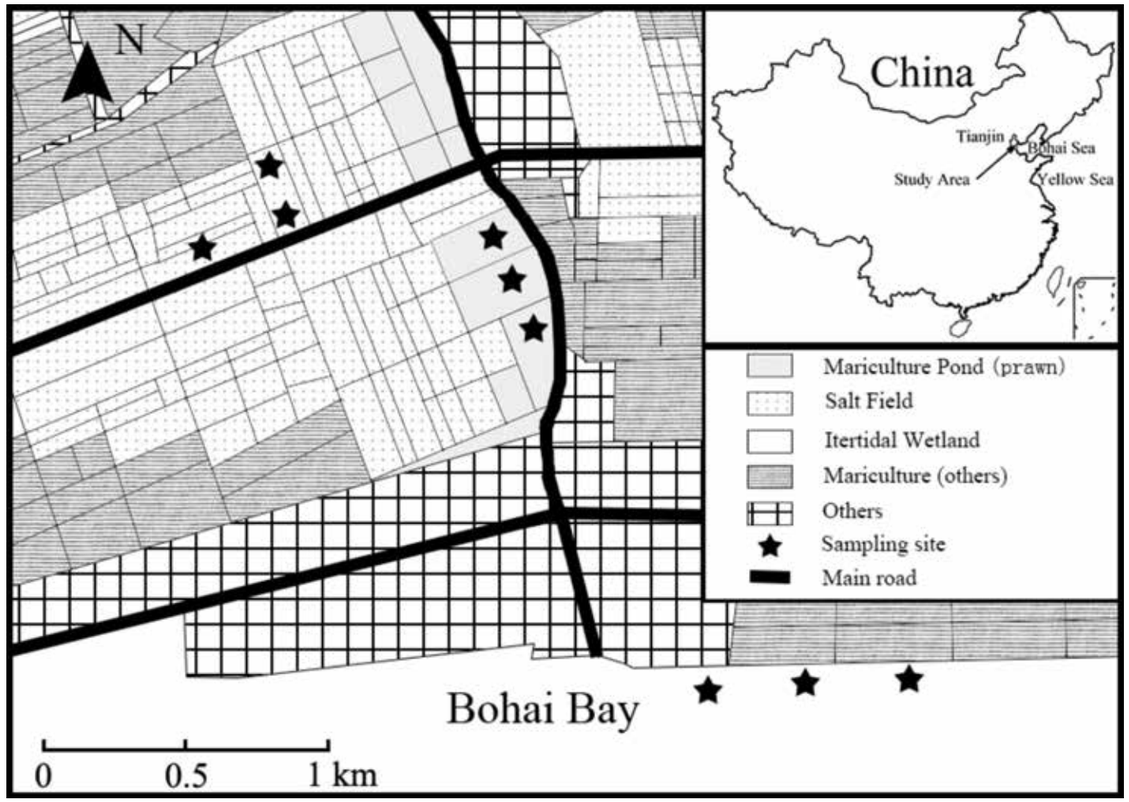

Figure 1. Sampling locations of the three coastal wetlands: intertidal wetland (IW), mariculture pond (MP), and salt field (SF).

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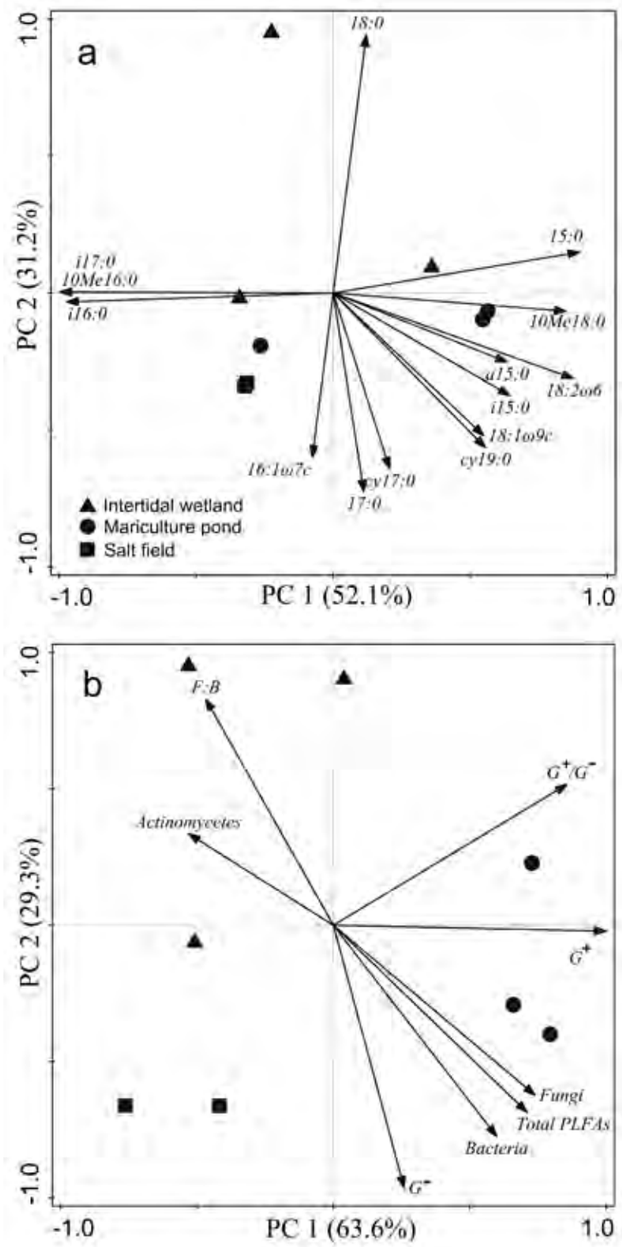

Figure 2. Principal components analyses (PCA) of individual phospholipid fatty acids (PLFAs) (a) and microbial groups (b).

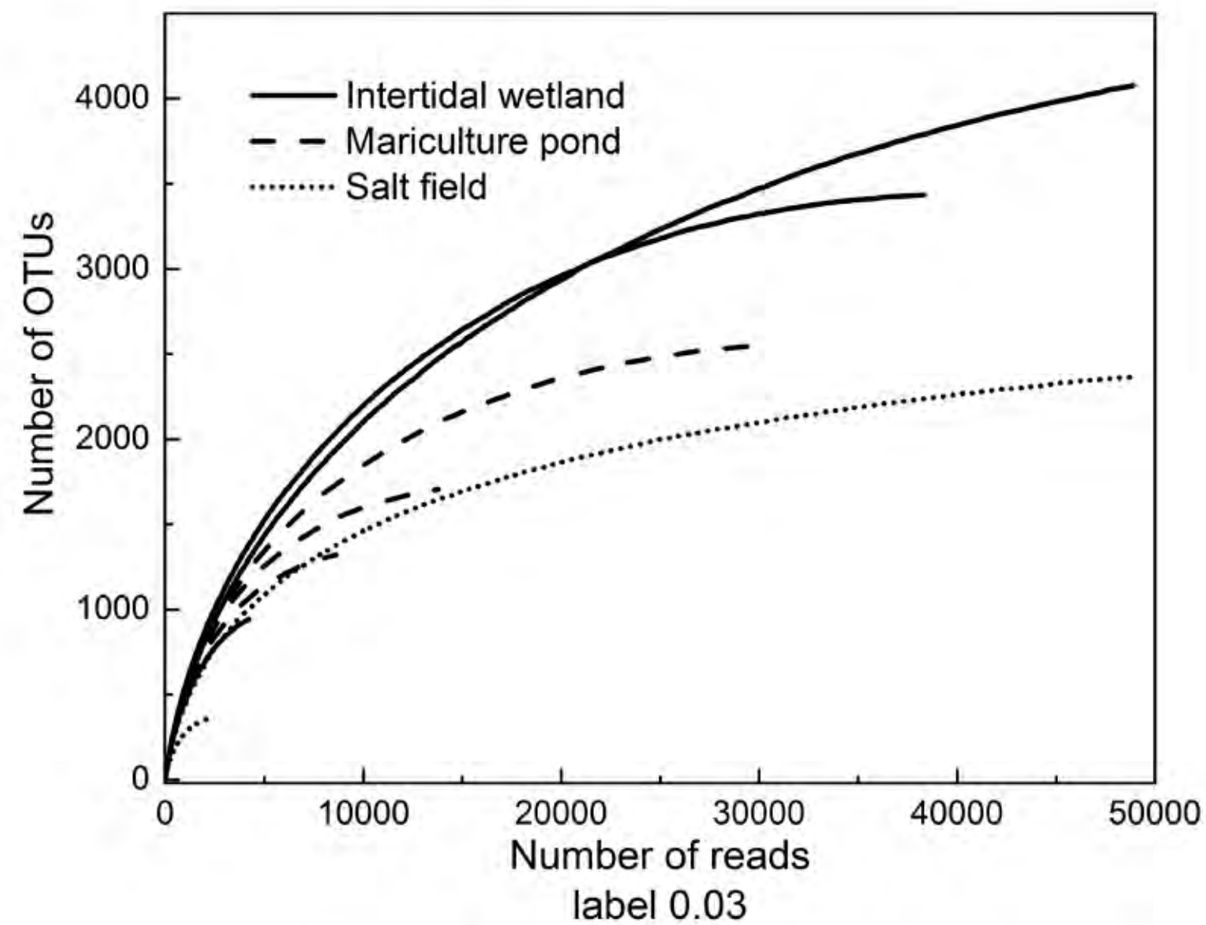

Figure 3. Rarefaction curves of the 16S rRNA gene libraries. The OTUs were formed at the 0.03 level.

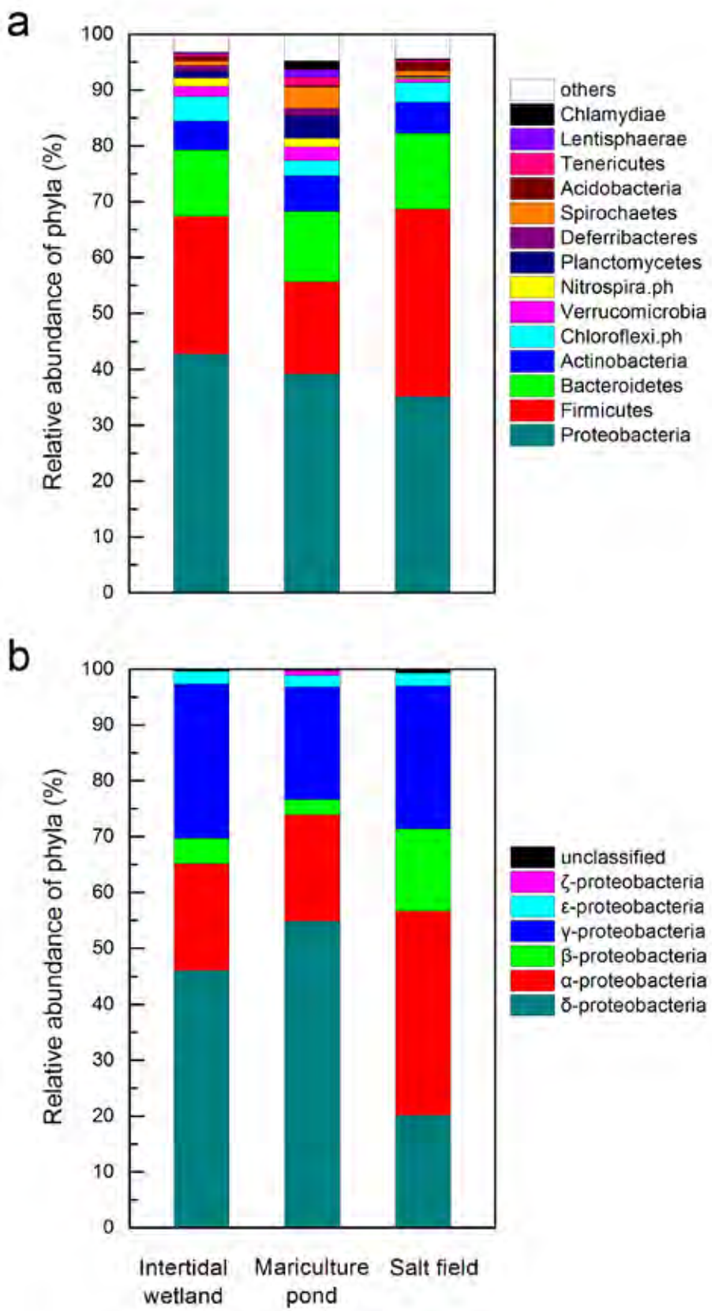

Figure 4. Relative abundances of the bacterial phyla (%) (a) and the classes of *Proteobacteria* (%) (b) in the three wetlands.

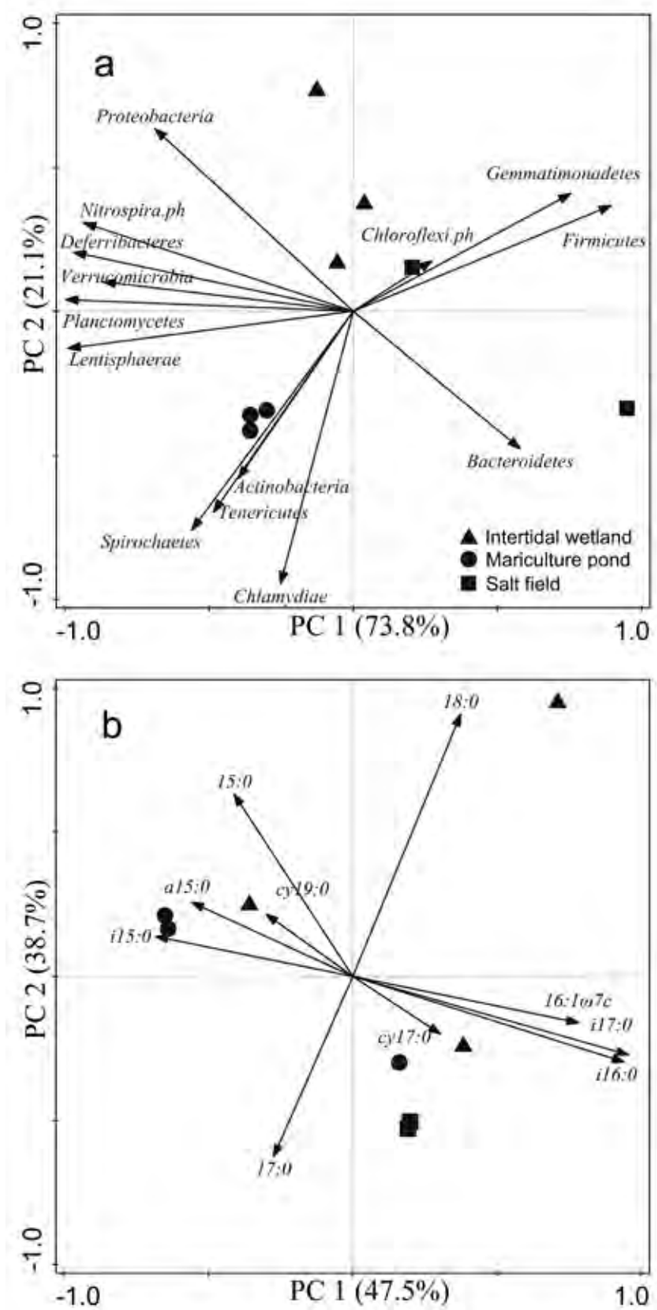

Figure 5. Principal component analyses (PCA) of the relative abundances of bacterial phyla (a) and bacterial PLFAs (b) in the three wetlands.

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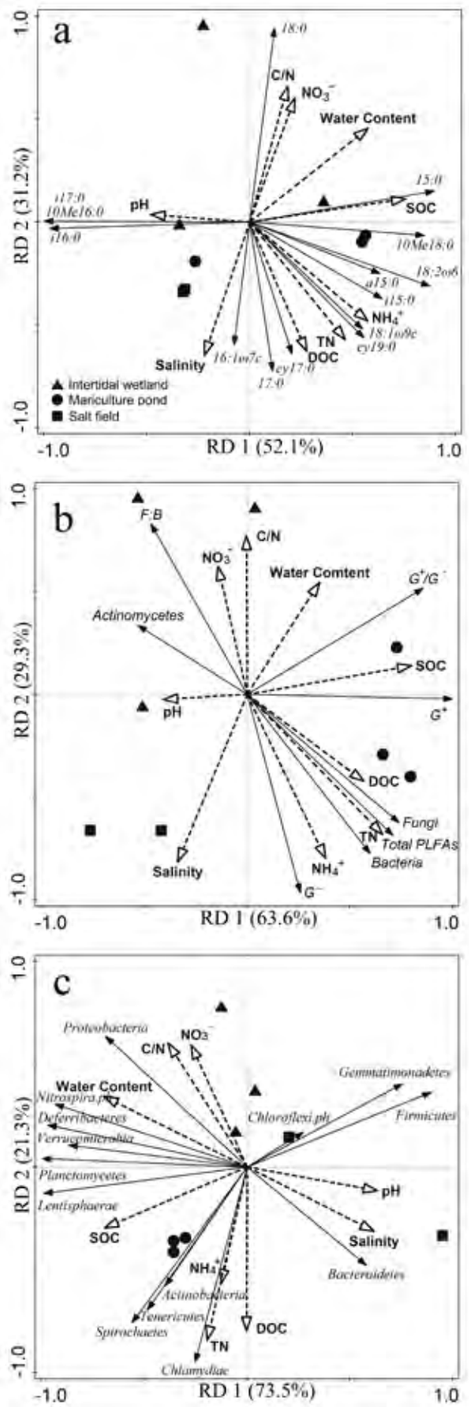

Figure 6. Redundancy analyses (RDA) of the microbial community composition and sediment properties: individual PLFAs (a), microbial groups (b), and bacterial phyla (c). The solid lines indicate the microbial signatures, and the dashed lines represent the sediment characteristics.

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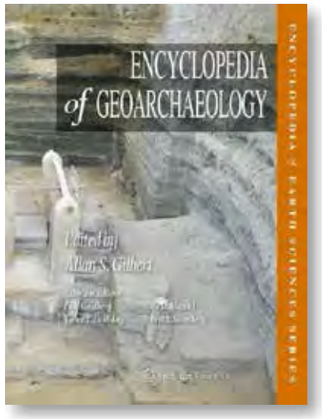

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- **Investigates the collaboration of archaeology and earth science to discover past human behavior**

Geoarchaeology is the archaeological subfield that focuses on archaeological information retrieval and problem solving utilizing the methods of geological investigation. Archaeological recovery and analysis are already geoarchaeological in the most fundamental sense because buried remains are contained within and removed from an essentially geological context. Yet geoarchaeological research goes beyond this simple relationship and attempts to build collaborative links between specialists in archaeology and the earth sciences to produce new knowledge about past human behavior using the technical information and methods of the geosciences.

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This encyclopedia defines terms, introduces problems, describes techniques, and discusses theory and strategy, all in a format designed to make specialized details accessible to the public as well as practitioners. It covers subjects in environmental archaeology, dating, materials analysis, and paleoecology, all of which represent different sources of specialist knowledge that must be shared in order to reconstruct, analyze, and explain the record of the human past. It will not specifically cover sites, civilizations, and ancient cultures, etc., that are better described in other encyclopedias of world archaeology.

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Robert S. Sternberg is Professor of Geosciences at Franklin & Marshall College, a small liberal arts college in Lancaster, Pennsylvania. He holds a B.S. from Cornell University in engineering physics, and M.S. and Ph.D. degrees from the University of Arizona in geophysics. His research applies magnetic methods to archaeology: archaeomagnetic secular variation and dating, magnetic prospection, and magnetic properties of obsidian. He has been associated for many years with the Society for Archaeological Sciences, currently as the General Secretary.

Continued on Next Page

Introducing the Contents of the Encyclopedia of Geoarchaeology

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Contents

Continued on Next Page

Continued on Next Page

Continued on Next Page

Preface

"Geoarchaeology" is the archaeological subfield that uses the methods of geological investigation to gather information and solve problems in the exploration of the human past. Under the label of "archaeological geology," it is also the subfield of geology that explores geoscience aspects of human antiquity. In its varied manifestations, then, geoarchaeological research attempts to build collaborative links between specialists in archaeology and the Earth sciences and, in so doing, produce new knowledge about past human behavior by merging methods and concepts from the geosciences with those commonly applied by archaeologists.

Archaeological recovery and analysis are already geoarchaeological in the most fundamental sense because the buried remains left by former humans are contained within, and removed from, an essentially geological context, and many of the finds are themselves composed of earthen or rock materials. But geoarchaeology moves beyond this simple relationship to pursue a broad range of questions, many of which address the interactions and influences between humans and the environments in which they once lived. The proximate goals of geoarchaeology might be described as elucidating the processes of site formation, reconstructing ancient environments and the influence of humans on them at the local and regional levels, and learning which environmental factors were significant in the evolutionary emergence of humankind and the cultural changes undergone by the world's diverse societies over time. Tactically, the toolkit of research techniques, conducted in both field and laboratory contexts, includes analyses of soils, sediments, rocks, and landforms, and a wide range of geophysical, geochemical, and microscopic methods. At a finer scale of resolution, for example, the study of archaeological deposits to infer past human activities and behaviors – such as agriculture, pastoralism, and fire – lies firmly within the scope of geoarchaeology. There is an overlap of geoarchaeological methods covered in this work with techniques also considered to be part of archaeometry: materials analysis, dating, methods of site location and prospecting, and tracing raw and artifactual materials to their sources. The ultimate goal, like many other subfields of archaeology, is the recovery of new information that would permit fresh and more detailed interpretations of human antiquity.

Early studies of the natural world in Europe and America during the eighteenth and nineteenth centuries often included a concern for humans and their place in nature. Much initial prehistoric research in both hemispheres was in fact conducted by geologists, who took an interest in the remains of human activities (and the remains of humans themselves) deposited along with geological materials. In the 1950s and 1960s, a greater emphasis on environmental factors in archaeology led eventually to a "contextual approach" involving "geoarchaeological" investigations proposed by Karl Butzer in the 1970s. The subfield is therefore relatively young compared to archaeology and the geosciences in general. Yet, for archaeologists, the specialized preparation needed in order to understand the geological complexities of their research has made geoarchaeology relatively inaccessible to many. Most geoarchaeologists working today have had some interdisciplinary training in the Earth sciences, or their degrees were earned wholly in the geosciences. Such credentials are necessary for those exploring prehistoric periods, as they must acquire the expertise to obtain accurate dating of sites and finds, understand the depositional history of a site and its contents over long intervals, and reconstruct paleoenvironmental conditions to interpret ancient lifeways in their original settings. Archaeometric research holds a significant place in the archaeology of historical periods, but with some exceptions, field geoarchaeological practice and familiarity with its methods and knowledge base tend to be lesser components of archaeological research conducted on recent cultures and sites. New World historical archaeology tends to

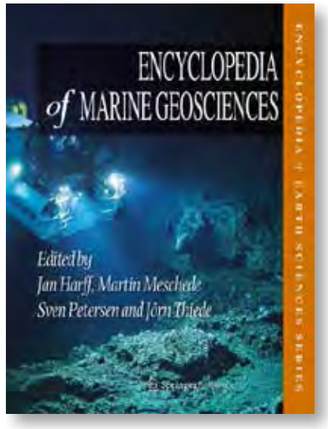
place little emphasis on geoarchaeological matters, while the archaeology of Roman and later periods in Europe is more likely to use it in the analysis of sites.

The potential benefit of geoarchaeological applications to all archaeological investigations has prompted the present volume. While specialized treatises on geoarchaeology began to appear in the 1960s and 1970s, it was Rhodes Fairbridge, founding editor of the Earth Science Encyclopedia Series (EEES), who proposed that an encyclopedic work on geoarchaeology be added to the list of published volumes. He enlisted a newly minted Ph.D. in Anthropology at Columbia University, Allan Gilbert, to help with the project, and the first publication contract was signed in 1981. The geoarchaeological landscape 35 years ago was distinctly incipient, with but a limited number of active practitioners engaged in research and publication, and a small body of basic knowledge that had already accumulated. Had that volume been realized, it would have been restricted to only the few geoarchaeological projects and subject areas that had been explored at the time, and much of the rest would have comprised entries on archaeological or geological topics. Sadly, but perhaps luckily, the contract was cancelled in the mid-1980s due to a change in publishers and a realignment of priorities at the new publishing house. The volume then began a lengthy search for a new agreement elsewhere. It did not find solid grounding with a new publisher until Springer offered to contract the project in 2002. Fairbridge passed away in 2006, and in the subsequent years Gilbert enlisted the assistance of four established geoarchaeologists (Paul Goldberg, Vance Holliday, Rolfe Mandel, and Rob Sternberg) to serve as associate editors and help assemble a new entry list that incorporated the advances and discoveries made within the subfield over the preceding two and a half decades. This volume is dedicated to the memory of Rhodes Fairbridge, whose appreciation for archaeology's contributions to Quaternary geoscience prompted his insistence that a reference work on geoarchaeology belonged within the stable of volumes he guided into print over his 40 years of editing the EEES.

This encyclopedia, appearing so many years after its initial conceptualization, contains data and discussion from a far wider range of practicing geoarchaeologists working within a far more mature discipline than would have been the case at its inception. It defines terms, introduces problems, describes techniques, and discusses theory and strategy, all in a language designed to make specialized details accessible to students and nonspecialists. It covers subjects in environmental archaeology, dating, prospection, materials analysis, soil and sediment investigation, and landforms, among other matters, and it includes a sampling of the most important sites known for their geoarchaeological contributions. The volume does not cover sites, civilizations, and ancient cultures that are less germane to the geoarchaeological focus and better described in other encyclopedias of world archaeology.

As mature as geoarchaeology has become, it is still a young and dynamic area of research. New applications are constantly emerging as the results of novel investigative techniques fill the pages of professional journals (notably *Geoarchaeology, An International Journal*; *Archaeological and Anthropological Sciences*; *Journal of Archaeological Science*; and *Archaeometry*), and as geoarchaeological approaches are aimed at different archaeological problems in different parts of the world. Original insights emanating from such developments will inevitably require revisions of this volume to keep up with progress, and coupled with the fact that lacunae remain in this book and will always exist in any comprehensive compilation, the *Encyclopedia of Geoarchaeology* will doubtless grow in detail and inclusiveness once this first edition appears. We look forward to constructive suggestions from readers about what is missing or in need of updating, as no editorial supervision will ever control the enormous diversity of innovation that will surely characterize the near future of geoarchaeology.

Allan S. Gilbert
Paul Goldberg
Vance T. Holliday
Rolfe D. Mandel
Robert S. Sternberg



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Jan Harff is Professor of Geosciences and Seafloor Geology at the University of Szczecin, Poland. His previous research focused on sedimentary basin analysis at the Central Institute for Physics of the Earth (ZIPE, subsequently the GeoForschungs Zentrum, GFZ), Potsdam, and marine geology at the Leibniz Institute for Baltic Sea Research Warnemünde and the University of Greifswald, Germany.
He cooperates, on a permanent basis, with marine research institutes of the Chinese Academy of Sciences, Chinese universities and the Guangzhou Marine Geological Survey, Guangzhou, China. His research interests concern marine geology in general, sedimentology, coastal geology, palaeo-oceanography, palaeoclimatology, mathematical geology and basin modelling. In addition to having authored and co-authored numerous research papers and having served as editor of other scientific publications, he acted as corresponding editor of "Modeling of Sedimentary Systems" (Springer, 1999) and "The Baltic Sea Basin" (Springer, 2011).

Martin Meschede is Professor of "Regional and Structural Geology" at the Institute of Geography and Geology, University of Greifswald, Germany. His research interests focus on geodynamic processes at plate margins, subduction, large igneous provinces, exhumation, paleogeography, paleoclimatology, basin evolution, and glacial tectonics. He participated in several marine research expeditions, among these are the Joides Resolution of IODP and a diving cruise with Shinkai 6500. Besides a number of scientific publications, he is author and coauthor of several textbooks on plate tectonics, structural geology, and regional geology of Germany.

Sven Petersen is a senior researcher at GEOMAR, Helmholtz Centre for Ocean Research Kiel in Germany. His research focuses on understanding the processes that form and change seafloor hydrothermal systems and associated mineral deposits with time. He participated in more than 30 research cruises to submarine hydrothermal systems in the Pacific, Atlantic, and Indian Ocean. Major aims of his research are to understand their chemical variability, the use of mobile drilling techniques and geophysical methods to investigate their sub-seafloor extent as well as the use of autonomous underwater vehicles for their exploration.

Jörn Thiede is the leader of the KÖPPEN-Laboratory of the Institute of Earth Sciences of Saint Petersburg State University. He worked 1967-1987 at the universities of Aarhus (Denmark), Bergen (Norway), Oregon State University in Corvallis (USA), Oslo (Norway) and Kiel (Germany) and learned to sail the world's oceans to understand their history. Afterwards he pursued the foundation of GEOMAR. In 1997 he joined The Alfred Wegener Institute-Helmholtz Centre for Polar and Marine Research. In 2008 he served at the Geocenter Denmark as well as at UNIS (Longyearbyen/Svalbard) and in 2011 was invited to join the St. Petersburg State University (Russia).

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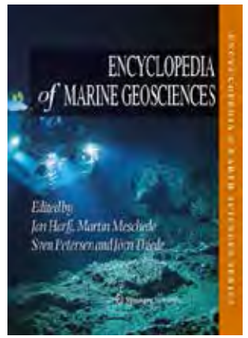

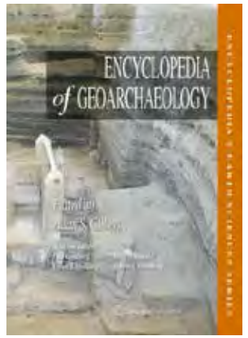

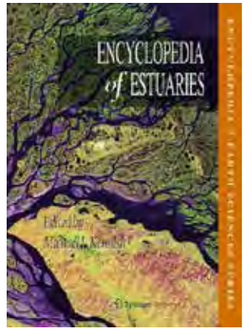

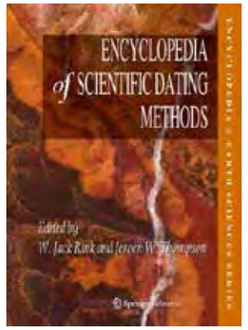

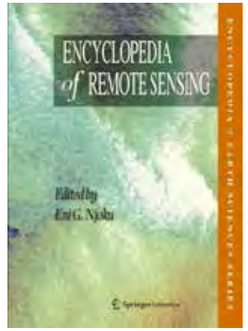

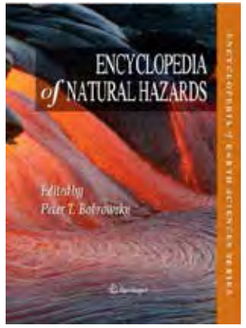

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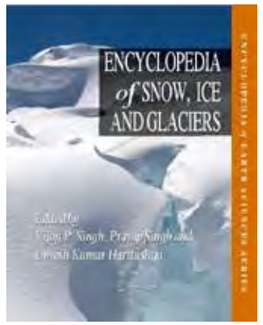

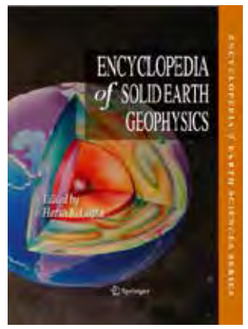

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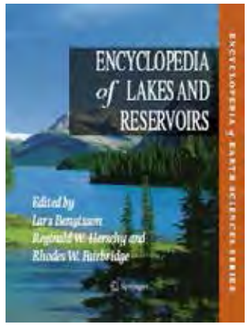

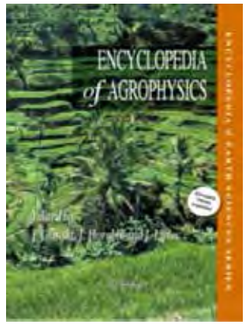

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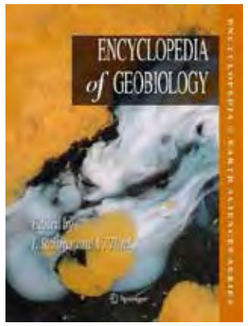

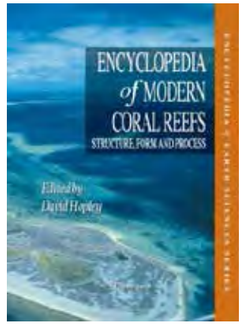

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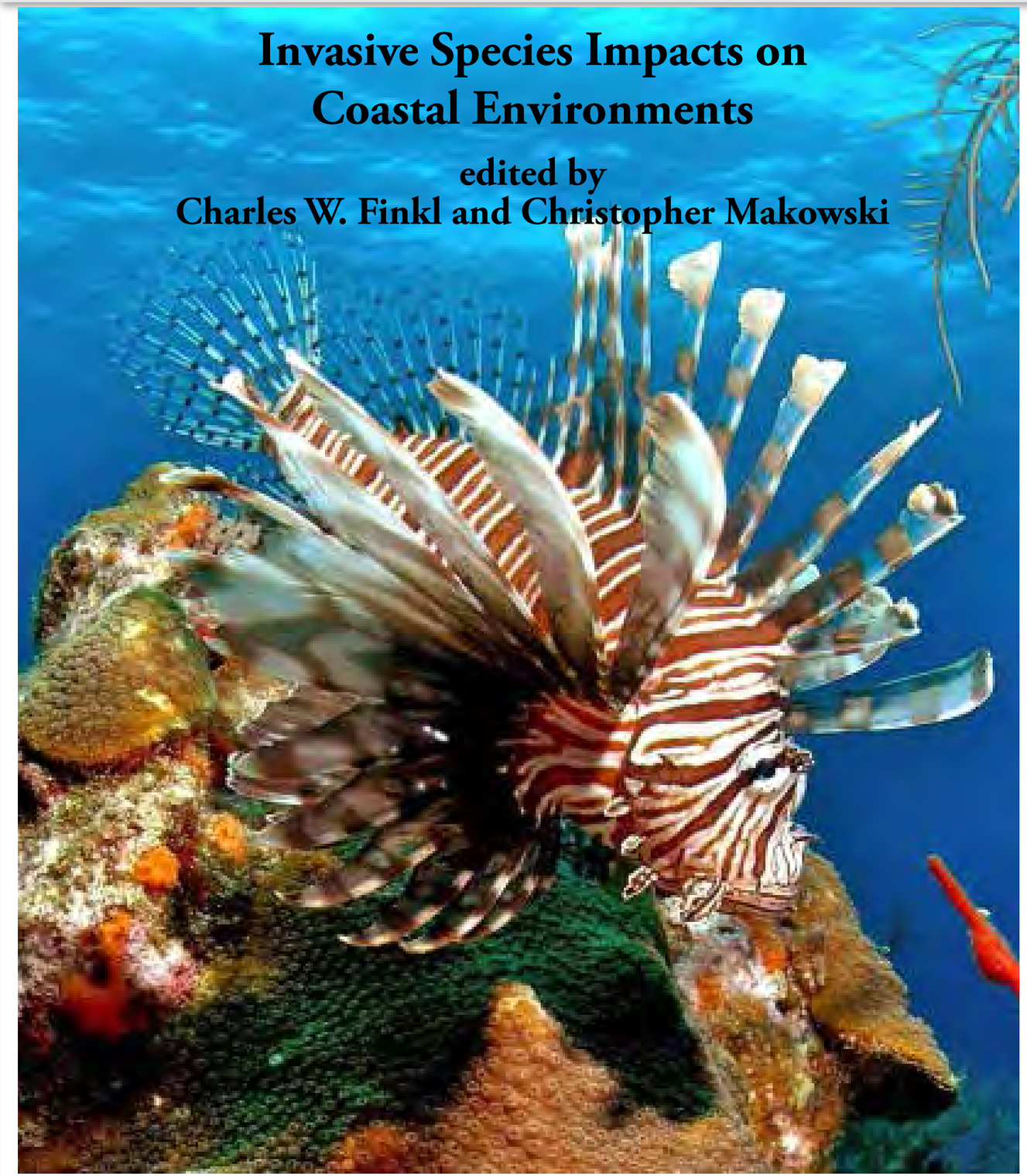

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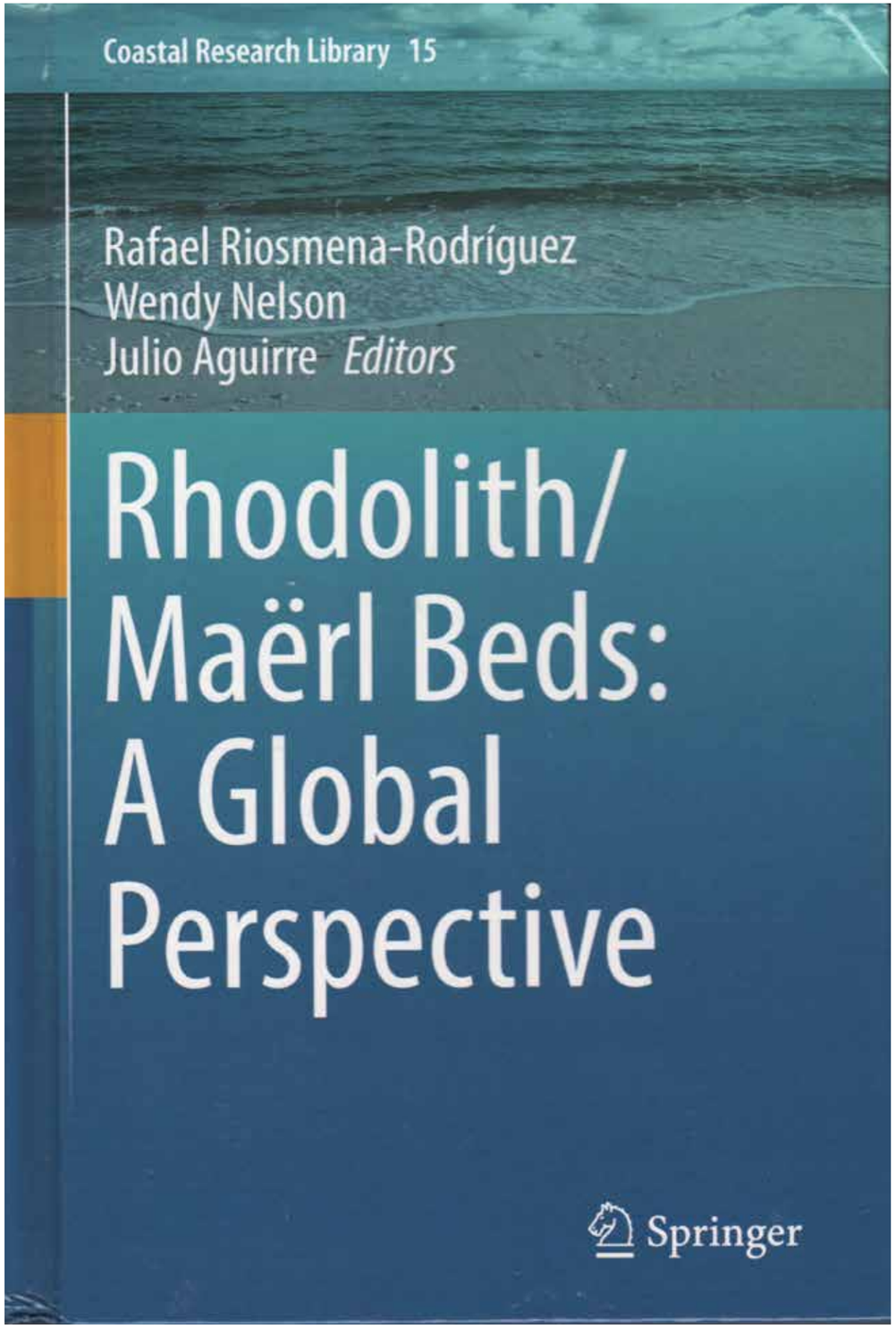

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The Biological Flora of Coastal Dunes and Wetlands: *Halodule wrightii Ascherson*

The Biological Flora of Coastal Dunes and Wetlands: *Halodule wrightii Ascherson*

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ABSTRACT

Information on the seagrass *Halodule wrightii* was assembled describing its taxonomy, phylogeny, and geographic distribution and its plant communities, ecology, population biology, reproduction, and biotic interactions. The objective was to review the current understanding of its role as a pioneer species that thrives in nutrient-rich waters and has a broad tolerance range to abiotic factors, such as salinity, temperature, depth, and light. Its short life cycle, high degree of vegetative reproduction, and rapid growth allow it to colonize areas that have undergone disturbances, *e.g.*, those affected by hurricanes. It occurs in monospecific stands or mixed with other seagrasses (*Ruppia maritima*, *Thalassia testudinum*, *Syringodium filiforme*, *Zostera marina*) and exhibits both vegetative and sexual reproduction but does not flower often. Worsening water quality is the main cause of seagrass decline in the world, along with other human activities, such as fishing, dredging, boating, and tourism. Given its usefulness, it is important to establish programs for the restoration and management of this species.

ADDITIONAL KEY WORDS: *Coastal protection, decline, distribution, eutrophic environments, pioneer species, seagrass.*

INTRODUCTION

Halodule wrightii Ascherson is one of more than 60 seagrass species in the world (Short *et al.*, 2007) and belongs to the Cymodoceaceae family. It is considered a pioneer or opportunistic species because of its ability to colonize disturbed environments and modify or create substrate conditions upon which other seagrass species are dependent (Phillips and Meñez, 1988). It is often the first seagrass to colonize denuded areas after storms and other disturbances (Van Tussenbroek *et al.*, 2010) and has been planted as a habitat stabilizer before transplanting *Thalassia testudinum* and other seagrasses in restoration efforts (Fonseca, Kenworthy, and Thayer, 1998). During seagrass succession, *Halodule wrightii* allows for the rapid recolonization of areas stripped of vegetation. It has a long dormancy period and, thus, great potential to form seed reserves in sediments, which serve as a potential source for recolonization after disturbance (McMillan, 1981). There is a general decline in the presence of seagrassbeds (Short *et al.*, 2006; Waycott *et al.*, 2006), and climate change will increase the frequency and intensity of storms and hurricanes damaging them, opening spaces for pioneer and opportunistic species.

A literature review on *Halodule wrightii* was conducted to compile what is known about its distribution, ecology, life history, and management and to identify areas in which more research is needed. The first step to seagrass restoration and recovery of the environmental services of subaquatic vegetation begins with pioneer species.

TAXONOMY AND VARIATION

The family Cymodoceaceae contains five genera: *Halodule*, *Cymodocea, Syringodium*, *Thalassodendron*,and *Amphibolis*. Morphologically, the family is homogeneous and monophyletic. The identifying characteristics are the shape of the leaf tip and the leaf width. The genus *Halodule* has six species: *H. ciliata* (Hartog) Hartog, *H. emarginata* Hartog, *H. bermudensis* Hartog, *H. pinifolia*

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(Miki) Hartog, *H. uninervis* (Forssk.) Boiss, and *H. wrightii* Asch. (Plant List, 2010)

GEOGRAPHIC DISTRIBUTION

Halodule wrightii has an extensive range, being present in five of the six global bioregions identified by Short *et al.* (2007) for seagrass distribution as defined by the physical restrictions of the oceans, tectonic origins, and climate. It is found in the Temperate North Atlantic, Tropical Atlantic, Mediterranean, Temperate North Pacific, and Tropical Indo-Pacific bioregions and is absent from the Temperate Southern Oceans bioregion, possibly because of temperature limitations. The widespread distribution of *H. wrightii* includes tropical and temperate habitats (McMillan, 1979; Short *et al.*, 2007), in which optimum temperatures are 208C–308C (Phillips, 1960) (Figure 2).

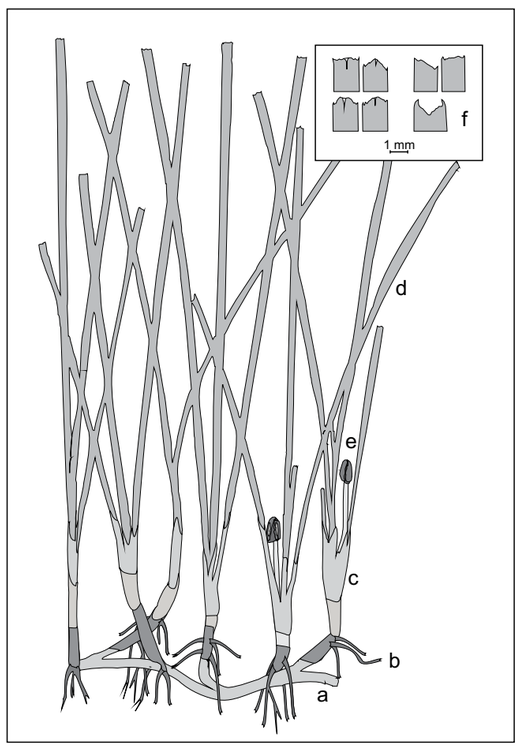

Figure 1. Vegetative structure of *Halodule wrightii* (a) rhizome, (b) root, (c) sheath, (d) leaf, (e) male flower, and (f) leaf tip morphology (modified from Van Tussenbroeck *et al.*, 2010).

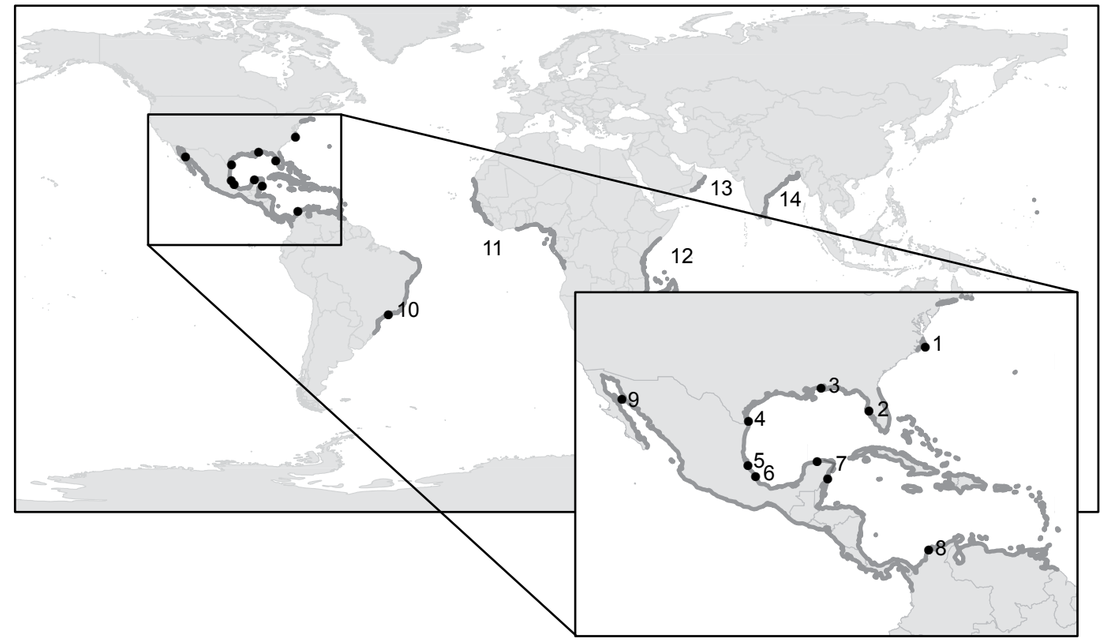

Figure 2. Map showing the distribution of *Halodule wrightii.* The specific study sites mentioned in the text are indicated in parenthesis for each state. In the United States: (1) North Carolina (Pamlico Sound), (2) Florida (Tampa Bay, Florida Bay), (3) Alabama (Bayou La Batre), and (4) Texas (upper Laguna Madre, Matagorda Bay, Galveston Bay, Corpus Christi Bay). In Mexico: (5) Veracruz (Laguna Tampamachoco), (6) Veracruz-La Mancha, (7) Mexican Caribbean (Yucatan, Puerto Morelos), and (9) Gulf of California (Tiburon Island). In Colombia: (8) Colombian Caribbean. In Brazil: (10) Brazilian Coast, (11) Atlantic Ocean, (12) Indian Ocean, (13) Arabian Sea, and (14) Bay of Bengal. General distribution redrawn from IUCN, 2015.

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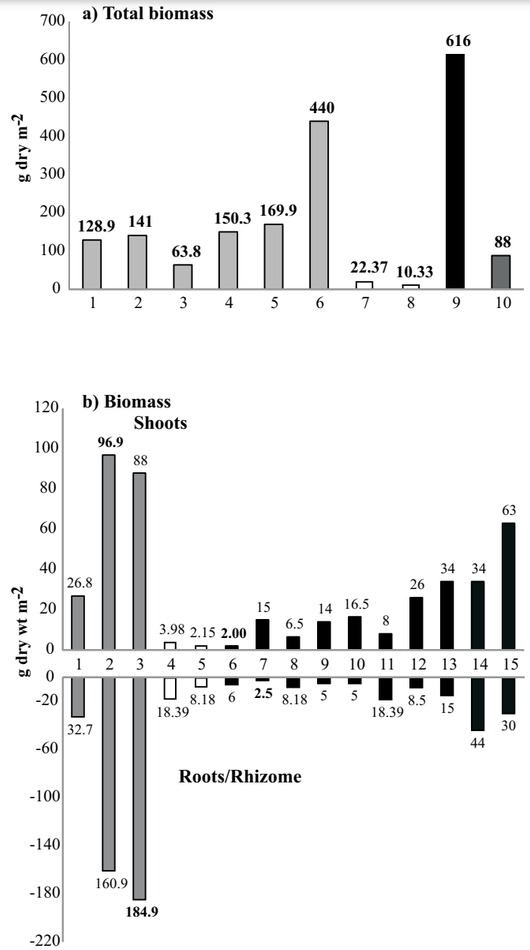

Figure 3. (a) Variation in total biomass for *Halodule wrightii* from different regions of the Gulf of Mexico (gray bars: Texas; white bars: Veracruz), the Mexican Caribbean (black bars), and Brazil (gray dark bars). Bars are the mean value for the site. (1–4) Texas (Matagorda Bay complex; Adair, Moore, and Onuff, 1994), (5) Texas (Galveston Bay complex; Adair, Moore, and Onuff, 1994), (6) Texas (Redfish; Pulich, 1985), (7–8) Veracruz (Tampama-choco, La Mancha; Rivera-Guzmãn *et al.*, 2014), (9) Mexican Caribbean (Gallegos *et al.*, 1994), and (10) Brazil (São Sebastião; Oliveira *et al.*, 1997).(b) Variation in above ground and belowground biomass of *Halodule wrightii* from Texas (gray bars), Veracruz (white bars), and Brazil (black bars). Bars are the mean value for the site. (1–3) Texas (Black Jack, East Flats and Laguna Madre; Dunton, 1996), (4–5) Veracruz (Tampamachoco, La Mancha; Rivera-Guzmãn *et al.*, 2014), (6–15) Brazil (Saco da Velha, Piraquara de Dentro, Paqueta, Catita, Pitangueira, Fazenda, Ferradura, Ilda do Japonés, João Fernandinho, Aguada; Creed, 1999). It is worth mentioning that sampling methods and the times of year that sampling took place were most likely different among the studies.

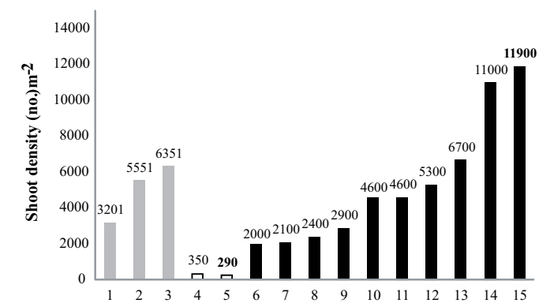

Figure 4. Variation in shoot density of *Halodule wrightii* from Texas (gray bars), Veracruz (white bars), and Brazil (black bars). Bars are the mean value for the site. (1–3) Texas (Black Jack, East Flats and Laguna Madre; Dunton, 1996), (4–5) Veracruz (Tampamachoco, La Mancha; Rivera-Guzmãn *et al.*, 2014), (6–15) Brazil (Saco da Velha, Piraquara de Dentro, Paqueta, Catita, Pitangueira, Fazenda, Ferradura, Ilda do Japonés, João Fernandinho, Aguãda; Creed, 1999). It is worth mentioning that sampling methods and the times of year that sampling took place were most likely different among the studies.

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Progradation of a Beach Ridge Plain between 5000 and 4000 Years BP Inferred from Luminescence Dating, Coquimbo Bay, Chile

Progradation of a Beach Ridge Plain between 5000 and 4000 Years BP Inferred from Luminescence Dating, Coquimbo Bay, Chile

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ABSTRACT

Luminescence dating was carried out to determine the depositional history of a 2-km-wide, shore-parallel, beach ridge sequence at Coquimbo Bay, Chile, for which no direct dating had previously been done. The beach ridge plain at Coquimbo Bay represents one of the most extensive Holocene depositional features preserved along the Pacific Coast of South America. Both optically stimulated luminescence (OSL) and infrared stimulated luminescence (IRSL) dates indicate a rapid period of beach ridge progradation lasting approximately 1000 years at an average rate of 2 m y^{-1}. However, based on previously reported luminescence deficiencies of geologically "young" quartz, it is proposed that IRSL dates are more representative of the actual depositional age of the beach ridges. These IRSL ages indicate that the beach ridge plain at Coquimbo Bay was formed between *ca*. 5000 and 4000 years BP, after the hiatus of eustatic sea-level rise in the mid-Holocene, and that a relatively stable shoreline location has likely prevailed over the last 4000 yrs. The height of beach ridges 8 to 10 m above modern sea level is difficult to interpret but is likely the result of several factors, including the build-up of an eolian cap on each beach ridge at the time of its formation, the height of wave runup, and tectonic uplift. Although uncertain, the cumulative effect of all three of these factors appears to be insufficient to account for all of the present beach ridge elevation, and thus a fall in sea level after the mid-Holocene at this location cannot be ruled out. Archaeological and geomorphic evidence support the idea of a mid-Holocene sea-level high stand and a 1 to 2 m mid-Holocene high stand is well established at many other circum-Pacific, far-field locations.

ADDITIONAL INDEX WORDS: *Sea-level change, luminescence dating.*

INTRODUCTION

In this study, optically stimulated luminescence (OSL) and infrared stimulated luminescence (IRSL) dating were used to estimate the timing of beach ridge deposition at Coquimbo Bay, Chile. Previous workers have shown that the Coquimbo Bay beach ridge plain is likely Holocene in age based on archaeological grounds (Ota and Paskoff, 1993); however, the timing of beach ridge deposition was not determined. By constraining the timing of the beach ridge sequence, this paper fills an important gap in knowledge about Holocene coastal processes along this active margin coastline. Discrepancies between OSL and IRSL age results for beach ridges and why these results are important for future research are also discussed. Finally, the age of beach ridges provides a first approximation of relative sea-level change during the Holocene along the Chilean coastline, for which, at present, few data have been published.

Beach Ridges

Beach ridges have been recognized as important records of Holocene sea-level change and coastal morphodynamic change in many areas of the world (Scheffers *et al.*, 2012). Stapor (1975) defined beach ridges as "linear, mound-shaped ridges roughly paralleling the coast. Ridge crests have elevations well above the mean high tide, and the bottom of the adjacent troughs or swales have elevations not far from the mean low tide." Beach ridges are progradational features mainly formed by direct onshore transport of sand by wave action and by wind (Taylor and Stone, 1996). However, beach ridges are also formed at the tips

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of migrating spits by littoral transport. Many beach ridges consist of an inner core of wave-deposited sand, capped with a thin layer of eolian sand along the ridge crest, so-called "dune decoration." Recent studies have used ground-penetrating radar to distinguish eolian and marine deposits in beach ridges (Nielsen and Clemmensen, 2009; Tamura *et al.*, 2008). The orientation and size of beach ridges may be controlled by changes in sediment supply, wave incident angle, and sea-level change. Accurate dating of beach ridges is necessary to understand Holocene sea-level change and to estimate coastal progradation rates (Hansen *et al.*, 2016). Although ^{14}C dating has been used to date beach ridges, this method may not allow for precise estimates of progradation rates because the dates obtained apply only to the organic material and not necessarily to the actual deposition of sand in the beach ridge. If the organic material is a disarticulated mollusk shell, as is typically the case, then numerous ^{14}C dates must be obtained on single shells from an individual site to account for the possibility of shells being eroded from older deposits and reincorporated into a younger deposit (Stapor, Mathews, and Lindfors-Kearns, 1991). Even if shell reworking is accounted for, ^{14}C dates may well provide only a maximum estimate of depositional age. For this reason, luminescence dating is a superior method, because it has the potential to date the time of sand deposition directly. In dating beach ridges, the question arises as to whether samples need to be taken from the core of the ridge within the area of wave-deposited sand to avoid sampling the dune-decorated eolian sand. However, if the eolian sand cap is specific to each beach ridge, having formed at essentially the same time, then a strict distinction between wave-deposited sand and eolian sand would not be necessary to date changes in shoreline location.

Study Area

The Coquimbo Bay beach ridge plain of north-central Chile (29.9° S, 71.3° W; Figure 1) is characterized by a semiarid, dry, summer climate, dominated by the stabilizing effects of the subtropical high pressure belt and the cold Peru Current. Most rainfall occurs in the winter months as a result of the northward movement of the polar front into the region. The average annual rainfall in La Serena is 110 mm, 80% of which falls between the months of May and August. The Elqui River discharges into Coquimbo Bay, with the highest discharges coinciding with winter rains and spring snowmelt. The Elqui River basin (drainage area 9800 km^2) has a total relief of more than 6000 m over a distance of 100 km. The average tidal range in Coquimbo Bay is approximately 1.5 m, and the average wave height is 1 m, with winter storm waves reaching 2–3 m (Valle-Levinson *et al.*, 2000). In 2015, tsunami waves reached a maximum height of 4.5 m, inundating the town of Coquimbo at the south end of Coquimbo Bay. Before that time, the last major tsunami to affect the area was in 1922, with waves reaching 7 m above mean sea level at Coquimbo (Fritz *et al.*, 2011).

The coastal geomorphology of the Coquimbo Bay region was first described by Charles Darwin (1846), who identified a flight of six marine terraces and attributed the creation of these terraces to "the action of the sea" whose elevations "mark so many periods of comparative rest in elevatory movement." Modern research in the area was begun by Roland Paskoff in the 1960s, who interpreted Coquimbo marine terraces to be paleo-shoreline features carved by wave action into the Miocene-age Coquimbo Formation and capped with Quaternary beach sands and gravels deposited during interglacial sea-level highstands (Paskoff, 1993).

Holocene-age coastal deposits are not well preserved along the active margin coastline of South America, except in occasional sheltered embayments. The most extensive Holocene coastal plain in this region, and perhaps the entire west coast of South America, is located at Coquimbo Bay (30° S, 71° W). Extending inland from Coquimbo Bay for 2 km is a sandy, crescent-shaped coastal plain (Figure 2) marked by a series of shore-parallel beach ridges (Novoa, 1991). Darwin (1846) described the beach ridge plain at Coquimbo Bay as rising "quite insensibly from the beach to a height of twenty-five feet (7.5 m) at the foot of the next plain . . . it is sandy, and abundantly strewed with shells." Ota and Paskoff (1993) interpreted the Coquimbo beach ridge plain to be Holocene in age, based on archaeological evidence and on radiocarbon ages from disarticulated shells found in beach deposits. The beach ridge plain ends abruptly at the foot of several Pleistocene terraces (Figure 2), the first and lowest of which is known locally as the Herradura II terrace, being capped with nearshore marine deposits from the most recent interglacial sea-level highstand (Leonard and Wehmiller, 1992).

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The Elqui River cuts across the beach ridge plain; however, the beach ridges' shore-parallel pattern persists right up to the river with no change in basic geometry. So while the Elqui River is considered to be the ultimate source of the sand present in these ridges, it is probably not the immediate source. There is no deltaic bulge or cuspate headland and no bulges or beach cusps at the mouth of the Elqui River, which would be expected if the beach ridges were built by longshore transport of sediment delivered contemporaneously from the Elqui River. Instead, the sand composing the Coquimbo Bay beach ridge plain most likely was transported directly onshore from the entire nearshore region of Coquimbo Bay, where much of the older deltaic sediment has accumulated over time.

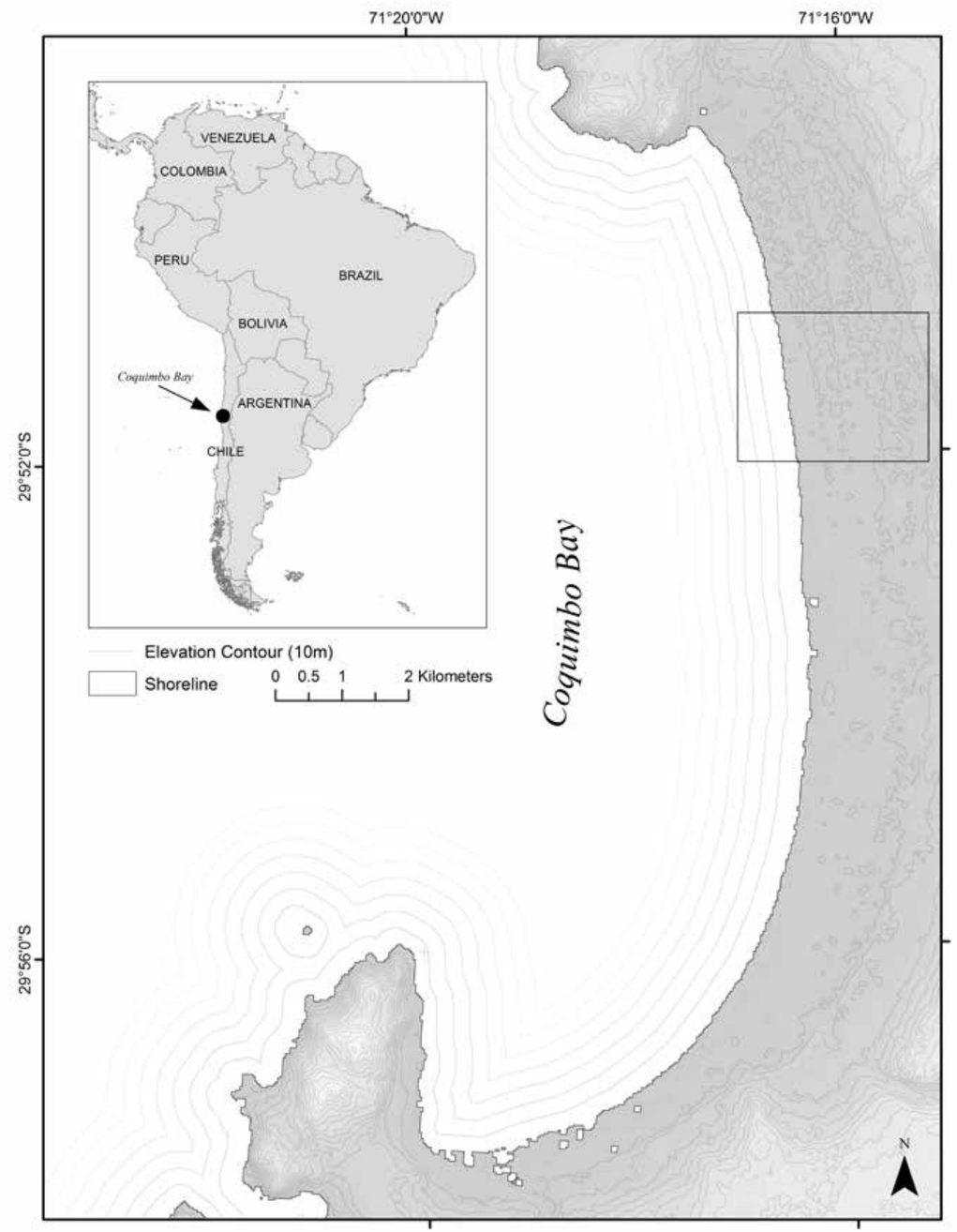

Figure 1. Location of study area in central Chile. Box shows map inset corresponding to Figure 3.

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Figure 2. LANDSAT image of the northern section of Coquimbo Bay, showing Elqui River mouth and refracted waves in Coquimbo Bay. Box shows map inset corresponding to Figure 3.

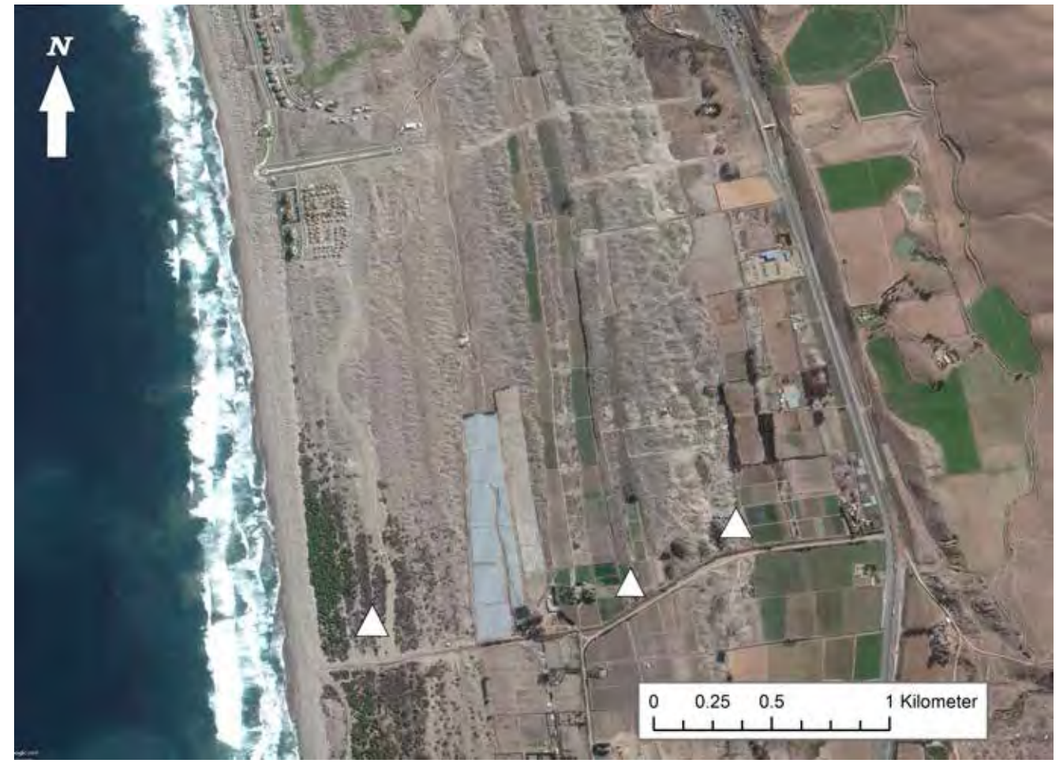

Figure 3. Google Earth image showing detail of the beach ridge plain at Coquimbo Bay and sample locations Vega-1, –2, and –3. These same locations are also referred to in Figure 4 and Table 1.

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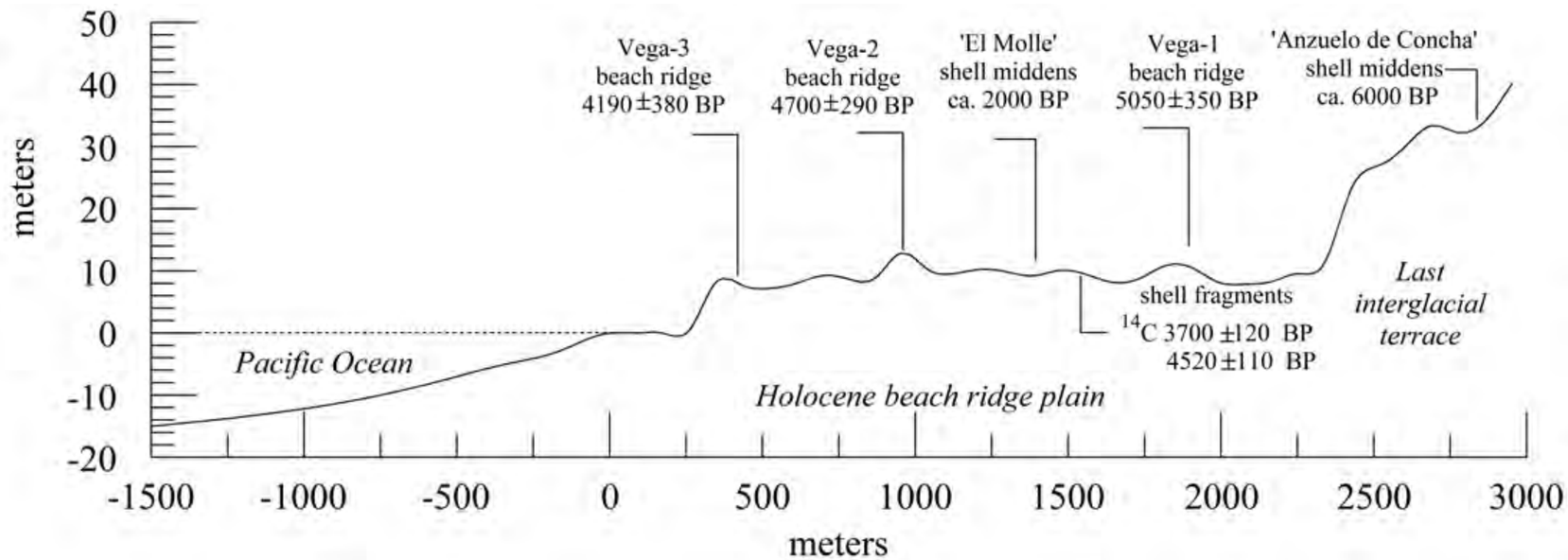

Figure 4. Topographic profile across the Coquimbo Bay beach ridge plain, made from Shuttle Radar Topography Mission elevation data and local bathymetry data. Vega beach ridge dates are IRSL ages from this study. All other dates are from Ota and Paskoff (1993). Vertical exaggeration 20:1.

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Determining the Spatial Variability of Wetland Soil Bulk Density, Organic Matter, and the Conversion Factor between Organic Matter and Organic Carbon across Coastal Louisiana, U.S.A.

Determining the Spatial Variability of Wetland Soil Bulk Density, Organic Matter, and the Conversion Factor between Organic Matter and Organic Carbon across Coastal Louisiana, U.S.A.

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ABSTRACT

Soil bulk density (BD), soil organic matter (SOM) content, and a conversion factor between SOM and soil organic carbon (SOC) are often used in estimating SOC sequestration and storage. Spatial variability in BD, SOM, and the SOM–SOC conversion factor affects the ability to accurately estimate SOC sequestration, storage, and the benefits (*e.g.*, land building area and vertical accretion) associated with wetland restoration efforts, such as marsh creation and sediment diversions. There are, however, only a few studies that have examined large-scale spatial variability in BD, SOM, and SOM–SOC conversion factors in coastal wetlands. In this study, soil cores, distributed across the entire coastal Louisiana (approximately 14,667 km^2) were used to examine the regional-scale spatial variability in BD, SOM, and the SOM–SOC conversion factor. Soil cores for BD and SOM analyses were collected during 2006–09 from 331 spatially well-distributed sites in the Coastwide Reference Monitoring System network. Soil cores for the SOM–SOC conversion factor analysis were collected from 15 sites across coastal Louisiana during 2006–07. Results of a split-plot analysis of variance with incomplete block design indicated that BD and SOM varied significantly at a landscape level, defined by both hydrologic basins and vegetation types. Vertically, BD and SOM varied significantly among different vegetation types. The SOM–SOC conversion factor also varied significantly at the landscape level. This study provides critical information for the assessment of the role of coastal wetlands in large regional carbon budgets and the estimation of carbon credits from coastal restoration.

ADDITIONAL INDEX WORDS: *Soil organic carbon sequestration, Coastwide Reference Monitoring System, hydrological basins, vegetation types, van Bemmelen factor.*

INTRODUCTION

Soil bulk density (BD) and soil organic matter (SOM) content are two important descriptors of soil physical and biological structures in terrestrial and wetland ecosystems (Gosselink, Hatton, and Hopkinson, 1984; Mitsch and Gosselink, 2000). BD is an indicator of pore space and solid particles within the soil profile, which determine soil water-holding capacity (McKee and Cherry, 2009; Mitsch and Gosselink, 2000). SOM is an indicator of soil development and an important source of nitrogen and micronutrients required for plant growth (Bruland and Richardson, 2006). These two soil parameters are often used in estimating soil organic carbon (SOC) stocks and sequestration capacity (Hansen and Nestlerode, 2013; Markewich *et al.*, 2007; Zhong and Xu, 2009), which, in turn, are used to assess contributions of ecosystems to global and regional carbon budgets and mitigation of greenhouse gas emissions (*e.g.*, Crooks *et al.*, 2011; DeLaune and White, 2012). To reduce chemical analysis costs, SOM is often used as a predictor of SOC, and the conversion factor of 1.724 from SOC to SOM (the van Bemmelen factor), which assumes organic matter is 58% organic carbon, has been widely used in not only terrestrial eco-

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systems but also wetland soils (DeLaune and White, 2012; Hatton, DeLaune, and Patrick, 1983; Zhong and Xu, 2009).

Ecosystem restoration efforts have increased worldwide to mitigate the loss of wetlands, which provide critical ecosystem services, including carbon sequestration (*e.g.*, Couvillion *et al.*, 2013; Crooks *et al.*, 2011). In coastal wetlands, BD and SOM are also used in estimating vertical accretion and surface elevation change (Couvillion *et al.*, 2013; Day *et al.*, 2011; DeLaune, Patrick, and van Breemen, 1990; Hatton, DeLaune, and Patrick, 1983; Nyman *et al.*, 1993, 2006; Wang *et al.*, 2014). Often, BD and SOM are required to assess restoration benefits, such as sustained or new land-building areas and carbon sequestration of sediments and nutrients at a scale equal or larger than project boundaries (Boustany, 2010; Couvillion *et al.*, 2013; Crooks *et al.*, 2011; DeLaune and White, 2012; Wamsley, 2013). The American Carbon Registry has recently approved a standard wetlands restoration methodology for the Mississippi Delta in which SOM and BD data in different stratums are required to estimate carbon sequestration capacity (http://americancarbonregistry.org/). Therefore, changes in BD and SOM could largely affect the estimation of coastal restoration benefits. For example, the potential land-building area created by a freshwater diversion could be reduced by 22–38% when a BD value from the high end of the spectrum (0.5 g cm^{-3}) is used to replace a BD value from the low end of the expected range (0.21 g cm^{-3}) for saline marsh (Wamsley, 2011).

It is well established that BD and SOM vary spatially at landscape scales for a number of ecosystems, including wetlands, because of changes in soil texture, age, depth, and plant community structure (*e.g.*, Bruland and Richardson, 2005). In the Gulf of Mexico coastal wetlands, soil BD is largely controlled by mineral matter content (*e.g.*, Hatton, DeLaune, and Patrick, 1983), which is often a function of tidal action, riverine sediment delivery, and hurricanes and winter storms, and is associated sediment deposition and erosion (Meselhe *et al.*, 2013; Nyman, DeLaune, and Patrick, 1990; Piazza *et al.*, 2011; Turner *et al.*, 2006; Wamsley, 2013). These physical processes vary across the landscape. For example, the highest bulk densities in coastal Louisiana after the passage of hurricanes Katrina and Rita were coincidental with the thickest, newly deposited sediments on the eastern side of the center of the storm track (Smith *et al.*, 2015; Turner *et al.*, 2006). SOM is mainly determined by primary production and decomposition (Neubauer, 2008; Nyman, DeLaune, and Patrick, 1990; Nyman *et al.*, 1993), which are biological processes controlled by environmental conditions, such as porewater salinity and soil nutrient concentrations, and ecological characteristics, such as plant and microbial community composition (Neubauer *et al.*, 2013) that vary spatially. For example, wetland above- and belowground productivity declines with decreasing elevation beyond an optimum elevation, which can vary at both local and landscape scales (*e.g.*, Kirwan and Guntenspergen, 2012). In Breton Sound Estuary, along coastal Louisiana, significant increases in organic matter accumulation and nutrient input were found at sites nearest the Caernarvon Freshwater Diversion Structure (DeLaune *et al.*, 2003). Thus, spatial variation of wetland soil attributes may also be influenced by inundation and salinity changes associated with restoration activities (*e.g.*, Snedden, Cretini, and Patton, 2015). Therefore, it is not surprising that the van Bemmelen factor, 1.724 converting SOC to SOM is too low for most soils, including wetland soils (Ahn and Jones, 2013; Nelson and Sommers, 1996; Pribyl, 2010).

Despite the functional importance of BD and SOM, few investigations have examined the spatial variability in wetland soil properties, including BD, SOM, and the SOM–SOC conversion factor across a range of multiple vegetation types within different hydrologic basins and coastal plains at regional scales. This lack of information is partially due to the difficulty of collecting a large number of samples covering entire basins. The ability to accurately estimate ecosystem capacity to store carbon and nutrients and the ecosystem's role in mitigating greenhouse gas emissions is limited without an understanding of the spatial variability in BD, SOM, and the SOM–SOC conversion factor. In addition, large uncertainties exist in assessing carbon credits and restoration benefits without examining the spatial variability within the larger spatial scales (*e.g.*, land building or land-loss reduction) (*e.g.*, Mack *et al.*, 2015).

The Coastwide Reference Monitoring System (CRMS) network, which was established and authorized in 2003 under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), provides a large, unique data set for examining the spatial variability in soil properties, including SOM and BD and the relationship between SOM and SOC across the entire Louisiana

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coast (Couvillion *et al.*, 2013; Piazza *et al.*, 2011; Steyer *et al.*, 2003). CRMS is a regional-scale ecosystem monitoring system that provides data on wetland hydrology, ecology, soil, and geomorphology for large-scale coastal resto-ration and management applications (http://lacoast.gov/crms2/home.aspx). CRMS also provides a platform for scientific research on structure and functions of coastal wetlands (Piazza *et al.*, 2011). The objectives of this study were to use coastal Louisiana as an example to examine the spatial variability in (1) BD and SOM, and (2) the SOM–SOC conversion factor in coastal wetlands at a regional scale by relating BD, SOM, and the SOM–SOC conversion factor to hydrological basins and vegetation types. Hydrological basins across coastal Louisiana represent variation in hydrology (magnitude, duration, and frequency of flooding) because of the Mississippi River, Atchafalaya River, Mississippi River tributary channels, interdistributary lakes, bays, and tidal channels (Cahoon *et al.*, 1995). These basins also represent variations of mineral sediment transport and delivery from riverine and marine sources because of the changing location of the Mississippi River depocenter during the Holocene (review of Cahoon *et al.*, 1995). Vegetation types and associated community composition, density, and biomass are mainly determined by estuarine salinity (Visser *et al.*, 2002), which is affected by tidal forcing, river flow, winds, and sea-level rise (SLR) (*e.g.*, Day *et al.*, 2000; La Peyre *et al.*, 2016). A quantification of the spatial variability of these variables will contribute to a better understanding of the role of coastal wetlands in the national and global carbon budget and mitigation of climate change and, importantly, improve the assessment and prediction of restoration outcomes in the selection of the most cost-effective projects for coastal restoration.

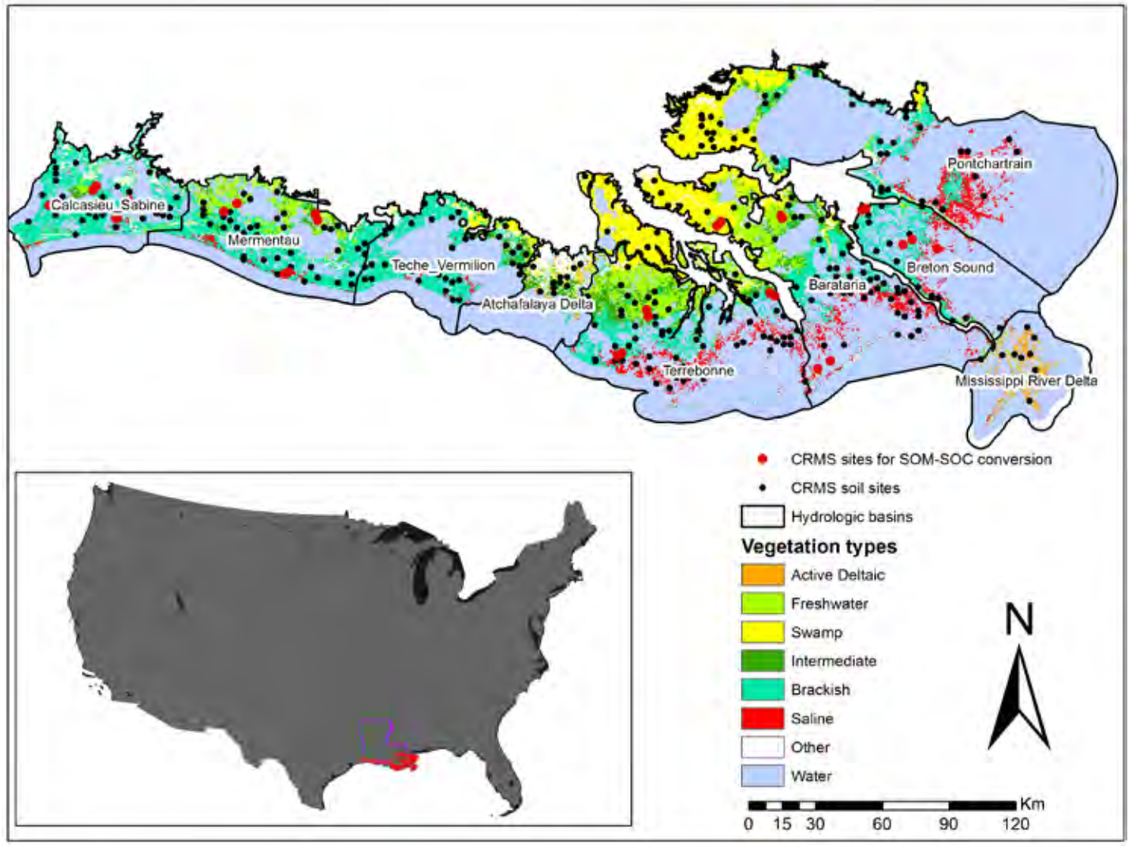

Figure 1. Location of CRMS soil sample sites within different hydrologic basins and vegetation types across coastal Louisiana. Data for BD and SOM analysis were from 331 CRMS soil sites sampled during March 23, 2006, to July 23, 2009. Data for SOM–SOC conversion were from 15 CRMS sites sampled during spring 2006 to fall 2007.

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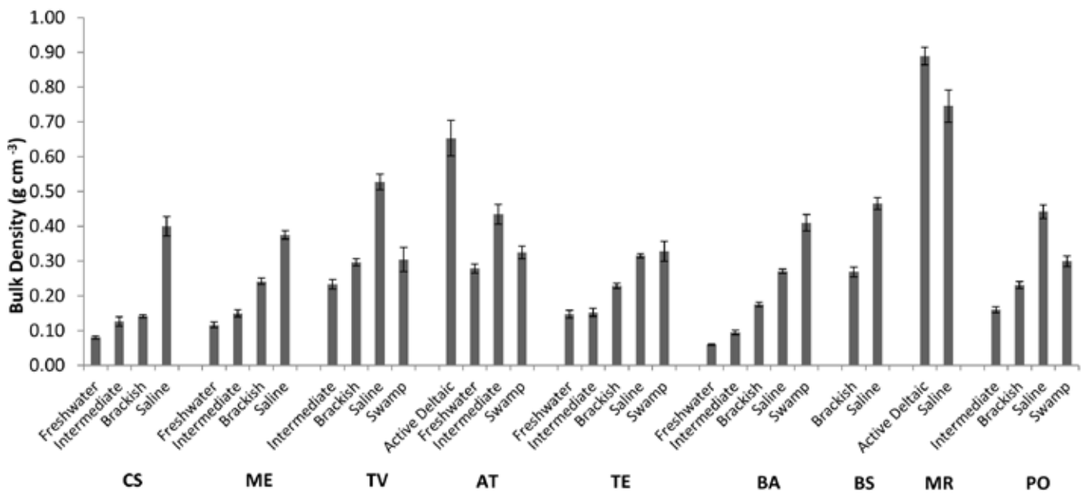

Figure 2. Spatial variation in soil bulk density defined by nine hydrologic basins and six vegetation types combined groups across coastal Louisiana. The nine hydrologic basins are listed from west to east: Calcasieu/Sabine (CS), Mermentau (ME), Teche/Vermilion (TV), Atchafalaya (AT), Terrebonne (TE), Barataria (BA), Breton Sound (BS), Mississippi River Delta (MR), and Pontchartrain (PO). Bars represent mean – 1 SE to mean + 1 SE.

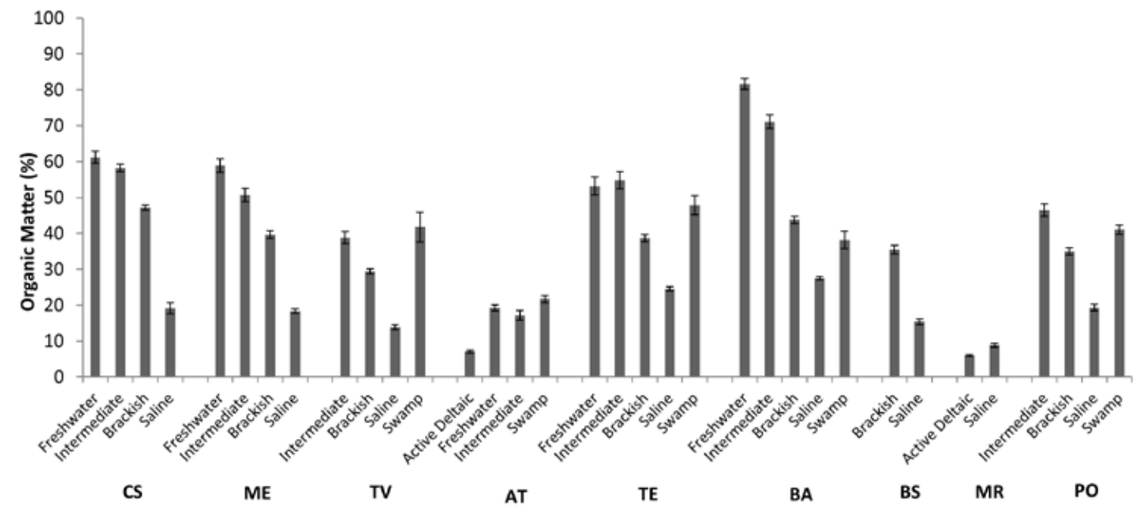

Figure 3. Spatial variation in soil organic matter defined by nine hydrologic basins and six vegetation types combined groups across coastal Louisiana. The nine hydrologic basins are listed from west to east: Calcasieu/Sabine (CS), Mermentau (ME), Teche/Vermilion (TV), Atchafalaya (AT), Terrebonne (TE), Barataria (BA), Breton Sound (BS), Mississippi River Delta (MR), and Pontchartrain (PO). Bars represent mean – 1 SE to mean + 1 SE.

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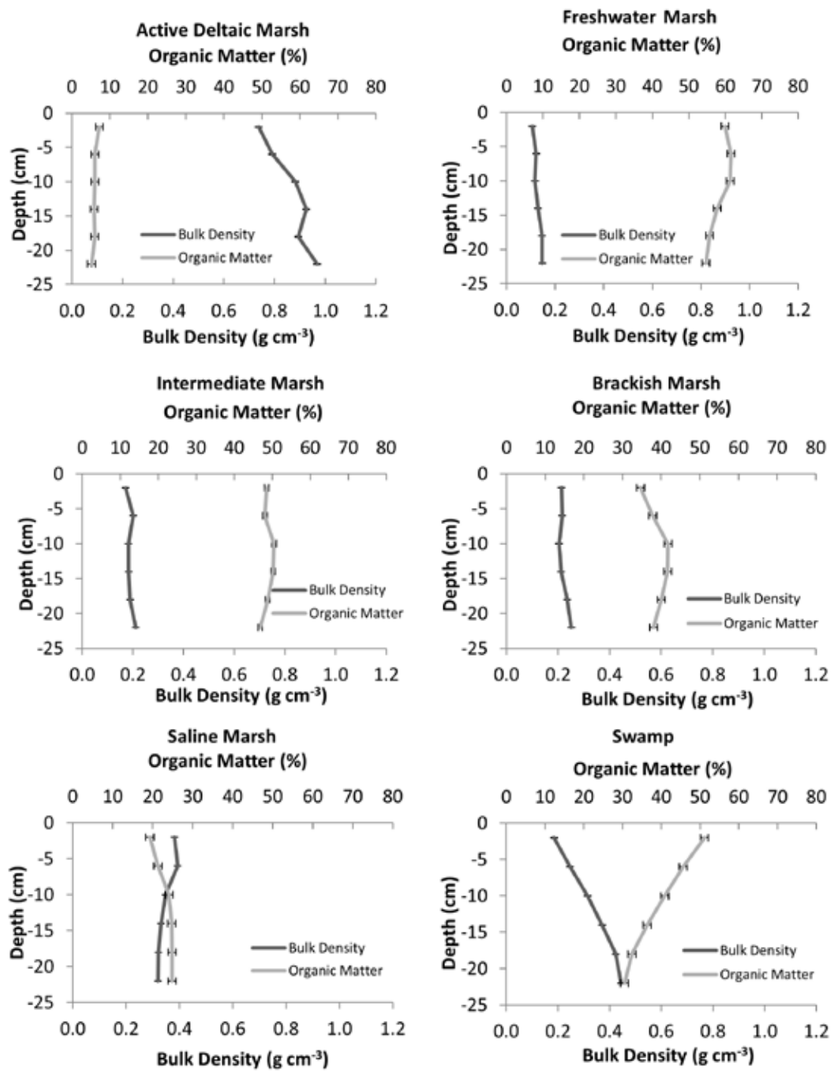

Figure 4. Vertical variation in soil bulk density and organic matter by vegetation type across coastal Louisiana. Bars represent mean –1 SE to mean + 1 SE.

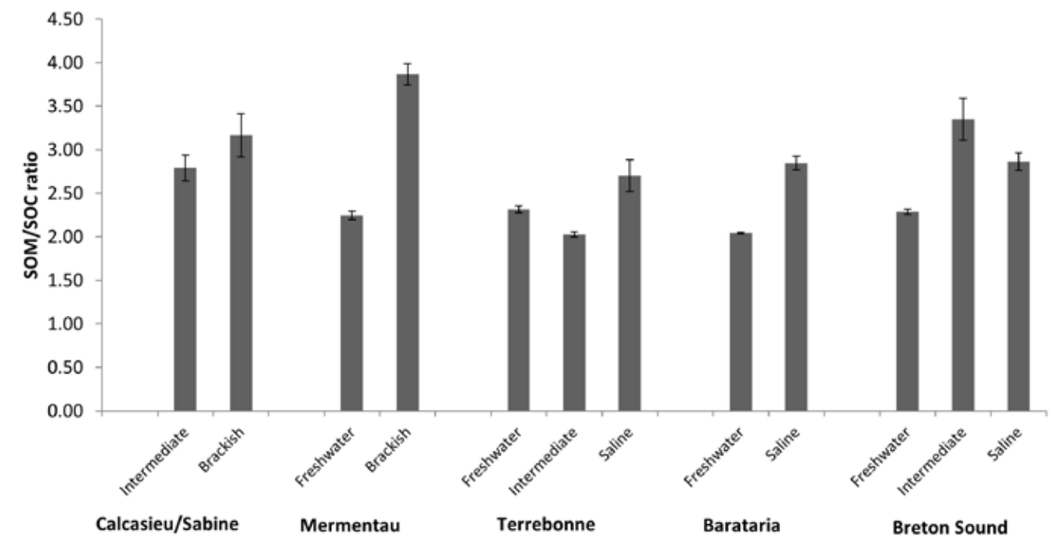

Figure 5. Spatial variation in SOM:SOC ratio defined by five hydrologic basins and four vegetation types combined groups across coastal Louisiana. Bars represent mean –1 SE to mean + 1 SE.

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ICS2018

Committee Programs Abstracts Registration Accommodations Tours Sponsorship & Exhibition Information

NEWS & NOTICES

KEY DATES

Call for abstract submissions open	1st week of March 2017
Abstract submissions close	30th May 2017
Authors advised of acceptance of abstracts	Early September 2017
Paper submissions	Early September 2017 – 31st October 2017
Papers reviewed	November 2017
Final papers submitted	31st December 2017
Early bird registration	October 2017 – 28th February 2018

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Continued on Next Page

History of ICS

The Coastal Education & Research Foundation (CERF) and the Journal of Coastal Research (JCR) have been organizing the International Coastal Symposium since 1990, with the first meeting in Skagen, Denmark. Local hosts and organizers cooperate under the umbrella of CERF-JCR to provide meeting venues, agendas and field excursions.

Proceedings of the ICS traditionally appear as printed volumes in special issues of the JCR. The proceedings are sent to the Thomson Reuters Web of Science (formerly ISI Web of Knowledge) for abstracting and electronic searches on the web.

Prior meetings

- ***1st ICS*** : Skagen, Denmark (Hosted by Per Bruun and N. Kingo Jacobsen, ICS1990 ; JCR Special Issue No. 9)
- ***5th ICS*** : Palm Beach, Florida (Hosted by Charlie Finkl and Per Bruun, ICS1998 ; JCR Special Issue No. 26)
- ***10th ICS*** : Lisbon, Portugal (Hosted by Carlos Pereira da Silva, ICS2009 ; JCR Special Issue No. 56)
- ***12th ICS*** : Plymouth, United Kingdom (Hosted by Gerd Masselink, ICS2013 ; JCR Special Issue No. 65)
- ***13th ICS*** : Durban, South Africa (Hosted by Andrew Cooper and Andrew Green, ICS2014 ; JCR Special Issue No. 70)
- ***14th ICS*** : Sydney, Australia (Locally hosted by Ana Vila-Concejo, ICS2016 ; JCR Special Issue No. 75)

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Korea Institute of Ocean Science & Technology (KIOST) is a government affiliated research institution tasked with discovering new scientific knowledge about the ocean. We strives to develop cutting-edge scientific technology and to cultivate talented next-generation human resources for our better life and sustainable ocean development. KIOST also advises Korean government concerning the research and development of marine science and technology.

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About KSCDP

Korean Society of Coastal Disaster Prevention (KSCDP) aims to improving the safety and welfare of the people securing and preserving the coast from coastal disasters and seeking ways to keep maintenance the coast. KSCDP is developing an academic and practical coastal disaster prevention method through active contribution and participation among people to exchange of comprehensive knowledge and response to the disaster of the coast.

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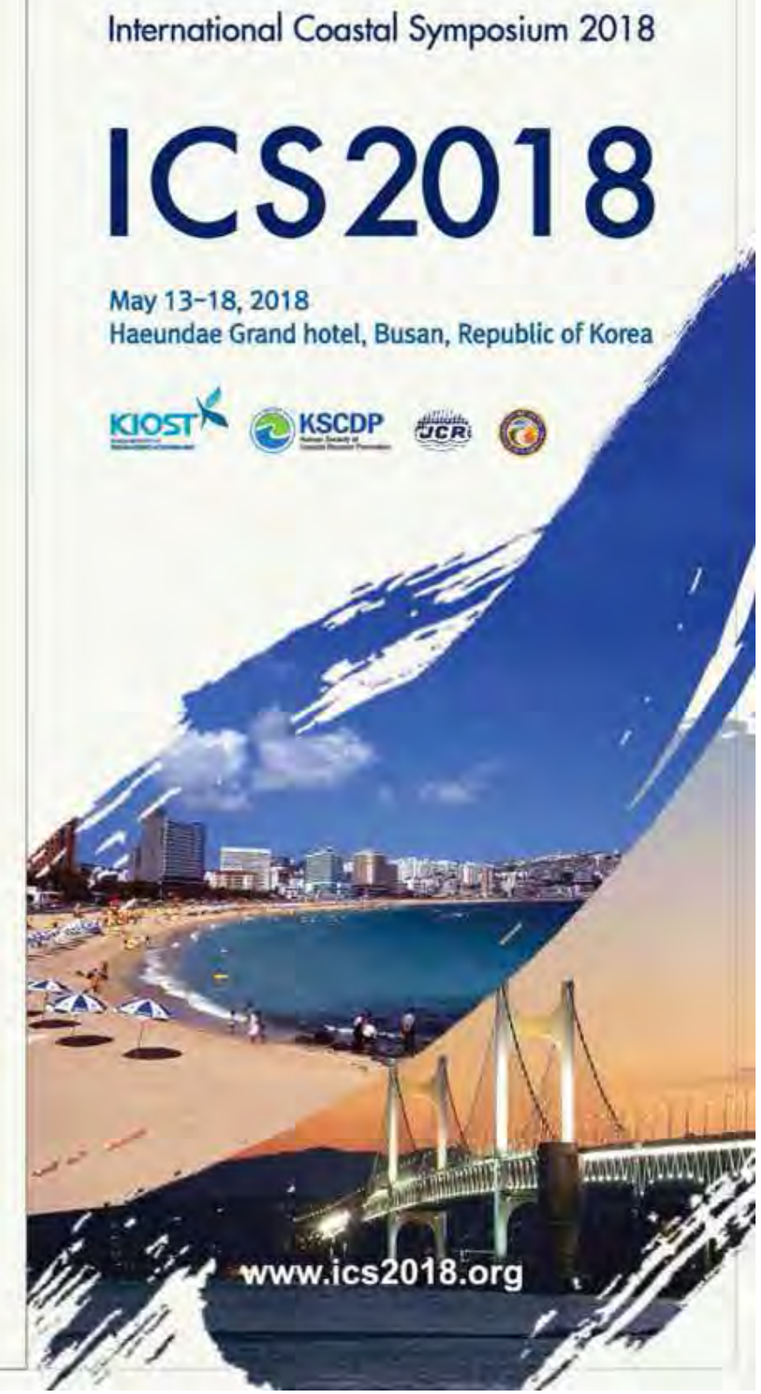

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Welcome to 15th International Coastal Symposium 2018

"The symposium is organized in Busan, Korea from 13th to 18th May, 2018"

It is with great pleasure that we invite you to the International Coastal Symposium (ICS2018), to be held from Sunday 13th – Friday 18th May 2018 at the Haeundae Grand Hotel, Haeundae Beach, Busan, Republic of Korea. The theme is 'Safe Coasts Beyond Climate Change'.
The International Coastal Symposium (ICS) is now in its 15th edition and this is the first time in Asia.

The Symposium is co-hosted by Korea Institute of Ocean Science & Technology (KIOST) and Korean Society of Coastal Disaster and Prevention (KSCDP), under the auspices of the Coastal Education and Research Foundation (CERF) and the Journal of Coastal Research (JCR)

The ICS brings together delegates from all over the world to collaborate and discuss the most current coastal research studies and projects. The proceedings of the conference, published as peer-reviewed papers in the Journal of Coastal Research, represent an invaluable resource for coastal scientists, engineers and managers.

Local Organizer of ICS 2018

1. Dr. Jae-Seol Shim, Chairman of ICS2018

- Principal Research Scientist of KIOST
- Vice-President of KSCDP

2. Dr. Insik Chun, Co-Chairman of ICS2018

- Professor of Konkuk University
- President of KSCDP

3. Dr. Hak-Soo Lim, Secretary of ICS2018

- Principal Research Scientist of KIOST
- Secretary of KSCDP

Key Dates

Call for abstract submissions open	*1st week of March 2017*
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Final papers submitted	*31st December 2017*
Early bird registration	*September 2017 – 28th February 2018*
Non early bird registration	*1st March 2018 – 30th April 2018*
Conference	*13th - 18th May 2018*

Program

oral, posters, field trip

Sunday 13th May	Registration open Welcome Reception
Monday 14th May	Conference day 1, including keynote & poster session
Tuesday 15th May	Conference day 2, including keynote & poster session
Wednesday 16th May	Conference day 3, including keynote & poster session
Thursday 17th May	Conference day 4, including keynote & Offsite conference dinner
Friday 18th May	Full day field trips
SAT - SUN 19th - 20th May	Optional field trips

Haeundae Grand Hotel is located at Haeundae Beach in Busan located at the southeastern end of the Korean Peninsula.

The Haeundae Beach, a famous beach, has an approximately 1.6km long and 70m wide coastline.

Busan, a city thriving with talent, technology and culture with about 3.6 million residents is a perfect example of harmony between mountains, rivers and sea.
Its geography includes a coastline with superb beaches, scenic cliffs, and mountains which provide excellent hiking, extraordinary views, and hot springs scattered throughout the city. Busan enjoys four distinct seasons and a temperate climate that never gets too hot nor too cold.

We look forward to welcoming you to Haeundae Beach, Busan for ICS2018.

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JCR 30(4)
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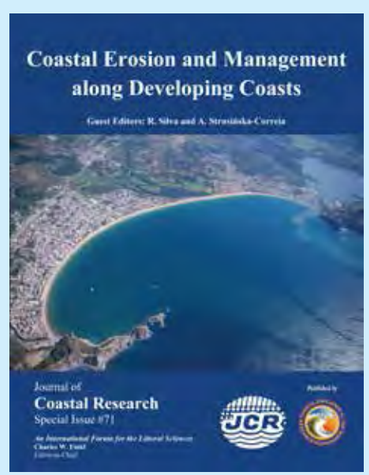

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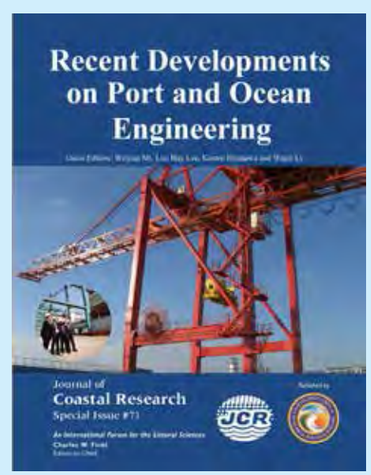

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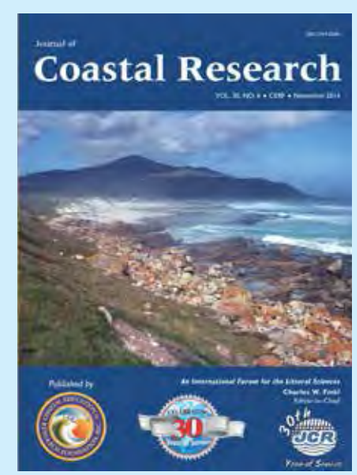

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Introducing the new official website of the Coastal Education and Research Foundation (CERF)

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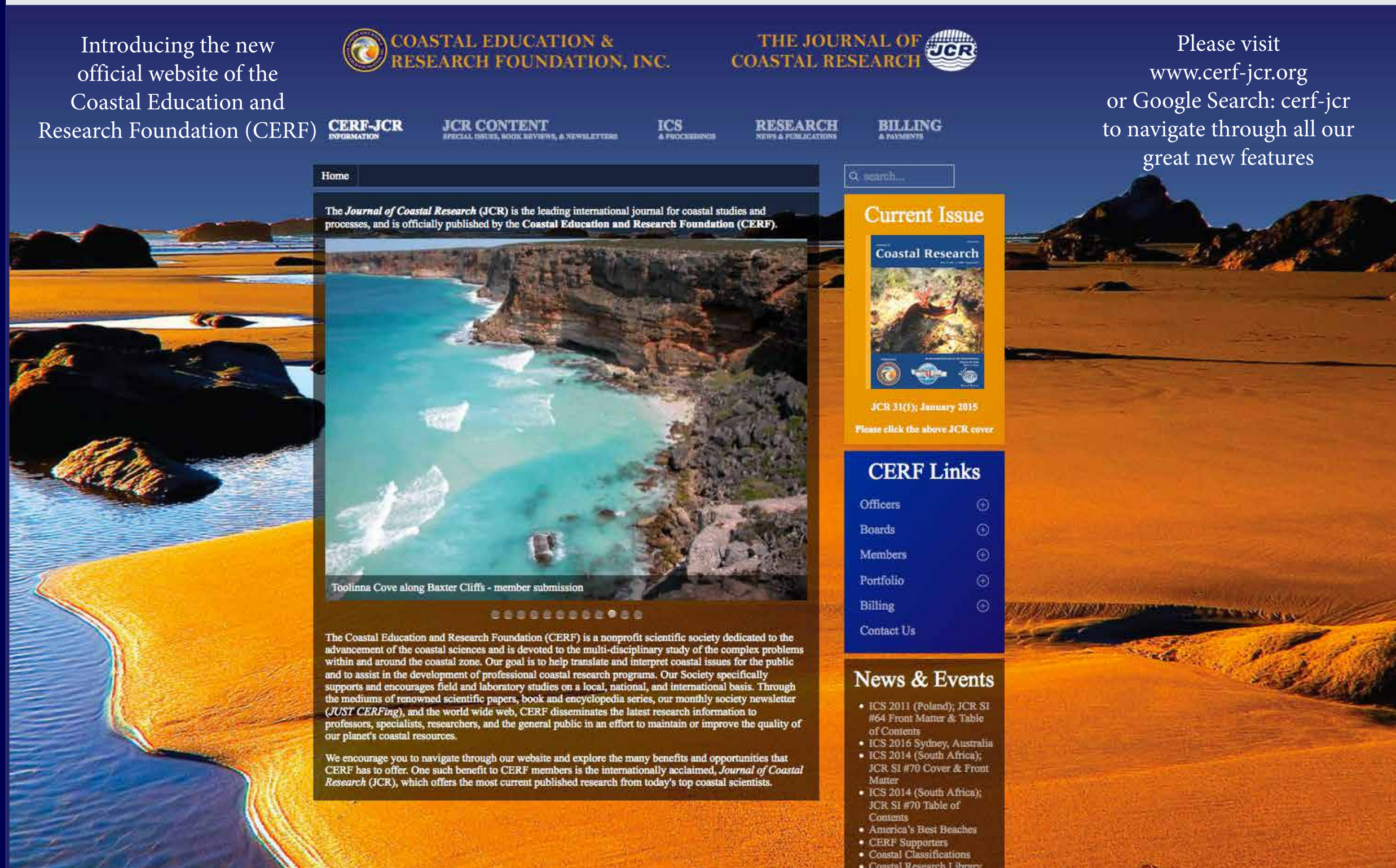

Publish Your Coastal Photographs in the JCR!

As a CERF member, you have the unique opportunity to become a published photographer in our internationally renowned journal!

All possible submissions must depict some coastal or underwater/marine scene and must be high-quality (>300 dpi) image files in either a jpg, tiff, or gif format. In addition, a short caption must accompany the photograph. The caption should include the specific location of the photograph, the date taken, the geological or coastal significance, and your CERF member contact information (full name, title, phone, email, and CERF member number). Example captions can be found on the Gallery page of this website.

While most submissions will be selected for either the CERF website or inside the JCR, a chosen few will actually be selected to be the cover image of a JCR Issue! So dust off those cameras and submit your photos.

Submit your photo and information by email attachment to CMakowski@cerf-jcr.com

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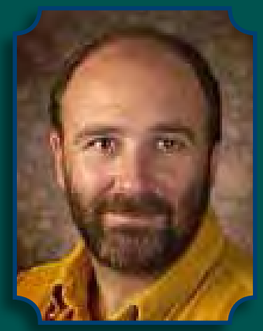

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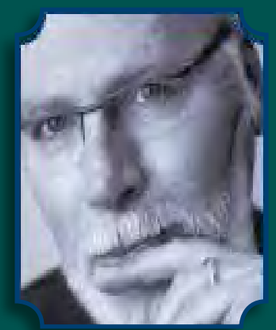

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A Special Acknowledgement To:
Associate Professor Dr. Charles Lemckert
CERF Lifetime Member

We are proud to acknowledge Associate Professor Dr. Charles Lemckert as the Coastal Education & Research Foundation's first ever Lifetime Member. Dr. Lemckert has always showed great support for CERF and the JCR, and even served as the Chair and Organizer of the 9th International Coastal Symposium (ICS) at Griffith University (Queensland, Australia) in 2007. We are honored to have Dr. Lemckert as a Lifetime Member and warmly recognize his devotion to our coastal research society.

Associate Professor Lemckert has active research interests in the fields of physical limnology, coastal systems, environmental monitoring techniques, environmental fluid dynamics, coastal zone management and engineering education. Along with his postgraduate students and research partners he is undertaking research studies on water treatment pond design (for recycling purposes), the dynamics of drinking water reservoirs, the study of whale migration in South East Queensland Waters, end ocean mixing dynamics.

Selected Publications:

Ali, A.; Lemckert, C.J.; Zhang, H., and Dunn, R.J.K., 2014. Sediment dynamics of a very shallow subtropical estuarine lake. *Journal of Coastal Research*, 30(2), 351-361.

Dunn, R.J.K.; Lemckert, C.J.; Teasdale, P.R., and Welsh, D.T., 2013. Macroinfauna Dynamics and Sediment Parameters of a Subtropical Estuarine Lake—Coombabah Lake (Southern Moreton Bay, Australia). *Journal of Coastal Research*, 29(6A), 156-167.

Ali, A.; Lemckert, C.J., and Dunn, R.J.K., 2010. Salt fluxes within a very shallow subtropical estuary. *Journal of Coastal Research*, 26(3), 436-443.

Brushett, B.A.; King, B., and Lemckert, C.J., 2011. Evaluation of met-ocean forecast data effectiveness for tracking drifters deployed during operational oil spill response in Australian waters. *Journal of Coastal Research*, 64, 991-994.

Lemckert, C.J.; Zier, J., and Gustafson, J., 2009. Tides in Torres Strait. *Journal of Coastal Research*, 56, 524-52.

For a complete list of Dr. Lemckert's publications or his contact information, please visit:
http://www.griffith.edu.au/engineering-information-technology/griffith-school-engineering/staff/associate-professor-charles-lemckert

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A Special Acknowledgement To:
Professor Yong-Sik Cho
CERF Lifetime Member

We are proud to acknowledge Professor Yong-Sik Cho as a Lifetime Member of the Coastal Education & Research Foundation. Professor Cho, Yong-Sik received his bachelors and masters degrees from Hanyang University in February 1981 and August 1988 respectively, and his Ph.D. from the School of Civil and Environmental Engineering of Cornell University in January, 1995. The title of the thesis is Numerical Simulations of Tsunami Propagation and Run-up (Advisor: Professor Philip L.-F. Liu).

He had continuously worked at Cornell University as a Post-Doctoral Associate after graduation. From March of 1997, he had been employed as an Assistant Professor at the Department of Civil and Environmental Engineering at Sejong University and then moved to Hanyang University in March, 2000. From February 2003 to January 2005, he had served as the Chair of the Department of Civil and Environmental Engineering at Hanyang University. Professor Cho has served as the Director of Innovative Global Construction Leader Education Center, a government enterprises sponsored by the Ministry of Education, Science and Technology, and the Chair of Graduate Studies of the Department of Civil and Environmental Engineering since 2006.

Professor Cho has published 52 journal papers in prominent international journals registered in Science Citation Index such as Coastal Engineering, the *Journal of Coastal Research*, the *Journal of Fluid Mechanics*, the *Journal of Hydraulic Research*, *Physics of Fluids*, the *Journal of Geophysical Research*, the *Journal of Engineering Mechanics*, *and Ocean Engineering*. He has also published 120 papers in domestic journals and about 360 proceedings in international and domestic conferences. Professor Cho has also registered eight patents.

Selected Publications:

Kim, Y.-C.; Choi, M., and Cho, Y.-S., 2012. Tsunami hazard area predicted by probability distribution tendency. *Journal of Coastal Research*, 29(5), 1027-1038.

Cho, Y.-S., 2012. Numerical study for spreading of a pollutant material in coastal environment. Energy Sources, Part A, 34(16), 1459-1470.

Cho, Y.-S.; Kim, T.-K.; Jeong, W.-C., and Ha, T.-M., 2012. Numerical simulation of oil spill in ocean. *Journal of Applied Mathematics*, 2012, 1-15.

For a complete list of Professor Cho's publications or his contact information, please visit: http://civil.hanyang.ac.kr/coast/

 Continued on Next Page

A Special Acknowledgement To:

Professor Ya-Ping Wang

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DEGREES AND DIPLOMA

July, 2000: Ph.D. (Marine Sediment Dynamics), Institute of Oceanology, Chinese Academy of Sciences (China)

July, 1997: M.Sc. (Coastal Geomorphology and Sedimentology), Department of Geography, Nanjing Normal University (China)

July, 1994: B.Sc. (Geomorphology and Quaternary Geology), Department of Geo-Ocean Sciences, Nanjing University (China)

RESEARCH INTERESTS

Marine Sediment Dynamics; Benthic Boundary Layer Processes; Estuarine and Coastal Morphodynamics

RESEARCH PROGRAMMES (PI)

Monitoring and Development of support system on seabed topographical changes in Pearl River Estuary and Taiwan Shoal. Ocean special funds for scientific research on public causes (No. 201105001-2). 2011-2014. RMB 1,570,000 (about USD240,000).

Simulation on the evolution and realignment of North branch, Changjiang Estuary (No. BK2010050). Jiangsu Key NSF. 2010-2012. RMB 250,000 (about USD38,000).

Physical processes near bottom boundary layer in shallow seas with strong tides and high turbid water. China NSF (No. 40876043). 2009-2011. RMB 500,000 (about USD77,000).

Study and strategy on typical marine hazards of Hainan. Comprehensive Survey and Evaluation Program of Coastal Sea, Hainan Province (No. HN908-02-05). 2008-2011. RMB 250,000 (about USD38,000).

Sediment dynamics and associated environment response in intertidal area and estuary. Program for New Century Excellent Talents in University(No. NCET-06-0446). 2007-2009. RMB 500,000 (about USD77,000).

Wave-current dynamic processes and tidal basin system evolution over tidal flats. China NSF (No. 40576040). 2006-2008. RMB 380,000 (about USD58,000).

The estuary evolution by human activity impacts and associated hazards potential analysis. Jiangsu NSF (No. BK2006131). 2006-2008. RMB 75,000 (about USD12,000).

Siltation hazard and strategy on major embayment and estuary. National Comprehensive Survey and Evaluation Program of China Coastal Ocean (No. 908-02-03-08). 2005-2009. RMB 250,000 (about USD38,000).

Physical oceanography and marine meteorological survey in Jiangsu coastal sea. National Comprehensive Survey and Evaluation Program of China Coastal Ocean (No. JS-908-01-01). 2005-2009. RMB 921,000 (about USD140,000).

SELECT PUBLICATIONS; Refereed Publications (English papers only)

Huang, H; Wang, Y.P.; Gao, S.; Chen, J.; Yang, Y., and Gao J., 2012. Extraction of morphometric bedform characteristics from profiling sonar datasets recorded in shallow coastal waters of China. *China Ocean Engineering*, 26(3), 469-482.

Yunling Liu, Y.; Wang, Y.P.; Li, Y.; Gao, J.; Jia, J.; Xia, X., and Gao, S., 2012. Coastal embayment long-term erosion/siltation associated with P-A relationships: A case study from Jiaozhou Bay, China. *Journal of Coastal Research*, 28(5), 1236-1246.

 Continued on Next Page

A Special Acknowledgement To:

Professor Nicholas K. Coch, Ph.D., C.P.G

CERF Lifetime Member

We are proud to acknowledge Professor Dr. Nicholas K. Coch as a Lifetime Member of the Coastal Education & Research Foundation. Dr. Coch received his Ph.D. in 1965 from Yale University with a specialization in sedimentology and coastal geology. In 1967, he joined the faculty at Queens College of the City University of New York (CUNY). He is now a Professor of Geology in the School of Earth and Environmental Sciences at Queens College of C.U.N.Y. and a member of the Doctoral Faculty of CUNY at the Graduate Center. He has co-authored two college geology textbooks (PHYSICAL GEOLOGY) and is the author of GEOHAZARDS (Pearson). In 2008, he received the President's Award for Teaching Excellence at Queens College and the John Moss Award For Excellence in College Teaching from the National Association of Geology Teachers. His research studies since 1967 have included sedimentation on the Moon, as a Principal Investigator in NASA's Lunar Sample Study Program, and shipboard studies of continental shelf, coastal and estuarine areas in the Northeast, as well as ground and aerial studies of the effects of hurricanes on coasts and urban centers.

His recent research deals with the effects of hurricanes on coasts, urban centers and inland areas, in predicting hurricane damage and in critically analyzing our coastal management policies in a time of sea level rise. He has carried out ground and aerial studies of most recent hurricanes as well as forensic studies of older (16th-20th century) hurricanes.

He is a Fellow of the Geological Society of America and a Member of The American Meteorological Society, Society of Sedimentary Geologists, National Association of Geology Teachers, American Association of Petroleum Geologists and is a Certified Professional Geologist.

Dr. Coch is an expert on Northern Hurricanes and has been a consultant to the N.Y. City Emergency Management Organization and the N.Y.S. Office of Emergency Management. He has presented hurricane seminars to emergency management and government officials in every county in southern New York as well as insurance, reinsurance and risk management groups nationwide. In 2003, he was chosen as a Sigma Xi Distinguished Lecturer for 2004-2007, and presented lectures on his research at educational and research facilities in the U.S. and Canada.

Programs including aspects of his hurricane research have aired on the CNN, PBS, Weather, Discovery, History and National Geographic Channels, and in local, national and international news programs and periodicals.

Selected Publications:

Coch, N.K., 2015. Unique vulnerability of the New York-New Jersey Metropolitan Area to Hurricane Destruction. *Journal of Coastal Research*, 31(1), 196-212.

Coch, N.K., 2013. A field course in tropical coastal geology. *Journal of Coastal Research*, 29(6A), 214-225.

Coch, N.K., 2006. The unique vulnerability of the Northeast U.S. to hurricane damage. Geologic Society of America, Abstract with programs, National G.S.A. Meeting (Philadelphia, Pennsylvania).

For a complete list of Dr. Coch's publications or his contact information, please visit:
http://www.qc.cuny.edu/Academics/Degrees/DMNS/sees/People/Pages/FacultyResearch.aspx?ItemID=23

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Continued on Next Page

A Special Acknowledgement To:

Hany Elwany, Ph.D.

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We are proud to acknowledge Dr. Hany Elwany as a Lifetime Member of the Coastal Education & Research Foundation. Dr. Elwany received a B.S. degree in Engineering from Alexandria University in 1971. In 1977, he completed his Ph.D. at the University of Dundee, United Kingdom. He obtained an additional B.S. degree in Mathematics and Statistics at Alexandria University in 1980. Dr. Elwany has extensive experience with nearshore oceanography, coastal processes, coastal engineering, and estuarine dynamics. He was the principal investigator for the physical oceanographic program of one of the largest environmental studies ever conducted on the U.S. west coast (at San Onofre). He has conducted in-depth studies of Nile Delta erosion, particularly since the construction of the Aswan Dam. His experience also includes projects involving optimization, numerical modeling, structural dynamic analysis, design of offshore structures, and data analyses, simulation, and dynamic modeling of ocean and coastal conditions. As an educator, both at Liverpool and Alexandria Universities, he taught courses in dynamics, statistics, numerical analysis, computer applications, and maritime engineering.

Dr. Elwany also serves as the President of Coastal Environments, a unique multi-disciplinary oceanographic, coastal engineering, and environmental consulting firm. Coastal Environments, founded in 1988, is comprised of over 30 professional associates, all experts in their respective fields. Technical specialties include coastal and ocean engineering, engineering geology, oceanography, marine biology and geology, environmental analysis, economics, statistics, and computer programming/modeling.

For more information about Dr. Elwany and Coastal Environments, please visit:

http://coastalenvironments.com/

 Continued on Next Page

A Special Acknowledgement To:

Björn Kjerfve, Ph.D., Chancellor

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We are proud to acknowledge Dr. Björn Kjerfve as a Lifetime Member of the Coastal Education & Research Foundation. He is the former Dean of the College of Geosciences and was a Professor of Oceanography at Texas A&M University, 2004-2009. While at Texas A&M, he oversaw four academic departments, the Texas Sea Grant Program, and the Integrated Ocean Drilling Program (IODP), including the 475'ocean sciences drilling vessel, D/V JOIDES Resolution. Kjerfve was previously Professor of Marine and Geological Sciences at the University of South Carolina, 1973-2004, and served as the Director of the Marine Science Program, 2000-2004. He received Ph.D., M.S., and B.A. degrees from Louisiana State University (Marine Sciences), University of Washington (Oceanography), and Georgia Southern University (Mathematics), respectively.

Professor Kjerfve's expertise is coastal and estuarine physical oceanography. He has published some 12 books and 250 scientific journal papers, book chapters, and reports; has supervised 14 Ph.D. dissertations and 24 M.S. theses, and taught more than 6,000 oceanography students. His research includes problem-solving in estuarine and coastal waters as well as climate change and has attracted $20 million in research funding for 90 projects. Dr. Kjerfve's field research has taken place along the East and Gulf coasts of the USA, the Caribbean, Brazil, Mexico, Colombia, Chile, Thailand, Malaysia, the Persian Gulf, Papua New Guinea, and Australia. Dr. Kjerfve was elected as a corresponding member of the Academia Brasileira de Ciências, the Brazilian Academy of Sciences in 2012. Dr. Kjerfve has served as the President of the World Maritime University from 2009 to 2014. He now has the great honor of serving as the fourth Chancellor of the American University of Sharjah in the UAE.

Selected Publications:

Cavalcante, G.H.; Kjerfve, B.; Bauman, A.D., and Usseglio, P., 2011. Water currents and water budget in a costal mega-structure, Palm Jumeirah Lagoon, Dubai, UAE. *Journal of Coastal Research*, 27(2), 384-393.

Cavalcante, G.H.; Kjerfve, B.; Knoppers, B., and Feary, D.A., 2010. Coastal currents adjacent to the Caeté Estuary, Pará Region, North Brazil. *Estuarine Coastal and Shelf Science*, 88(1), 84-90.

Medeiros, C. and Kjerfve, B., 2005. Longitudinal salt and sediment fluxes in a tropical estuary: Itamaracá Brazil. *Journal of Coastal Research*, 21(4), 751-758.

Perillo, G.M.E. and Kjerfve, B., 2005. Regional estuarine and coastal systems of the Americas: An introduction. *Journal of Coastal Research,* 21(4), 729-730.

For a complete list of Dr. Kjerfve's publications or
his contact information, please visit: http://www.aus.edu

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A Special Acknowledgement To:

Associate Professor Wei Zhang, Ph.D.

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Dr. Wei Zhang works as an associate professor of Harbor, Coastal, and Offshore Engineering in State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering, Hohai University. He focuses on the tidal current, sediment and salinity movement and transportation laws of estuaries and coasts. Dr. Zhang has published over 20 papers in recent years, including five papers indexed by SCI and EI. He took part in one Key Project of National Nature Science Foundation of China, one 95th Year Key Science and Technology Project for the Ministry of Transport, and two Science and Technology Research Projects of Guangdong Province. He has also led youth projects for the National Nature Science Foundation.

 Continued on Next Page

A Special Acknowledgement To:

Charles Thibault

CERF Lifetime Member

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Chuck Thibault is currently a Ph.D. candidate at the University of Memphis and a Geologist for EarthCon, Inc. Mr. Thibault received his M.S. from the University of Washington (Geology) and a B.S. from the University of Memphis (Geology). His research interests include coastal and environmental hydrogeology and coastal geomorphology. His current research investigates the movement of storm surge generated saline water plumes through coastal surficial aquifers. Mr. Thibault's field research has taken place along the U.S. coasts of Mississippi, Louisiana, and Washington, and on the eastern coast of Kamchatka, Russia.

For more information, please contact Mr. Thibault at: cthibalt@memphis.edu

 Continued on Next Page

A Special Acknowledgement To:
Dr. EUR ING Erik Van Wellen, CEng IntPE(UK) FICE FRGS MCIArb
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We are proud to acknowledge Dr. Erik Van Wellen as a Lifetime Member of the Coastal Education and Research Foundation. Dr. Van Wellen received M.Sc. degrees from both the Artesis Antwerpen (Civil Engineering) and the University of Liverpool (Maritime Civil Engineering). In 1999 he subsequently received his Ph.D. from the University of Plymouth with a specialization in sediment transport modeling. He has authored several papers in prominent international journals and conference proceedings.

He has research interests in the fields of natural marine sediment dynamics and mechanically driven sediment transport, renewable energy, carbon-economics, operational optimization, data analyses and mathematical simulations. During his time on the EuDA (European Dredging Association) Environment Committee he fostered a keen interest in Integrated Coastal Zone Management strategies and how to best balance the competing interests of developments such as harbor facilities, coastal defenses, tourism infrastructures and coastal environment conservation; including how best to strike a balance with mitigation and compensation.

He has previously worked as a commercial diver; and since 1999 has worked for the DEME Group (Dredging, Environmental and Marine Engineering) where he has held several operational, technical and commercial roles in a worldwide setting and is currently employed as an international Project Director.

He is a Fellow of the Institution of Civil Engineers and a Fellow of the Royal Geographical Society, a Member of the Chartered Institute of Arbitrators and a Member of the CEntral Dredging Association. Dr. Van Wellen is a Registered Professional Engineer in continental Europe (EUR ING), the UK (CEng) and internationally IntPE(UK). He is considered an expert in such matters as Civil Engineering, Maritime Construction and Dredging; and has considerable knowledge in the field of contract law and alternative dispute resolution. He also has several patents related to aforementioned technical fields registered to his name.

When not working on engineering or maritime construction projects he can be found teaching diving as a Staff Instructor for the Professional Association of Diving Instructors or actively involved in conservation work such as Dive Against Debris or Project AWARE Shark Conservation. His outstanding underwater photographs have graced the cover of the *Journal of Coastal Research* (JCR) more than once.

For a complete list of publications and more information, please contact Dr. Van Wellen via Skype on: vanwellenerik.

 Continued on Next Page

A Special Acknowledgement To:

Frédéric Bouchette Ph.D.

CERF Lifetime Member

Associate Professor of Littoral Dynamics
Geosciences Montpellier
UMR 5243 – University of Montpellier / CNRS

Following a M.Sc. in physics and mechanics, Fred Bouchette received his Ph.D. in March 2001 from the University of Montpellier, South of France. The title of the thesis is Wave/Seabottom Interaction: The Liquefaction Process (free translation from French; advisor: Professor M. Séguret). After his Ph.D., Fred had been employed at the University of Montpellier as an associate professor in the department of Geosciences. From 2008 to early 2011, he had moved to the Institute of mathematics and modeling of Montpellier for a three years long stay. Then, until 2012, he has been hosted as an invited professor in the METOS laboratory at the University of Oslo, Norway. He is now back to the University of Montpellier in the same department of Geosciences.

From 2002, Fred was asked to build a scientific staff on littoral hydro-morphodynamics called GLADYS (www.gladys-littoral.org). From that time, the group GLADYS has grown progressively. At now, Fred co-leads the group GLADYS, which rallies most of the scientists working on littoral hydro-morphodynamics along the French Mediterranean Coast, with distinct approaches ranging from applied mathematics to geosciences.

The scientific activity of Fred Bouchette concerns the development of concepts and methods in relation with the dynamics of shallow water environments. He studies the domain that extends from a few tens of meters of water depth at sea to the coastal watershed onshore, with a strong emphasis on the littoral area and the shoreline itself. He has worked in Spain, Taiwan, Canada, Norway, Chad, Italy, Greece, Switzerland, Tunisia, in the French Alps and in the Gulf of Lions (Mediterranean Sea). As testified by his publications, his research combines various points of view from geophysics to geology, including applied mathematics, civil engineering, quantitative geomorphology, with a strong connection to coastal archeology and the analysis of littoral hazards. Nevertheless, his heart's passion still lies with geophysics and applied mathematics.

Presently, Fred Bouchette actively works on the conceptualization of the growth of long term shoreline instabilities such as cuspates or sand spits. On that topic, his last contribution for the *Journal of Coastal Research* (JCR) is the following proceeding:

Bouchette, F.; Manna, M.; Montalvo, P.; Nutz., A.; Schuster, M., and Ghienne, J.-F., 2014. Growth of cuspate spits. *In*: Green, A. and Cooper, J.A.G. (eds.), *Proceedings from the International Coastal Symposium (ICS) 2014 (Durban, South Africa)*. *Journal of Coastal Research*, Special Issue No. 70, pp. 47-52.

Fred Bouchette has published>50 papers and short papers in international journals such as *Coastal Engineering*, *Journal of Coastal Research*, *Discrete and Discontinuous Dynamical Systems*, *Journal of Geophysical Research, Sedimentology, Continental Shelf Research*, *Quaternary Research, Ocean Engineering, Marine Geology, and Climate Research*. Most of his works were performed with and for students. He has contributed to more than 80 proceedings in international or domestic conferences. Fred Bouchette also heads the scientific development of a HPC numerical platform for coastal engineering (www.mirmidon.org).

For a complete list of publications and more information, please visit: www.bouchette.org

A Special Acknowledgement To:

Dr. Stephen P. Leatherman

CERF Lifetime Member

Department of Earth & Environment
Laboratory for Coastal Research
Florida International University
Miami, FL 33199
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leatherm@fiu.edu

We are proud to acknowledge Dr. Stephen P. Leatherman as a Lifetime Member of the Coastal Education and Research Foundation (CERF). Dr. Leatherman is Professor and Director of the Laboratory for Coastal Research at Florida International University. He received his Ph.D. in Environmental (Coastal) Sciences from the University of Virginia, and completed his undergraduate degree in Geosciences at North Carolina State University.

Prior to joining FIU, Stephen was Professor and Director of the Laboratory for Coastal Research at the University of Maryland; Director of the National Park Research Unit at the University of Massachusetts, Amherst; and Assistant Professor in the Department of Geology at Boston University.

Stephen has authored or edited 16 books, including Sea Level Rise: Causes and Consequences; Barrier Island Handbook; Overwash Processes; Cape Cod: From Glaciers to Beaches; and America's Best Beaches. He has also authored over 200 journal articles and technical reports, including articles in both Science and Nature.

Stephen has provided expert testimony multiple times for the U.S. Senate and U.S. House of Representatives. He was also the on-screen host and co-producer of the 1992 film "Vanishing Lands", winner of three international film awards, including the Golden Eagle.

For more information, please contact Dr. Leatherman at:
http://www.drbeach.org/aboutdrbeach.htm

 Continued on Next Page

A Special Acknowledgement To:

Dr. Philip D. Osborne

CERF Lifetime Member

Golder Associates Ltd.
Vancouver, British Columbia, V5M 0C4, Canada
posborne@golder.com

We are proud to acknowledge Dr. Philip D. Osborne as a Lifetime Member of the Coastal Education and Research Foundation (CERF). Dr. Osborne is the Principal Senior Coastal Geomorphologist at Golder Associates [British Columbia, Canada]. Of particular note was when a Certificate of Achievement in the technological and ecological safety contribution category was presented to Dr. Osborne by Confidence Capital and the Organization for Security and Co-operation in Europe (OSCE) in recognition of Golder's contribution in the field of promoting environmental and industrial safety. Dr. Osborne gave a presentation at the organization's 2nd International Conference on "Onshore and Offshore Oil Spills: Prevention and Response" conference held in Almaty, Kazakhstan in March 2013, where his topic was the Experimental Offshore Air & Water Quality Monitoring System (AWQMS) for the D-Island. He spoke about Golder's experience with the installation and first year of operation of the water quality monitoring system in the North Caspian Sea being used to establish project baseline and an early warning system for project related environmental impacts.

Established in 1960, Golder is a global, employee-owned organization driven by the purpose to engineer earth's development while preserving earth's integrity. Their goal is to help their clients find sustainable solutions to the challenges society faces today including extraction of finite resources, energy and water supply and management, waste management, urbanization, and climate change. Golder does this by providing a wide range of independent consulting, design and construction services to their clients in specialist areas of earth, environment, and energy.

For more information, please contact Dr. Osborne at:
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Continued on Next Page

A Special Acknowledgement To:

Dr. Yoshi Saito

CERF Lifetime Member

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We are proud to acknowledge Dr. Yoshiki Saito as a Lifetime Member of the Coastal Education and Research Foundation (CERF). Dr. Saito (D.Sc.) is the Prime Senior Researcher and Leader of the Coastal Sedimentology Research Group for the Institute of Geology and Geoinformation (IGG) at the Geological Survey of Japan (GSJ), AIST. His principle research interests are shallow marine sedimentology, modern sedimentary processes, sequence stratigraphy, strata formation, and human impacts. Current projects that Dr. Saito is working on include deltas in Southeast and East Asia, strata formation, sequence stratigraphy, morphodynamics, and modern sedimentary processes of deltas and incised-valley fills, with close links to sea-level changes, climate changes and human impacts. His credentials also include Leader of the Asian Delta Project (IGG/AIST), Co-Leader of IGCP-475 "Deltas in the Monsoon Asia-Pacific region: DeltaMAP", Leader of CCOP "Integrated Geological Assessment of Deltas in the SE and E Asian region: DelSEA-II" Project, and Leader/Chief Coordinator of JSPS AA Science Platform Program "Mega-Delta Watching in Asia: Networking and Capacity Building.

For more information, please contact Dr. Saito at:
https://staff.aist.go.jp/yoshiki.saito/

 Continued on Next Page

A Special Acknowledgement To:

Prof. Dr hab. Kazimierz Furmańczyk

CERF Lifetime Member

Remote Sensing and Marine Cartography Unit
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We are proud to acknowledge Prof. Dr hab. Kazimierz Furmańczyk as a Lifetime Member of the Coastal Education and Research Foundation (CERF). Dr. Furmańczyk is currently Full Professor at the University of Szczecin and co-founder (with prof. S. Musielak) of the Institute of Marine and Coastal Sciences (IMCS). His active research interests include morphodynamics of the coastal zone using remote sensed methods. Since 1991, Dr. Furmańczyk has been a Polish coordinator of several EU Projects: BASYS, CoastLearn, EUROSION, MESSINA, and MICORE. Together with his staff, he has also participated in the SatBałtyk project (Satellite monitoring of the Baltic Sea) since 2009. Dr. Furmańczyk is also responsible for lecturing at Erasmus (IP) international summer schools: on ICZM in Porto (2002) and Ponta Delgada (2003); on *Multidisciplinary Approach to Flood Risk Analysis - IMARA* in Italy (2010-2012); *Multirisk Assessment and Mitigation in Europe MIRAME* in San Giovanni Valdarno - Italy (2013) and Aveiro – Portugal (2014); and also at the Erasmus Mundus study on *Water River and Coastal Management* in Faro - Portugal. He served as the Chair and Organizer of the 11th International Coastal Symposium (ICS) at Szczecin University (Poland) in 2011.

In 1999, Dr. Furmańczyk received the Fulbright Senior Grant when he visited the University of Florida in Gainesville. He was also given a German DAAD grant for visiting the Christian Albert University of Kiel. Dr. Furmańczyk is an initiator and editor of a periodic: *ICZM in Poland – present state and perspectives*, edited by University of Szczecin. Since 2005, he has edited 5 volumes and has several achievements in research of the South Baltic coastal development regularities, which were provided in numerous papers. Recently, the greatest achievements of his staff are: construction of a prototype of *Early Warning System – Storm impact forecasting* www.micore.eu and construction of sub-system, SatBaltic - Coast" as a part of SatBałtyk system www.satbaltyk.pl

Selected Recent Publications:

- Musielak, S.; **Furmańczyk, K.**, and Bugajny N., in press. Factors and processes forming the Polish Southern Baltic Sea coast on various temporal and spatial scales. *In*: Harff, J.; Furmanczyk, K., and von Storch, H. (eds.), *Coastline changes of the Baltic Sea from South to East - Past and Future Projection*. Coastal Research Library (CRL), Dordrecht, The Netherlands: Springer International Publishing.
- Bugajny, N. and **Furmańczyk, K.**, in press. Comparison of short-term changes caused by storms along natural and protected sections of the Dziwnow Spit, Southern Baltic Coast. *Journal of Coastal Research*.
- **Furmańczyk, K**. and Musielak, S., 2015. Polish spits and barriers. In: Randazzo, G.; Jackson, D.W.T., and Cooper, J.A.G. (eds.), *Sand and Gravel Spits.* Coastal Research Library (CRL), Volume 12, Dordrecht, The Netherlands: Springer International Publishing, pp. 181-195.
- Bugajny, N. and **Furmańczyk, K**., 2014. Dune coast changes caused by weak storm events in Miedzywodzie, Poland In: Green, A.N. and Cooper, J.A.G. (eds.), *Proceedings from the International Coastal Symposium (ICS) 2014* (Durban, South Africa). *Journal of Coastal Research*, Special Issue No. 70, pp. 211-216.

For more information, please contact Dr. Furmańczyk at:
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The Coastal Education and Research Foundation (CERF) proudly welcomes the following new members to our coastal research society:

Aboobacker Mamun, Basil
Al-Nasrawi, Ali K.M.
Amarjouf, Najat
An, Soonmo
Aranguena, Edorta A.
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Barnett, Joel
Barreto, Maritza
Belknap, Daniel
Bilgili, Ata
Black, Mart
Bologna, Paul
Bouchette, Frédéric
Bui, Trong Vinh
Campbell, Foster
Caudle, Tiffany
Chapalain, Georges
Chen, Jianfang
Chen, Yongpin
Chun, Hwusub
Claudino-Sales, Vanda
Contreras, Manuel
Cornwell, Jeffrey
Currin, Carolyn
Cutrim, Marco
Dahm, Jim
Dai, Heng Non
Dai, Peng
Dally, William
Dean, Cornelia Diane
Do, Duc
Donnangelo, Alejandro
Douglass, Scott
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Ezer, Tal
Faulkes, Zen
Fellowes, Thomas
Ferina, Nicholas
Fitchen, William M.
Fitzgerald, Tom
Flampouris, Stylianos
Funderburk, William
Gonzalez Leija, Mariana
Gonzalez-Alvarez, Sergio
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Guzman, Emanuel
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Hart, Deirdre
Hatcher, Bruce
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Hsu, Yulun
Huang, Zhenhua H.
Hwang, Jin H.
Jewell, Kim
Kana, Timothy
Karimpour, Arash
Kearney, Michael S.
Kelly, Sean
Kerans, Andrew
Kolahdoozan, Morteza
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La Peyre, Megan
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Lane, Hillary
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Legare, Bryan
Lees, Dennis
Linder, B. Lee
Liritzis, Ioannis
Little, David
Liu, James
Lockwood, Lucy
Long, Joshua
Lucas, Kelly L.
Lynk, Kenneth
Mann, Thomas
McCants, Carson
Miyazaki, Yusuke
Mooneyhan, David
Moreno-Casasola, Patricia
Nadal-Caraballo, Norberto
Naess, Arvid
Nagdee, Mohammed Rafik
Narine, Patrick
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Oakley, Adrienne
Oellermann, Lawrence Keith
Ofo Numbere, Aroloye
Paine, Jeffrey G.
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Purandare, Jemma
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Sharples, Chris
Slattery, Michael Patrick
Song, Zhiyao
Soerensen, Per
Stiros, Stathis C.
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Tajul Baharuddin, Mohamad Faizal Bin
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Twomey, Niall
van Keulen, Mike
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Xu, Chunyang
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Zhang, Wei
Zhang, Xueqing
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CERF MEMBERS

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Arens, Bas
Armbruster, Charles, K.
Armono, Haryo
Arntsen, Oivind
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Aucoin, Francis
Augustinus, Pieter
Azuz-adeath, Isaac Andres
Baas, Andreas
Bae, Jae Seok
Baeteman, Cecile
Baganha Baptista, Paulo
Balouin, Yann
Banks, Ken
Bao, Kunshan
Baptista Baganha
Barbaro, Giuseppe
Barboza, Eduardo
Barnard, Patrick
Barnett, Joel
Barnhardt, Walter
Barreiros, Joao
Barreto, Maritza
Barut, Ipek
Batayneh, Awni
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Beck, Tanya M.
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Bethel, Matthew
Biljili, Ata
Billy, Julie
Birch, Gavin
Bittencourt, Abilio
Black, Mart
Bologna, Paul
Bonetti, Jarbas
Boon, John
Boothroyd, Jon
Bouchette, Frédéric
Brander, Rob
Brill, Dominik M.
Brook, Adam
Brooke, Brendan
Brown, Alyson
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Brutsche, Katherine
Buenfil-lopez, Luis
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Bui, Trong Vinh
Burningham, Helene
Bush, David, M.
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Chao, Min
Chapalain, Georges
Charlier, Roger H.
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Chen, Guan-yu
Chen, Jianfang
Chen, Jianyu
Chen, Yongping
Cheng, Jun
Cheng, Yan
Chevalier, Cristele
Childs, Jayson
Cho, Yong-Sik
Choi, Byung Ho
Chrystal, Clinton
Chua, Vivien
Chun, Hwusub
Chun, Insik

Continued on Next Page

Cienfuegos, Rodrigo
Clara, Moira
Claudino-Sales, Vanda
Cline, Marie
Coch, Nicholas K.
Cohn, Nicholas
Concejo, Ana Vila
Conley, Daniel C.
Contreras, Manuel
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Crowell, Mark
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Cuc, Nguyen
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Cutrim, Marco
D'Sa, Eurico
da Silva Dias, Francisco
da Silva, Anderson
da Silva, Andre
Dahm, Jim
Dai, Heng Non
Dai, Peng
Dai, Zhijun
Dally, William
Davidson-Arnott, R.
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Guastella, Lisa
Guedes Soares, Carlos
Gundlach, Erich

Continued on Next Page

Guzman, Emanuel
Ha, Taemin
Haas, Kevin
Hale, Rachel
Halsey, Susan D.
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Hanlon, Lynda Michelle
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Johnson, Markes E.
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Karimpour, Arash
Kaszubowski, Leszek
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Laboyrie, Kurt
Labuz, Tomasz
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Laibi, Raoul
Lakhan, V. Chris
Lally, John
Lam, Nina
Lane, Hillary
Lapine, Chris
Larnier, Stanislas
Lathrop, Richard
Latif, Shahid

Continued on Next Page

Leadon, Mark
Leatherman, Stephen P.
Lee, Hee
Lee, Jun-Whan
Lee, Tae-Won
Lees, Dennis
Lefebvre, Jean-Pierre
Legare, Bryan
Lemckert, Charles
Lencart e Silva, João
Levoy, Franck
Lewis, Matt
Lewis, Roy
Li, Jin
Li, Linjuan
Liang, Bingchen
Liang, Shin-Jye
Liang, Shuxiu
Lim, Hak-Soo
Lin, Haijiang
Lin, Tsung-Yi
Linder, B. Lee
Linhoss, Anna
Liritzis, Ioannis
Lisimenka, Aliaksandr
Lisle, Lorance Dix
List, Jeffrey
Little, David Irving
Little, Mimely
Liu, James
Liu, Kam-biu
Liu, Sen
Liu, Yue
Lockwood, Lucy
Lonard, Robert
Long, Jordan
Long, Joshua
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Lopes, Carina
López Gutiérrez, Jose S.
López, Gloria
Losada Rodriguez, Miguel
Louda, J. William
Loureiro, Carlos
Loveson, Victor
Lucas, Kelly L.
Lucrezi, Serena
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Lychagin, Mikhail
Lynk, Kenneth
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Mahgoub, Mohamed
Mahiques, Michel
Maio, Christopher
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Malan, Niel
Malvarez Garcia, Gonzalo
Mann, Thomas
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Marchese, Christian
Marcomini, Silvia
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Marrack, Lisa
Martinez Diaz de Leon, Asdrubal
Martinez Flores, Guillermo
Martinez, Maria
Martins, Ana
Martivs, Maria
Mason, Owen
Mateo, Zenon
Matias, Ana
Mattheus, Robin
Mawdsley, Robert
Mazaheri, Said
McBride, Randolph Alexander
McCants, Carson
McCorquodale, Alex
McDowell Peek, Katie
McKenna, Kimberly K.
McLaren, Patrick
Medellin, Gabriela
Medina-Gomez, Israel
Medina, Raul
Mehta, Ashish
Mendelssohn, Irving
Mendoza-Gonzalez, Gaby
Messaros, Roy
Meyer-Arendt, Klaus
Miles, Jon
Miller, Deborah
Miller, Eric
Miller, Ian
Mimura, Nobuo
Min, Jee-Eun
Miossec, Alain
Miyazaki, Yusuke
Monge, Jackie
Montefalcone, Monica
Monteiro, Marcos
Mooneyhan, David
Moore, Gregg
Moran, Kelli
Moreland, Kimber
Moreno-Casasola, Patricia Barcelo
Moskalski, Susanne
Mozley, Edward, C.
Mull, Jeremy
Munoz-Perez, Juan
Murakoshi, Naomi
Murdukhayeva, Angelica
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Murren, Courtney
Nadal-Caraballo, Norberto
Naess, Arvid
Nagdee, Mohammed Rafik
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Naquin, James
Narine, Patrick
Nava-Sanchez, Enrique
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Needelman, Brian
Negro, Vicente
Nettles, N.S.
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Neves, Claudio F.
Nguyen, Anh
Nicholls, Robert J.
Nicolas, Robin
Nordstrom, Karl
November, Eben
Numanoglu, Genc Asli
Nunes Barboza, Conceicao

 Continued on Next Page

O'brien Delpesh, Charmaine
O'Shea, Michael
Oakley, Adrienne Jean
Oakley, Brian
Oakley, Bryan
Obeysekera, Jayantha
Obiefuna, Jerry
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Ortiz, Juan
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Ozturk, Derya
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Paquier, Anne-Eleonore
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Park, Kyeong
Parker, Hugh
Parks, David
Parnell, Kevin
Pattiaratchi, C.B.
Paulsen, Manfred
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Pelinovsky, Efim
Pereira da Silva, Carlos
Pereira, Luci
Perez, Carlos
Peterson, Curt D.
Phillips, Mike
Pierce, Aaron
Pilkey, Orrin
Pinet, Paul R.
Pintado, Emilia
Pinto, Josep
Pirazzoli, Paolo
Pivovaroff, Alex
Plecha, Sandra
Poate, Timothy
Pokavanich, Tanuspong
Pons, Frank
Pousa, Jorge
Pranzini, Enzo
Psuty, Norbert P.
Pucino, Nicolas
Pupienis, Donatus
Purandare, Jemma
Pye, Kenneth
Quan, Steven
Quigg, Antonietta
Radermacher, Max
Radtke, Ulrich
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Rahn, Jennifer
Ramos, Carmela Cristhy
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Randazzo, Giovanni
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Reid, Sergey
Ren, Hai
Renato, Paulo
Resio, Don
Restrepo, Juan C.
Richards, Russell
Riksen, Michel
Ritphring, Sompratana
Ritter, Erich
Ro, Young Jae
Roberts, H.H.
Robertson, John
Robertson, William
Rogers, Kerrylee
Romeu, Marco
Rosen, Peter S.
Rossi-Santos, Marcos
Rua, Alex F.
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Rusenko, Kirt W.
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Saitoh, Takehisa
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Sander, Lasse
Sanders, Brett
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Scheffers, Anja Maria
Schembri, Patrick
Schiller, Rafael
Schmid, Keil
Schwab, William
Schwartz, Maurice
Schwarzer, Klaus
Scott, Timothy
Sealey, Kathleen
Seidle, Peter
Sembiring, Leo
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Senechal, Nadia
Serra-Raventos, Jordi
Sexton, Walter J.
Shaffer, Anne
Shah, Dharmendra
Shahrizal, Ab Razak Mohd
Sharples, Chris
Shaw, Charles
Sherman, Douglas J.
Sherman, Heidi
Shih, Ruey-Syan
Shim, Jae-Seoul
Shin, Sungwon
Shipman, Hugh
Short, Andrew
Shrestha, Pravi
Silva Gomes, Raimunda K.
Silva, Juliana
Silva, Rodolfo
Simeone, Simone
Simpson, David
Sinclair, Alex
Slattery, Michael Patrick
Slaymaker, David
Slim, Pieter
Slinger, Jill
Smith, Alan
Smith, Ernest

Continued on Next Page

Solari, Sebastian
Sommerfield, Christopher
Song, Zhiyao
Soerensen, Per
Souza Filho, Jose R.
Souza, Alejandro
Spencer, Tom
Spetter, Carla
Sposato, Patricia
Staiger, Jon C.
Stanley, Jean-Daniel
Steichen, Jamie
Stewart, William
Stiros, Stathis C.
Stive, Marcel
Stokes, Christopher
Stotz, Wolfgang
Styles, Richard
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Suh, Kyung-duck
Suh, SeungWon
Sundar, Vallam
Sutherland, Michael
Suursaar, Ülo
Swanson, Larry
Swanson, Robert Lawrence
Switzer, Adam
Szefler, Kazimierz
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Tajul Baharuddin, Mohamad Faizal Bin
Talke, Stefan
Tanski, J.
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Thorpe, Antony
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Tomlinson, Rodger
Tong, Chuan
Tõnisson, Hannes
Torio, Dante
Trembanis, Arthur
Tseng, Yung
Tsujimoto, Gozo
Tuan, Do Anh
Tuominen, Jyrki
Turner, Eugene R.
Turpie, Kevin
Twilley, Robert R.
Twomey, Niall
Underwood, Steve
Vacchi, Matteo
van der Meulen, Frank
van der Valk, L.
van Dijk, Deanna
van Dongeren, Albertus
van Heteren, Sytze
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van Wellen, Erik
Varnell, Lyle
Vaz, Nuno
Vella, Godfrey
Venekey, Virag
Verville, Jean-François
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Villagran, Mauricio
Vilumaa, Kadri
Vollmer, Heather
Walker, Cameron
Walker, Ian J.
Walker, Simon
Wallace, Davin
Walter, Scott
Walther, Michael
Wang, Fu
Wang, Jian-hua
Wang, Jieyong
Wang, Ke
Wang, Ping
Wang, Ya Ping
Wang, Ying
Wang, Zongming
Ward, Larry
Warren, Richard E.
Waters, Jeffrey P.
Watson, Phil
Webb, Bret Maxwell
Weir, Adam
Weishar, Lee
Wells, John
Wetzelhuetter, Chris
Weymer, Bradley
White, John
Widmer, Walter
Williams, Allan Thomas
Williams, Harry
Windom, Herb
Wolters, Michel
Woodroffe, C.D.
Woodworth, Philip
Woolard, Liza
Wootton, Louise
Wright, Eric
Wright, Ian
Wu, Jia-Ping
Wu, Weiming
Wynja, Valerie
Xharde, Regis
Xie, Zhenglei
Xu, Chunyang
Xu, Yan
Yang, Qingxuan
Yao, Yu
Ye, Ming
Yokoyama, Katsuhide
Yoshida, Jun
Young, Donald
Young, Robert S.
Yu, Guo
Yu, Tai-Yi
Zahid, Ahmed
Zalewski, Tomasz
Zavala-Hidalgo, Jorge
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Zhang, Keqi
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Continued on Next Page

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Continued on Next Page

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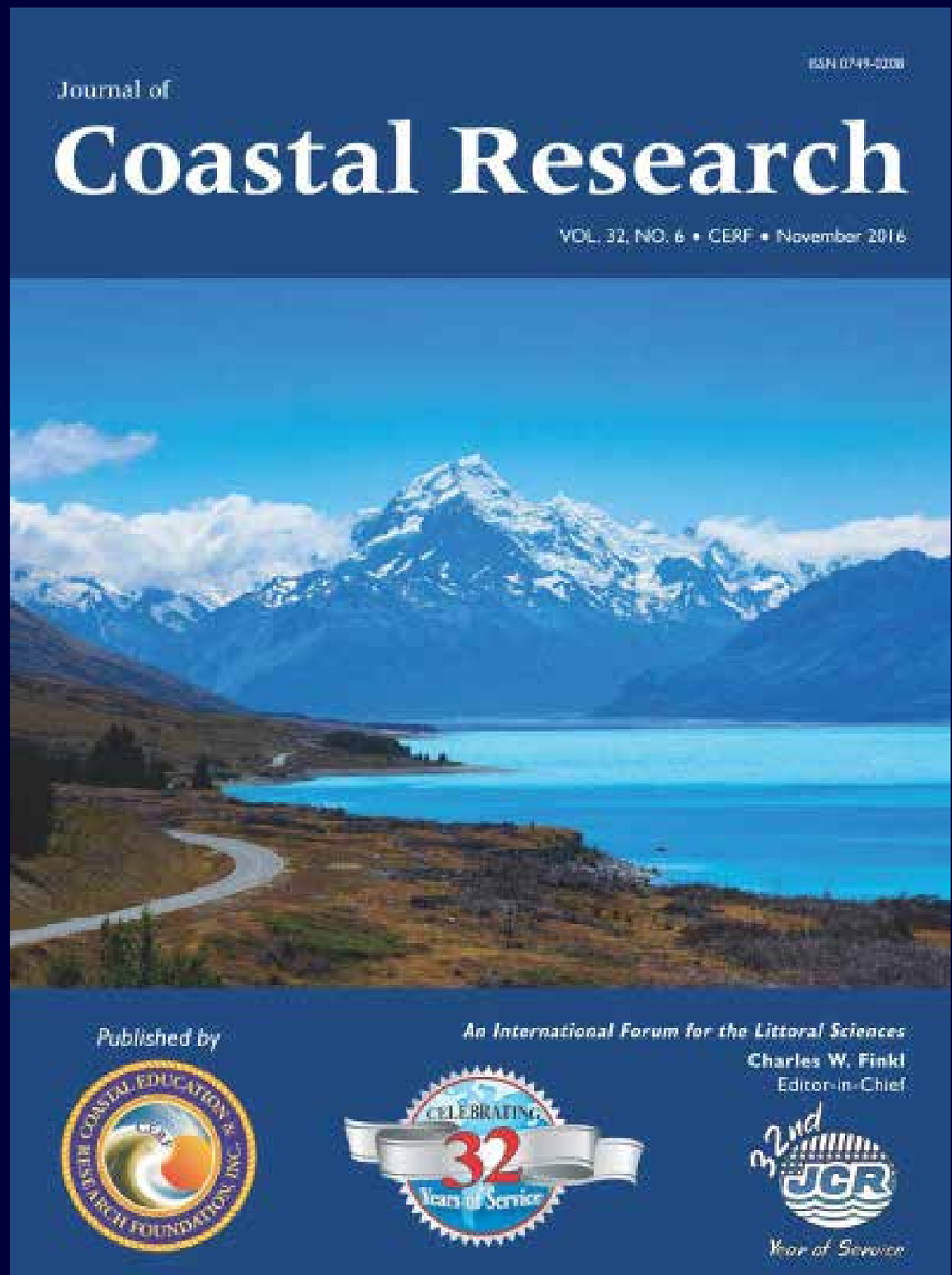

COVER PHOTOGRAPH:
Peak of Aoraki/Mount Cook in the Southern Alps mountain range, New Zealand.

Peak of Aoraki/Mount Cook in the Southern Alps mountain range, New Zealand. Aoraki/Mount Cook is the highest mountain in New Zealand. Its height since 2014 is listed as 3,724 m, down from 3,764 m before December 1991, due to a rockslide and subsequent erosion. It lies in the Southern Alps, a mountain range which runs the length of the South Island, with the foothills forming the coast to several proglacial lakes, which include Lake Pukaki, Lake Tekapo, Lake Ohau, and Tasman Lake. A popular tourist destination, it is also a favorite challenge for mountain climbers. The summits lie slightly south and east of the main divide of the Southern Alps, with the Tasman Glacier to the east and the Hooker Glacier to the west. The Southern Alps were formed by tectonic uplifting and pressure as the Pacific and Indo-Australian Plates collided along the South Island's western coast. The uplifting continues, raising Aoraki/Mount Cook an average of 7 mm each year. However, erosive forces are also powerful shapers of the mountains. The severe weather is due to the mountain's jutting into powerful westerly winds of the Roaring Forties which run at approximately 45°S latitude, south of both Africa and Australia. In fact, the Southern Alps are the first obstacle the winds encounter after South Africa and Australia, having moved east across the Southern Ocean. (Photograph taken 20 January 2016 by Dr. Jooyong Lee, Sungkyunkwan University [SKKU], Suwon, Republic of Korea.)

The Coastal Education & Research Foundation *[CERF]* graciously thanks you for your membership and involvement in our international society. We hope that you have enjoyed this latest edition of *Just CERFing*, our society's official newsletter. As mentioned previously, we encourage the worldwide communication of our members through the *Just CERFing* newsletter. If you have any news or announcements that you would like to promote, please send your request or questions directly to Dr. Charles W. Finkl at cfinkl@cerf-jcr.com CERF continues to provide our members with the most up-to-date, professional features of the society. We encourage you to please visit our Foundation's website at http://www.cerf-jcr.org to see all the new content that has been added.

Next Issue of *Just CERFing* coming January 2017.

IN THIS ISSUE