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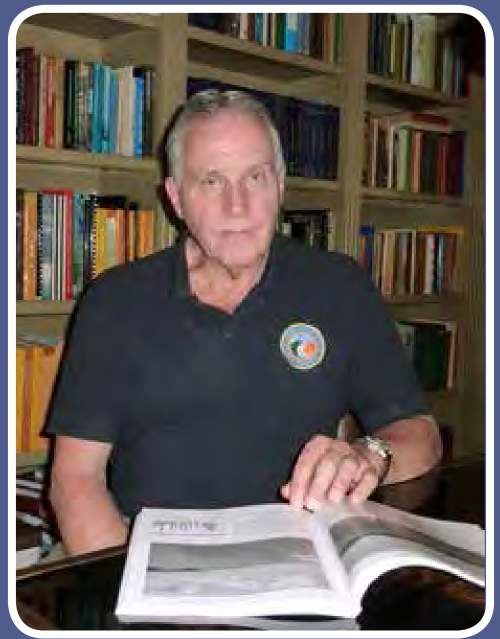

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Coastal Education and Research Foundation *[CERF]* is pleased to announce our newly appointed Regional Vice Presidents (RVP), who throughout the international scientific community continue to provide outstanding representation of our coastal research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

CERF Regional Vice Presidents

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Michael Phillips, Ph.D.
Marcel J.F. Stive, Ph.D.

Oceania

Charles Lemckert, Ph.D.
Anja Scheffers, D.Sc.
Vic Semeniuk, Ph.D.
Andrew D. Short, Ph.D.

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CERF RVP (Southeast Asia)

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.

CERF RVP (North America)

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.

CERF RVP (South America)

Vanda Claudino-Sales, Ph.D.

Vanda Claudino-Sales holds a Ph.D. in Geography from the Sorbonne University and a Post-Doctorate in Coastal Geomorphology from the University of South Florida; coming back later to those universities as visiting professor. Now, she is a professor in the Department of Geography at the Federal University of Ceará and part of the Master in Geography program at the State University Valley of Acarau, in Brazil. Her research focuses on areas of geoscience, acting mainly in coastal geomorphology, environmental geomorphology and geoconservation. With her graduating students and her research team, she is currently studying the coastal dynamics and the impacts of development in tropical coasts. She also has an interest in coastal management and participates in environmental social actions in Brazil.

Omar Defeo, D.Sc.

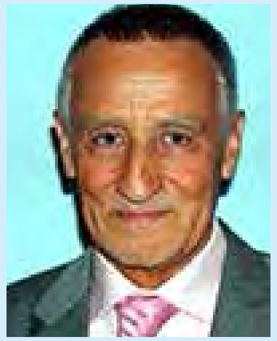
Omar Defeo, D.Sc., is a professor in the Marine Science Unit at the Universidad de la República in Uruguay. He is also among a select group of ecologists worldwide working on sandy beach ecosystems and how they are threatened by climate change. For the past 15 years, Prof. Defeo has also been involved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

CERF RVP (Eastern Europe)

Niki Evelpidou, Ph.D.

Dr. Dr. M.Sc. Niki Evelpidou is an Associate Professor at the Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens. She is a distinguished Doctor in both the Faculty of Geology and Geoenvironment of the University of Athens and the Faculty of Geoarchaeology of the University of Franche Compte (France). Dr. Dr. Evelpidou is actively involved in the research fields of geomorphology, coastal geomorphology, sea level changes, palaeogeography, geology, spatial technologies, study and modelling of natural hazards, while emphasizing on the use of new technologies and innovation. She counts more than 180 scientific publications and 17 books and textbooks, while she has given many lectures in Greece and abroad.

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.

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CERF RVP (Western Europe)

Luciana S. Esteves, Ph.D.

Luciana Esteves, Ph.D., is a principal academic in the Faculty of Science and Technology and Global Engagement Leader for the Department of Life and Environmental Sciences, Bournemouth University, U.K. The scope of her research includes monitoring and quantifying coastal changes driven by natural and human-induced process and the implications to coastal management. More recently, her work on managed realignment schemes in Europe and practical applications of ecosystem based management in northeast Brazil have led to capacity building workshops for government practitioners and researchers in South Africa and Latin America. She was involved in the organising committee of the International Coastal Symposium 2013 and will co-chair the ICS in 2022. Dr. Esteves actively promotes gender equity in science (she is a founding member of the international network Women in Coastal Geosciences and Engineering) and undergraduate students engagement in research (she chaired the British Conference of Undergraduate Research in 2017 and coordinates the Showcasing Undergraduate Research Excellence conferences at Bournemouth University).

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.

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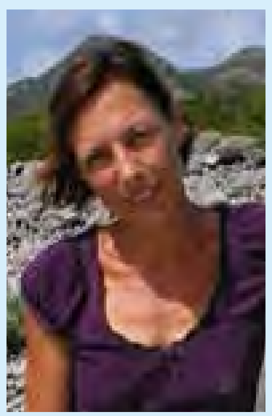
CERF RVP (Oceania)

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.

Anja Scheffers, D.Sc.



Anja Scheffers, D.Sc., is currently Full Professor at Southern Cross University in Lismore, NSW, Australia. Her main area of study is coastal evolution, including sea-level change and marine physical natural hazards. Her research specializes in using sedimentary signatures to decipher long-term records of environmental change from the natural environment. She is particularly interested in processes that shape and modify coastal landscapes over a variety of length and time scales and the coupling and feedback between such processes, their rates, and their relative roles, especially in the contexts of variation in climatic and tectonic influences and in light of changes due to human impact. Dr. Scheffers is also the recipient of the ARC Future Fellowship Award for "Unraveling Western Australia's Stormy Past - A Precisely-Dated Sediment Record of Cyclones over the past 7000 years" and has been awarded multiple research grants from such prestigious entities as the German Research Council, the German Research Foundation, and the Australian Research Council.

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 Austra-lian Beach Safety and Management Program in cooperation with Surf Life Saving Australia. Dr. Short is mainly interested in the processes and mor-phology of coastal systems. His present research focuses on the beach and barrier systems of Australia, as it relates to the morphodynamics of repre-sentative systems in variable wave and tide environments, and in the nature, hazards, and usage of all Australia beach systems.

Characterization of the Dry Beach Profile: A Morphological Approach

Characterization of the Dry Beach Profile: A Morphological Approach

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ABSTRACT

The dry part of the beach is probably the most extensively used part of the beach system. It comprises the zone from high tide level to the landward edge, which can be either a dynamic (dune field) or a fixed boundary (cliff, rocky ledge, or promenade). Here is presented a complete description of its morphology on the basis of the analysis of 91 study sites selected along the entire coast of Spain. The analysis comprises four different regions in terms of wave climate, geology, and tidal range, covering a wide range of coastal environments. In this study, a zonation of the dry beach profile is presented attending to the dynamics, the morphometric index, and the timescales of variation in which three different segments are defined: the foreshore segment, from the mean high water level to the berm, if present; the seasonal segment, which represents the zone between seasonal berms; and the interannual segment, which comprises the segment between the winter berm (or the most stable berm in case of no seasonality) and the landward edge of the beach. Besides, through cluster profile analysis—applying the *K*-Means classification algorithm to the entire data set of profiles—four types of dry beach profile are proposed, described, and related to a particular beach modal state: dissipative, intermediate, reflective, and ultradissipative. The observations and results presented here contribute to understanding the morphodynamics of the dry part of the beach and set the basis for subsequent studies concerning the equilibrium dry beach profile.

ADDITIONAL INDEX WORDS: *Subaerial beach morphology, morphological classification, K-Means (KMA), Spanish coastline, conceptual beach model, beach modal state.*

INTRODUCTION

The dry part of the beach, named also subaerial beach, comprises the zone between the upper limit of the intertidal zone and the landward edge. It is a zone that is episodically affected by both swash and aeolian sand transport, forming a dynamic boundary between the wave-and-tide-dominated zone and the wind-dominated dune system (Short, 1999). The dry beach is normally backed by a fixed boundary like a cliff, a seawall, or a promenade, but can also be delimited by a nonfixed boundary like a dune system. Numerous works can be found in the literature dealing with the morphology of the submerged and intertidal zones and their equilibrium profile (Bernabeu, Medina, and Vidal, 2003; Brunn, 1954; Dean, 1991; Larson and Kraus, 1995), as well as with the morphology of the dune system (Bochev-van der Brug, Wijnberg, and Hulscher, 2011; Cariolet and Suanez, 2013; de Vries *et al.*, 2012; Hesp, 2002, 2012; Nordstrom *et al.*, 2012; Otvos, 2000). Conversely, besides being the primary focus of erosion research (Mull and Ruggiero, 2014), morphological studies related to the dry part are required. This study is focused on the morphology of the dry beach profile and based on previous work by Chappell and Eliot (1979), Short (1979), Wright (1981), and many others who were the first to propose the essential "conceptual beach model."

Nowadays, the use of conceptual beach models is largely extended and accepted. They predict beach morphologies as a function of wave, tide, and sediment parameters, and provide a specific framework in which beach features and dynamics can be studied precisely. These models offer a better understanding of the whole beach system, and are therefore useful for scientists, policy makers,

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and beach users. The specific framework provided by a conceptual model can help in understanding and avoiding the two main problems affecting beaches: damage by wave action during winter and lack of space during summer. Indeed, during winter the protective role of the hinterland may be affected and infrastructures such as promenades can be damaged, so the dry beach has to be wide enough to avoid being completely eroded by storms; in the summer, there may not be sufficient emerged beach to allocate users, thus the available sand volume should allow the generation of a beach wide enough to offer a sufficient space for leisure.

The first conceptual beach models proposed by the authors mentioned above related wave climate and sediment characteristics with morphology, but their studies were developed in microtidal environments, under relatively low energetic conditions and limited to the coastal environment in which they were developed. Wright and Short (1984) refined these previous works, whereas Wright *et al.* (1987) improved the existing classification including energetic environments and tidal influence. Then, Masselink and Short (1993) included the effect of tides by adding the relative tidal range (RTR = MSR/H_b, where MSR is the mean spring tide range and H_b is the breaking wave height) as a main hydrodynamic control variable to their model (Davis and Hayes, 1984). Their model classified the various morphotypes attending to the relation between RTR and the dimensionless fall velocity Ω (Ω= *H* /=(1) *T*, where *H* is the wave height, *T* is the peak period, and (1) is the sediment fall velocity) (Dalrymple and Thomson, 1976; Dean, 1977). In later studies, Short (2006) added the geological constraint as an important driven factor in governing beach morphology. More recent works like Scott, Masselink, and Russel (2011) extended the previous beach models by adding beaches ranging from fully dissipative to fully reflective, and from flat to multibarred in mesomacrotidal environments. They pointed out the importance of geological control and wave power as fundamental variables.

For the dry beach morphology, the wave climate and grain size appear to be the governing factors, as some previous works have pointed out: according to Short (1979), the term "beach type" refers to the prevailing nature of the beach, including the morphology of the surf zone (waves, currents, bars, troughs) and that of the subaerial beach. He found evidence that the morphology of the subaerial beach is directly related to its modal state, which is defined by the value of Ω and represents the prevailing morphology of the beach. Hesp (1988) and Short and Hesp (1982) showed that there is a direct relationship between modal state and type, volume, and size of the front dune, which suggests that the morphology of the zone in between, *i.e.* the dry beach, is also directly related to the modal state of the beach.

The above-mentioned authors dealt fundamentally with the part of the beach that is fully controlled by waves and tides, only providing morphologies of the submerged and intertidal zone. Wright *et al.* (1987) found that only one-third of the observed states matched the predicted models. Gomez-Pujol *et al.* (2007) demonstrated that intermediate states are not rigorously represented by the controlling variables proposed by Wright and Short (1984). Scott, Masselink, and Russel (2011) added some insight into applicability of the models and agreed with Jackson, Cooper, and del Rio (2005), arguing that there is no universal beach model and their predictions must be taken carefully and always under a proper understanding of the morphodynamics of the specific study site.

Taking into consideration these limitations about the applicability of the models, and on the basis of the demonstrat ed relation between the surf zone modal state and dry beach morphology, the aim of this work is to present a description of the dry beach profile, *i.e.* from the mean high water level (MHW) to the landward edge. Here is proposed a classification into profile types, following the bases built up in previous works dealing with conceptual beach models. The classification is based on observations and analyses of 91 different beaches along the Spanish coast, encompassing diverse wave climate zones and tidal regimes, and formed within different sedimentological and geological environments.

Dry Beach Profile Zonation

A conceptual zonation, or a division in segments of the dry beach profile, was carried out to ease the interpretation of the clustering results and to set the basis for the morphology-based classification of the dry beach profile. This zonation helps in understanding in a comprehensive way the different morphologies and shapes along the dry beach profile, and is based on the analysis

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of morphometric indices: widths, composite slopes, changes in curvature, and heights. Thus, the dry beach profile was divided into three segments or zones attending to their specific morphologies and their own temporal scales of variability. In Figure 1, a schematic illustration of the three segments, *i.e.* foreshore segment, seasonal segment, and interannual segment, is presented.

Foreshore Segment

This segment covers from the MHW to the berm, if present. The berm is built by wave action and its width varies depending on daily wave height and tidal moon cycles. Comprehensive studies on berm development and erosion that provide tools to calculate berm height precisely can be found in the literature (*e.g.*, Bendixen, Clemmensen, and Kroon, 2013; Weir, Hughes, and Baldock, 2006). The surf zone beach state, given by sediment size, wave breaking height, and peak period, determines the slope, width, and temporal variability of this part of the dry beach. In case of highly energetic environments or beaches formed with very fine grain size, the profile may not display berm and the extension of this segment may encompass the entire extension of the dry beach profile.

Seasonal Segment

This segment appears in locations under significant seasonal variations in wave climate (mostly on zone I in this study). It covers the zone of the profile between seasonal berms. According to Bascom (1951), berm crest height is a function of the wave height at the time of formation. Seasonality in wave climate induces, therefore, the construction of two main berms. During high-energy wave events, beaches display a residual or abandoned berm on the upper backshore, formed as the beach retreated: the winter berm. During lower energetic periods or seasons, they are fronted by an active berm on the lower beach, which is formed during lower wave-energy periods. The presence and extension of this segment depends directly on wave climate variability, but also on sediment characteristics, and thus on the state of the beach's surf zone (Katoh and Yanagishima, 1992).

Interannual Segment

This segment comprises the segment of the profile ranging from the winter berm (or the most stable berm in case of no seasonality) to the landward edge of the beach (wall, foredune, or cliff). It is the most stable part of the profile, and differs significantly between reflective and dissipative beaches due to the fact that the modal state controls its size and variability (Hesp, 1988). Beaches tending to be reflective are steeper and receive less energy from waves than beaches that tend to be dissipative, which present gentler slopes and receive more energy. Thus, the interannual segment of reflective beaches is generally more stable. Dissipative beaches of the database do not display interannual segment – mostly from zone I –, whereas reflective beaches – mostly from zone IV – present a wide and stable interannual segment. Beaches tending to be dissipative, or beaches subjected to an energetic environment, may not display this segment because storm surges cover the entire beach every year, displacing the berm to the edge and even causing dune scarping (Short and Hesp, 1982; Suanez *et al.*, 2012).

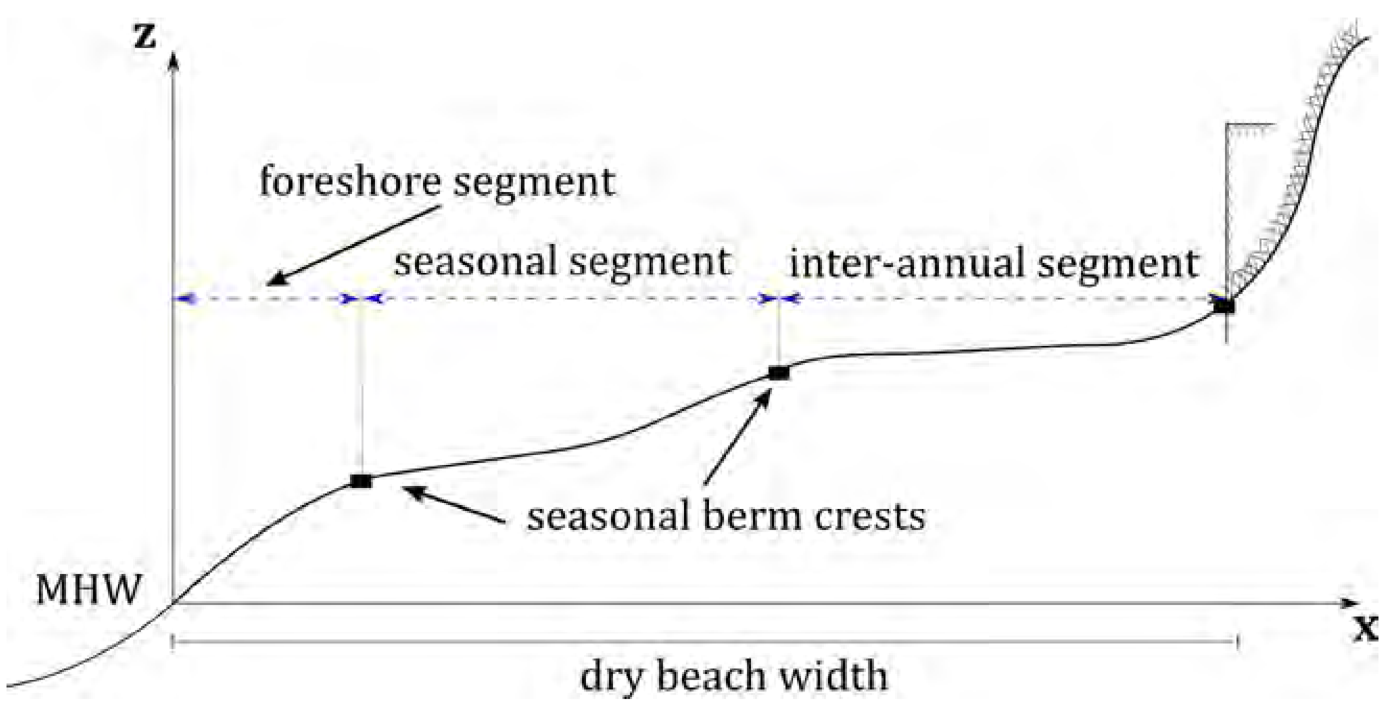

Figure 1. General scheme of the proposed zonation of a dry beach profile.

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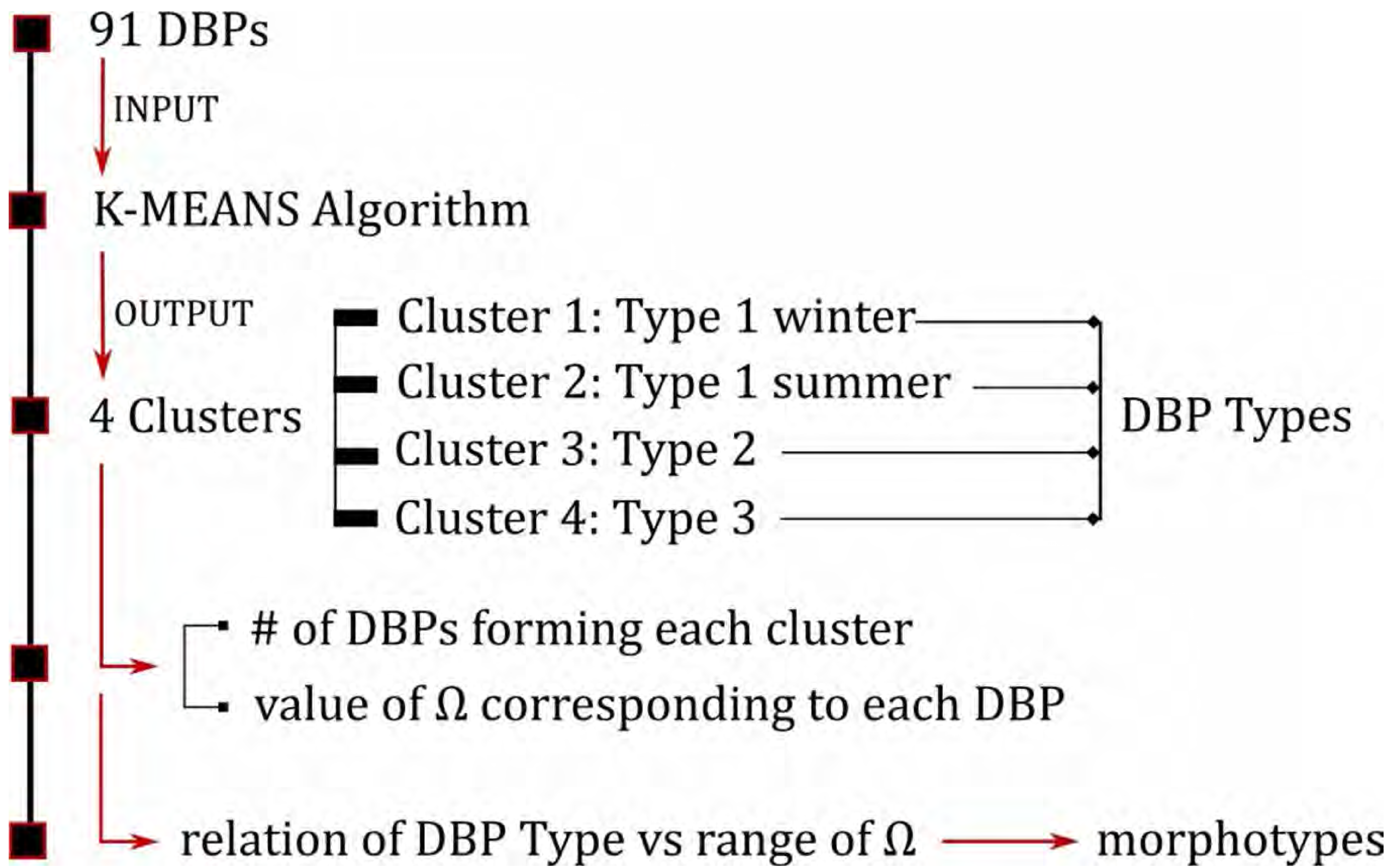

Figure 2. Flow chart detailing methodology. DBP: dry beach profile.

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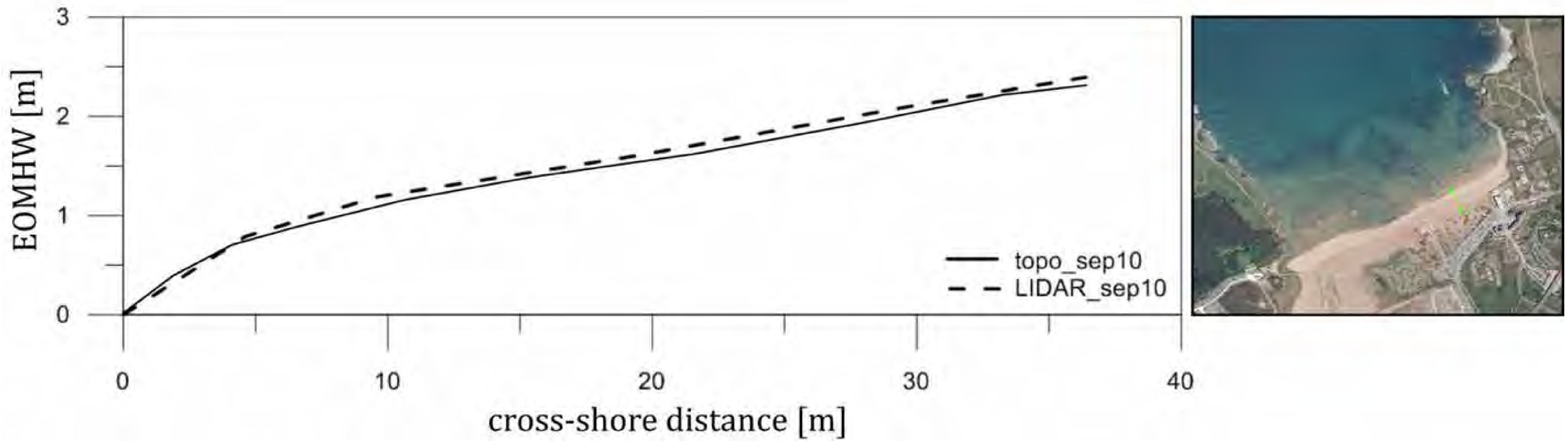

Figure 3. Comparison *vs.* topographic and LIDAR survey in Muskiz Beach (Gipuzkoa, Spain, Zone I). Correlation coefficient: 0.95; root mean-square deviation: 0.11 m. The vertical axis represents the elevation over the mean high water level (EOMHW).

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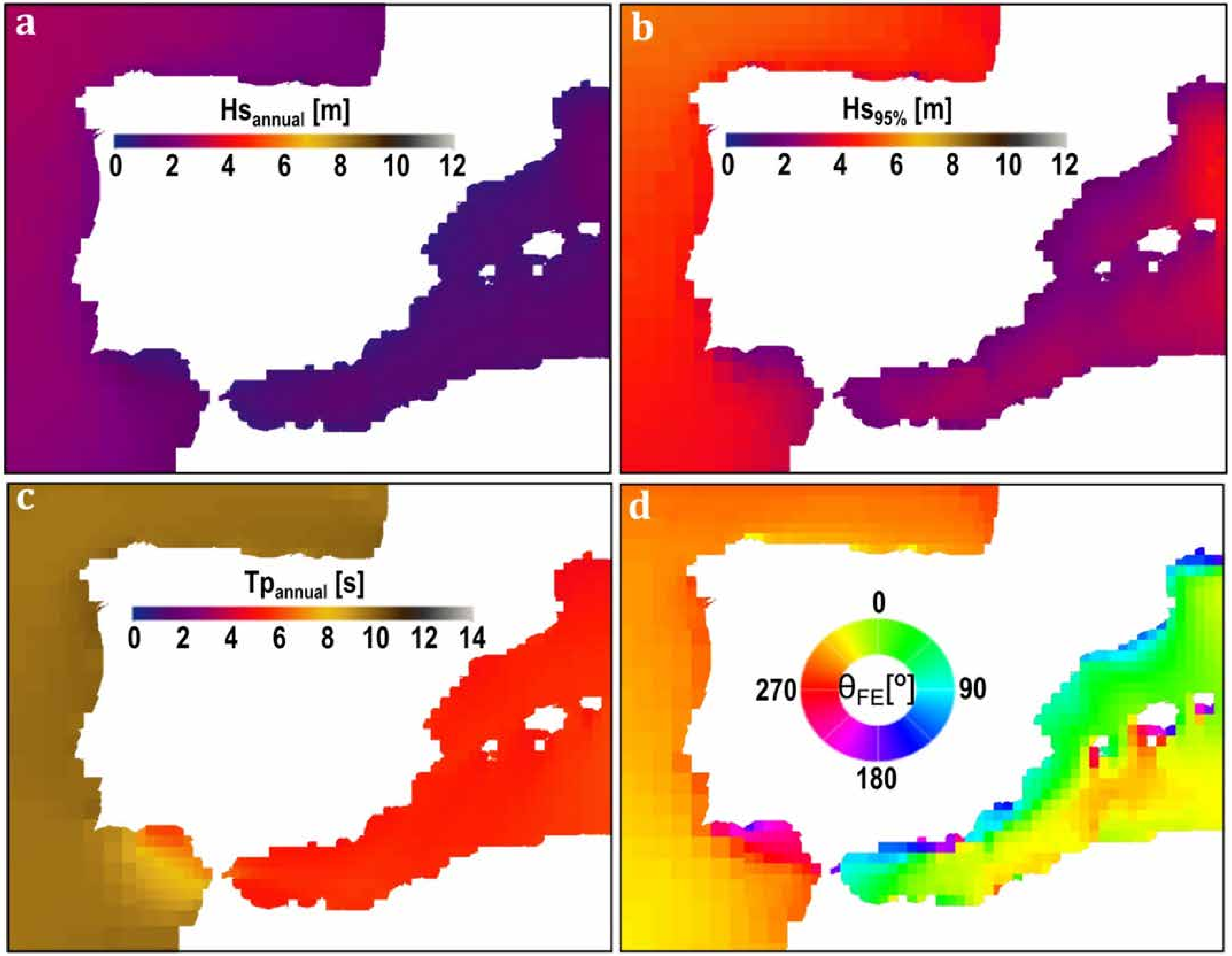

Figure 4. (a) Annual averaged significant wave height. (b) Statistical parameter $H_{s95\%}$, which indicates that only 5% of the waves during a year exceed this value. It is representative of the annual extreme wave conditions. (c) Annual averaged peak period. (d) Direction of the mean energy flux. Deepwater wave data statistics obtained from GOW database and shallow-water wave data statistics obtained from DOW database.

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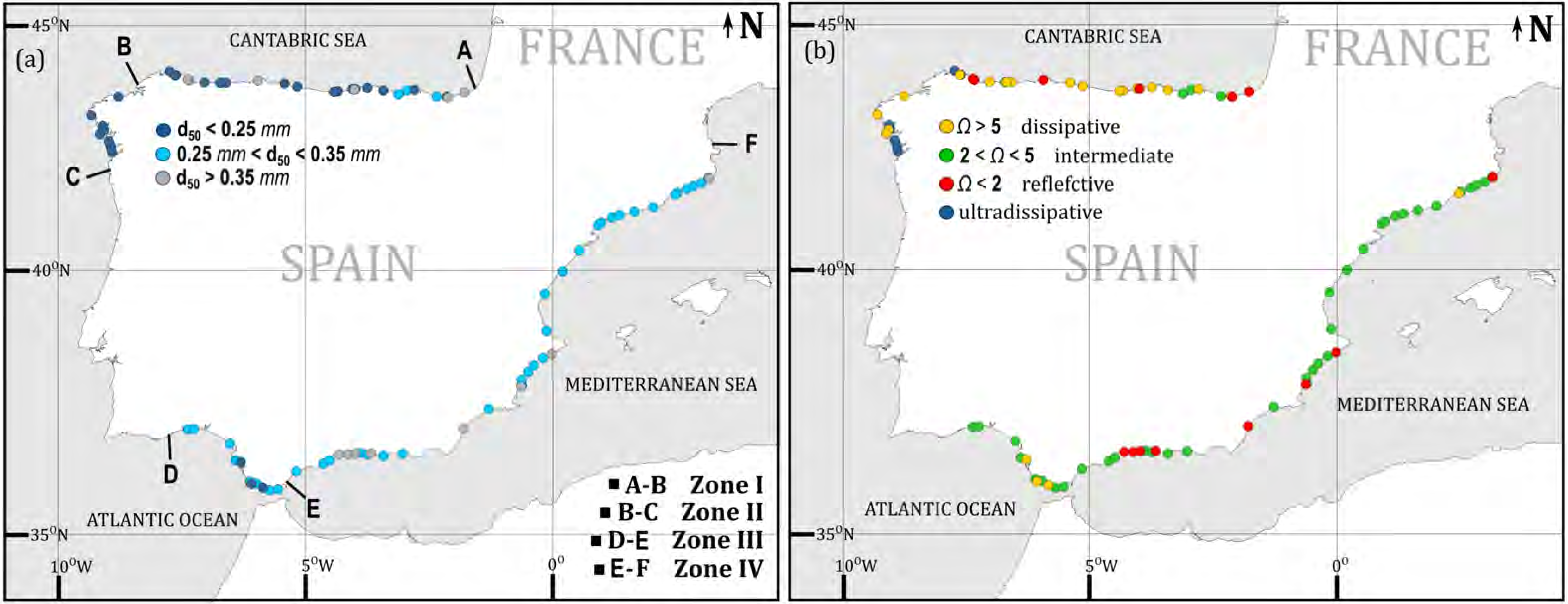

Figure 5. (a) On one side, this panel shows the zonation of the coast based on the different wave regimes shown in Figure 4. On the other side, the grain size distribution of the study sites is also presented. (b) The modal state ($\Omega = H/(1)\,T$) of each studied beach is shown and categorized into four subgroups: dissipative, intermediate, reflective, and ultradissipative.

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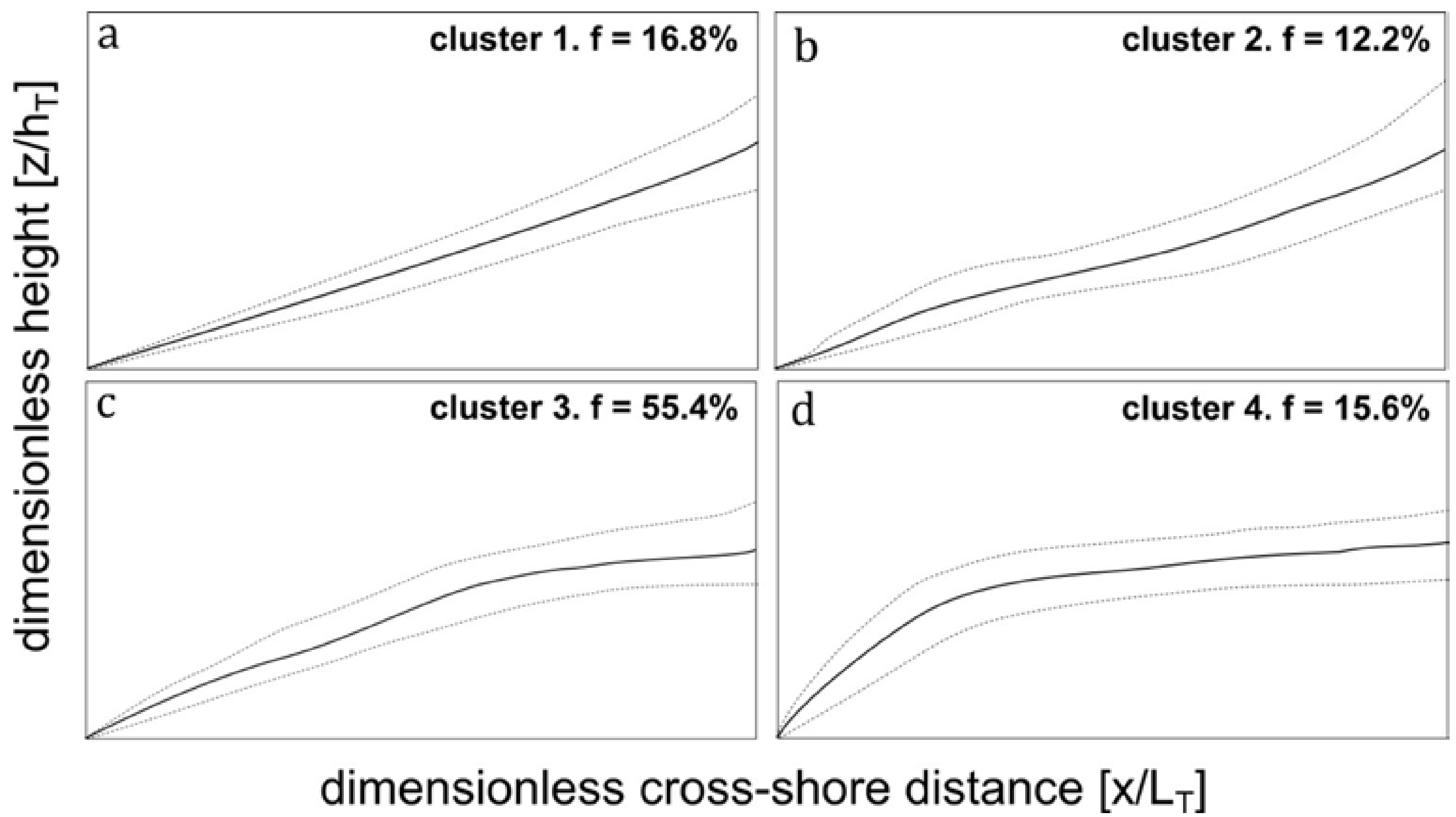

Figure 6. Cluster analysis using four centroids (clusters) plotted with 95% confidence bands, where *f* is the frequency of the cluster in percentage (%).

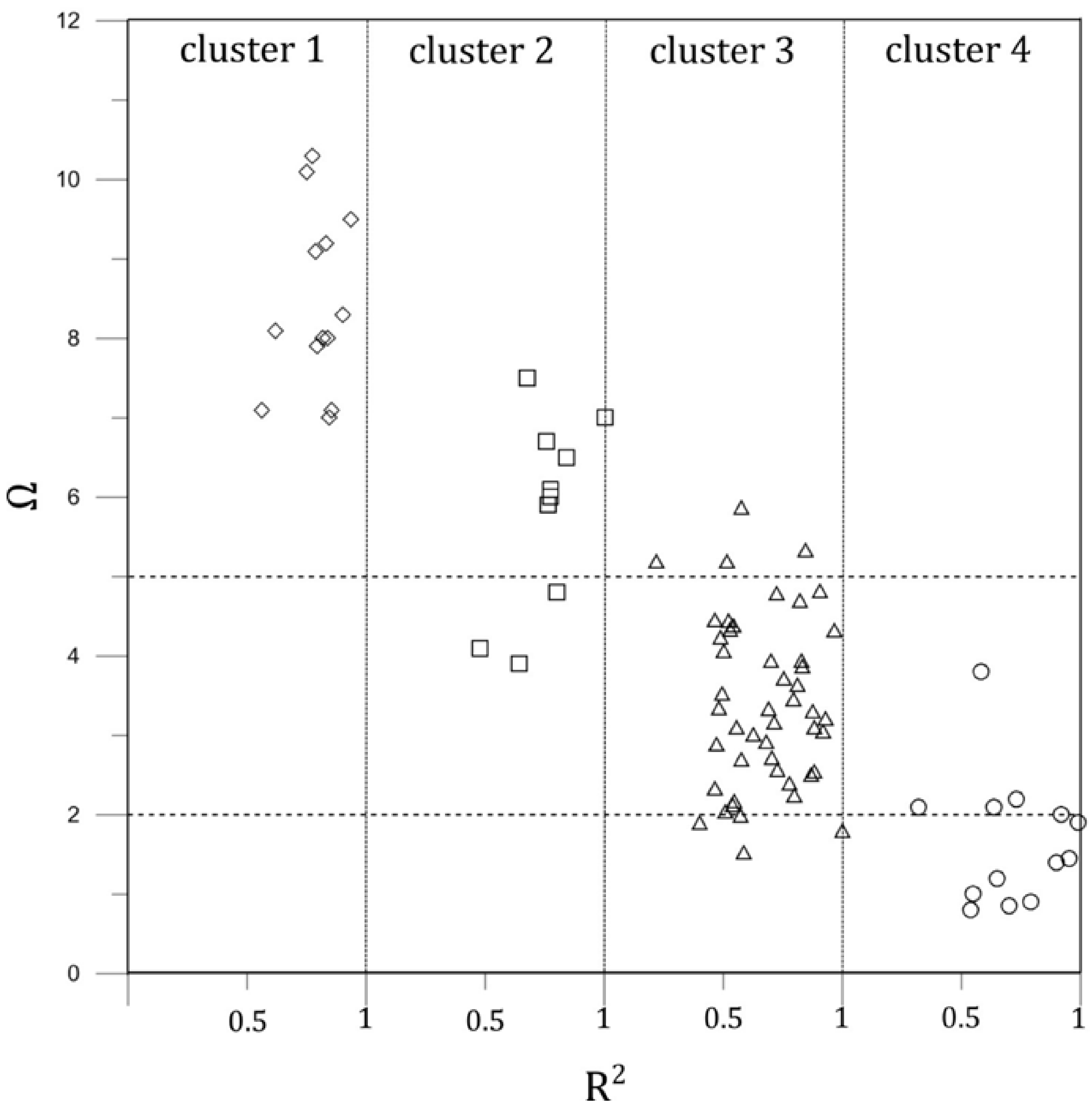

Figure 7. In the vertical axis is represented the dimensionless fall velocity value *Ω* for each study site. The horizontal axis is divided into four groups, one for each cluster. The scale makes reference to the R^2 value from the linear fittings between each single normalized profile and the corresponding centroid of its cluster. The closer to 1, the more similarity between the single profile and its cluster. Horizontal grid lines represent the values where transition between reflective, intermediate, and dissipative beaches occurs.

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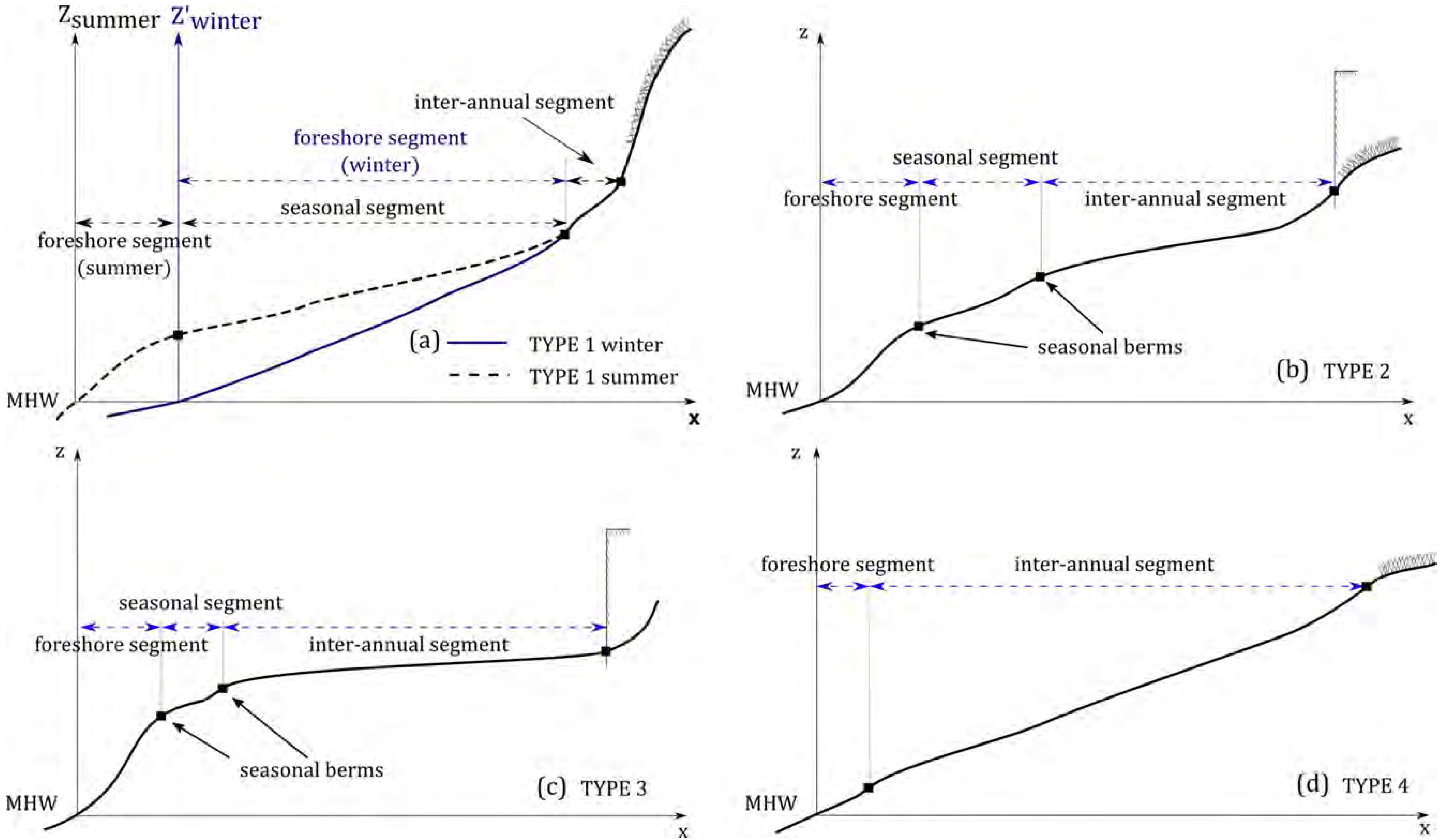

Figure 8. Morphotypes of dry beach equilibrium profiles. Each subfigure (a, b, c, and d) corresponds to the four different types of profile, including type 1 in two configurations.

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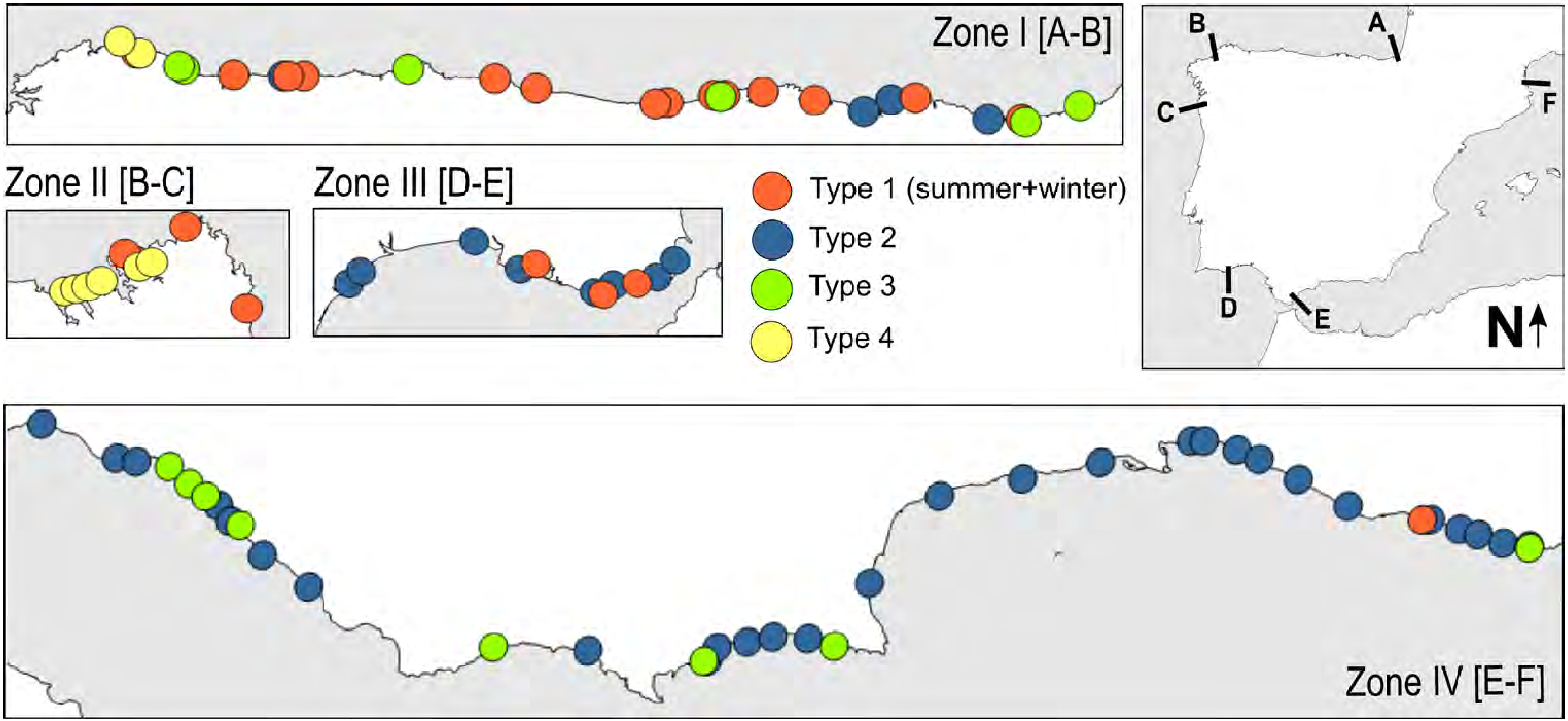

Figure 9. Distribution of the Spanish beaches analyzed in this study and categorized by their dry beach profile type.

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	segment						
	foreshore		*seasonal*		*inter-annual*		
	$\tan(\beta)_{mean}$	% d_{total}	$\tan(\beta)_{mean}$	% d_{total}	$\tan(\beta)_{mean}$	% d_{total}	
Cluster1 [*Type1wi*] #14sites	0.02 gentle	~100%	--	--	--	--	dissipative
Cluster2 [*Type1su*] #10sites	0.03 gentle	~55%	0.017 gentle	~45%	--	--	dissipative
Cluster3 [*Type2*] #46sites	0.04 intermediate	~30%	0.019 gentle	~5%	0.01 gentle	~65%	Ω=5 intermediate Ω=2
Cluster4 [*Type3*] #13sites	0.06 intermediate	~30%	--	--	0.008 sub-hor.	~70%	reflective
Type4 #8sites	0.08 steep	~5%	--	--	0.08 steep	~95%	Ω~0

Figure 10. Overview of dry beach equilibrium profile morphology. tan(ß) is the mean slope of each segment of all the profiles that fit in each cluster. % d_{total} represents the mean percentage of extension of each segment *vs.* the total extension of the entire profile through the analysis of the entire database. Slope: Subhorizontal: tan(ß) < 0.008; gentle: tan(ß) ~ 0.01–0.03; intermediate: tan(ß) ~ 0.03–0.07; steep: tan(ß) ~ 0.07–0.1. Slope ranges adapted from Masselink, Kroon, and Davidson-Arnott (2006). Symbol — indicates that the size of the segment is negligible compared with others.

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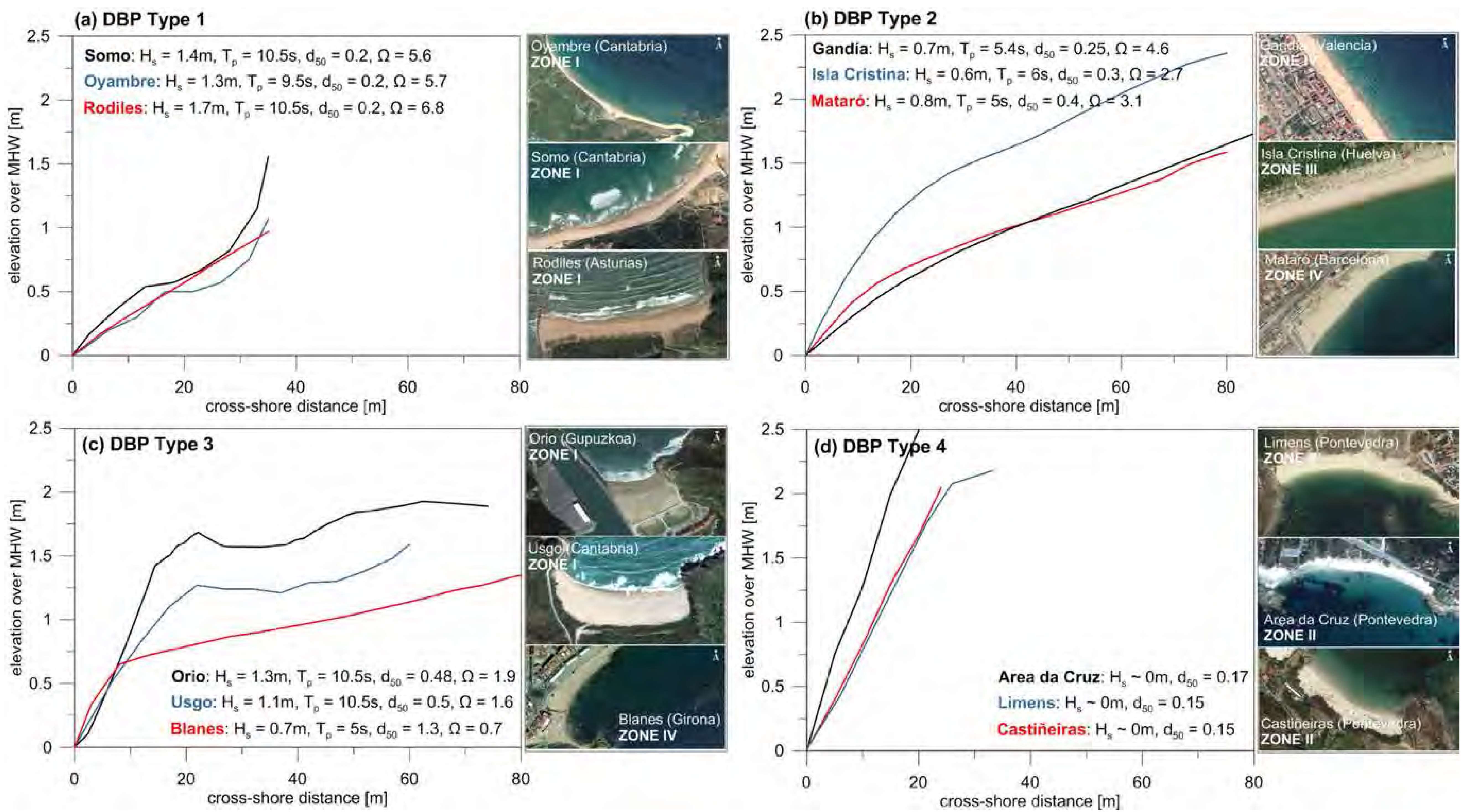

Figure 11. Examples of the four morphotypes described. (a) Type 1 in summer (Somo, Oyambre) and winter (Rodiles) configurations; (b) type 2; (c) type 3; (d) type 4.

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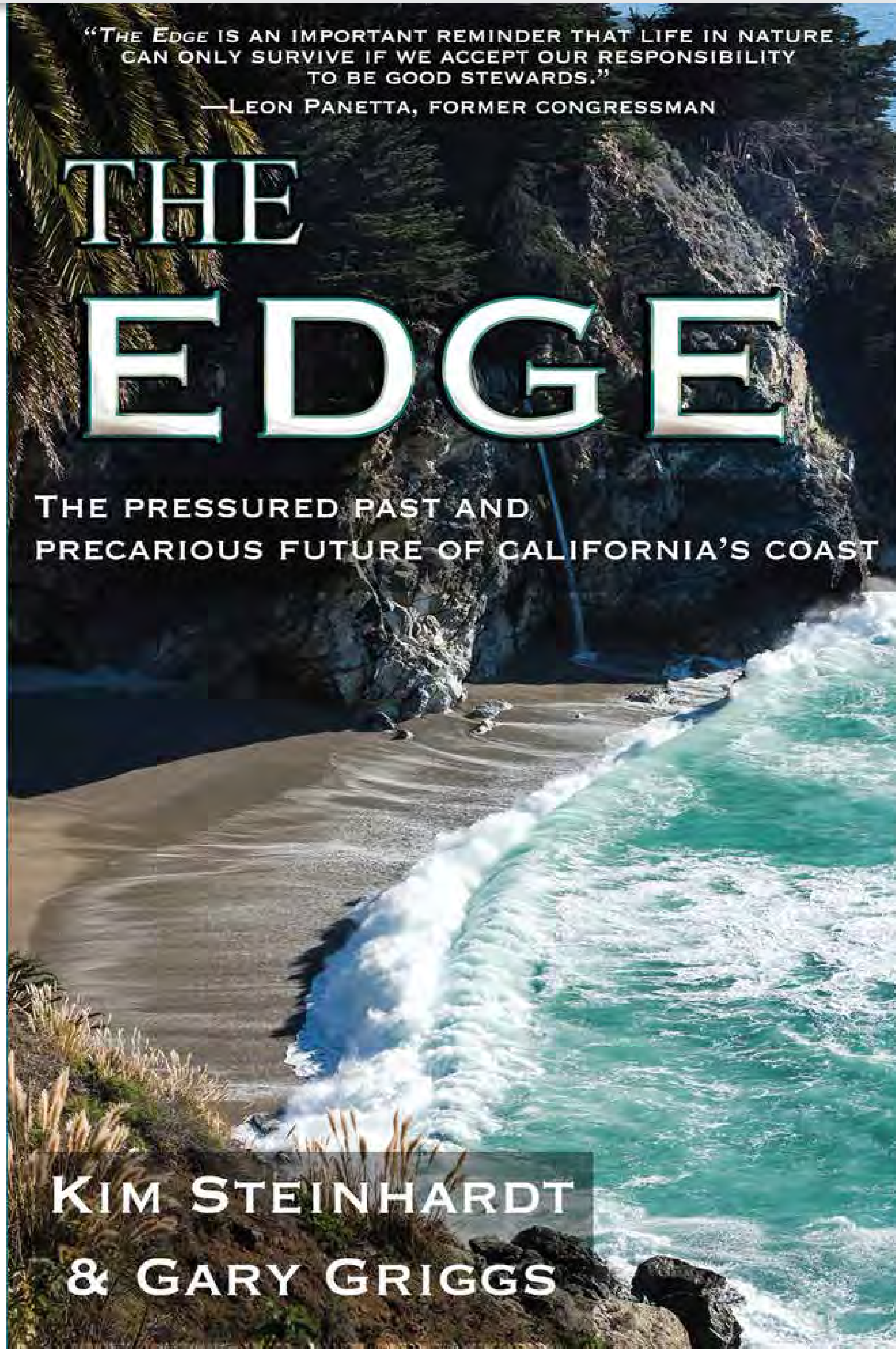

Advance Title Information

The Edge

The Pressured Past and Precarious Future of California's Coast

by Kim Steinhardt and Gary Griggs

Publication Date: October 1, 2017

$18.95 US • Trade Paperback • 6" x 9" • 300 pages
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Over 100 full color photographs • Index

The Pacific coast is the most iconic region of California and one of the most fascinating and rapidly changing places in the world. Densely populated, urbanized and industrialized — and also home to complex, fragile ecosystems — the coast is the place where humanity and nature coexist in a precarious balance that is never perfectly stable.

The Edge: The Pressured Past and Precarious Future of California's Coast is a dramatic snapshot of the California coast's past, present and probable future in a time of climate change and expanding human activity. Written by two marine experts who grew up on the coast, ***The Edge*** is both a celebration of the coast's natural and cultural uniqueness and a warning of the many complex changes that threaten that uniqueness.

As ocean levels rise, coastal communities are starting to erode, and entire neighborhoods have been lost to the sea. Coastal ecosystems and wildlife that were already stressed by human settlement now face new dangers. The competing impacts of climate change, housing and commercial growth, commercial fisheries, oil drilling and production, and environmental advocacy all combine to define the future of the region.

The Edge examines the current state of the coast's natural and social environments, gives the historical causes for the coast's present endangerment and offers informed projections on possible scenarios of the coast's future. A masterful and sweeping synthesis of environmental and social science, ***The Edge*** presents a comprehensive portrait of the history, people, communities, industries, ecology and wildlife of the California coast.

Audience: Readers interested in environmental issues, marine wildlife, climate change and California history.

About the Authors: A widely recognized marine wildlife photographer, former administrative law judge, and a long-time conservation advocate, **Kim Steinhardt** delivers popular lectures and photographic programs on coastal conservation and ocean stewardship issues for aquariums and marine centers, universities, state parks and other audiences. **Gary Griggs** has written or co-authored nine books about the coast and coastal issues both in California and globally. As a Distinguished Professor of Earth and Planetary Sciences at the University of California at Santa Cruz, he is known for his expertise in oceanography and coastal geology. He serves as the director of the Institute of Marine Sciences at UC Santa Cruz.

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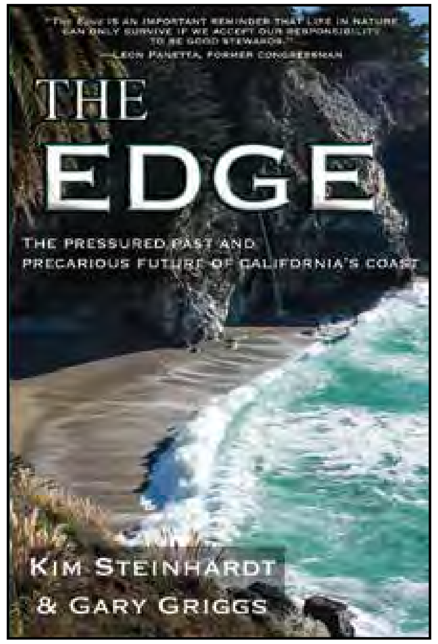
Blending science, history and ecology, *The Edge* presents a dramatic portrait of California's breathtaking and endangered coastline

"*The Edge* is an important reminder that life in nature can only survive if we accept our responsibility to be good stewards." —from the Foreword by former congressman Leon Panetta

The Pacific coast is the most iconic region of California and one of the most fascinating and rapidly changing places in the world. Densely populated, urbanized and industrialized — and also home to complex, fragile ecosystems — the coast is the place where humanity and nature coexist in a precarious balance that is never perfectly stable.



Two marine experts who grew up on the coast present a dramatic snapshot of a region undergoing massive change in ***The Edge: The Pressured Past and Precarious Future of the California Coast*** (Craven Street Books, October 2017).

Written in clear language for the layperson, ***The Edge*** presents an accessible survey of a huge range of topics, from sea-level rise to the history of offshore oil drilling to the health of the sea otter population. ***The Edge*** examines the current state of the coast's natural and social environments, gives the historical causes for the coast's present endangerment and offers informed projections on possible scenarios of the coast's future.

A fascinating blend of science, history, sociology and ecology, ***The Edge*** is both a celebration of the coast's natural and cultural uniqueness and a warning of the many complex changes that threaten that uniqueness.

In this era of rapid climate change, the threats to the California coast are serious. As glaciers melt and ocean levels rise, coastal communities are starting to erode, and entire neighborhoods have been lost to the sea. Coastal ecosystems and wildlife that were already stressed by human settlement now face new dangers.

–more–

But the coast has its heroes and defenders as well. ***The Edge*** presents exciting profiles of the people, organizations and programs that are working to maintain the coast's equilibrium, biodiversity and capacity to support wildlife. Co-authors Kim Steinhardt and Gary Griggs give their personal stories of how their coastal childhoods and personal love of the ocean fostered their commitments to environmental research and activism. Each chapter includes testimonies from ordinary Californians on what the coast means to them and why they think it is worth protecting.

Among the topics covered in ***The Edge*** are:

—A migrating edge: The line where the land meets the sea is never static, and now climate change is steadily eroding the California coastline. ***The Edge*** gives a lucid explanation of the science of sea-level rise, how rising waters are reshaping the California coastline, and how nature is whittling away at coastal land, transforming the California real estate market.

—Oil on the edge: One of the most contentious issues on the coast is offshore oil drilling. ***The Edge*** outlines the science of petroleum formation, the history of oil industry in California, and how oil drilling has repeatedly challenged and galvanized the environmental movement.

—Sea otter survival: Cute, playful and photogenic, sea otters have long been the poster child for coastal wildlife preservation. ***The Edge*** profiles the sea otters' pivotal role in the history of California, their comeback from the verge of extinction, and the ongoing threats this remarkably resilient species still faces.

—Additionally, ***The Edge*** covers the history of human settlement in California, the successes and failures of the environmental movement, detailed accounts of wildlife and human activity, and more.

A masterful and sweeping synthesis of environmental and social science, ***The Edge*** presents a comprehensive portrait of the history, peoples, communities, industries, ecology and wildlife of the coast.

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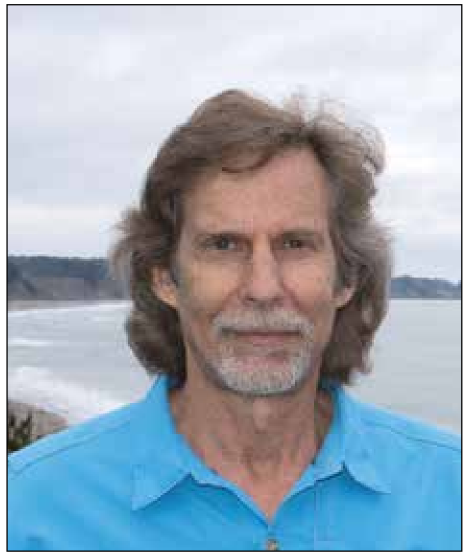
About Kim Steinhardt

Co-Author of *The Edge*

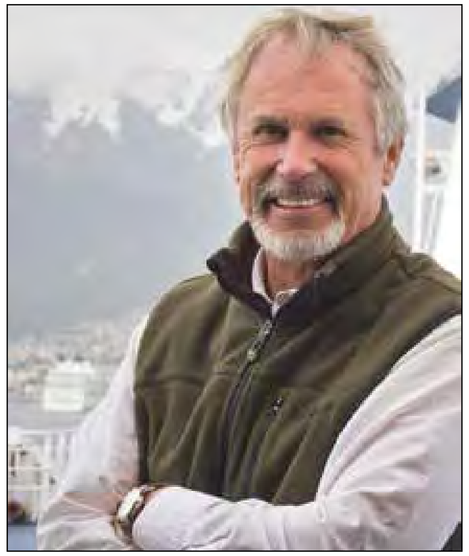


Kim Steinhardt delivers popular lectures and photographic programs exploring the universe of sea otters and coastal conservation for aquariums and marine centers, universities, state parks, and other audiences. He has been recognized for his award winning marine wildlife photography and is currently working with National Geographic on publication of a book of his sea otter images and coastal storytelling. He has also served as an advisor regarding sea otters for the NatGeo Kids Explore My World series and, for the last five years, has written a newsletter column about marine wildlife and the ocean. As a long-time conservationist drawing on his former service as a California state administrative law judge, litigator and public interest advocate, he helps translate ocean conservation concerns to the public to build support for citizen action and legislative policymaking.

For more information on ***The Edge*** (Craven Street Books, October 2017) or to arrange an interview with co-authors **Kim Steinhardt** and **Gary Griggs,** please contact Jaguar Bennett at Craven Street Books, (800) 345-4447,Publicity@QuillDriverBooks.com.

About Gary Griggs

Co-Author of *The Edge*



Gary Griggs has written or co-authored nine books about the coast and coastal issues both in California and globally. As a Distinguished Professor of Earth and Planetary Sciences at the University of California at Santa Cruz, he is known for his expertise in oceanography and coastal geology. He is a frequent contact for news media on questions of climate change, sea-level rise, coastal erosion and other related issues. He has written a popular biweekly newspaper column ("Our Ocean Backyard") for nine years, and is in high demand for talks throughout California. He serves as the director of the Institute of Marine Sciences at the University of California at Santa Cruz, which includes the Long Marine Laboratory and the Seymour Marine Discovery Center, a popular educational destination for tens of thousands of visitors each year.

For more information on ***The Edge*** (Craven Street Books, October 2017) or to arrange an interview with co-authors **Kim Steinhardt** and **Gary Griggs,** please contact Jaguar Bennett at Craven Street Books, (800) 345-4447,Publicity@QuillDriverBooks.com.

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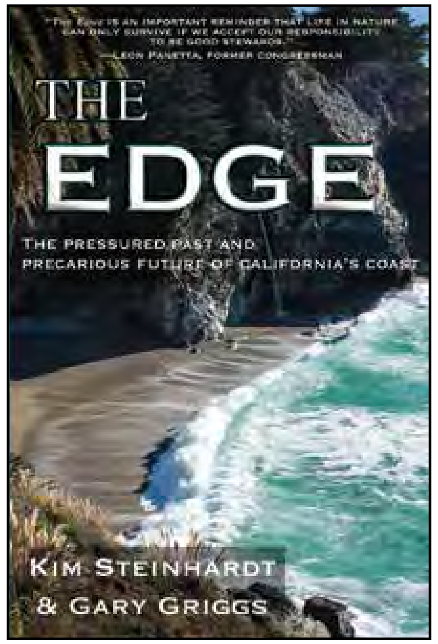
Advance praise for *The Edge*



"***The Edge*** is an important reminder that life in nature can only survive if we the living accept our responsibility to be good stewards. The legacy of the beauty of our coastline that was passed on to us must be protected for future generations. ***The Edge*** is a comprehensive portrait of the Pacific coast and why we are responsible for its future."
—from the Foreword by **Leon Panetta**, former congressman and chair of the Pew Oceans Commission

"This book captures the magic of the coast. It has an intimate blend of nature, science, politics, policy, culture, history, and adventure, and there is a well-informed urgency that gives readers more than just the information and heightened awareness they need to bring about real change to our ocean policies and practices: It is a personal call to action. Dive in!"
—Sam Farr, former congressman and ocean advocate

"Steinhardt and Griggs have created a delightful and insightful tour of California's coastal edge, past, present, and future. They do a masterful job of weaving together the interconnections of the changing natural world over different time scales with the changing societal landscape and human interventions to modify the coastal edge as population grew and societal priorities changed. Their discussions of how those interventions were shaped by clashes between conservationists and those with strong economic motivations are infused with some of their own values. In combination with the first two chapters that introduce the reader to the backgrounds of the authors, these personal views enhance the narrative. Their stories of the boom and bust cycles of many of our fisheries and of populations of marine mammals have many lessons for us today, not only for resource managers, but for everyone concerned with human rights. I recommend this book to all who are interested in one of the most beautiful coasts in the world."
—Jerry R. Schubel, Ph.D., President and CEO, Aquarium of the Pacific

"Kim Steinhardt and Gary Griggs each have had a long love affair with the California coast. You can see it in their personal stories, and how they worry about the long-term effects of human interaction between land and water. This is a must read for anyone who shares their love for the coast and concern for its future."
—John Laird, California Secretary for Natural Resources, and Chair of the California Ocean Protection Council

Competent *vs.* Observed Grain Size on the Seabed of the Gulf of Maine and Bay of Fundy

Competent *vs.* Observed Grain Size on the Seabed of the Gulf of Maine and Bay of Fundy

Paul S. Hill and Shaun Gelati

Department of Oceanography
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ABSTRACT

The output of a three-dimensional tidal circulation model and nearly 10,000 sediment samples are used to compare observed and competent grain sizes on the floor of the Gulf of Maine and Bay of Fundy. Competent grain size is the largest grain size a flow is capable of mobilizing. Competent and observed grain sizes have similar broad spatial distributions. Coarser observed grain sizes are found in regions of larger stress, and associated coarser competent grain sizes and finer observed sizes are found in regions with finer competent sizes. Areas in which competent sizes are finer than observed sizes likely have significant sources of seabed stress that are not included in the model, specifically from waves and subtidal flows. Areas in which competent sizes are coarser than observed sizes likely are regions where sediment input into the region overwhelms the ability of near-bed flows to transport sediment away from the region, leaving the seabed with a texture similar to that of the supply. The results indicate that sediment texture is unlikely to change greatly if large-scale tidal power development is pursued in Minas Passage, which connects the Minas Basin to the Outer Bay of Fundy. Forecast changes of sediment texture in the Gulf of Maine are small, and in the Bay of Fundy, sediment texture is unlikely to change because it is dominated by sediment supply, which should not be affected by tidal power development.

ADDITIONAL INDEX WORDS: *Sediment texture, tides, tidal power, cliff erosion.*

INTRODUCTION

The Gulf of Maine and Bay of Fundy on the east coast of North America (Figure 1) together form an embayment with a natural period that is nearly resonant with M2 tides (Garrett, 1972). Resonance, combined with the funnel shape of the Bay, produces large tidal ranges and associated strong tidal currents, making the region an attractive target for the development of tidal power generation. The push to develop tidal power is accompanied by efforts to evaluate the environmental effects of large-scale extraction of energy. This research is motivated by interest in whether tidal power generation will affect grain size on the seabed in the Gulf of Maine and Bay of Fundy.

The Gulf of Maine comprises three deep basins that are separated from the North Atlantic Ocean by Georges and Browns Banks (Figure 1). Wilkinson Basin occupies the southwestern portion of the Gulf, Jordan Basin lies in the northeastern part of the Gulf, and Georges Basin is in the southeastern part of the Gulf, just inside of Georges Bank. Connection to the deep Atlantic is through the Northeast Channel. The Bay of Fundy extends to the northeast of the Gulf of Maine (Figure 1). The head of the Bay, alternatively known as the Inner Bay of Fundy (Parker, Westhead, and Service, 2007), comprises two sub-basins. Chignecto Bay lies to the north and west, and the Minas Basin lies to the south and east. The Minas Channel and Minas Passage connect the Minas Basin to the Outer Bay of Fundy. Twice each day, 15 billion m^3 of water surge into and out of the Minas Basin (Parker, Westhead, and Service, 2007). The flow of this large volume of water through the relatively narrow

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and shallow Minas Passage produces observed maximum surface current speeds of more than 5 m s^{-1}, and maximum bottom currents are as high as 1.5 m s^{-1} (Oceans Ltd., 2009). These strong and regular tidal currents have the potential to deliver up to 2.5 GW of electrical power without significant changes to tidal amplitudes in the region (Karsten *et al.*, 2008).

Hasegawa *et al.* (2011) used a model to show that extraction of tidal energy from the Minas Passage would have an effect on tidal circulation in the whole Bay of Fundy and Gulf of Maine system. Because seabed sediment texture has been shown in other tidal environments to correlate with bed shear stress (Signell, List, and Farris, 2000; Uncles, 1983; Ward *et al.*, 2015), tidal power generation may have an effect on sediment texture in the system. Changes in sediment texture would be of ecological and economic importance because sediment texture affects the suitability of the seabed for spawning, shelter, and food acquisition for economically important species (*e.g.*, Methratta and Link, 2006).

Two basic modeling approaches predict the effect of tidal power on sediment texture. The first one, which has been developed most fully for gravel-bed rivers (Buffington and Montgomery, 1999), makes use of the concept of competent grain size. The competent grain size is the largest particle size that a flow is capable of mobilizing. In the absence of sediment supply to a sediment bed, the surface grain size approaches the competent grain size (Buffington and Montgomery, 1999; Parker, Hassan, and Wilcock, 2008). To illustrate, consider emplacement of a mixed grain size bed that is subsequently exposed to flowing water. Initially, the flow will resuspend and transport the sediment sizes that it is competent to mobilize. Without resupply, these grain sizes are eventually depleted, and the resulting sediment bed is composed of grain sizes that the flow is not competent to mobilize. When it reaches this condition, the bed is in hydrodynamic equilibrium with the overlying flow, and the grains that compose the sediment bed form a static armor that shields the substrate below from further removal of finer sediment grains. Faster flows produce beds with surface grain sizes that are larger than beds formed under slower flows (Pitlick *et al.*, 2008). According to this simple hydrodynamic equilibrium model, one can use flow competence to predict a change in grain size that would result from a change in flow. This represents a simpler approach than a second approach to modeling sediment texture, which is a coupled hydrodynamic and sediment transport model that tracks the evolution of the seabed (*e.g.*, Blaas *et al.*, 2007; Warner, Butman, and Dalyander, 2008).

On wave-dominated continental shelves, the concept that equilibrium exists between near-bed stress and sediment texture has been applied successfully to prediction of the depth of the sand-mud transition (Dunbar and Barrett, 2005; George and Hill, 2008). Observed grain sizes on the seabed also have been shown to vary with modeled seabed stresses in tidally dominated environments (Uncles, 1983; Ward *et al.*, 2015) The match between competent and observed grain size that would emerge under equilibrium has been posited for the Bay of Fundy and Gulf of Maine region on qualitative grounds (Amos, 1978; Emery and Uchupi, 1972), but such a relationship has not been evaluated quantitatively. The primary goal of this paper is to examine whether there is evidence of equilibrium between near-bed tidal flow and sediment texture in the Bay of Fundy and Gulf of Maine region. The secondary goal of this paper is to use the match or mismatch between competent and observed grain size to assess the potential effect on sediment texture of large-scale tidal power development in the Bay of Fundy.

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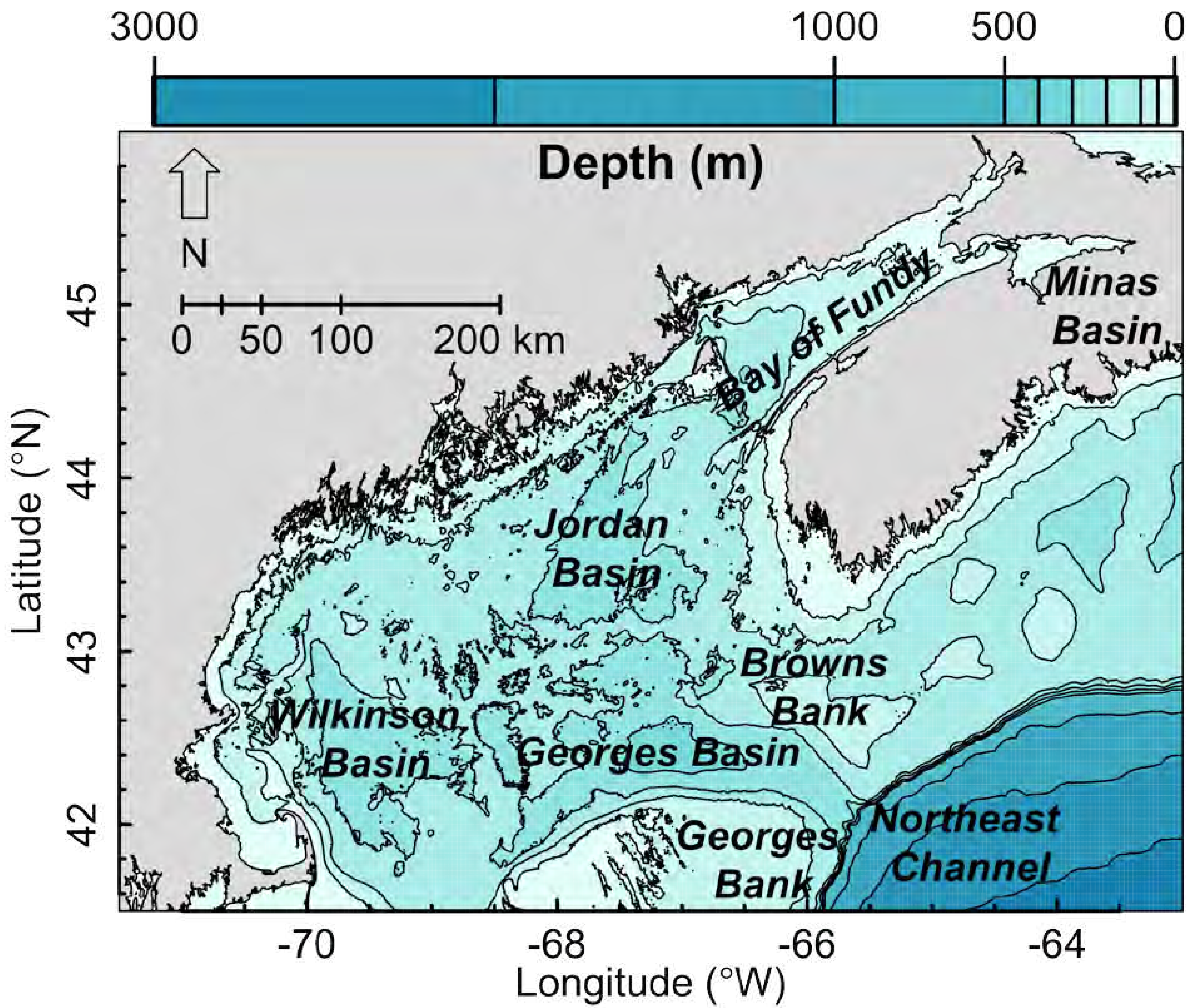

Figure 1. Map of the Gulf of Maine and Bay of Fundy region. Isobaths are drawn at 50, 100, 200, 300, 400, 500, 1000, 2000, and 3000 m.

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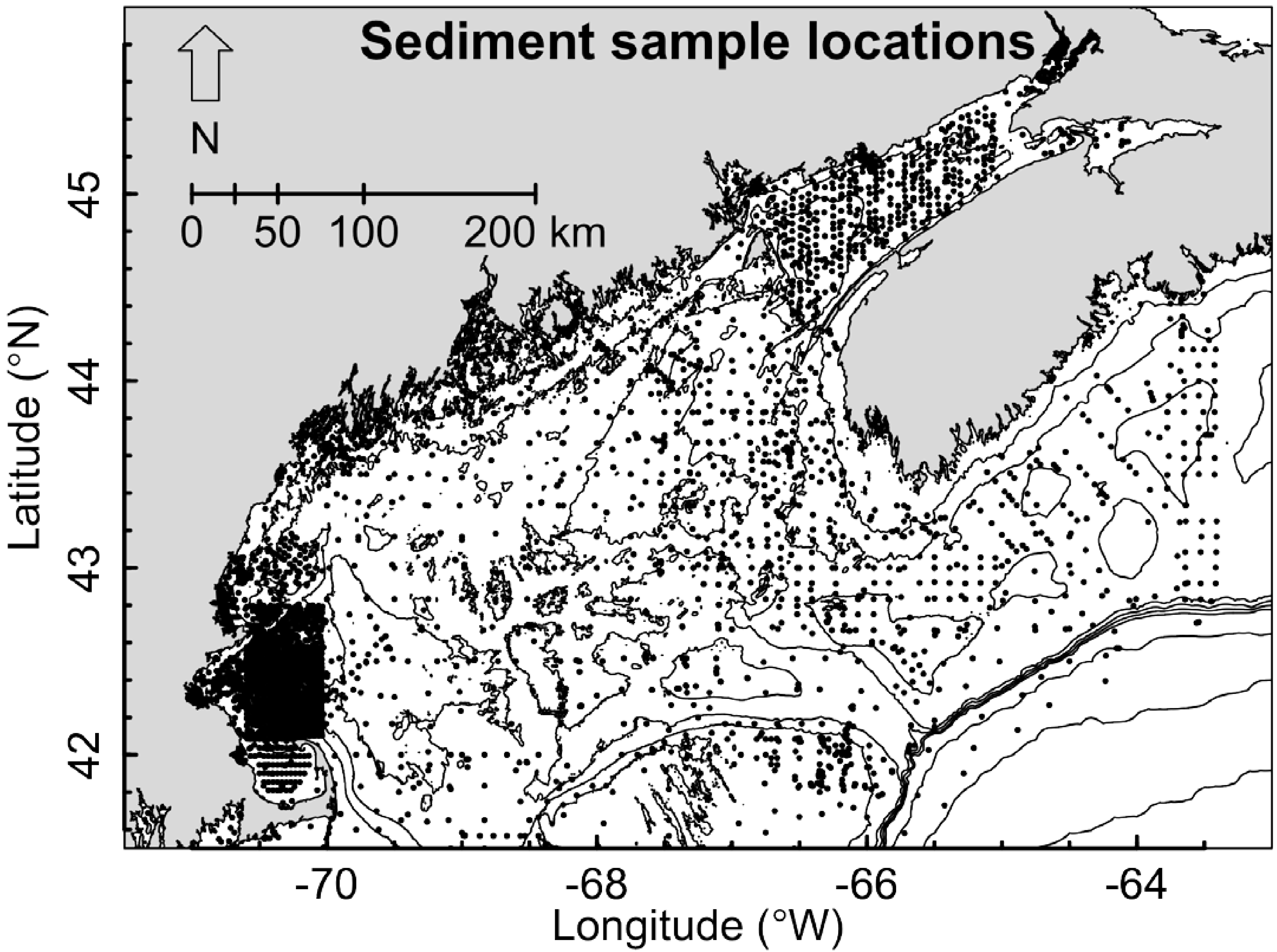

Figure 2. Compiled database sample locations in the Gulf of Maine and Bay of Fundy.

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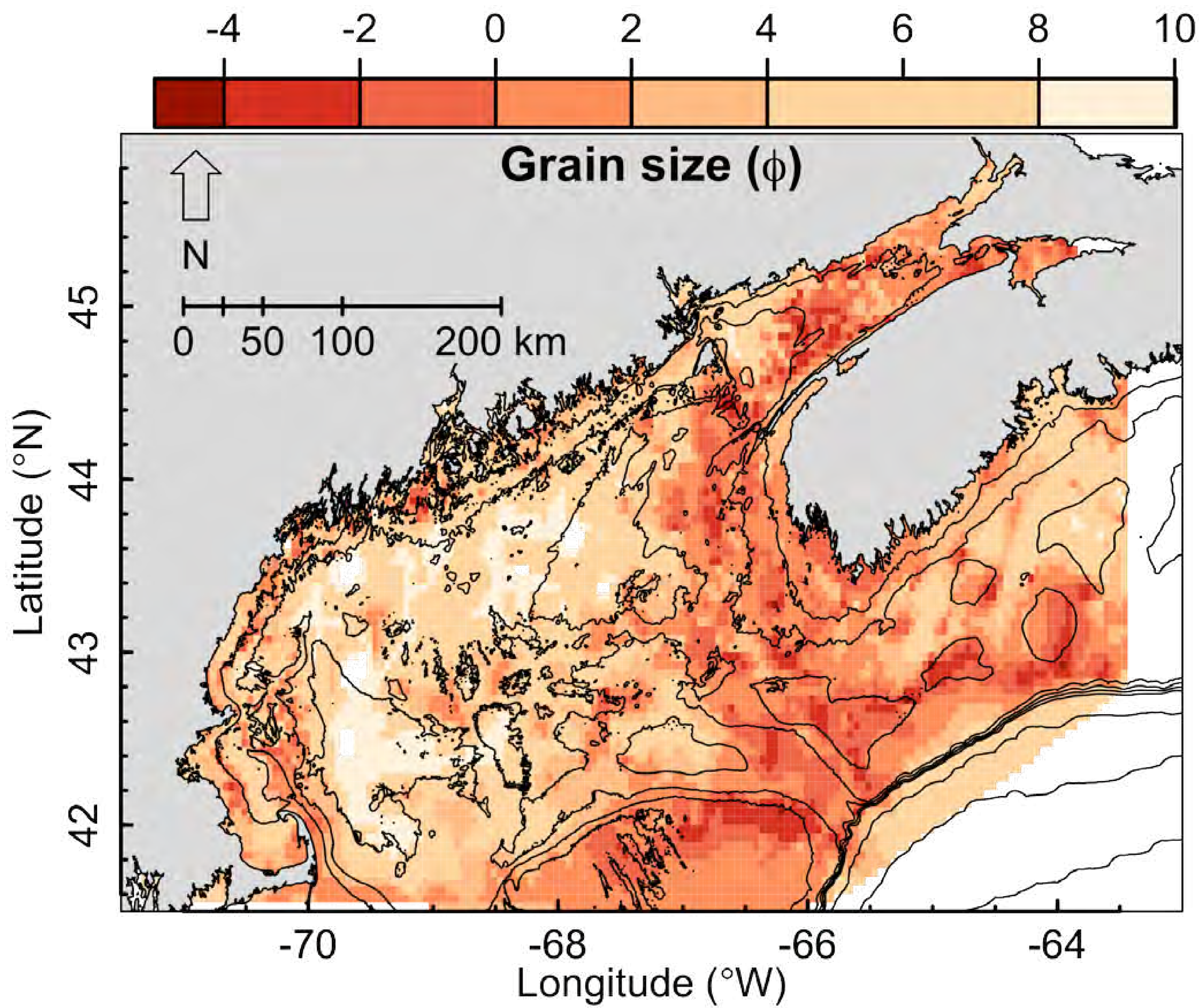

Figure 3. Map of observed mean grain size (ϕ units) in the Gulf of Maine and Bay of Fundy. The observations were interpolated with bilinear interpolation on a grid with 0.05° node spacing. Mean grain sizes tend to be coarser (lower ϕ) on banks and in the Bay of Fundy and finer in the basins of the Gulf of Maine.

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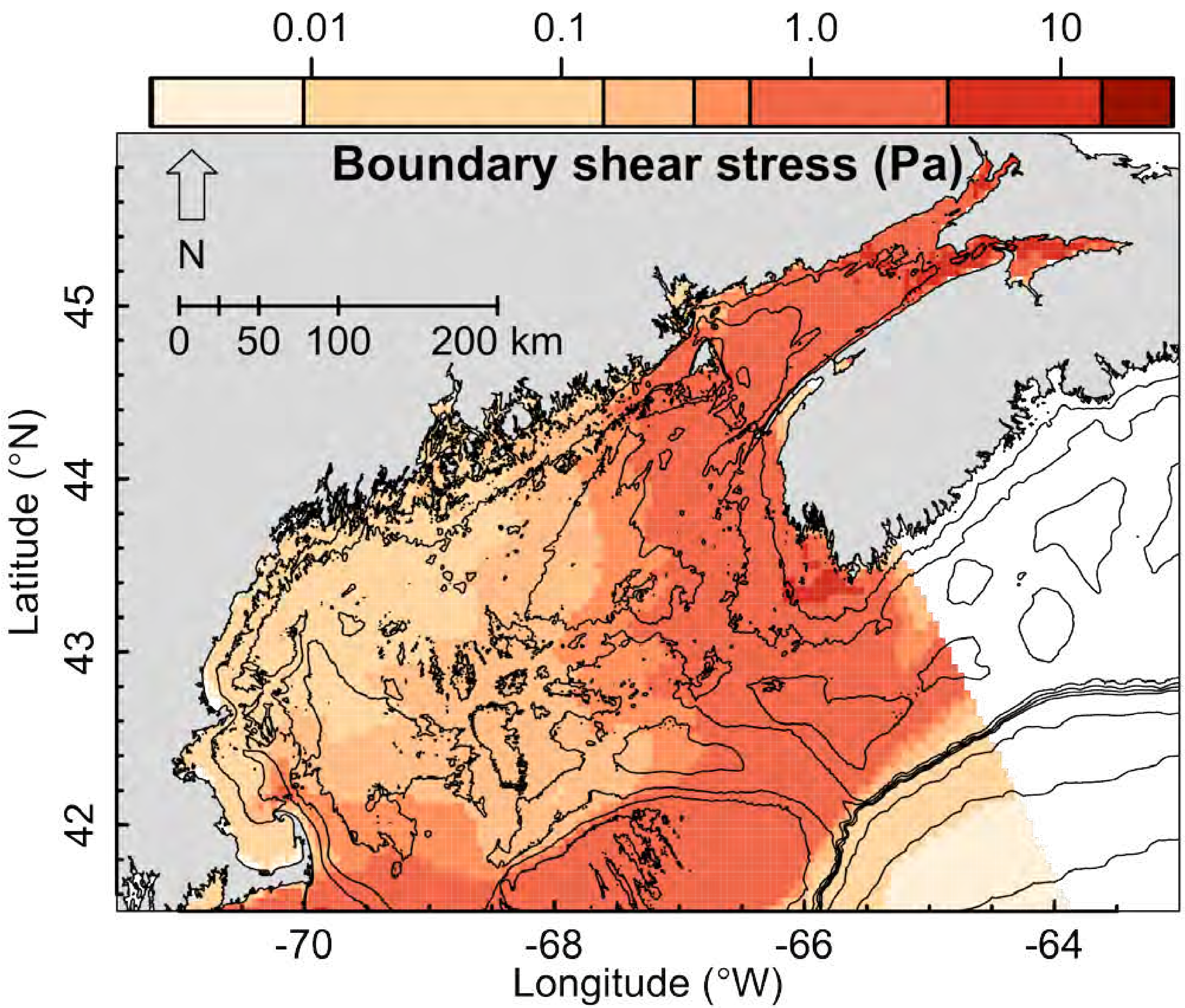

Figure 4. Map of maximum modeled tidal bed shear stress (Pa) for the Gulf of Maine and Bay of Fundy for the simulation ~30-d period. The color bar is arranged to display the critical erosion shear stress boundaries calculated for the grain size boundaries used in Figure 3, so it essentially is a map of competent grain sizes. Stresses generally are higher on banks and in the Bay of Fundy, and they are lower in basins.

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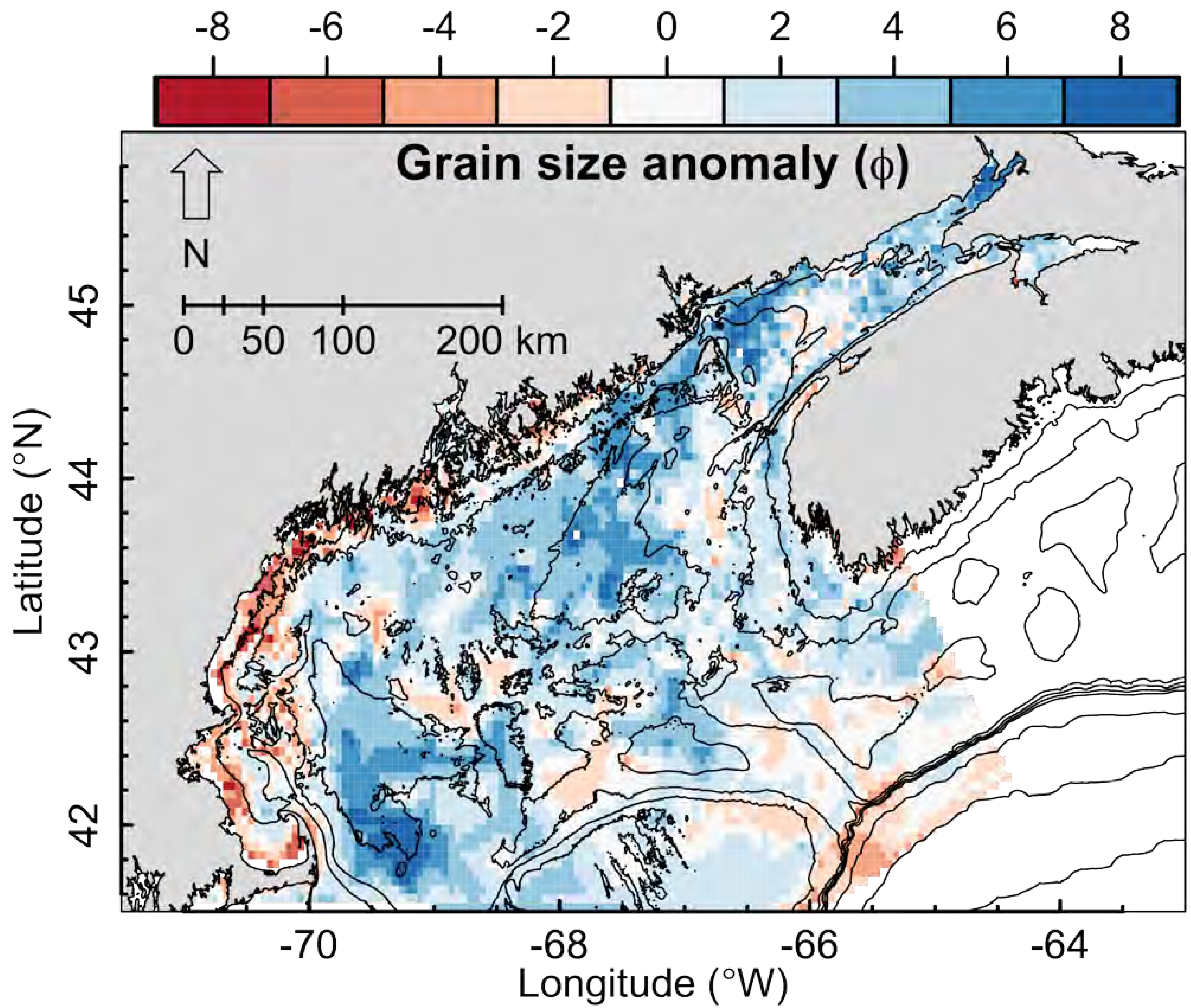

Figure 5. Map of grain size anomaly for the Gulf of Maine and Bay of Fundy. Positive anomalies indicates that observed grain sizes are finer than competent grain sizes, and negative grain size anomalies indicate that observed grain sizes are coarser than competent grain sizes. Regions of largest positive anomalies are the basins of the Gulf of Maine, an area on the northwestern margin of the Bay of Fundy where it meets the Gulf of Maine, and in the Inner Bay of Fundy. Regions of largest negative anomalies are the shallow areas on the southwestern margin of the Gulf of Maine and the Northeast Channel.

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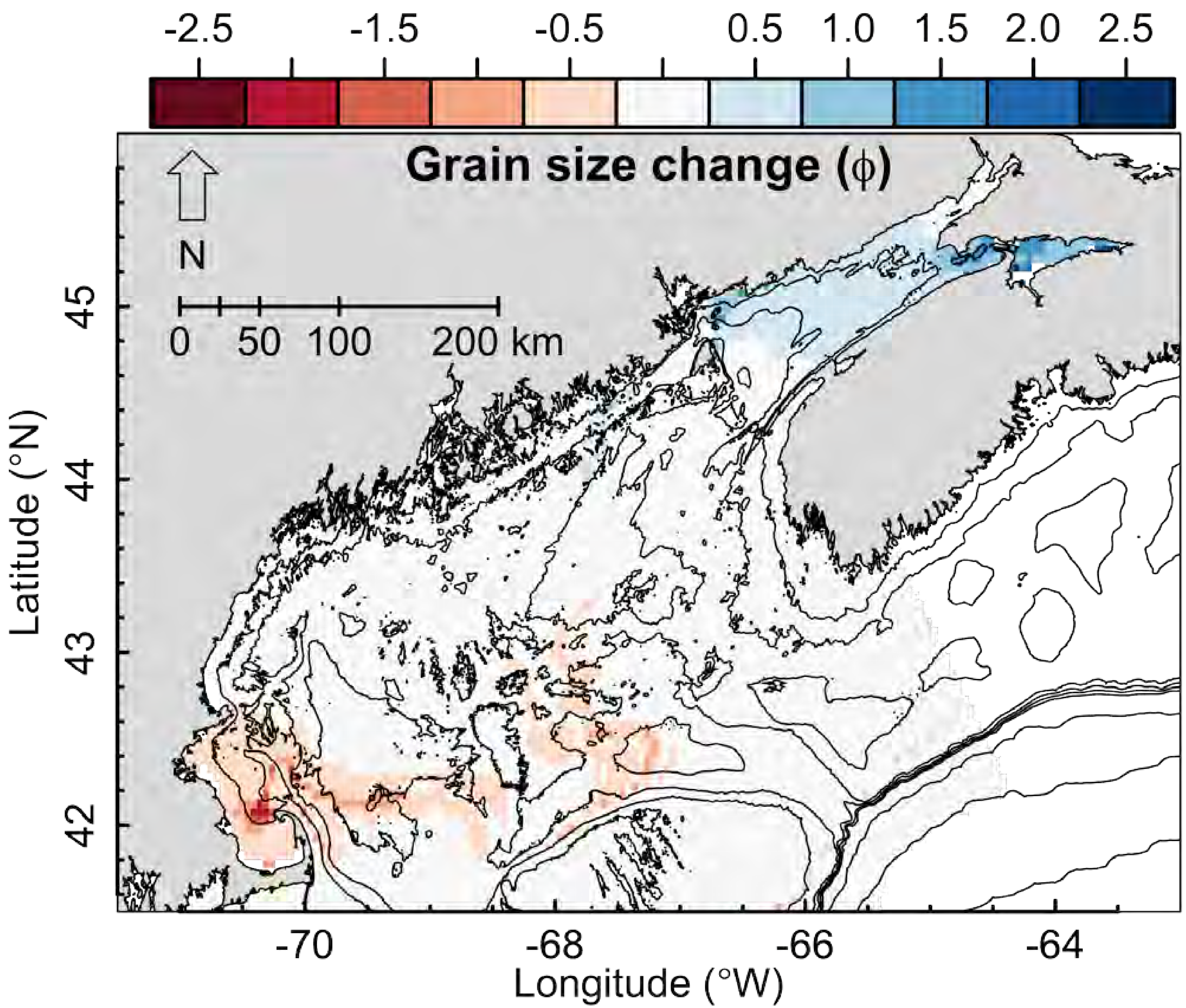

Figure 6. Map of effect (Δϕ) on competent mean grain size for 2.0-GW tidal power development scenarios in the Gulf of Maine and Bay of Fundy. Effect is defined as the difference between present-day and affected competent grain sizes. Positive values mean a fining of sediments, whereas negative values indicate a coarsening of sediments. Sediment fining is localized in the Bay of Fundy, and coarsening is predicted to occur in an area between 42° and 43° N latitude and 67° to 71° W longitude. Generally, predicted effects are less than 0.5ϕ) and maximum effects are less than 2ϕ.

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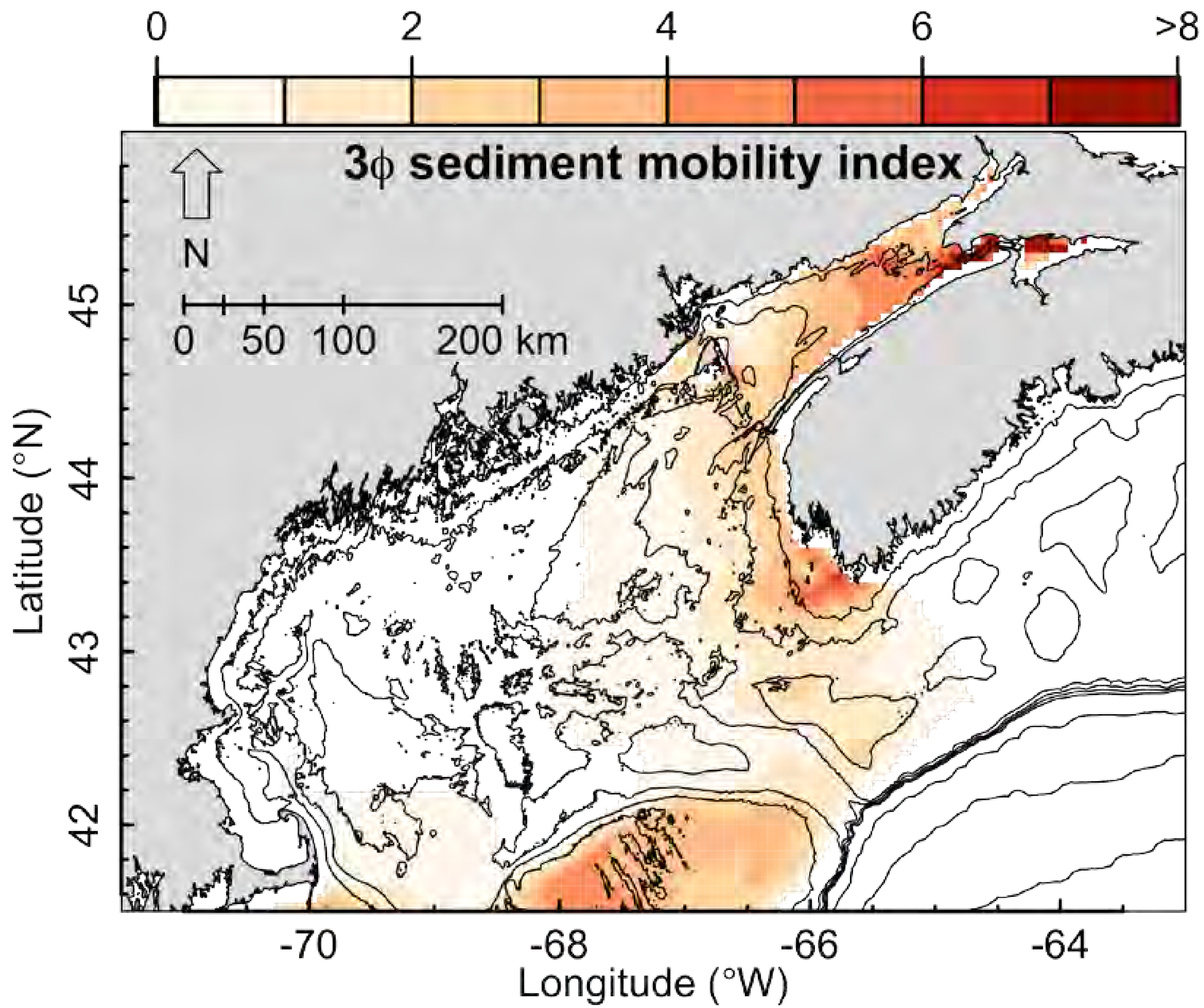

Figure 7. Map the sediment mobility index (SMI) for 3ϕ (125-lm) sand. The SMI is the average ratio of seabed stress to critical erosion shear stress during times when the critical erosion shear stress is exceeded, multiplied by the fraction of time that the critical erosion shear stress is exceeded. It is a measure of both the frequency and magnitude of sediment transport The 3ϕ SMI is generally large in regions of large shear stresses. An exception occurs on the northwestern margin of the Bay of Fundy where it joins the Gulf of Maine. In this region, maximum stresses are high, but SMIs are low. This discrepancy indicates that the modeled peak maximum shear stresses during spring tides were much greater than the typical semidiurnal maximum shear stresses during the 30-d model run. The SMI is very low or zero in the basins of the Gulf of Maine, indicating that the 3ϕ critical erosion shear stress is seldom or never exceeded in these regions during the 30-d model run.

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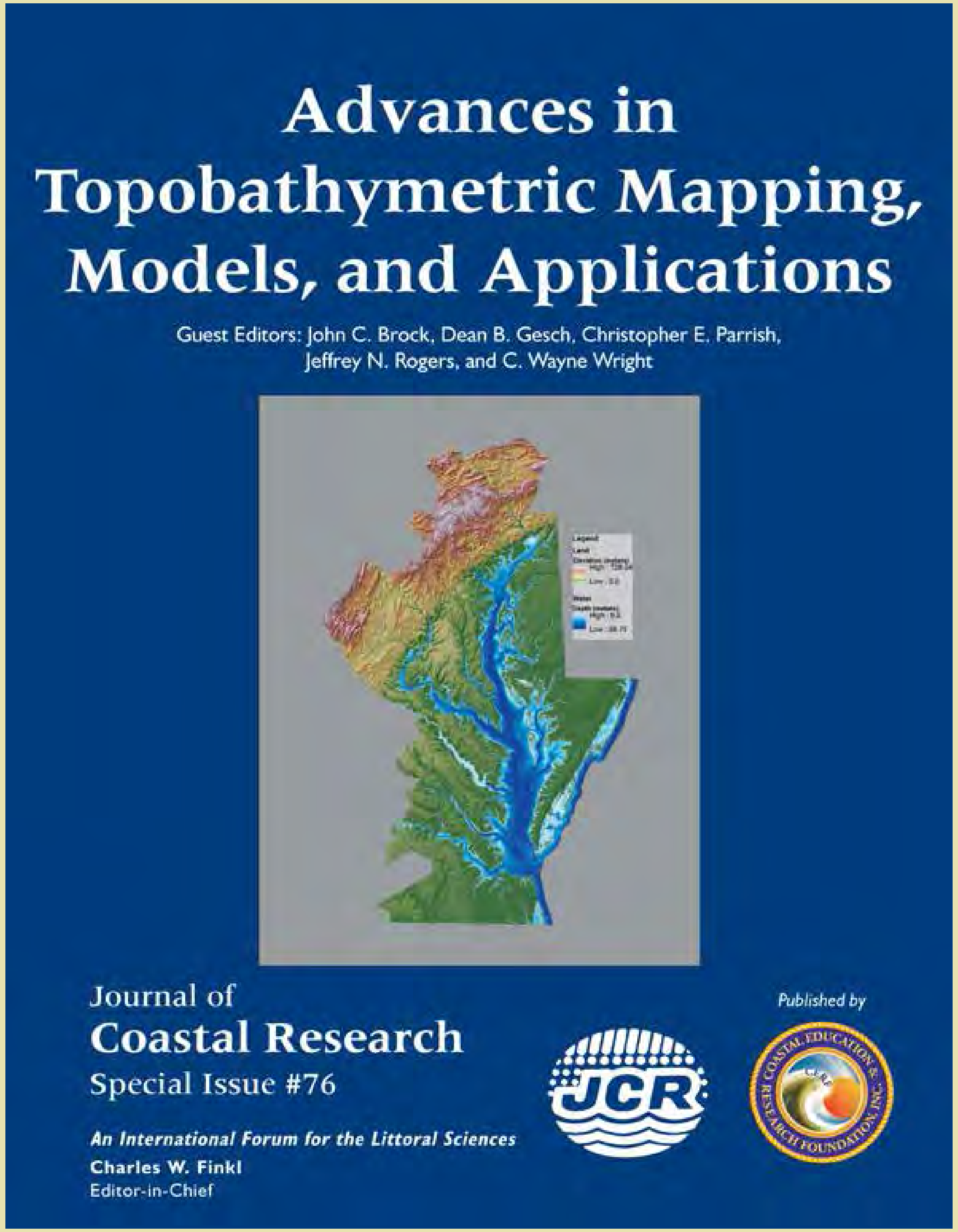

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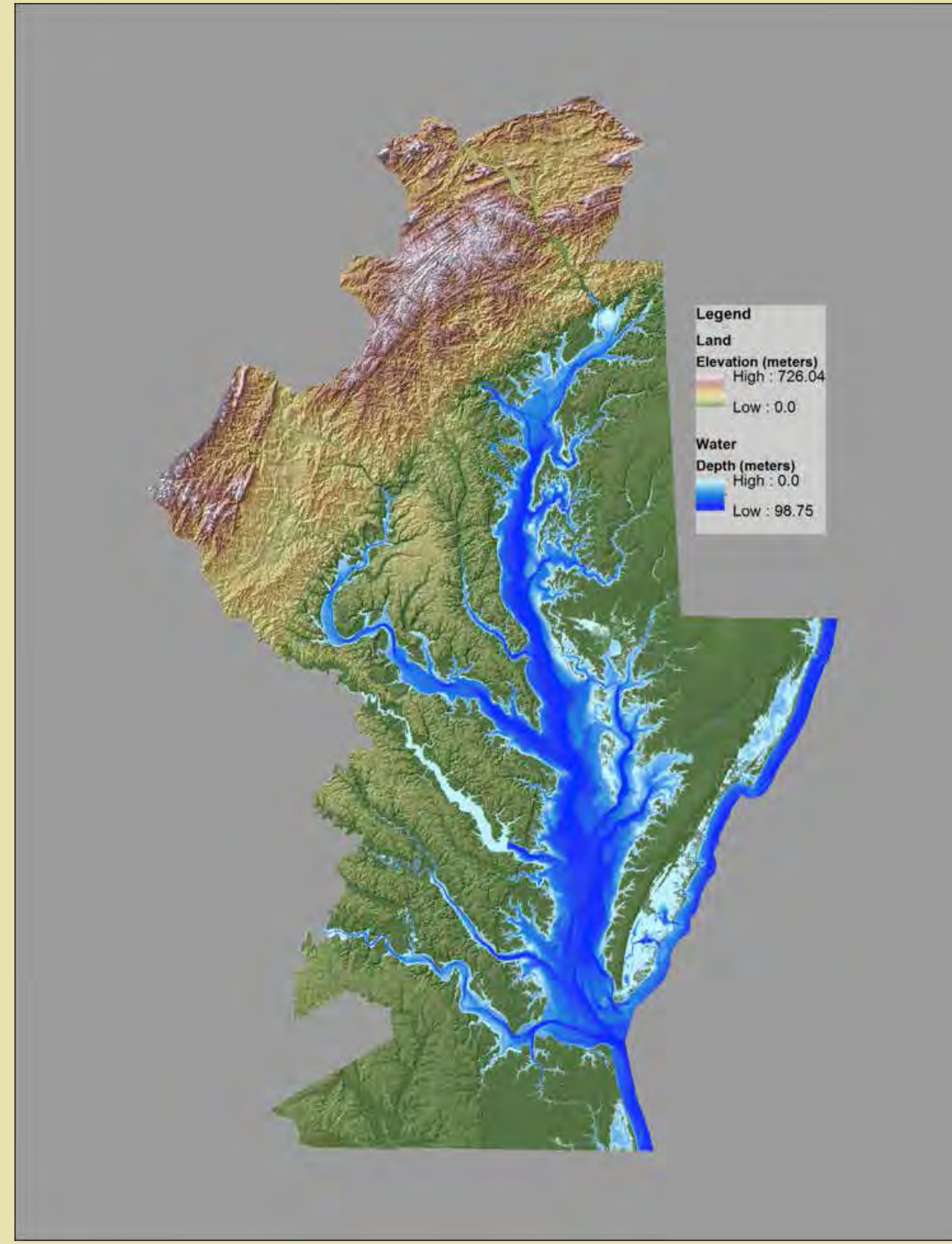
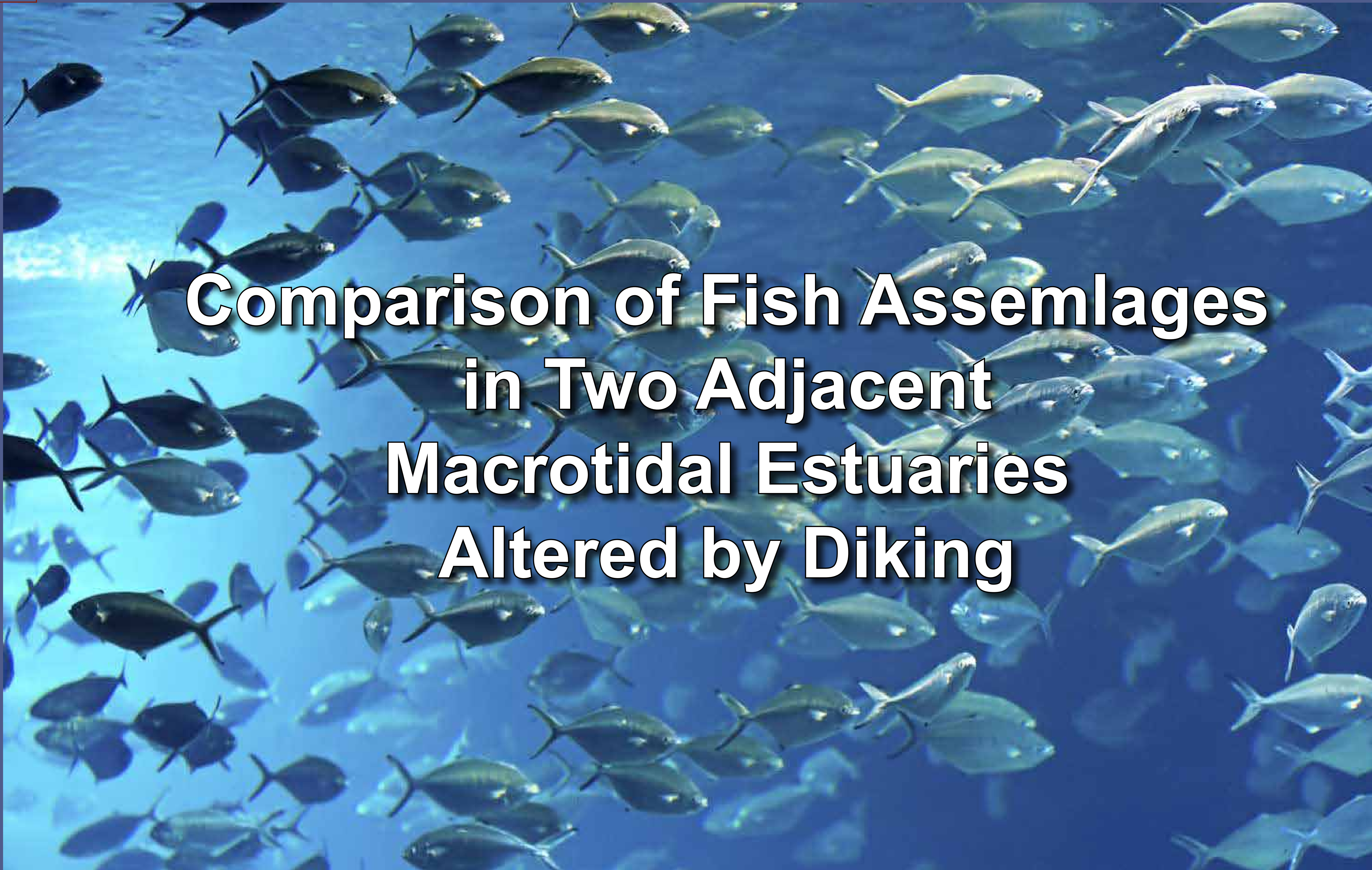


Cover image: Topographic-bathymetric digital elevation model (TBDEM) of a portion of the Chesapeake Bay watershed and adjacent areas along the Atlantic coast in the eastern United States. This dataset was developed by the U.S. Geological Survey (USGS) Coastal National Elevation Database (CoNED) project as part of an ongoing effort to improve elevation information for U.S. coastal regions. For further information and data access, please visit the CoNED web site: http://topotools.cr.usgs.gov/coned/. (Image produced by D. Tyler, USGS.)

Comparison of Fish Assemlages in Two Adjacent Macrotidal Estuaries Altered by Diking



Comparison of Fish Assemblages in Two Adjacent Macrotidal Estuaries Altered by Diking

Sun-Wan Hwang[†‡], Keun-Hyung Choi[§], and Sun-Do Hwang[††]

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ABSTRACT

This study characterized fish species composition and assemblage structure of two adjacent macrotidal estuaries that had been altered by diking. From February to December 2004, monthly fish samples were collected from the Geum River and Mangyeong River estuaries using stow nets. Coastal migrant fish and brackish-water fish represented 95.5% of species. Interestuary species composition similarity was relatively low between estuarine habitats (36.4%). The proportion of brackish-water fish was significantly higher in the Mangyeong River estuary (MRE) than in the Geum River estuary (GRE). This result may reflect the variability in the fish community associated with diking, which may have affected fish migration pathways. In the GRE, the estuary dike might have limited the access of brackish-water fish to brackish water. In contrast, in the MRE, it appears that movement of coastal migrant fish toward brackish waters was restricted by diking the estuary. The present study provides useful information for safeguarding the sustainability of estuarine ecosystems.

ADDITIONAL INDEX WORDS: *Estuarine fish, ecological guild, estuarine ecosystem, nonmetric multidimensional scaling, anthropogenic activity.*

INTRODUCTION

Estuaries are important habitats for fish, providing nursery grounds, foraging grounds, and migration routes (Day *et al.*, 1989; Fujita *et al.*, 2002; Hwang *et al.*, 2011). Having characteristics of both seawater and freshwater ecosystems, estuarine environments support high productivity and diversity of fauna (Cowley and Whitfield, 2002; Day *et al.*, 1989). Communities of marine, estuarine, riverine, and diadromous fish (*i.e.* catadromous, anadromous, and amphidromous fish), including many juveniles (Day *et al.*, 1989; Elliott and Dewailly, 1995; Hwang *et al.*, 2011), inhabit estuarine ecosystems. However, on the basis of their position within drainage basins, estuarine habitats are frequently disrupted by human activity, and therefore are among the most degraded habitats in the world (Blaber *et al.*, 2000).

Estuarine ecosystems are extremely dynamic and sensitive to human disruption; fish composition and assemblage structures are commonly affected by fluctuations in freshwater flow resulting from seasonal variation, droughts, upstream water extraction, and dike construction (Bauchbaum and Powell, 2008; Gillanders and Kingsford, 2002; Lee, Hwang, and Hwang, 2007; Lotze *et al.*, 2006). Variations in the scale, frequency, and seasonality of freshwater flows have profound effects, particularly on fish species that require flood pulses for successful breeding or survival in early larval stages (Drink-water and Frank, 1994; Ferguson, Ward, and Geddes, 2008). Therefore, restriction of upstream and downstream migration can reduce the abundance of diadromous fish species and can affect fish communities overall (Drinkwater and Frank, 1994; Ferguson, Ward, and Geddes, 2008; Hwang *et al.*, 2015).

In 1991, the Saemangeum reclamation project was launched with the commencement of the construction of the Saeman-geum dike (33 km in length) in the lower reach of the Mangyeong River estuary (MRE) as a national proj-

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ect of the Republic of Korea (Figure 1). The dike, which was completed in 2006, allows partial exchange of seawater only through gates, and has radically changed the brackish water environment inside the dike as well as the seawater environment outside the dike. After enclosure of the estuary by the dike, ecological events such as red tides, hypoxia, and coastal erosion/deposition have occurred repeatedly (Lie *et al.*, 2008), and the composition of the fish community inside the dike, as assessed by otter trawls, has become less diverse (Lee, Hwang, and Hwang, 2007).

Meanwhile, a dike was constructed in 1994 in the upper region of the Geum River estuary (GRE), located adjacent to the MRE. This dike blocked tidal propagation and intrusion of seawater upstream, changing the estuary from a well-mixed estuary to a partially mixed salt-wedge estuary (Lee *et al.*, 1999). After the construction of the dike, the maximum speed of the tidal current decreased by 30–40% of its natural level, and salinity generally increased in the lower region of the estuary, except during periods of freshwater discharge through the floodgates (Kwon, Kim, and Ko, 2001). Freshwater is episodically discharged during ebb tides, to control the freshwater level, and a large amount of freshwater is discharged during the rainy season (Lee *et al.*, 1999).

Although the GRE and MRE were disrupted by anthropogenic activity, comparisons of fish assemblages between the estuaries had not been made with respect to the effects of the dikes, even though fish communities had been examined for each estuary (Hwang *et al.*, 2005, 2011; Lee, Hwang, and Hwang, 2007).

The present study explored the differences of fish assemblages in the two adjacent macrotidal estuaries: the Geum River, in which the estuary was completely diked, and the Mangyeong River, in which the estuary was partially diked. Qualitative and quantitative data were collected and compared to determine whether dikes affect the composition and structure of fish assemblages in the estuarine ecosystems.

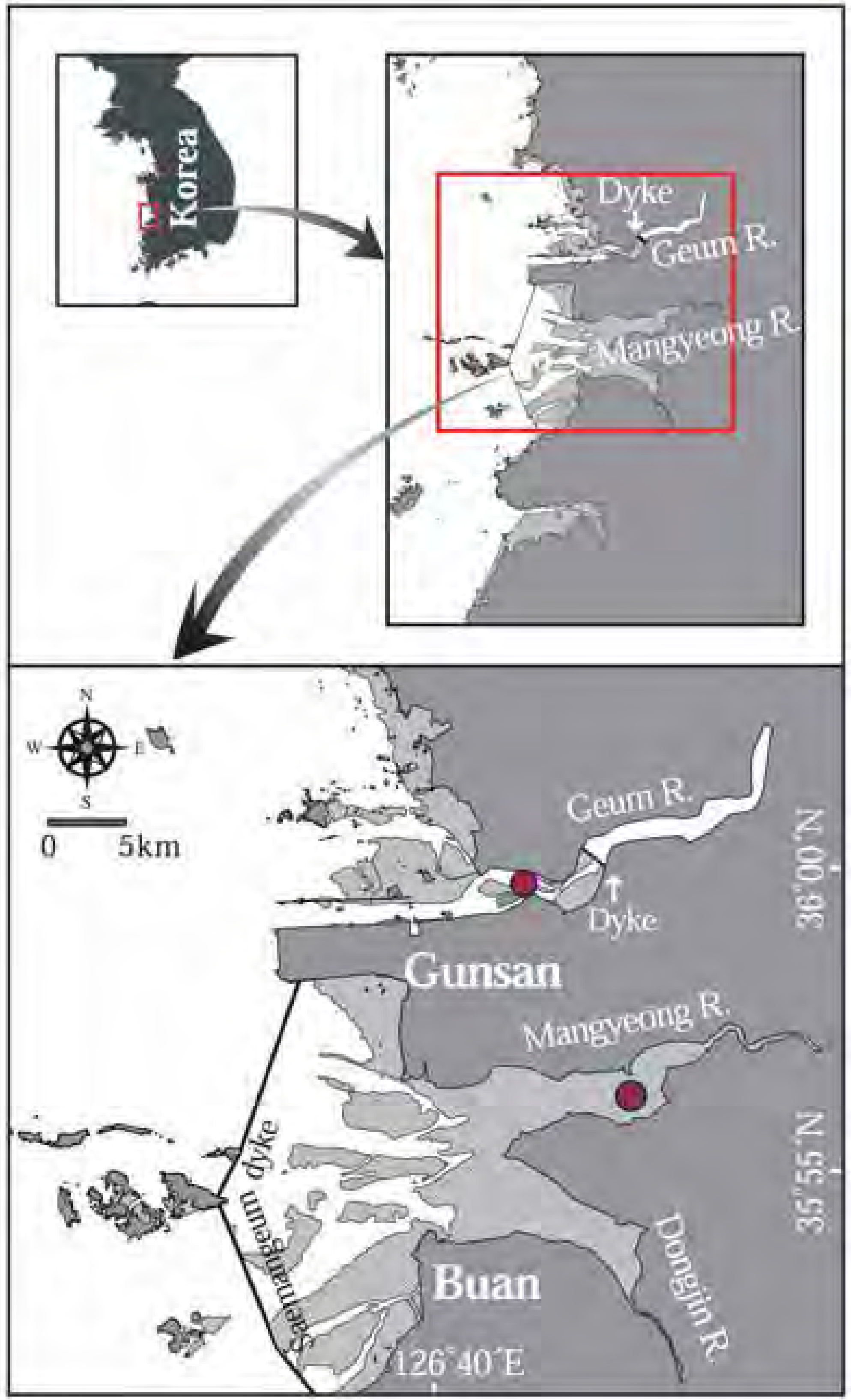

Figure 1. Map showing the region of the present study with sampling sites for fish in the estuaries of the Geum River and the Mangyeong River on the midwest coast of the Republic of Korea. Circles represent the sampling sites. Lightly shaded areas represent tidal flats.

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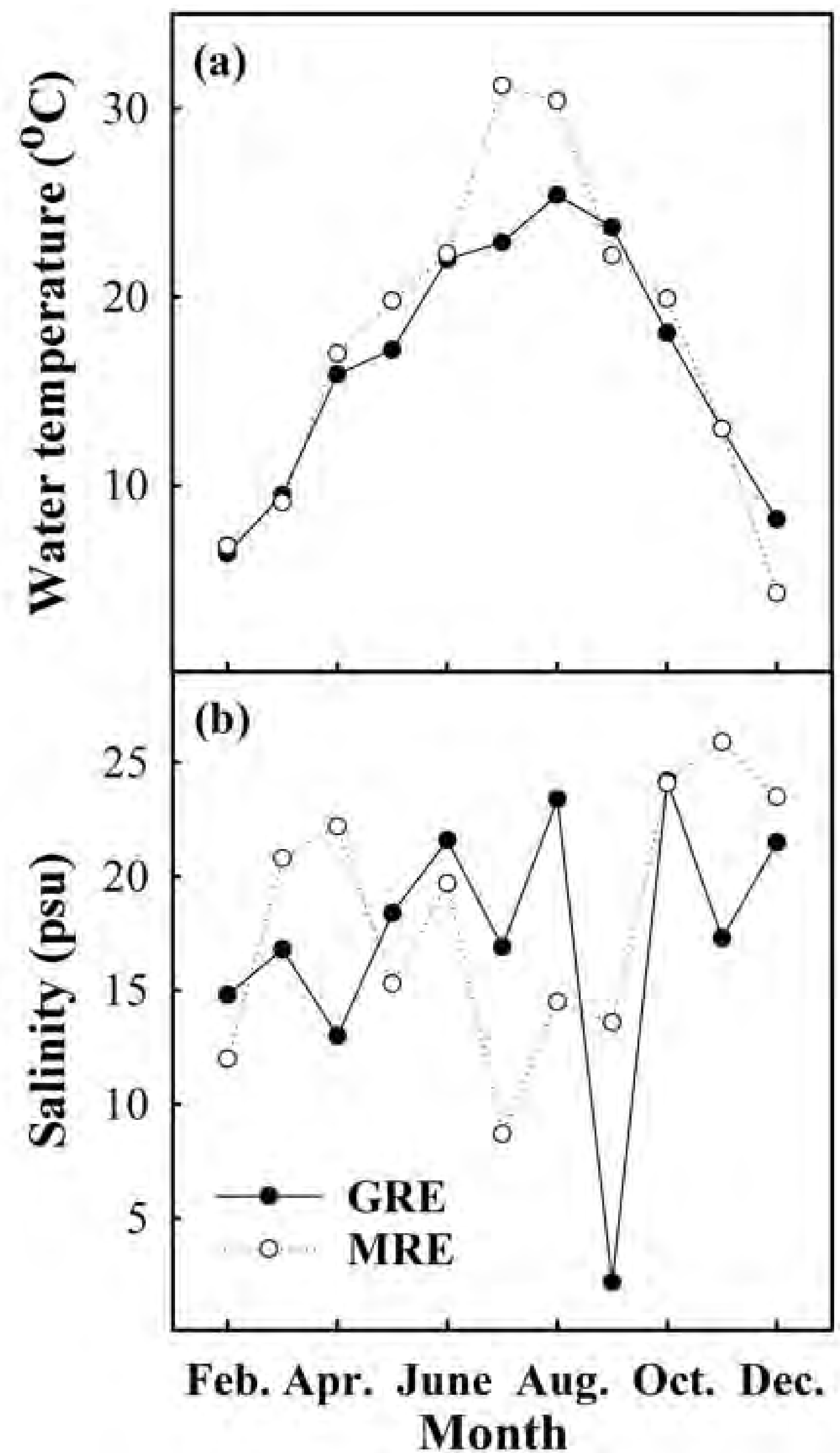

Figure 2. Temporal variations in (a) surface water temperature and (b) salinity in the estuarine habitats of the Geum River and the Mangyeong River on the midwest coast of the Republic of Korea, from February to December 2004. GRE and MRE represent the Geum River estuary and Mangyeong River estuary, respectively.

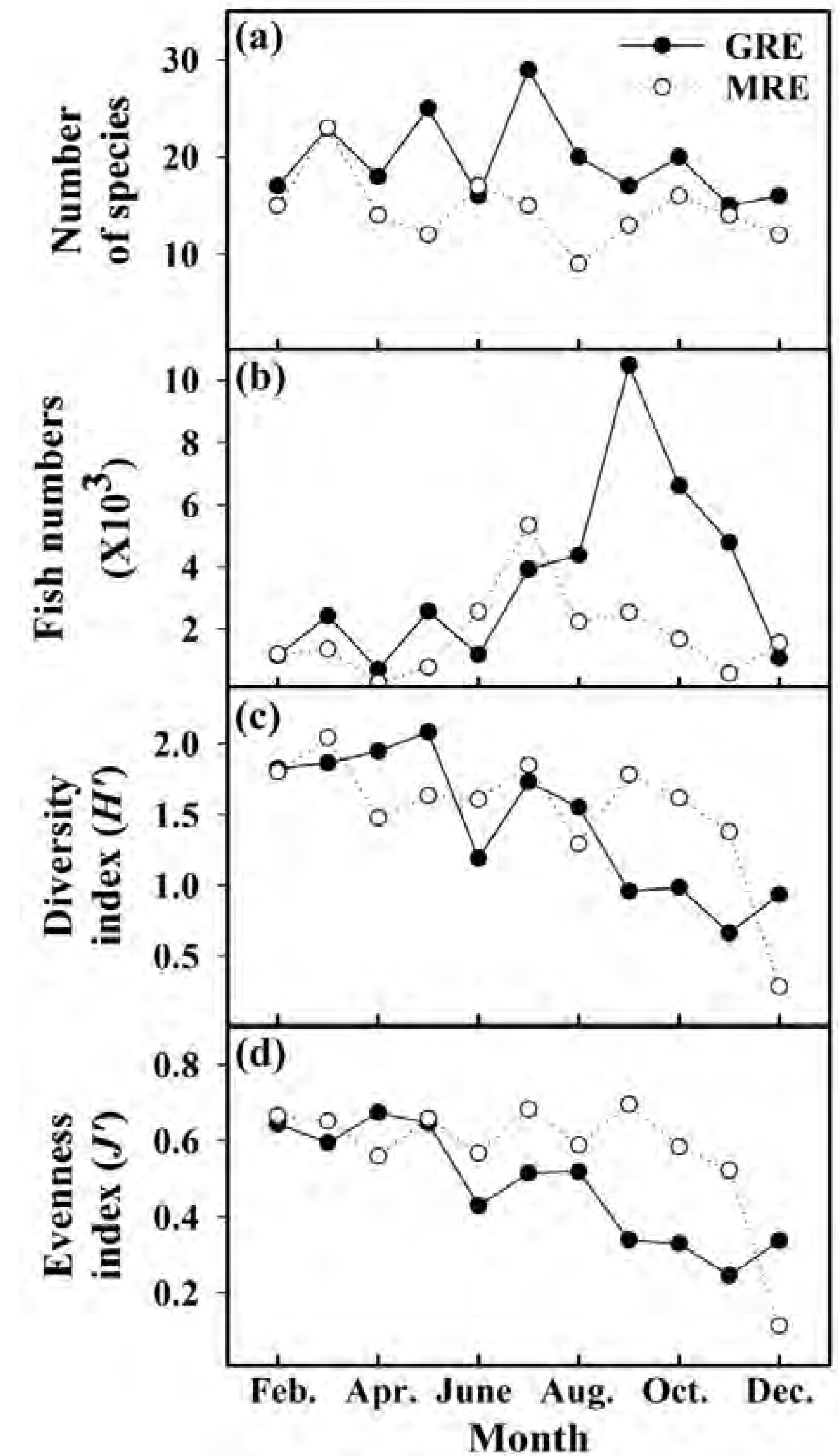

Figure 3. Monthly variations in (a) number of species, (b) number of individuals, (c) the diversity index (*H*'), and (d) the evenness index (*J*') of fish collected with stow nets in the estuaries of the Geum River and the Mangyeong River on the mid-west coast of the Republic of Korea, from February to December 2004. GRE and MRE represent the Geum River estuary and Mangyeong River estuary, respectively.

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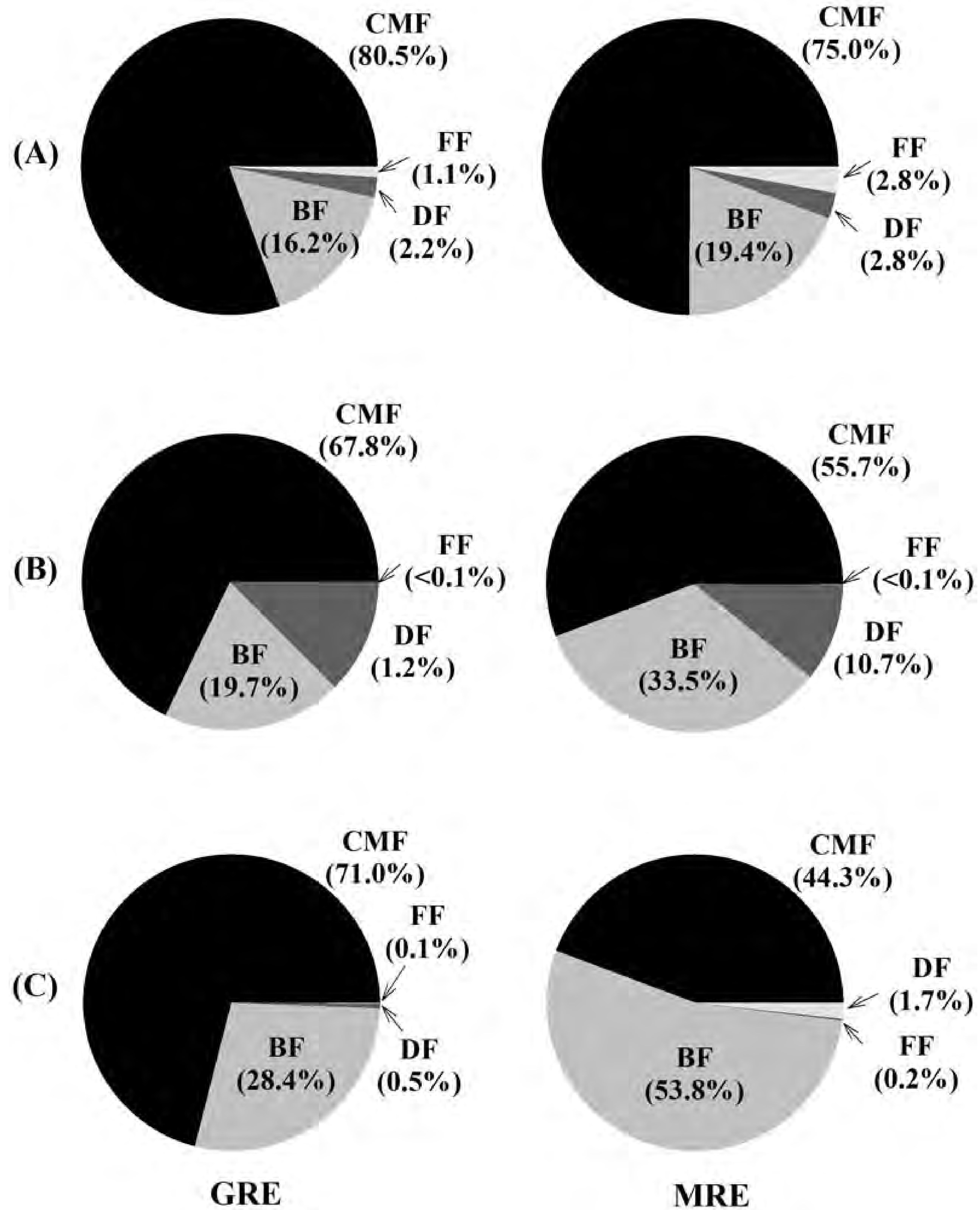

Figure 4. Comparison of the percentage of coastal migratory fish (CMF), brackish-water fish (BF), diadromous fish (DF), and freshwater fish (FF) among fish sampled in the estuarine habitats of the Geum River and the Mangyeong on the midwest coast of the Republic of Korea, from February to December 2004 by number of species (A), number of individuals (B), and biomass (C).

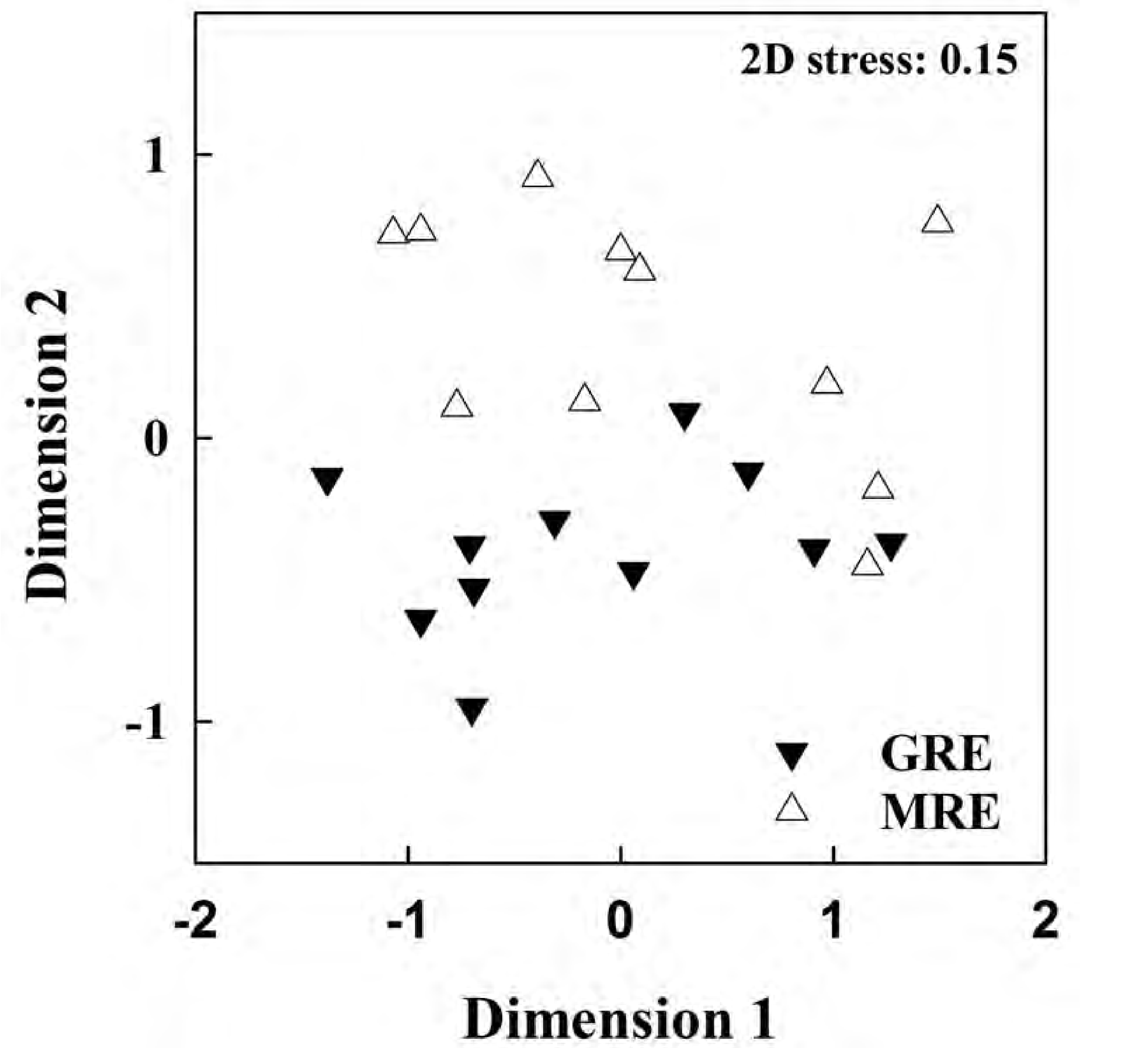

Figure 5. Nonmetric multidimensional scaling (NMDS) ordination plots displaying samples by habitat. The NMDS was based on Bray-Curtis similarity estimates between pairs calculated from the fourth root-transformed abundance data. Axes are rank order and thus unscaled. Juxtaposition, but not distance, between samples is an indication of similarity, based on species composition of the samples. GRE and MRE represent the Geum River estuary and Mangyeong River estuary, respectively.

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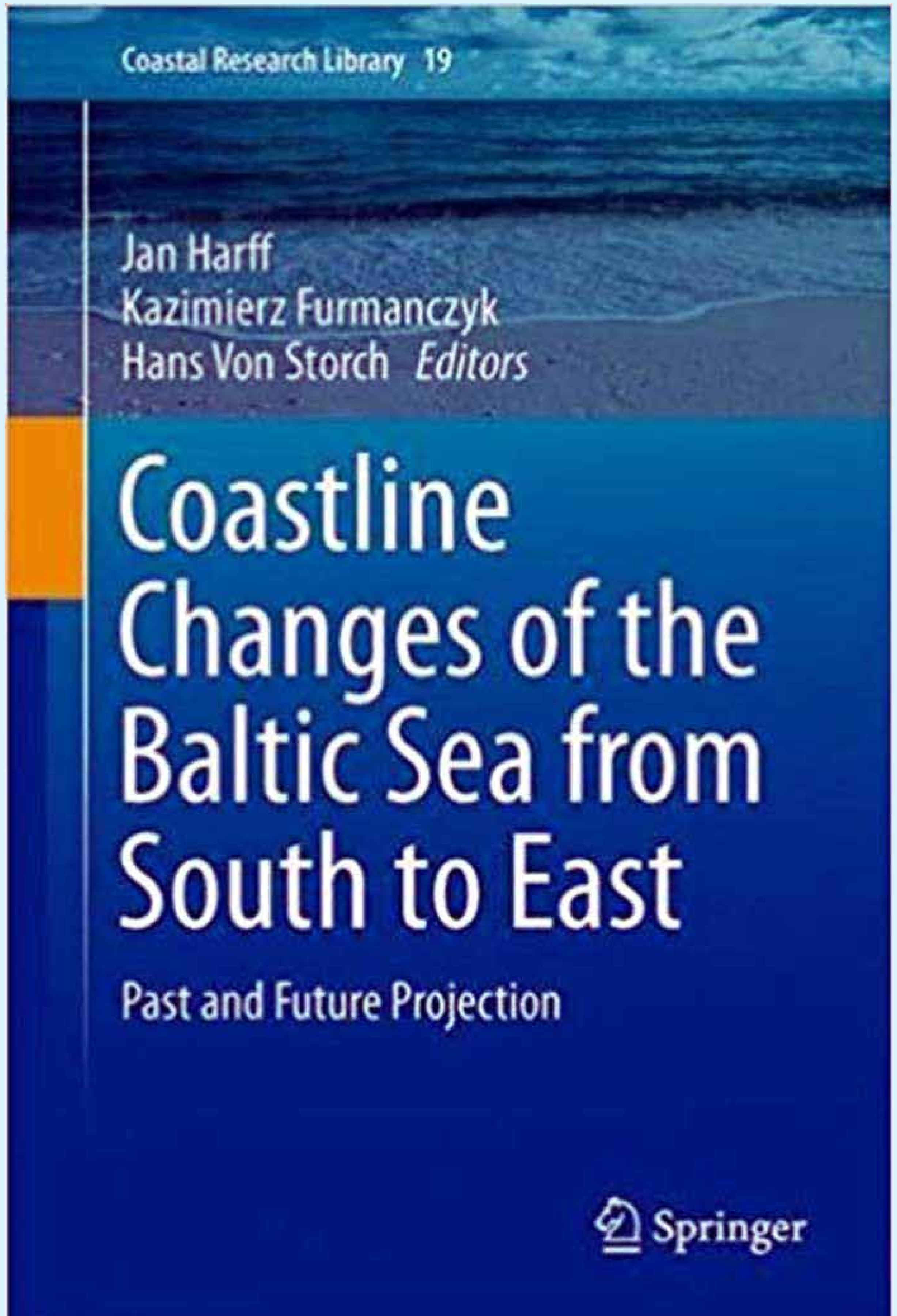

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This anthology comprises the results of the research project "Coastline Changes of the southern Baltic Sea – Past and future projection (CoPaF)" funded by the Polish Ministry of Science and Higher Education, which was run by a team of Estonian, German, and Polish geoscientists and coastal engineers from 2010 to 2013 and overlapped with and complemented the work of COST Action SPLASHCOS supported by COST (European Cooperation in Science and Technology). As the southern and eastern Baltic serves as a natural laboratory for the investigation of coastal processes, the project's findings contribute not only to the solution of regional problems in Baltic coastal research and engineering, but also to worldwide interests in description, modeling and parameterization of coastal processes and morphodynamics.

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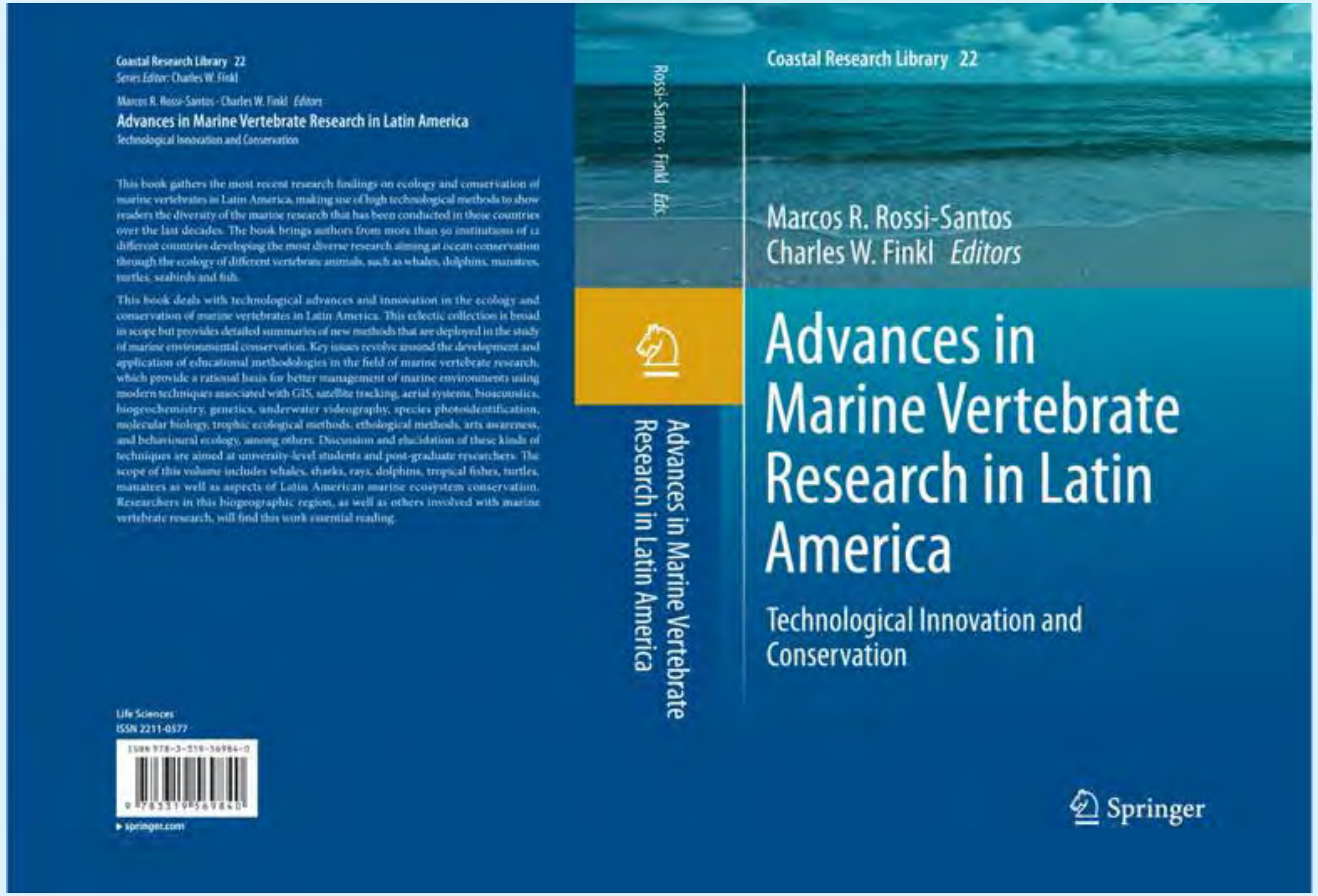

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This book also deals with technological advances and innovation in the ecology and conservation of marine vertebrates in Latin America. This eclectic collection is broad in scope but provides detailed summaries of new methods that are deployed in the study of marine environmental conservation. Key issues revolve around the development and application of educational methodologies in the field of marine vertebrate research, which provide a rational basis for better management of marine environments, as well as using modern techniques associated with GIS, satellite tracking, aerial systems, bioacoustics, biogeochemistry, genetics, underwater videography, species photoidentification, molecular biology, trophic ecological methods, ethological methods, and behavioural ecology. Discussion and elucidation of these kinds of techniques are aimed at university-level students and post-graduate researchers. Researchers in this biogeographic region, as well as others involved with marine vertebrate research, will find this work essential reading.

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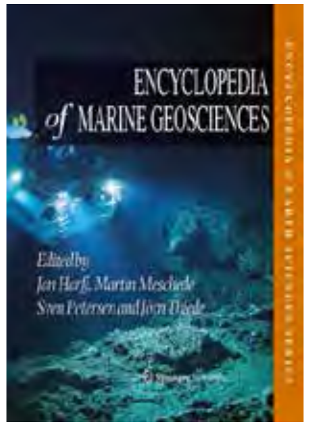

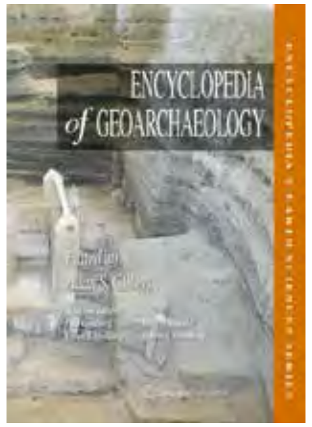

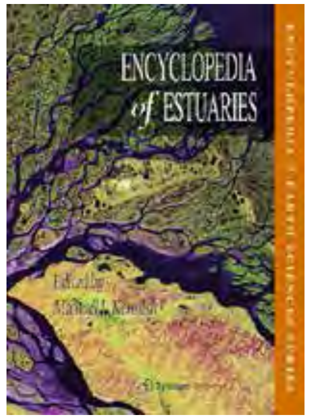

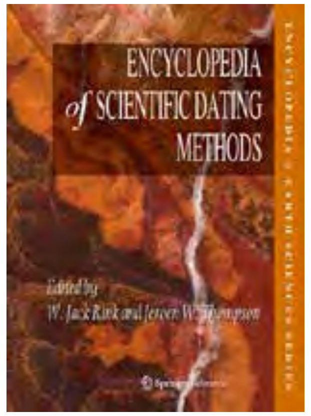

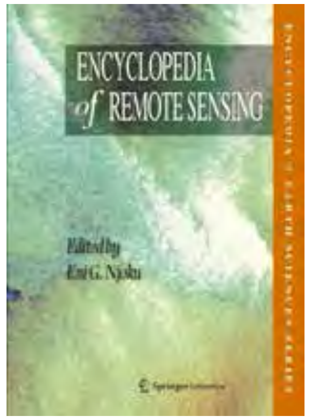

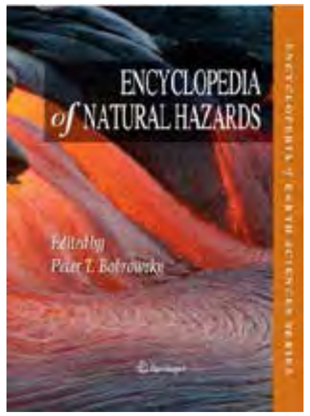

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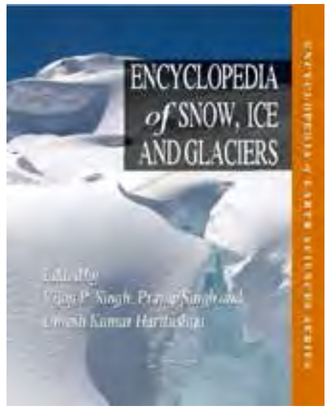

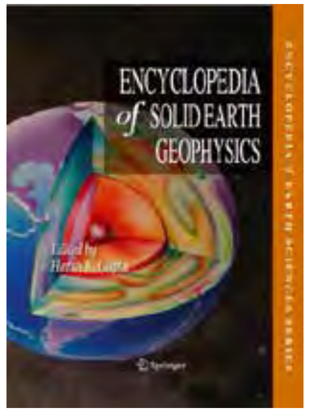

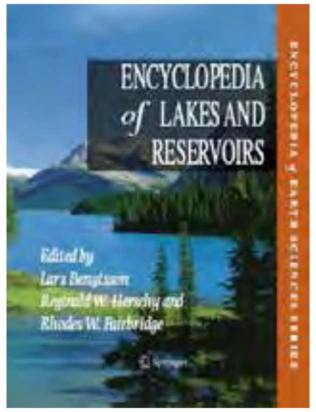

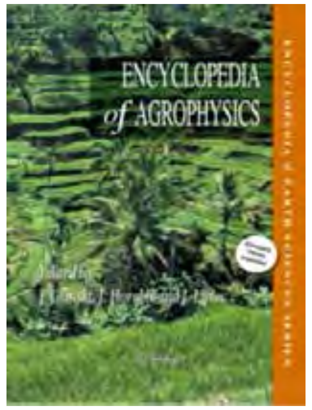

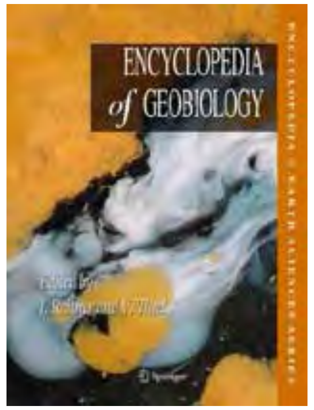

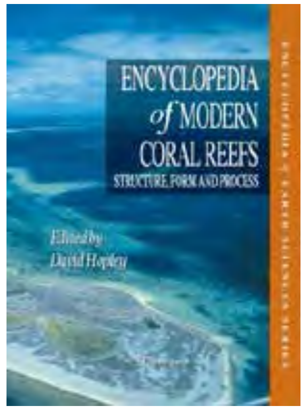

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Numerical Simulation of Louisiana Shelf Circulation under Hurricane Katrina

Numerical Simulation of Louisiana Shelf Circulation under Hurricane Katrina

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ABSTRACT

The response of currents on the Louisiana shelf to Hurricane Katrina was studied using the 3-D Finite Volume Community Ocean Model (FVCOM). The study area encompassed the Louisiana shelf covering both sides of the Mississippi River's Birdsfoot Delta. The model was forced by a wind field prepared by combining the Hurricane Research Division Wind Analysis System data for the hurricane with background winds outside of the hurricane's influence from National Centers for Environmental Prediction (NCEP)/North American Regional Reanalysis (NARR). Current and water-level data recorded at Wave-Current-Surge Information System (WAVCIS) stations over the inner shelf provided a unique opportunity to examine shelf hydrodynamics in response to Katrina. Model performance was evaluated by examining water-column stratification under different scenarios and using a range of parameters of the Mellor-Yamada level 2.5 turbulence closures for vertical eddy viscosity. This resulted in a set of appropriate closure parameters for the response of a shallow shelf to a hurricane. Simulated near-surface currents followed the overall pattern of hurricane wind structure over the outer shelf and to some extent over the inner shelf; however, currents over the shallow Louisiana shelf were affected by coastal geometry. Investigation of bottom currents showed a possible baroclinic response over both the inner and outer shelves. Over the Louisiana shelf, this was similar to the baroclinic response of stratified shallow waters for regions outside of the radius of maximum wind (R_{mw}), as identified in previous studies. A part of this baroclinic response can be explained by the horizontal baroclinic pressure gradient that resulted from the inhomogeneous hurricane-induced surface cooling.

ADDITIONAL INDEX WORDS: *Hydrodynamics, baroclinic, barotropic, stratification, FVCOM.*

INTRODUCTION

The energetics of hurricanes tremendously affects ocean/shelf water and produces large waves, storm surges, and enhanced current velocities. Waves generated by hurricanes can damage offshore structures (such as oil rigs) and coastal facilities (Cooper and Thompson, 1989a). Large hurricane storm surges are a serious threat to coastal areas and people's lives, especially in the vicinity of the hurricane's landfall (Chen, Wang, and Zhao, 2009). Hurricane-induced currents and waves may cause significant coastal erosion and redistribution of sediments, as well as significant sediment transport in coastal waters and on the continental shelf. Furthermore, strong horizontal velocity shear along with large waves can mix the water column and break down the stratification. This can have a significant impact on biogeochemical processes and dissolved oxygen concentration in the water column (Allahdadi, Jose, and Patin, 2013; Chaichitehrani, 2012; Chaichitehrani *et al.*, 2014; Tehrani *et al.*, 2013; Wiseman *et al.*, 1997). Hence, the understanding of hydrodynamics induced by a hurricane is vital for studying coastal erosion and water quality on the continental shelf.

Many studies have examined the hydrodynamic response to hurricanes in the northern Gulf of Mexico. Some studies focused on hurricane storm surges and wave field (Cardone, Cox, and Forristall, 2007; Rego and Li, 2009, 2010; Siadatmou-savi *et al.*, 2012). Currents and sediment transport induced by hurricanes in the northern Gulf of Mexico have been addressed by several

Continued on Next Page

studies based on both observations and numerical simulations (for example, Cooper and Thompson, 1989a,b; Keen and Glenn, 1999; Ly, 1994; Miner *et al.*, 2009; Mitchell *et al.*, 2005; Teague *et al.*, 2007; Xu *et al.*, 2016). Ly (1994) studied water levels and currents induced by Hurricane Frederic using a 3-D finite-difference ocean model with a sigma coordinate in the vertical. Hurricane Frederic made its landfall at Dauphin Island, Alabama, on 12 September 1979, producing currents of up to 2 m/s as well as inertial motions on the shelf in the northern Gulf of Mexico. Hurricane Ivan passed over an array of 14 acoustic Doppler current profilers (ADCPs) deployed at the edge of the continental shelf off Mobile, Alabama, in September 2004, which provided a unique opportunity to study the response of inner- and outer-shelf water in this area to a hurricane. Mitchell *et al.* (2005) and Teague *et al.* (2007) analyzed time series data for water level and current velocity and found that the outer-shelf response to the hurricane followed the same four stages suggested by Pedlosky (1979) and Price, Sanford, and Forristall (1994). These stages are defined by the magnitude and direction of hurricane wind and are functions of both the hurricane eye's location on the shelf and the radius of maximum wind (Mitchell *et al.*, 2005). On the edge of the shelf, the largest currents were recorded by the current meters to the left of the hurricane's eye, while on the outer shelf, the largest current was measured to the right of the hurricane track. The large near-bottom currents caused substantial scours at a depth of 90 m below the surface.

Hurricane Katrina was one of the most devastating hurricanes in U.S. history with respect to the damage it caused. Starting as a tropical depression over the Bahamas on 23 August 2005 (Knabb, Rhome, and Brown, 2005), Katrina upgraded to a Category 5 hurricane on 28 August after passing over warm waters associated with the Loop Current (Shen *et al.*, 2006). The hurricane degraded as it approached the Louisiana shelf. In the morning (GMT time) of 29 August, as a Category 3 hurricane, Katrina made its first landfall in the northern Gulf of Mexico between Grand Isle, Louisiana, and the Mississippi River mouth. Figure 1 shows the track of Hurricane Katrina as it traveled in the northern Gulf of Mexico.

Several modeling studies focused on the effect of storm surges and waves generated by Katrina (Cardone, Cox, and Forristall, 2007; Chen, Wang, and Tawes, 2008; Chen, Wang, and Zhao, 2009; Dietrich *et al.*, 2011; Wang and Oey, 2008); however, few studies focused on circulation. A modeling study of Katrina's current hydrodynamics was implemented by Wang and Oey (2008) using the Princeton Ocean Model. They found that, as a result of the high forward speed of Katrina, the inertial amplitudes of currents were much larger on the right side of the storm compared with the left side. The study, however, presented a general feature of Katrina's induced currents in the Gulf of Mexico, and the main focus was not on the Louisiana shelf and shallow-water effects. Cardone, Cox, and Forristall (2007) carried out another modeling study using the Advanced Circulation Model (ADCIRC)-2D model for simulating currents in the Gulf of Mexico during Katrina. Although the study shed some light on the general circulation produced by Katrina in the gulf, no specific information on the circulation of the inner Louisiana shelf was presented, similar to the study of Wang and Oey (2008).

In the present paper, the 3-D Finite Volume Community Ocean Model (FVCOM) was used to study the hydrodynamics of Hurricane Katrina, focusing on the current velocity structure and characteristics induced by the hurricane over the Louisiana shelf. Compared with previous studies, the present study benefits from a flexible computational mesh, a main focus on the Louisiana shelf, and evaluation of model ability using several water level and current measurements over the inner shallow shelf.

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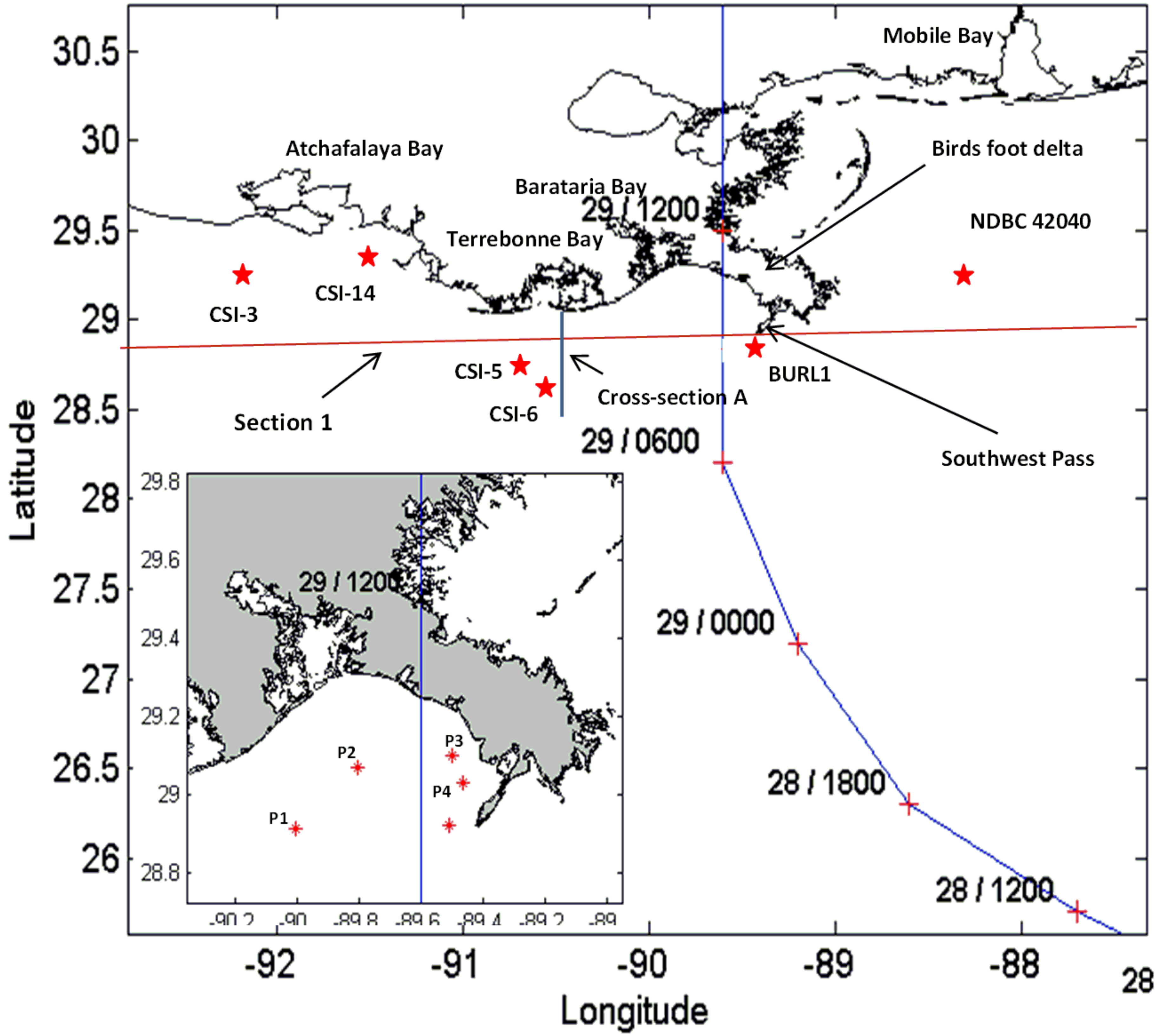

Figure 1. Track of Hurricane Katrina in the northern Gulf of Mexico at different dates and times. Asterisks show the locations of wind and current measurement stations, where simulated time series of current and water level are also presented. Locations of E-W cross section (Section 1) and N-S cross section (Cross section A), for which temperature profiles are presented in Figures 13 and 14, are shown by solid lines.

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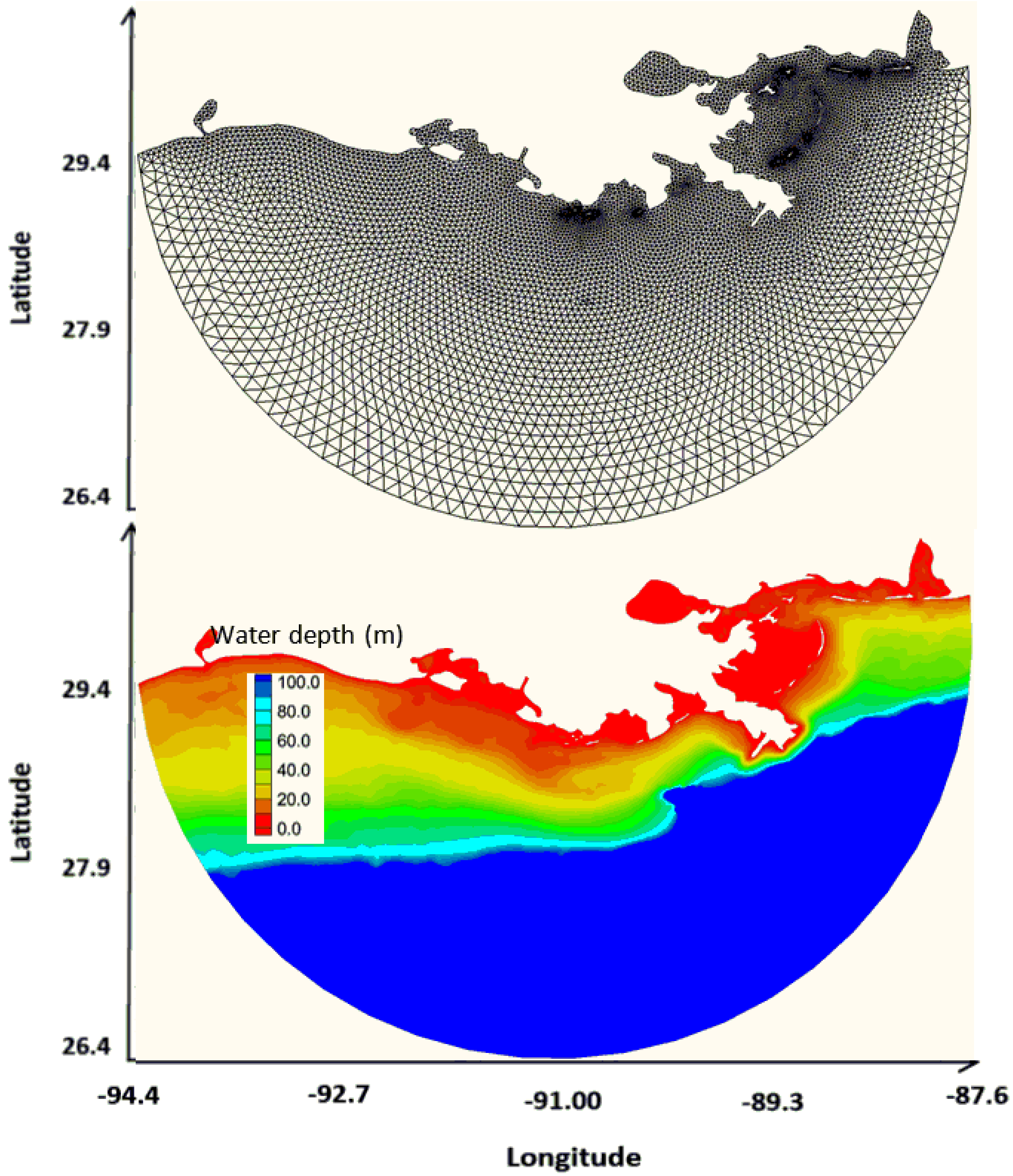

Figure 2. Computational mesh (upper panel); model bathymetry (lower panel).

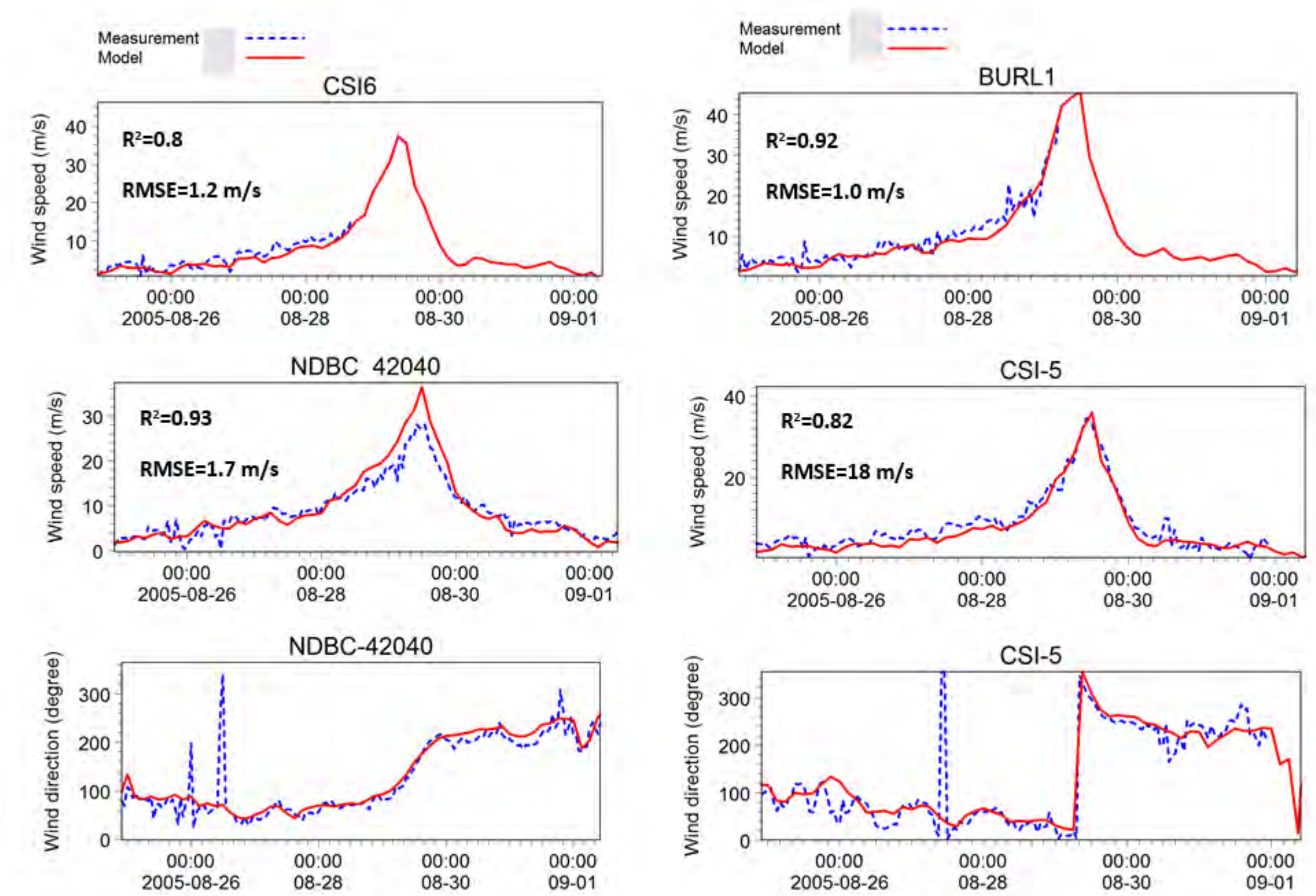

Figure 3. Comparison between the wind data obtained by blending H-WIND and NCEP/NARR and measured wind speeds and directions over the Louisiana shelf.

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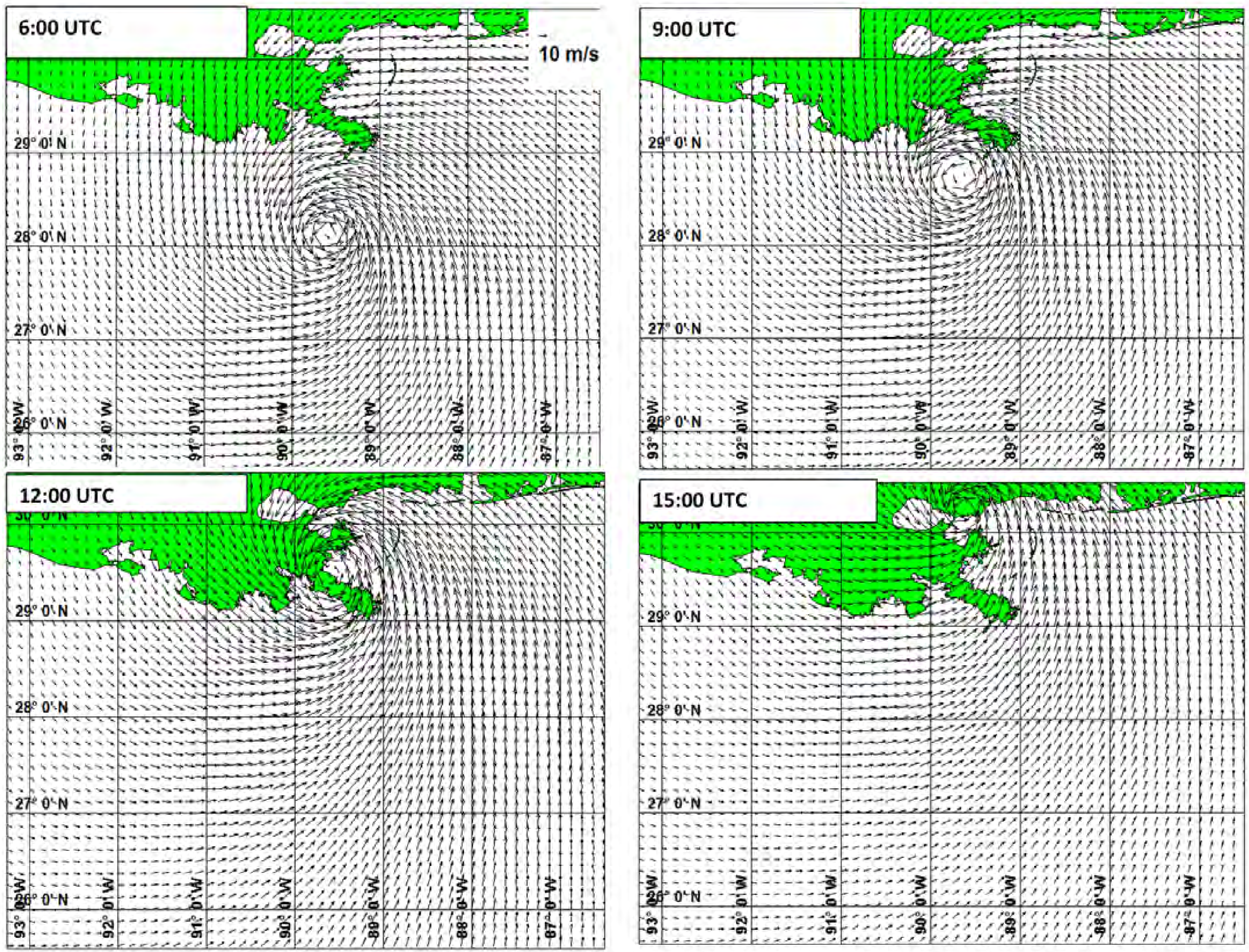

Figure 4. Katrina's wind field over the Louisiana shelf on 29 August 2005, used for hydrodynamics simulation at different times.

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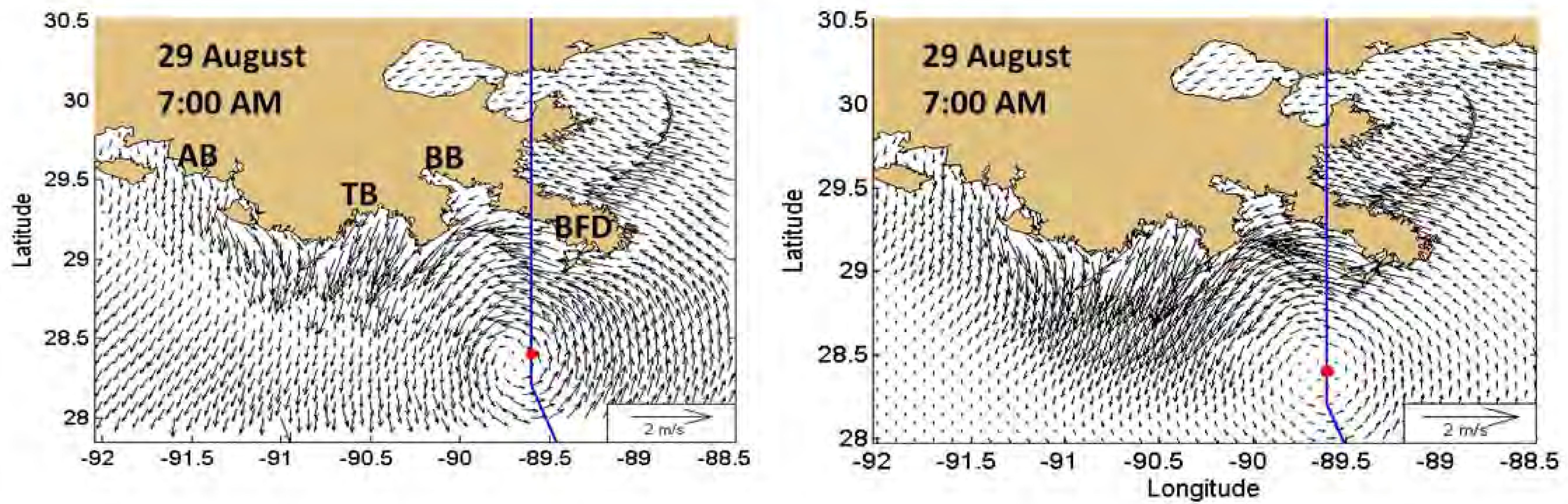

Figure 5. Sample simulated currents for the prestratified (left) and unstratified (right) water column.

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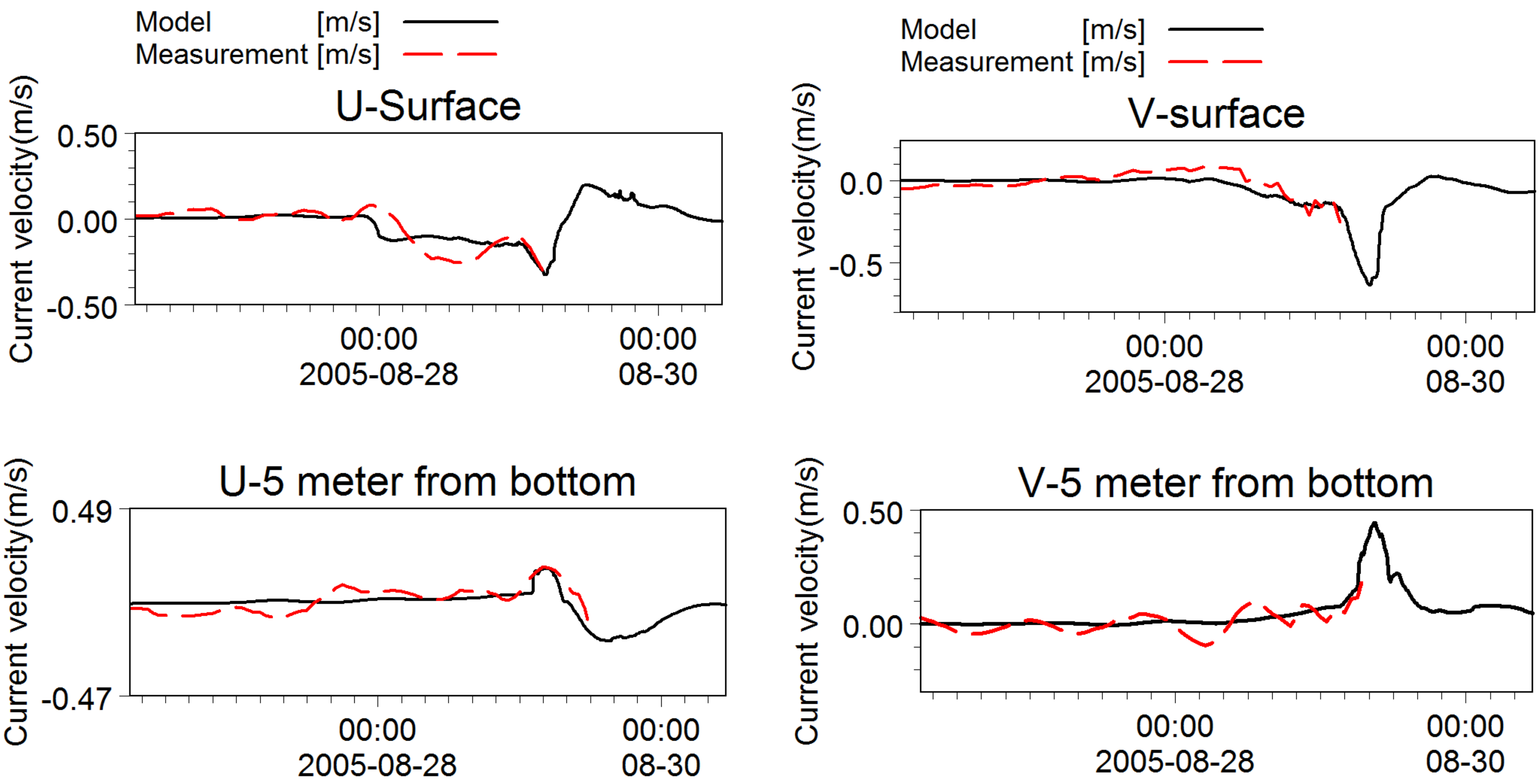

Figure 6. Comparison between simulated and measured currents at CSI-6.

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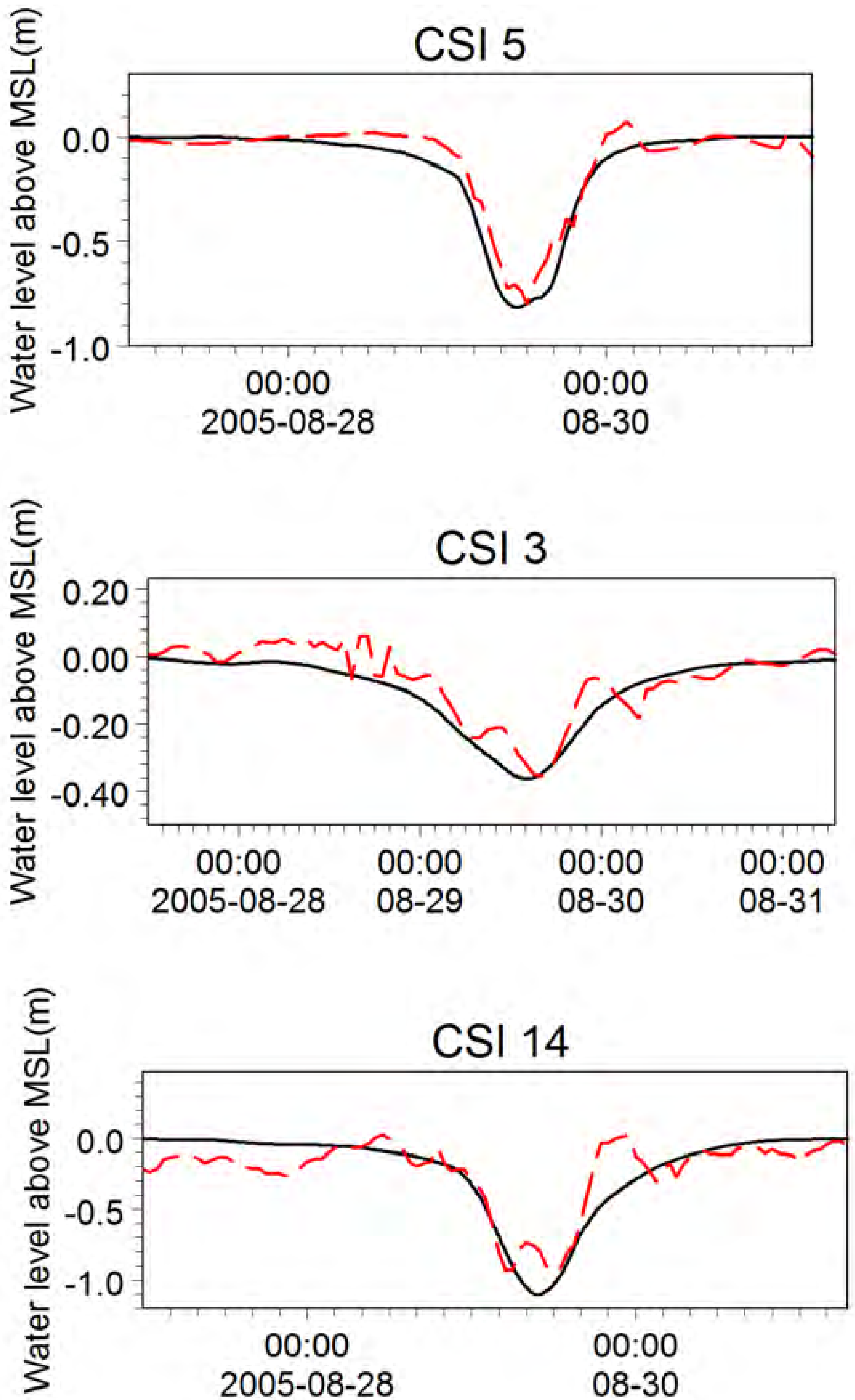

Figure 7. Comparison between measured and simulated water levels at different stations over the shelf.

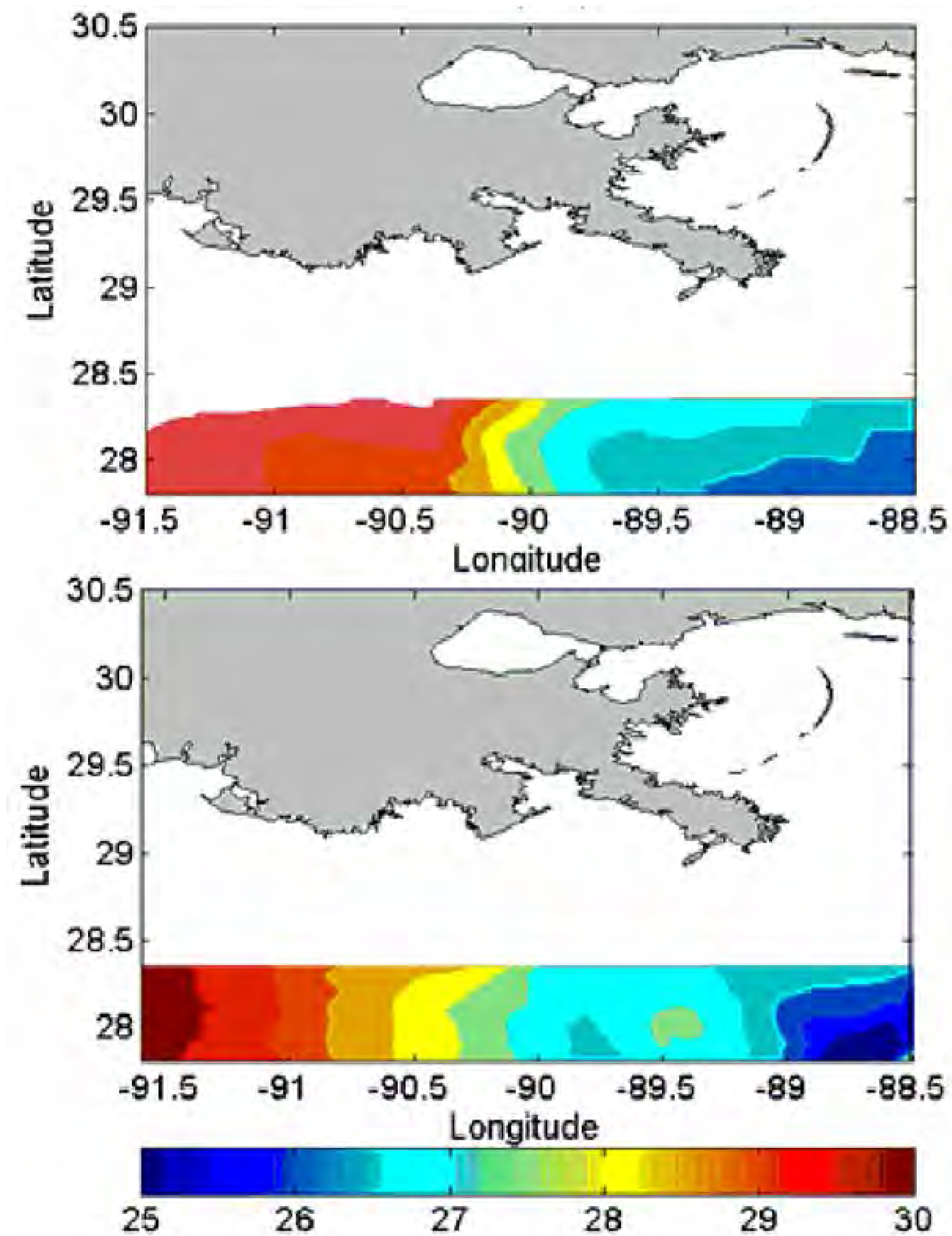

Figure 8. Sea surface temperature measured by satellite (MW-OI product) at 8:30 on 30 August 2005 along the Louisiana shelf-break (upper panel) and simulated SST at the same time (lower panel).

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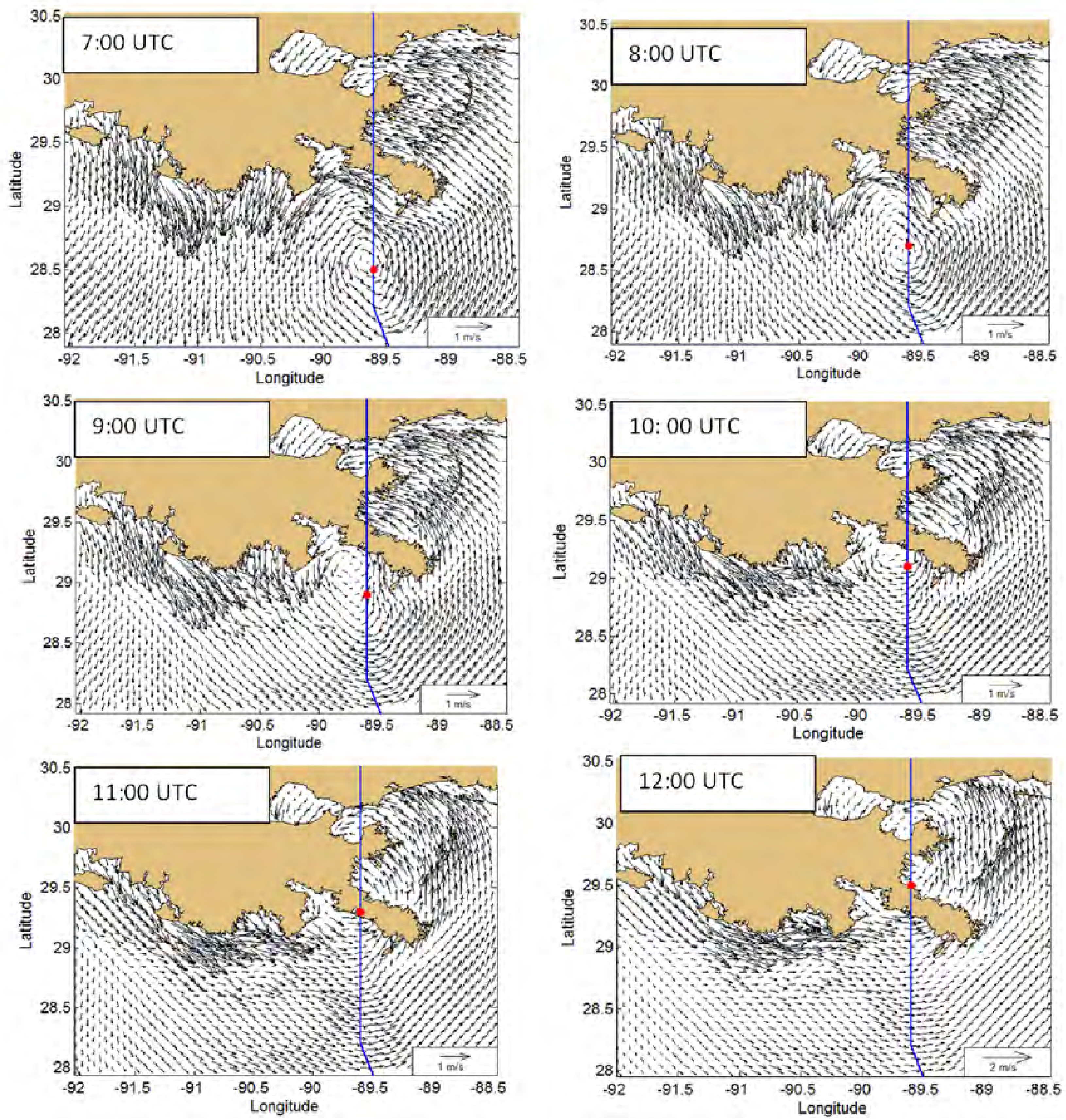

Figure 9. Simulated near-surface currents induced by Hurricane Katrina at different hours on 29 August 2005 (the solid line represents the hurricane's track and the circle shows the location of the hurricane's eye).

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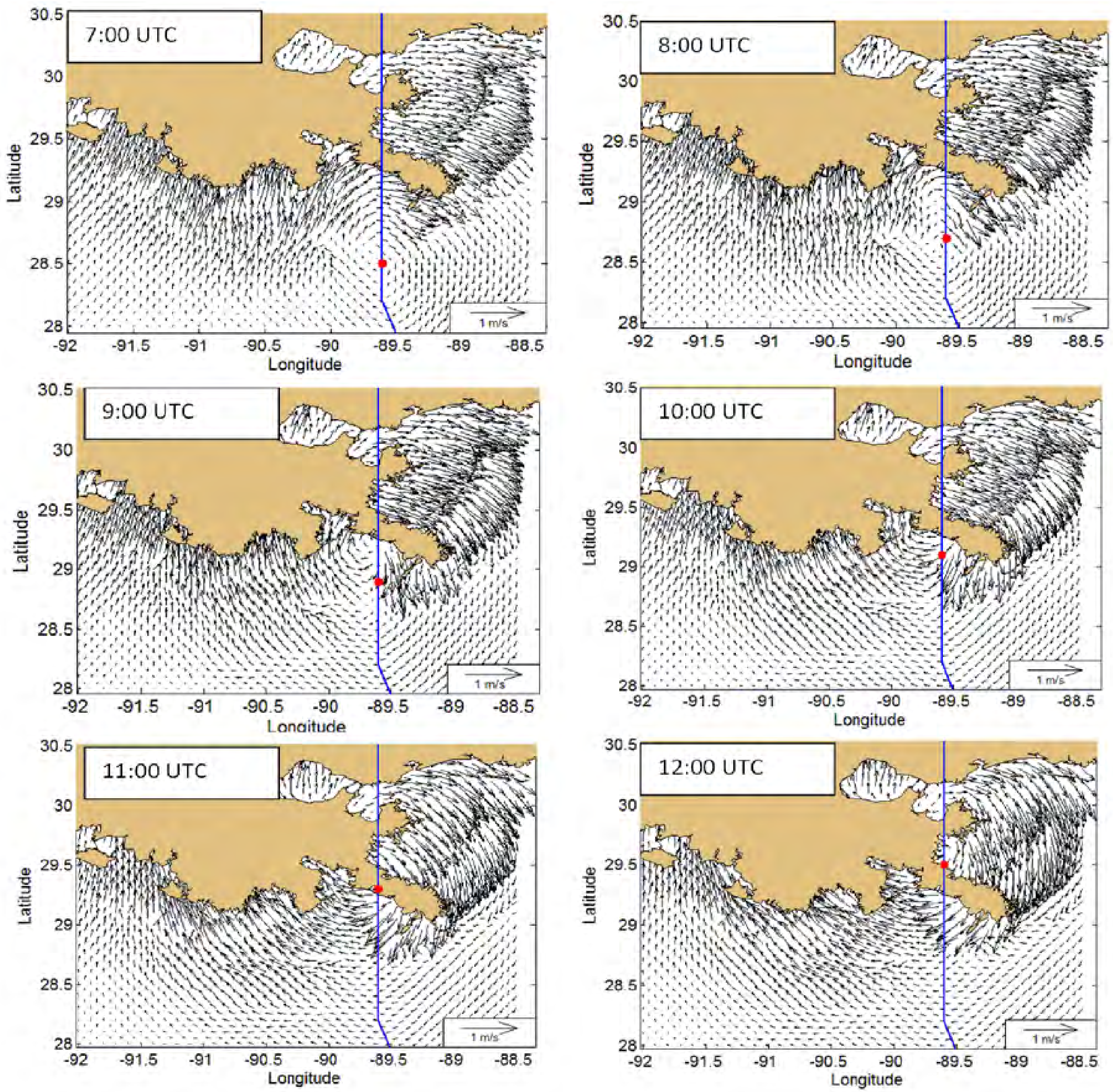

Figure 10. Simulated near-bottom currents induced by Hurricane Katrina at different hours on 29 August 2005 (11:00 is the landfall time over the Birdsfoot Delta).

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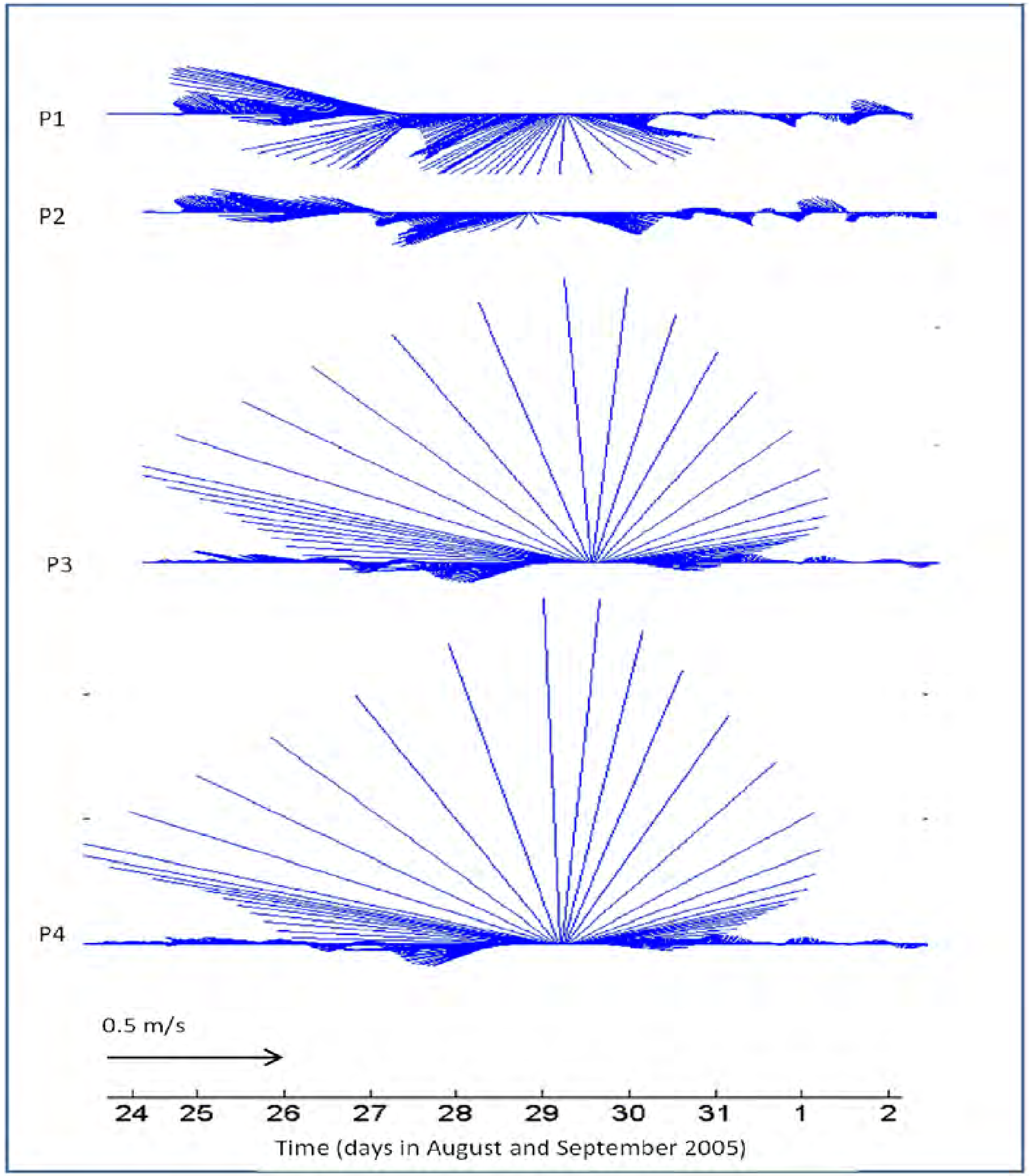

Figure 11. Time series of simulated surface currents at different locations over the shelf.

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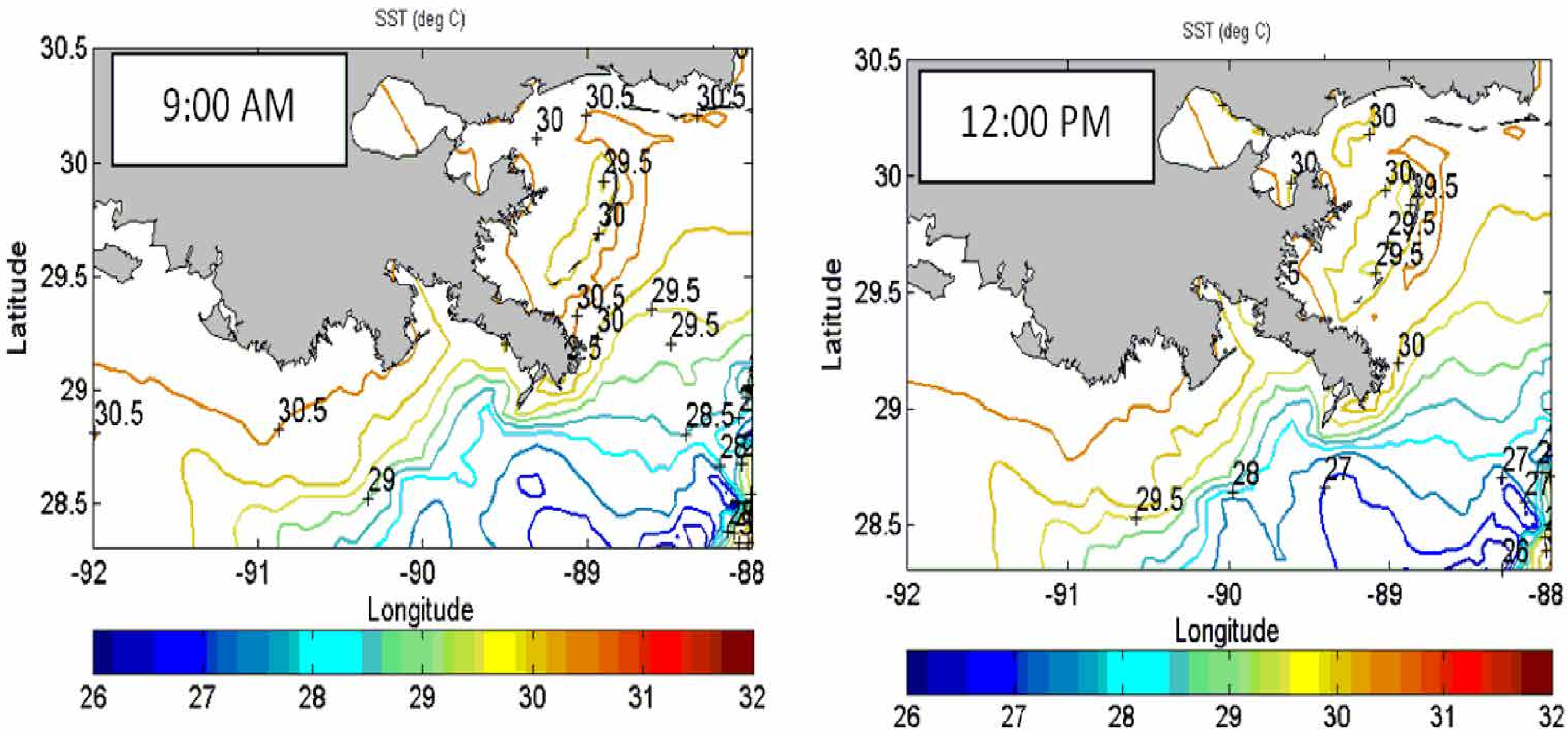

Figure 12. Simulated SST over the Louisiana shelf for two different positions of Katrina on the shelf on 29 August 2005.

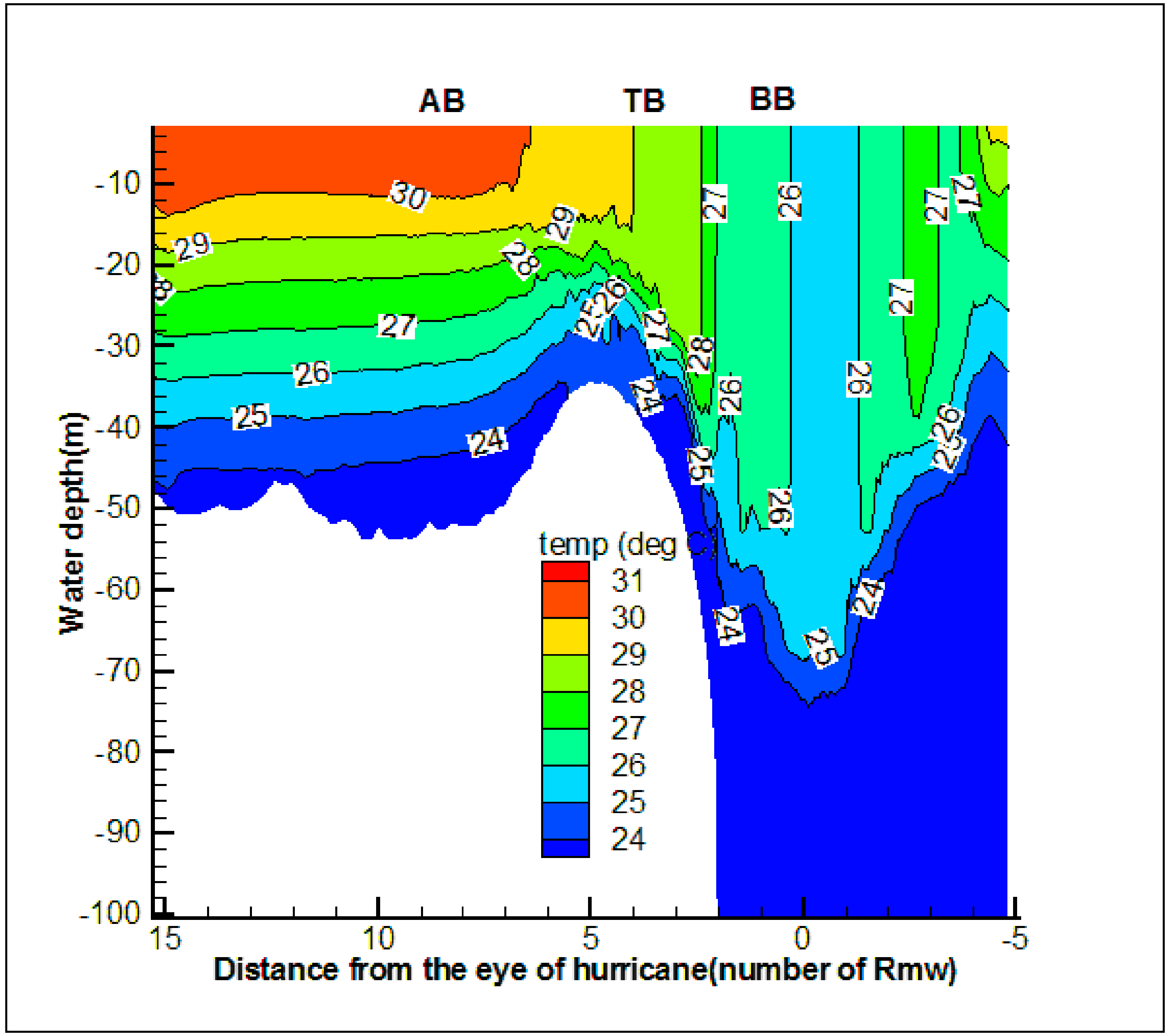

Figure 13. Vertical temperature structure across an E-W section over the Louisiana shelf at 10:00 on 29 August 2005 (Section 1 in Figure 1). Locations of the Barataria Bay, the Terrebonne Bay, and the Atchafalaya Bay are identified by BB, TB, and AB, respectively.

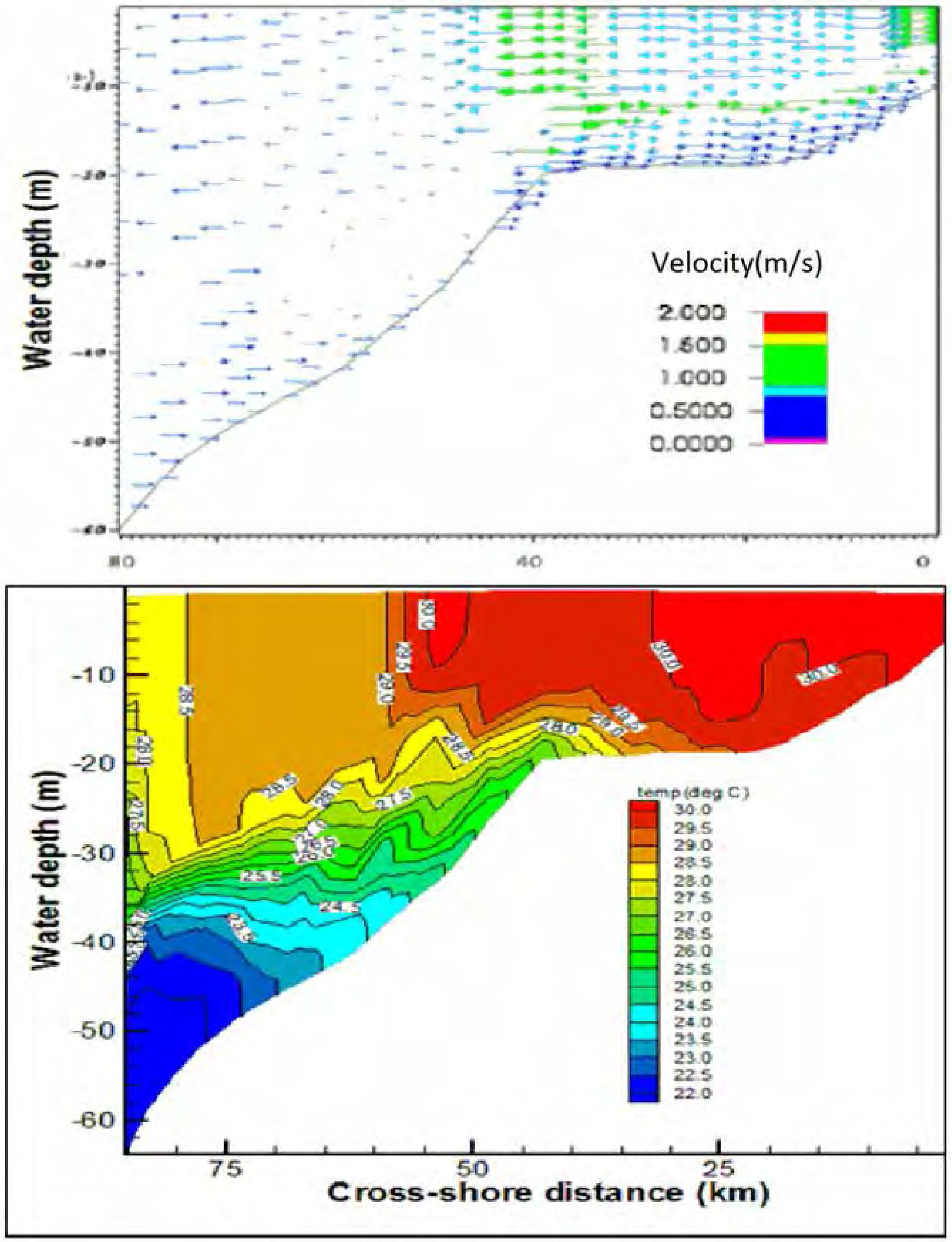

Figure 14. Upper panel: vertical pattern of simulated currents induced by Katrina across a N-S transect in front of Terrebonne Bay (Cross section A in Figure 1) when the eye is located west of the Birdsfoot Delta. Lower panel: the corresponding simulated temperature response.

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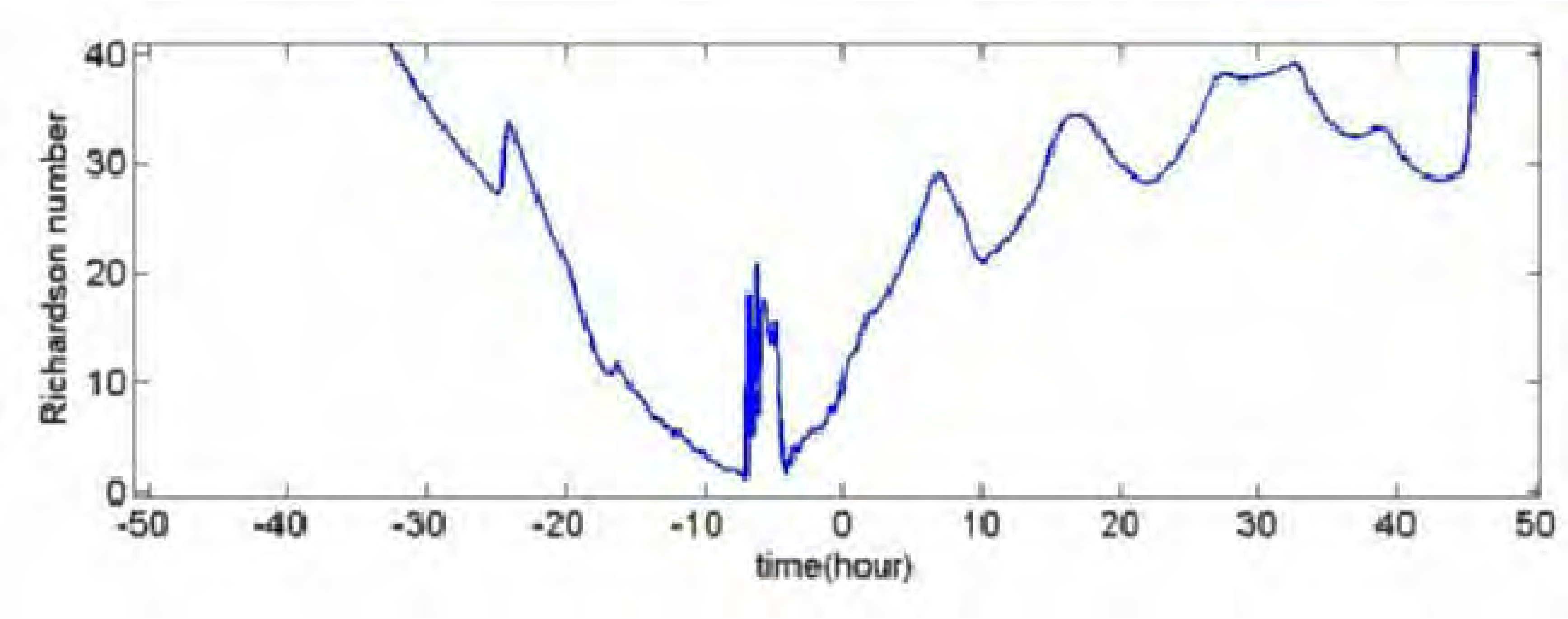

Figure 15. The Richardson number for a point across the water column of Transect A (time 0 is the time that the hurricane's eye is located right west of the Birdsfoot Delta, so negative and positive times indicate before and after that time, respectively).

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Swash Oscillations in a Microtidal Dissipative Beach

Swash Oscillations in a Microtidal Dissipative Beach

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ABSTRACT

This paper evaluates the relationship between gravity and infragravity energy with swash oscillations as well as the model's ability to reproduce the transformation of the wave as it approaches the shore on a dissipative beach. For this purpose, numerical experiments were conducted in a dissipative beach from Cartagena, Colombia. Mean free surface measurements were carried out for 2 days in February 2014 by installing a cross-shore array of pressure sensors, as well as a Fourier analysis from these measurements to identify frequency components that characterize the waves and the energy associated with them. To implement the numerical modelling, the SWASH model (The Simulation WAves till Shore is a numerical model that resolves nonlinear shallow-water equations) was set up by using the bathymetric profile of Bocagrande Beach obtained during the field campaign. The results of this numerical modelling enabled the study of the infragravity energy growth mechanism and the evolution of gravity energy as the wave approaches the shore, as well as the relationship between gravity and infragravity energy with swash oscillations. Overall, the results show that the model is able to reproduce the significant wave height and significant wave height associated with infragravity energy; moreover, the model is able to accurately describe processes of energy dissipation and energy transfer. Furthermore, through a spectral analysis applied to the swash oscillations time series it was possible to find that saturation occurs at low-frequency significant swash height and high-frequency significant swash height as the significant wave height increases, since its increase is not linear with respect to the signficant wave height incident.

ADDITIONAL INDEX WORDS: *SWASH model, gravity energy, infragravity energy, swash zone.*

INTRODUCTION

Waves are composed of a great number of spectral components with different frequencies and directions. These waves were classified and named according to their period as ordinary gravity waves, with periods from 1 to 30 seconds, and infragravity waves, with periods from 30 to 300 seconds (Munk, 1949). Field measurements and laboratory experiments have shown that low-frequency waves (30–300 s) make a significant contribution to the amount of energy within the surf zone (Aagaard and Bryan, 2003; Chiaia, Damiani, and Petrillo, 1990; Elgar *et al.*, 1992).

Several authors have pointed out that the relevance of the study of infragravity oscillations is based on the fact that sediment transport (Aagard and Greenwood, 2008; Holman and Bowen, 1982), harbor resonance (Sand, 1982), short wave modification (Goda, 1975), and coastal inundation (Pequignet *et al.*, 2009) are directly or indirectly related to the movements that occur in the low-frequency band of the wave spectrum. Therefore, the study of the interaction between infragravity waves with the shore, with gravity waves, and with hydrodynamics in general leads to a greater understanding of these phenomena.

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For example, from a series of measurements carried out on dissipative beaches, Guza and Thornton (1982) and Holman and Sallenger (1985) established that low-frequency energy (infragravity energy) was present in the swash zone, whereas high-frequency energy (gravity energy) dissipated, which led them to the conclusion that infragravity energy regulates the dynamics of sediment transport. For dissipative beaches, in particular, further studies in the swash zone indicate saturation of the energy spectrum as the offshore significant wave height increases (Guedes, Bryan, and Coco, 2013; Ruggiero, Holman, and Beach, 2004). In addition, it has been found that higher-energy conditions in the swash zone do not result from higher significant wave heights (Hs), which some authors have attributed to increased periods (Brinkkemper *et al.*, 2013; Senechal *et al.*, 2011). However, it is very challenging to explain this energy behavior in the swash zone from experimental data because longer time series are required.

For this reason, numerical tools capable of reproducing the wave transformation process as it approaches the shore become a reliable way to solve these phenomena, since they make it possible to evaluate waves with different heights and periods and also evaluate the wave's evolution with different beach setups (Filipot, 2016). Therefore, this study applies the Simulation WAves till SHore (SWASH) numerical model (Zijlema, Stelling, and Smit, 2011) to analyze the relationship between the gravity and infragravity energy with swash oscillations, as well as the relationship between the latter with the incident wave in a dissipative beach. The advantage of SWASH is the capability of the model to capture the nonlinear energy transfers, which are mainly responsible for the growth of the infragravity waves.

Study Area

Located in the city of Cartagena-Colombia, Bocagrande Beach was chosen to carry out the investigation (Figure 1). It has an offshore slope of 0.003 and a foreshore slope of 0.018; the surf similarity parameter, commonly called the Iribarren number f, is defined as (Battjes, 1974):

$$\xi = \frac{\beta}{(H/L_0)^{1/2}} \qquad (1)$$

where, ß is the beach steepness, H is the deepwater wave height and L_0 is the deepwater wave length; dissipative conditions are generally associated with values of Iribarren parameter less than 0.3 (Ruggiero, Holman, and Beach, 2004; Stockdon *et al.*, 2006), whereas intermediate and reflective conditions are associated with values larger than 0.3 (Holman and Sallenger, 1985). For Bocagrande Beach the surf similarity parameter is 0.18, which is typical of a dissipative beach (Figure 1A–C), where infragravity contribution is expected to be greater (Wright and Short, 1984). The study zone has an area of 234.647 m^2 with very few bathymetric variations in the longshore direction (Figure 1C,D). Boca-grande Beach has a microtidal regime (Andrade *et al.*, 2013); the wave climate for the proximal marine sector and the coastal platform in Cartagena is dominated by waves coming from the NE and ENE and there is little seasonal variation in the water level for much of the year (Ortiz-Royero *et al.*, 2013; Otero *et al.*, 2016). Waves come predominantly from the ENE sector, except during the period between December and March (dry season), where they travel from the NE (Restrepo *et al.*, 2012, 2017). However, this area is less likely to be affected by waves traveling from the W and SW.

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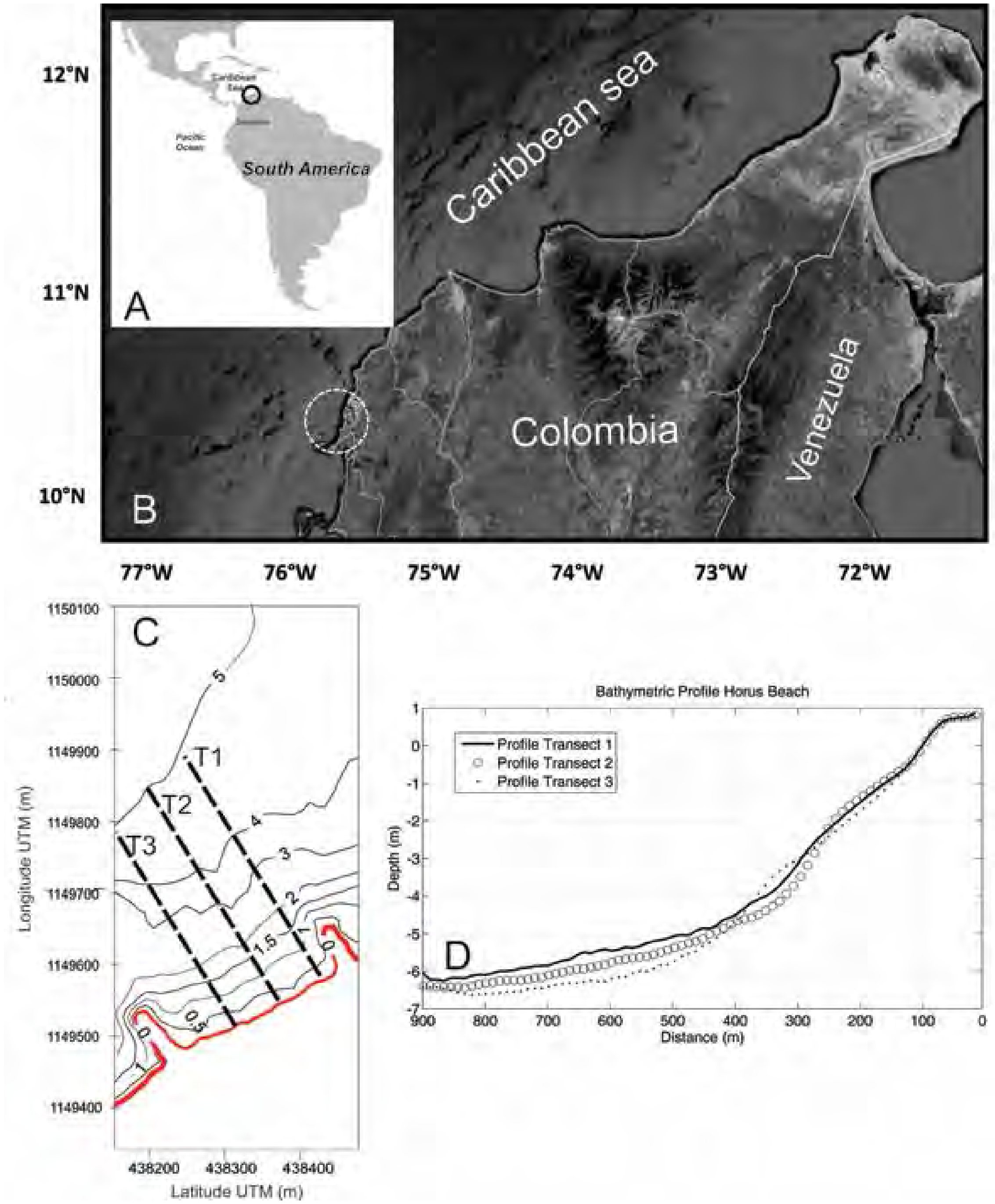

Figure 1. Study zone. (A) South America. (B) Colombian Caribbean coast. (C) Bathymetry study zone; T1, T2, and T3 are different transects obtained along the beach. (D) Typical Bocagrande Beach profile of each transect.

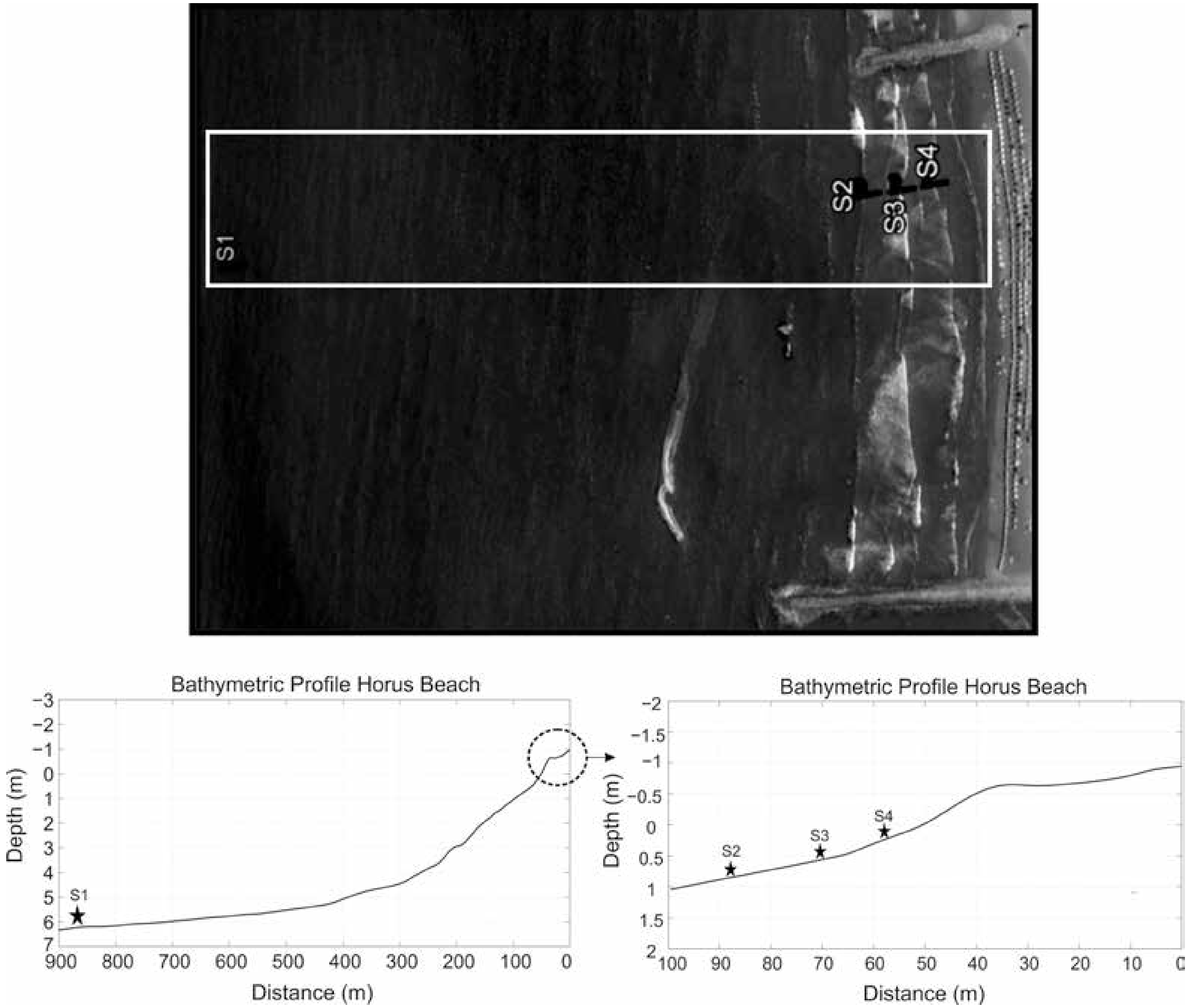

Figure 2. Equipment array in Bocagrande Beach (top panel). Bathymetric Bocagrande Beach profile corresponding to the transect T1 (lower panel). Stars indicate the location of pressure sensors, one in deep water, one in the shoaling zone, one in the breaker zone, and one in the surf zone.

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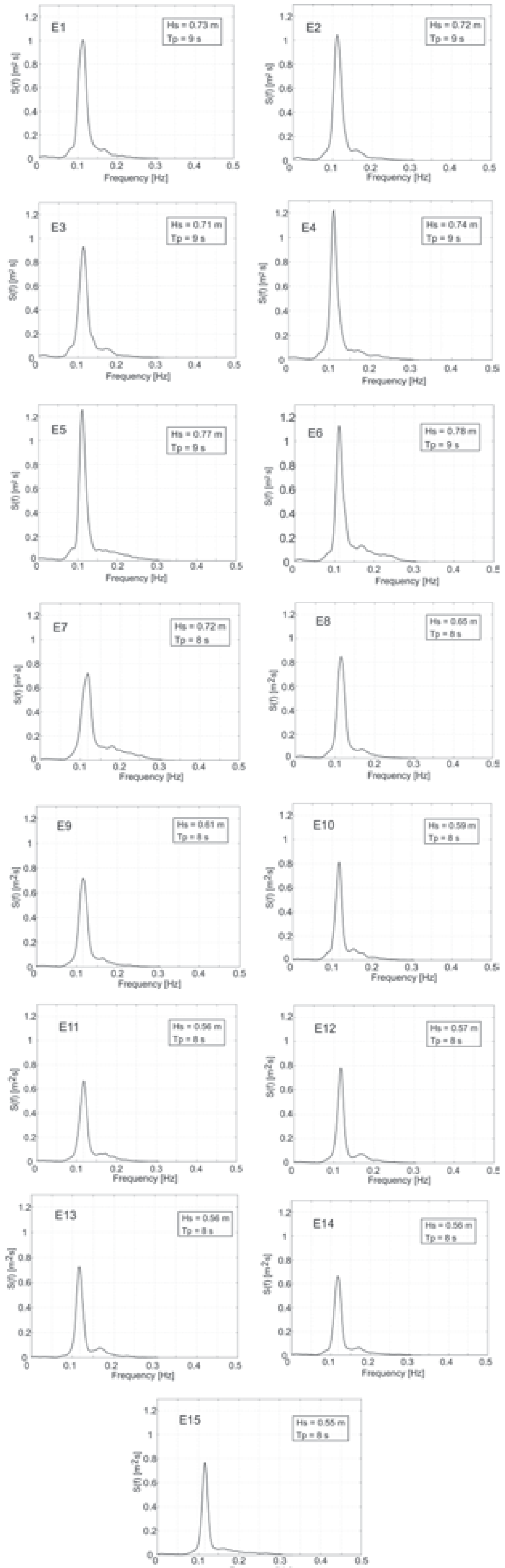

Figure 3. Energy spectra for each sea state obtained during the field campaign. These spectra correspond to the sea states where all the equipment were measuring simultaneously.

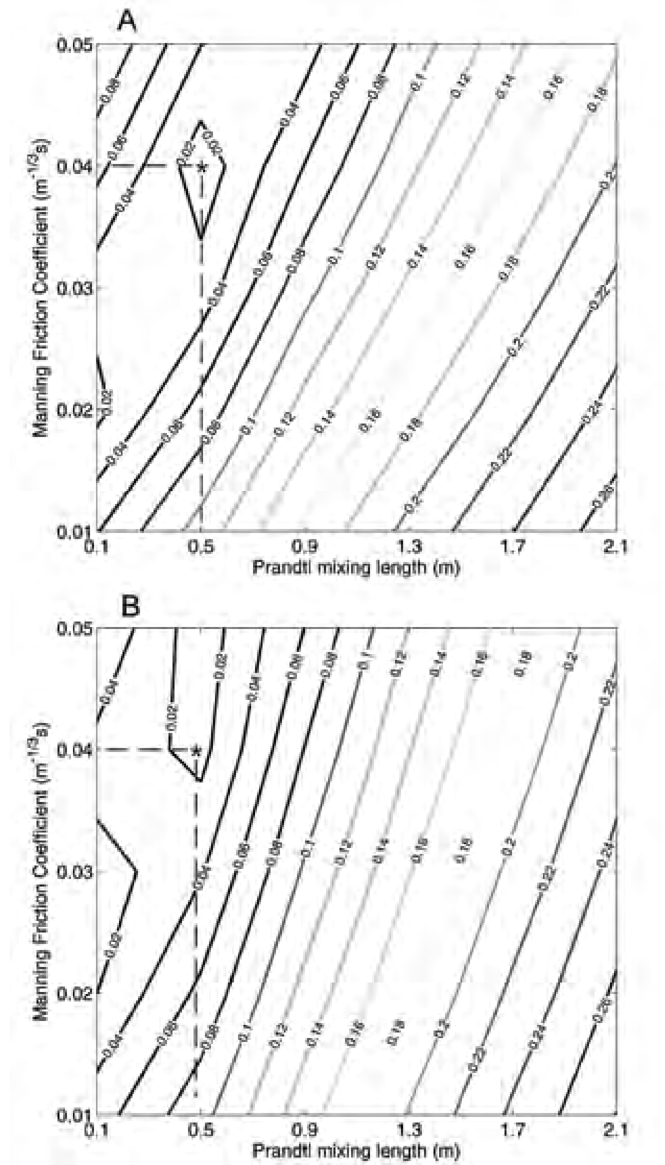

Figure 4. Sensitivity analysis of the bottom friction and the horizontal viscosity by the Manning's roughness coefficient n and the Prandtl mixing length. (A) Contour lines of the percentage of error between the simulated data and the measured data by the sensor S2. (B) Contour lines of the percentage of error between the simulated data and the measured data by the sensor S3.

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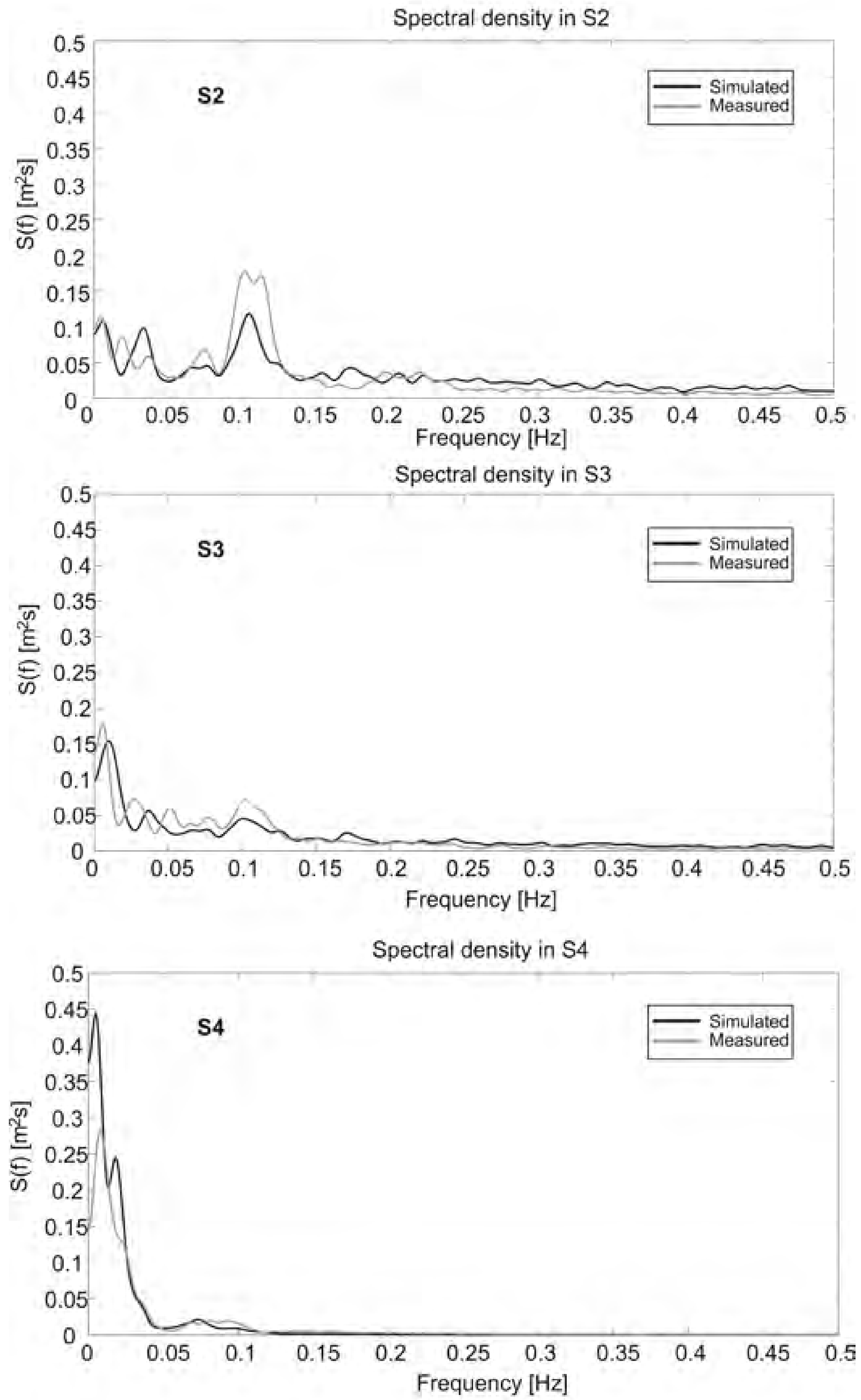

Figure 5. Measured (gray) and simulated (black) spectral density at each checkpoint for E1. The spectral analysis was estimated from the Fourier transform of the time series. The evolution of the simulated spectra agrees with that of the measured spectra, which showed energy peaks at the same frequencies.

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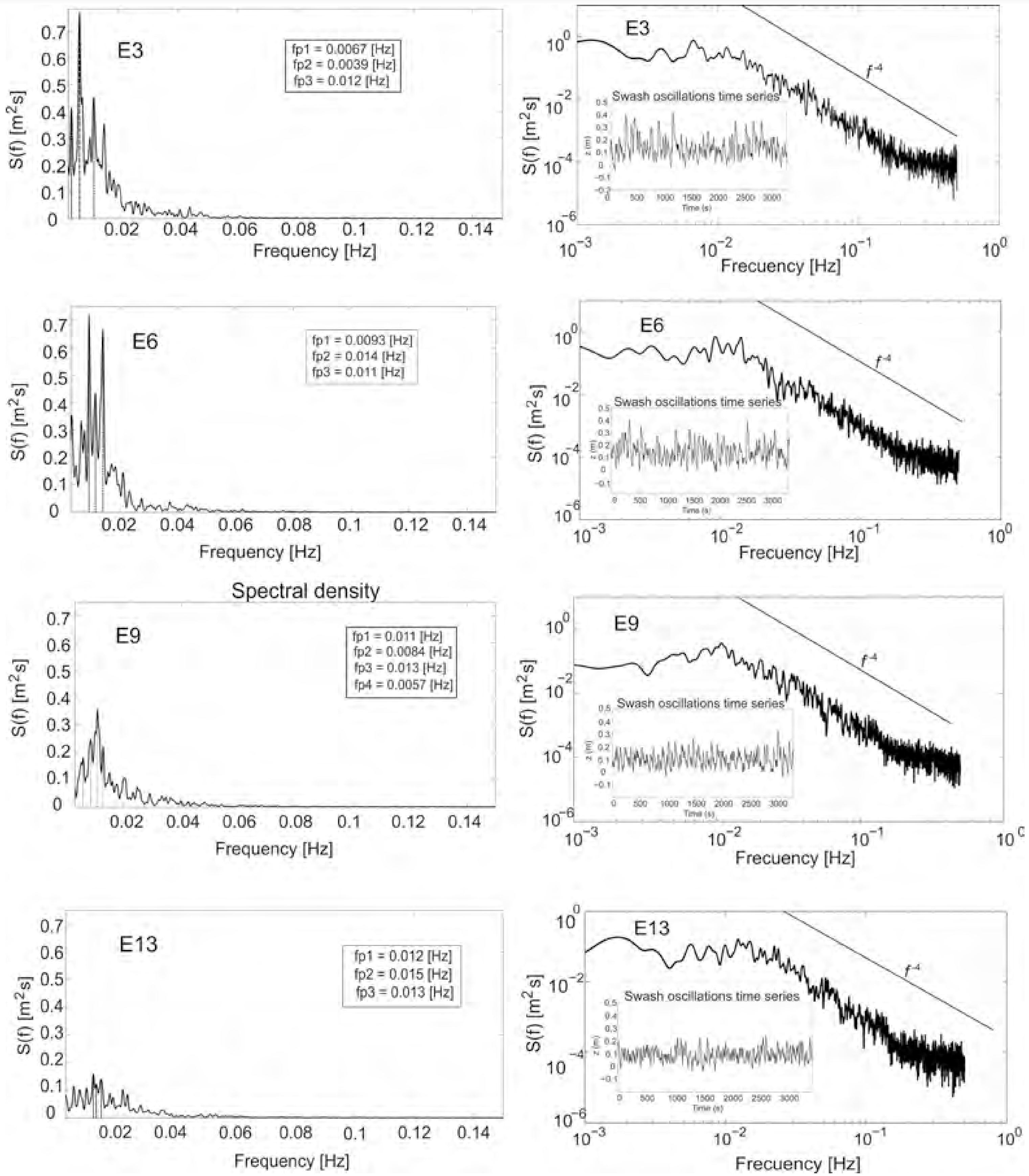

Figure 6. Spectral densities for four selected cases (E3, E6, E9, E13) at normal and logarithmic scale. The embedded image represents the time series of swash oscillation generated by the model. It is clear that oscillation in the swash zone is dominated by low-frequency oscillations, as expected for a dissipative beach. The representation of the spectra in a log scale shows that an f^{-4} spectral decay in the saturated region was detected.

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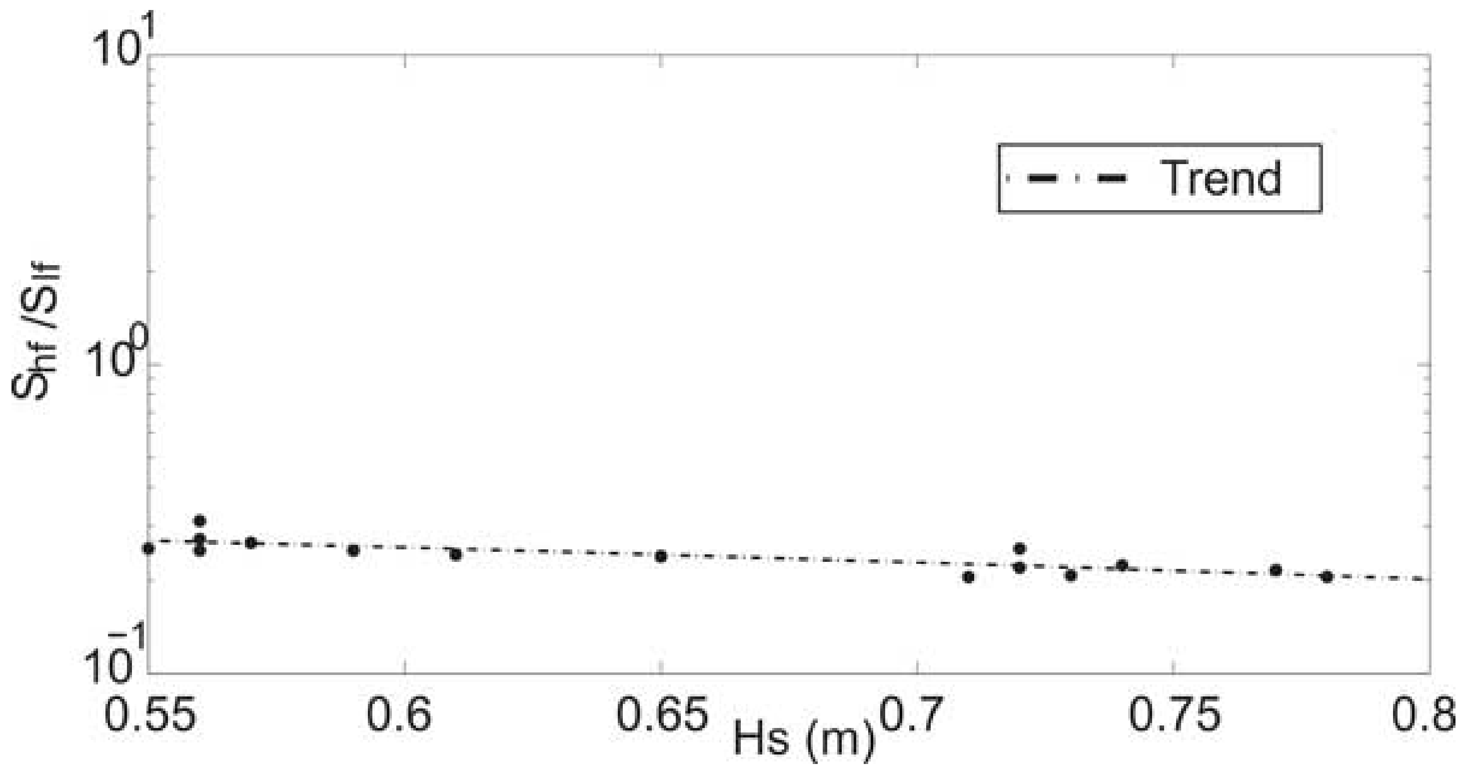

Figure 7. Ratio between S_{hf} and S_{lf} *vs.* H_s measured at the farthest sensor (S1). The ratio allow us to verify whether the infragravity frequencies dominate the swash zone movement in Bocagrande Beach. As all data are placed in values less than 10°, it is evident that low-frequency energy is the main contributor to swash oscillations.

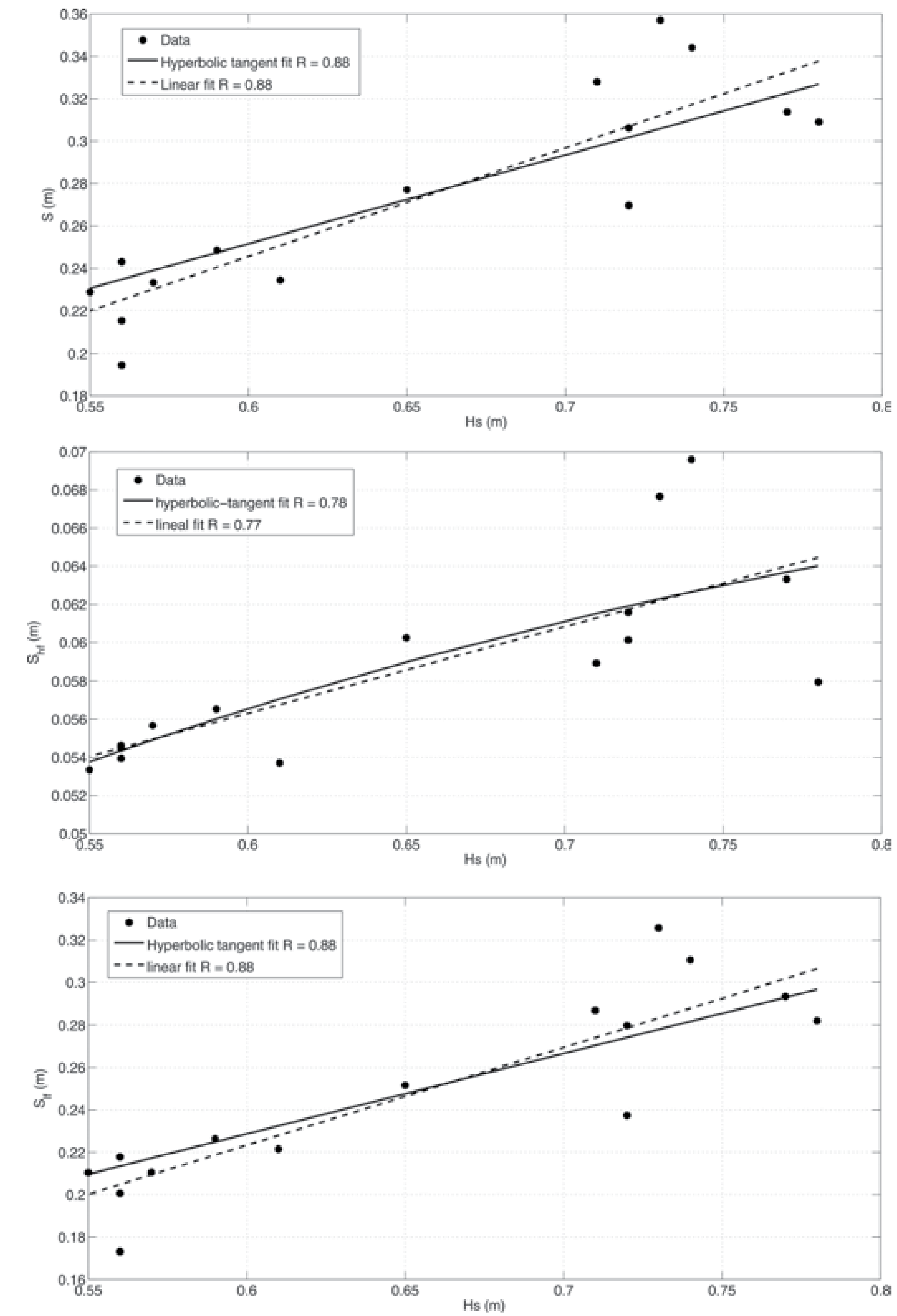

Figure 8. Top panel, significant swash height (S) *vs.* H_s (as measured at S1). Central panel, high-frequency swash height (S_{hf}) *vs.* H_s (as measured at S1). Bottom panel, low-frequency swash height (S_{lf}) *vs.* H_s (as measured at S1). The lines represent the linear fits (dashed lines) and hyperbolic tangent fits (solid lines) applied to the data. The linear fit and the hyperbolic tangent fit proved to be the best for this graph.

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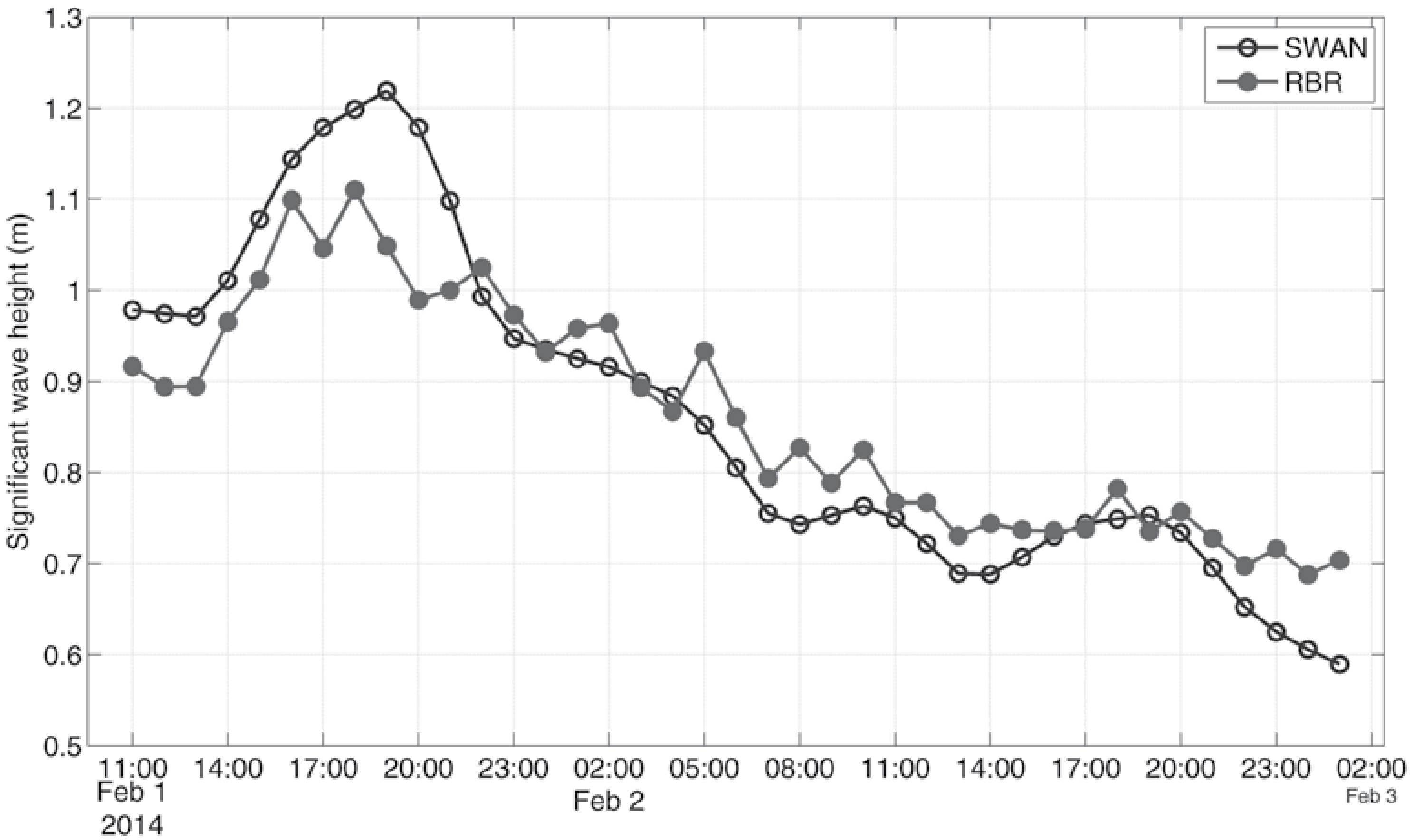
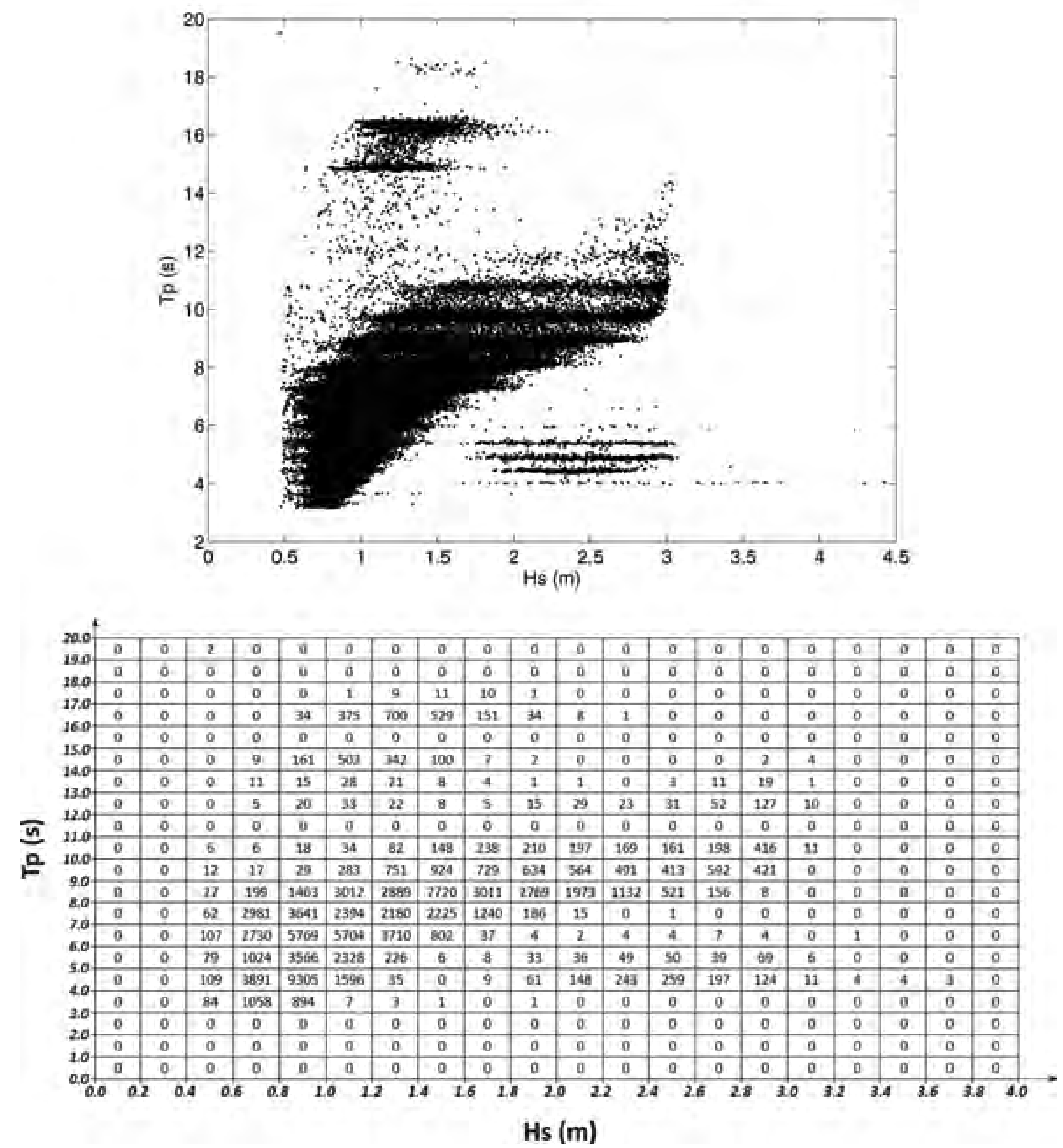


Figure 9. Measured by the pressure sensor (RBR sensor) (-●-) and modeled (-o-) significant height H_s (m) time series. It is possible to appreciate the good agreement between the measured and modeled time series.



Tp (s) \ Hs (m)	0.0–0.2	0.2–0.4	0.4–0.6	0.6–0.8	0.8–1.0	1.0–1.2	1.2–1.4	1.4–1.6	1.6–1.8	1.8–2.0	2.0–2.2	2.2–2.4	2.4–2.6	2.6–2.8	2.8–3.0	3.0–3.2	3.2–3.4	3.4–3.6	3.6–3.8	3.8–4.0
19.0–20.0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.0–19.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.0–18.0	0	0	0	0	0	1	9	11	10	1	0	0	0	0	0	0	0	0	0	0
16.0–17.0	0	0	0	0	34	375	700	529	151	34	8	1	0	0	0	0	0	0	0	0
15.0–16.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14.0–15.0	0	0	0	9	161	503	342	100	7	2	0	0	0	0	2	4	0	0	0	0
13.0–14.0	0	0	0	11	15	28	21	8	4	1	1	0	3	11	19	1	0	0	0	0
12.0–13.0	0	0	0	5	20	33	22	8	5	15	29	23	31	52	127	10	0	0	0	0
11.0–12.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10.0–11.0	0	0	6	6	18	34	82	148	238	210	197	169	161	198	416	11	0	0	0	0
9.0–10.0	0	0	12	17	29	283	751	924	729	634	564	491	413	592	421	0	0	0	0	0
8.0–9.0	0	0	27	199	1463	3012	2889	7720	3011	2769	1973	1132	521	156	8	0	0	0	0	0
7.0–8.0	0	0	62	2981	3641	2394	2180	2225	1240	186	15	0	1	0	0	0	0	0	0	0
6.0–7.0	0	0	107	2730	5769	5704	3710	802	37	4	2	4	4	7	4	0	1	0	0	0
5.0–6.0	0	0	79	1024	3566	2328	226	6	8	33	36	49	50	39	69	6	0	0	0	0
4.0–5.0	0	0	109	3891	9305	1596	35	0	9	61	148	243	259	197	124	11	4	4	3	0
3.0–4.0	0	0	84	1058	894	7	3	1	0	1	0	0	0	0	0	0	0	0	0	0
2.0–3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.0–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.0–1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 10. Top panel: Scatter plot of 30 years of H_s vs. T_p data at S1. Bottom panel: Joint distribution H_s–T_p. It is possible to appreciate that data have mostly significant wave height values ranging from 0.5 to 3.0 m and periods from 3 to 14 s.

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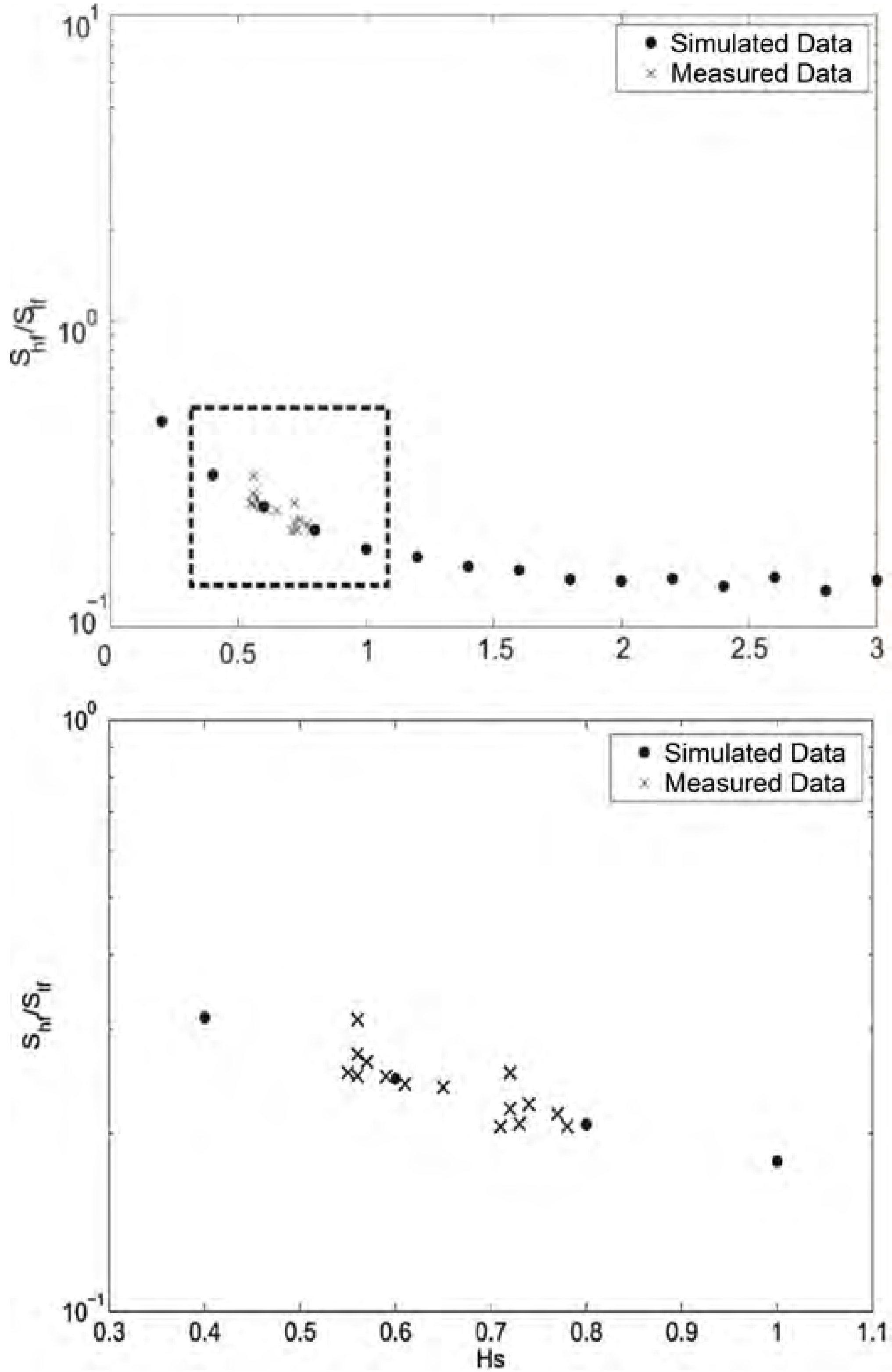

Figure 11. Top panel: Ratio between the S_{hf} and S_{lf} *vs.* modeled (points) and measured (crosses) significant wave height at the farthest sensor (S1). Bottom panel: Dotted area enlargement. As the significant wave height on intermediate waters increases, the energy of the swash zone is dominated by low-frequency energy. However, as significant wave height reaches the highest values in this zone, it is evident that there is also saturation in the infragravity component.

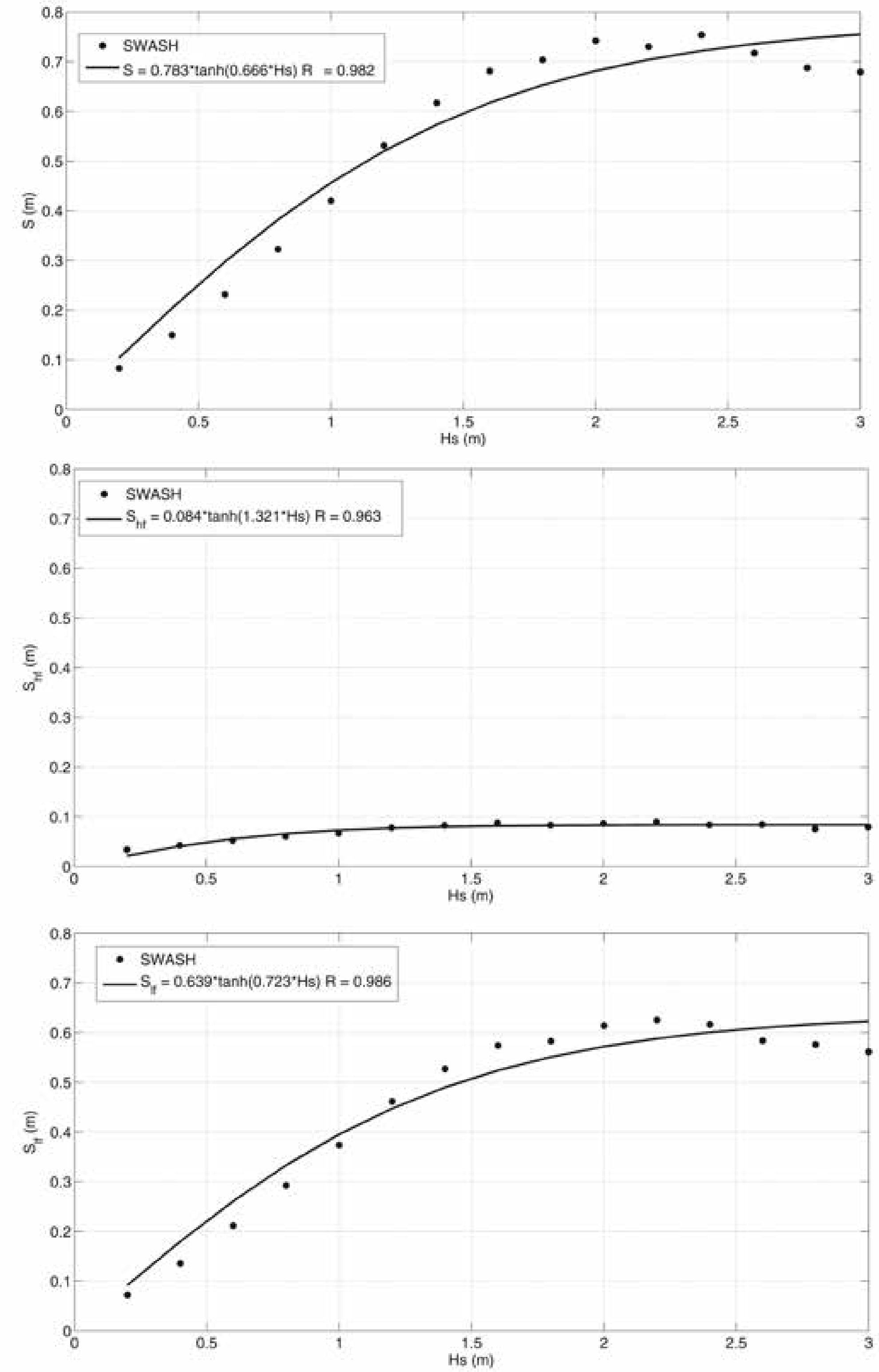

Figure 12. Top panel: Significant swash height *(S) vs. H_s.* Central panel: S_{hf} *vs. H_s*. Bottom panel: S_{lf} *vs. H_s*. The lines represent the hyperbolic tangent fitted to each graph. This graph highlights that the saturation of the energy is reached in all the regimens; in addition, the highest low-frequency swash height does not correspond with the highest offshore significant wave height.

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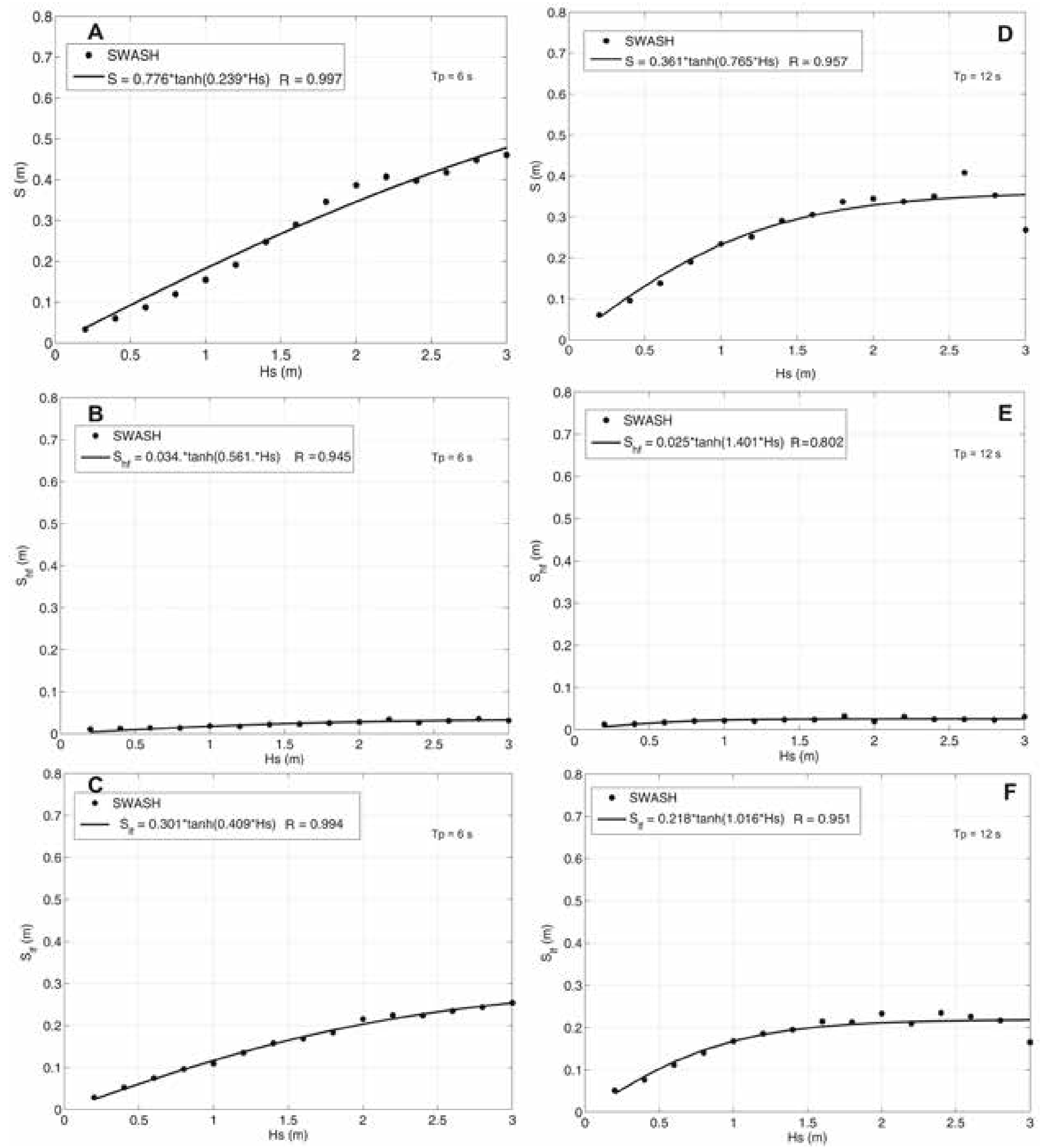

Figure 13. Left panel: (A) S *vs.* H_s, (B) S_{hf} *vs.* H_s, and (C) S_{lf} *vs.* H_s for waves of 6 s. The lines represent the hyperbolic tangent fitted to each graph. Right panel: (D) S *vs.* H_s, (E) S_{hf} *vs.* H_s, and (F) S_{lf} *vs.* H_s for waves of 12 s. It is possible to appreciate that there is still energy saturation at two different periods (T_p= 6 s and T_p= 12 s), thus confirming that saturation of swash height is independent of the wave period.

To access this full JCR Research Article, please visit:

http://www.jcronline.org/doi/abs/10.2112/JCOASTRES-D-16-00147.1

INVITATION

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 and Coastal Development'. 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 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.

Dr. Jae-Seol Shim
Chairman of ICS2018
Ph.D./Principal Research Scientist,
Operational Oceanography Research Center
Korea Institute of Ocean Science & Technology
jsshim@kiost.ac.kr

Prof. Insik Chun
Co-Chairman of ICS2018
Ph.D./PE/Professor
Coastal & Harbor Engineering/
Department of Civil Engineering/ Konkuk University
ischun@konkuk.ac.kr

PROGRAM

Date	May13 (Sun.)	May 14 (Mon.)		May 15 (Tue.)		May 16 (Wed.)		May 17 (Thu.)	May 18 (Fri.)	May 19. (Sat)
Am.		Opening Plenary, Keynote Speech		Keynote Speech		Keynote Speech		Keynote Speech	Field Trip	Field Trip (Optional)
Pm.		Session 1~5(6)	POSTER	Session 1~5(6)	POSTER	Session 1~5(6)	POSTER	Session 1~5(6)		
	Welcome Reception							Conference Dinner		

Continued on Next Page

CALL FOR ABSTRACTS

Abstract submission system is opened from 1st March 2017.

The ICS2016 Scientific Program Committee invites authors to submit an abstract for either an oral or poster presentation. The conference theme is 'Safe Coasts beyond Climate change and Coastal development'.

Abstract Guidelines

Please ensure you submit your abstract as a Word document. The abstract template is shown by .

Themes

Abstracts can be submitted from all areas of coastal science, from Geology to Coastal hazards. The themes* are:

- Rivers and Estuaries
- Tidal inlets
- Dunes and Beaches and Coasts
- Coastal Biology and Ecology
- Coastal Geology
- Continental shelves and slopes
- Coral reefs
- Climate and Sea level change
- Coastline and Estuarine evolution
- Blue carbon
- Coastal hazards
- Hydrodynamics
- Coastal engineering
- Marine renewable energy
- Coastal management
- Managing the coasts of Busan
- ICS2020 Seville : Coastal Research in the confluence of the Mediterranean and Atlantic

KEY DATES

- **1st Mar. 2017** — Call for abstract submission
- **30th June 2017** — Abstract submissions Close
- **1st Aug. 2017** — Authors advised of acceptance of abstracts
- **1st Aug.~ 31st Oct. 2017** — Paper submissions
- **1st~30th Nov. 2017** — Paper reviewed
- **31st Dec. 2017** — Final papers submitted
- **1st Aug. 2017~ 28th Feb. 2018** — Early bird registration

REGISTRATION FEES

Category		USD	KRW
Early Bird Registration Until 28 February 2018	Full Registration	700	800,000
	Student	450	500,000
Standard Registration From 1 March 2018	Full Registration	900	1,000,000
	Student	600	700,000
Early Bird Registration	CERF Member (5% discount)	665	750,000

All registration packages include

- Welcome Reception on Sunday 13 May
- Attendance at all conference sessions
- Conference Dinner on Thursday 17 May
- Choice of a number of full day field trips on Friday 18 May
- Arrival tea & coffee, morning tea, lunch and afternoon tea for the duration of the conference

CONTACT

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Event Manager
ICS2018 Secretariat
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Dr. Hak-Soo Lim
Secretary of ICS2018
Principal Research Scientist of KIOST, Korea
Email: hslim@kiost.ac.kr
Phone: +82-31-400-6334

REQUEST FOR QUALIFICATIONS
June 2017

The California State Coastal Conservancy ("Conservancy") anticipates a need for environmental, engineering, architectural, landscape architectural, and construction project management consulting services for Conservancy projects and programs over the next twelve months. The Conservancy seeks to identify individuals and firms providing these services. To submit your qualifications, complete the attached questionnaire, also posted at www.scc.ca.gov, and email it to mary.aledo@scc.ca.gov. The questionnaire is used to identify firms with appropriate qualifications. Specific requests for more detailed submittals will be issued for specific projects over the coming year.

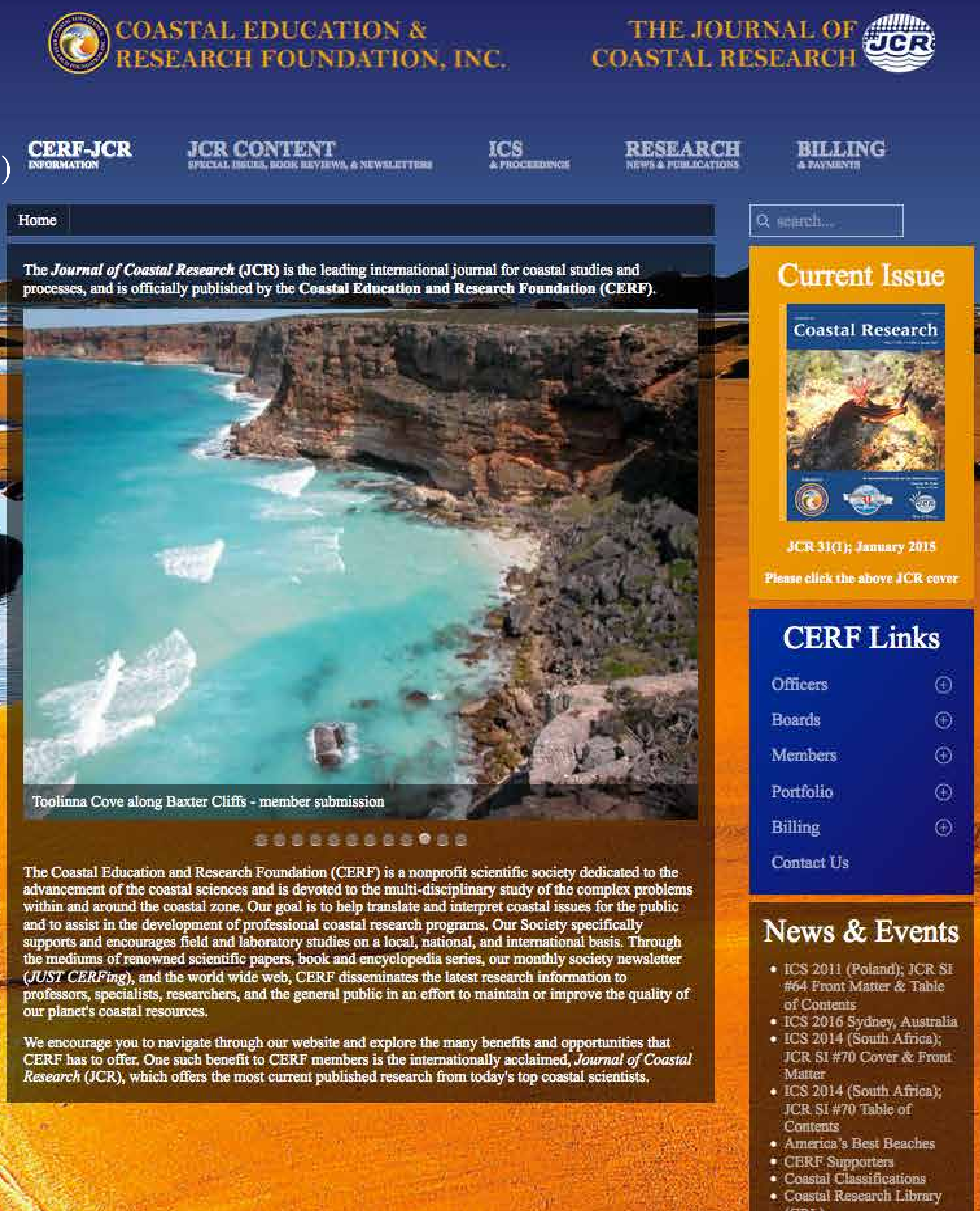
All information received will be kept on file for at least one year from the date of this request. Conservancy staff will use this information in soliciting services, as needed, for upcoming Conservancy projects. Specific project details including contract identification numbers are not available at this point. Any resulting contract will be awarded without discrimination based on race, color, ethnic group identification, religion, age, sex, sexual orientation, disability, or national origin. State certified Small Businesses and Disabled Veteran Business Enterprises are encouraged to submit.

The Conservancy acts to preserve, restore and enhance California's coastal and marine resources and to solve land use problems on the coast and around San Francisco Bay. Conservancy projects fall within the following categories: (1) public access (*e.g.*, trails, bridges, parking, recreational and interpretive facilities); (2) revitalization of urban waterfronts and shoreline facilities; (3) resource conservation and enhancement (*e.g.*, restoration and enhancement of wetlands and endangered species' habitats); (4) coastal preservation (*e.g.*, lot consolidation; transfer of development rights; coastal land acquisition); (5) agricultural land preservation (*e.g.*, acquisition of interests in coastal agricultural land and resolution of land use problems); (6) watershed restoration to improve water quality; (7) marine and coastal resource education; (8) climate change adaptation and mitigation; and (9) urban greening.

In connection with projects in these areas, we are soliciting consultants with experience and expertise in: surveying and mapping; climate change issues; construction project management; civil and hydrological engineering; habitat restoration design; landscape architecture; trail planning and engineering; water quality assessment; geotechnical and geomorphic assessment; structural analyses; pre-project feasibility analyses; economic analyses; hazardous or toxic substance investigations; wetland, watershed, or subtidal assessments; archaeological studies; environmental documentation and assessment under the California Environmental Quality Act and other environmental laws and regulation; botanical studies; agricultural studies; soil analyses; biological investigations; natural resource permitting; site and land use planning; environmental monitoring; and other program-related environmental services, such as appraisals for resource conservation purposes.

Coastal Conservancy

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



Please visit www.cerf-jcr.org or Google Search: cerf-jcr to navigate through all our great new features

CERF-JCR Membership Options

1. Individual CERF Membership; ONLINE ONLY SUBSCRIPTION to the JCR

(1-year subscription; $95) (2-year subscription; $185*) (3-year subscription; $275*)

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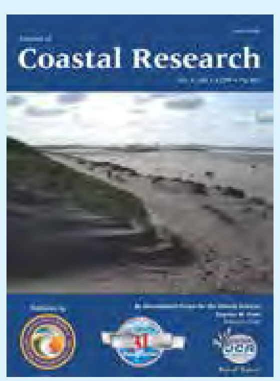

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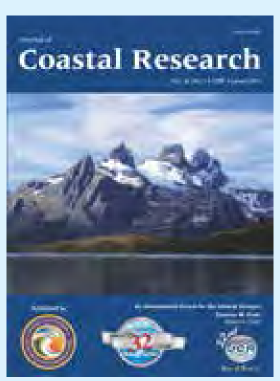
5. CERF Lifetime Membership ($1000)*An Honors Membership*



Includes:
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- A fully updateable Lifetime Member profile webpage detailing your affiliation, research, and announcements on our internationally-viewed Foundation and online journal websites http://www.cerf-jcr.org and http://www.JCRonline.org and in our society newsletter, *Just CERFing*
- A printed acknowledgement in every issue of the JCR
- Professional storyboard printout of JCR covers
- Greatly reduced fees for manuscript submission, publication, and color charges
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CERF-JCR Membership Options

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- Notices and reduced registration fees for the International Coastal Symposium (ICS), the official meeting of CERF

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- Official personalized CERF Member Certificate
- Notices and reduced registration fees for the International Coastal Symposium (ICS), the official meeting of CERF
- Registration into our manuscript submission website
- Reduced fees for manuscript submission, publication, and color charges
- Ability to submit coastal photographs for the purpose of publication in the JCR
- Participation & sharing with a distinguished international group of scholars and scientists

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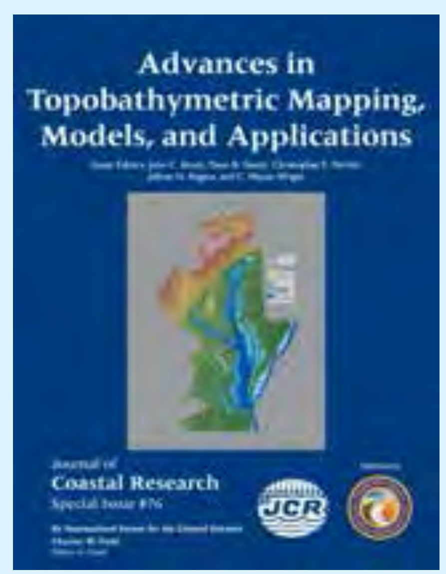
JCR 32(6)
December 2016

JCR 33(1)
January 2017



JCR Special Issue #76
Winter 2016

JCR Special Issue #79
Spring 2017

JCR 33(2)
March 2017

JCR 33(3)
May 2017

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

CERF Board of Directors (Trustees)

Continued on Next Page

CERF Board of Directors (Trustees)

Journal of Coastal Research (JCR) Editorial Board

Continued on Next Page

CERF Lifetime Members

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Dr. Yong-Sik Cho

Dr. Ya-Ping Wang

Dr. Nicholas K. Coch

Dr. Hany Elwany

Dr. Björn Kjerfve

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Dr. Philip D. Osborne

Dr. Yoshiki Saito

Prof. Dr hab. Kazimierz Furmańczyk

Dr. Gonzalo Malvárez

Dr. Fatima Navas

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. *In*: Furmańczyk, K.; Giza, A., and Terefenko, P. (eds.), Proceedings from the International Coastal Symposium (ICS) 2013 (Plymouth, United Kingdom). *Journal of Coastal Research,* Special Issue No. 64, pp. 991-994.

Lemckert, C.J.; Zier, J., and Gustafson, J., 2009. Tides in Torres Strait. *In*: da Silva, C.P. (ed.), Proceedings from the International Coastal Symposium (ICS) 2009 (Lisbon, Portugal). *Journal of Coastal Research*, Special Issue No. 56, pp. 524-528.

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
CERF Lifetime Member

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Jiangsu Key Laboratory for Coast and Island Development
Department of Coastal Ocean Sciences
School of Geography and Oceanography
Nanjing University, China
Telephone: (+)86 25 3597308 (O)
Fax: (+)86 25 3592686
E-mail: ypwang@nju.edu.cn

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.

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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

Continued on Next Page

A Special Acknowledgement To:

Hany Elwany, Ph.D.

CERF Lifetime Member

President, Coastal Environments
2166 Avenida de la Playa
La Jolla, California, U.S.A.

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

CERF Lifetime Member

American University of Sharjah
PO Box 26666, Sharjah
United Arab Emirates
http://www.aus.edu
bkjerfve@aus.edu

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
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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.

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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.

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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.

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A Special Acknowledgement To:

Frédéric Bouchette, Ph.D.

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Associate Professor of Littoral Dynamics
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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:
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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:
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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.

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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.

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A Special Acknowledgement To:

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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.

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Dr. Fatima Navas is head of the "Coastal Environments" Research Group (RNM-911) and Profesora Titular at Universidad Pablo de Olavide in Seville (Spain). She is also Sponsor Associate at Ulster University (UK). She has extensive experience in coastal processes, integrated coastal zone management, coastal tourism and spatial data information and mapping. Her research focuses in coastal morphodynamics, environmental impacts caused by human activities in coastal areas, sustainable management for tourism development in the Mediterranean, as well as storminess and environmentally sensitive coastal areas of the European Union. She is involved with the design and implementation of higher education programs, both graduate and postgraduate, as well as participated in numerous research projects, such as the EU ECHO Civil Protection FLOOD-CBA, ECOSHAZ, FLOOD-CBA#2, EU FP7 Program PEGASO, MEDINA Projects, and EU MED Program COASTGAP, among other projects. Her scientific work has been published in international impact index journals such as, for example, *Geology*, *Marine Geology*, *Journal of Coastal Research*, *Journal of Coastal Conservation*, *Journal of Tourism Management, and Coastal Engineering.*

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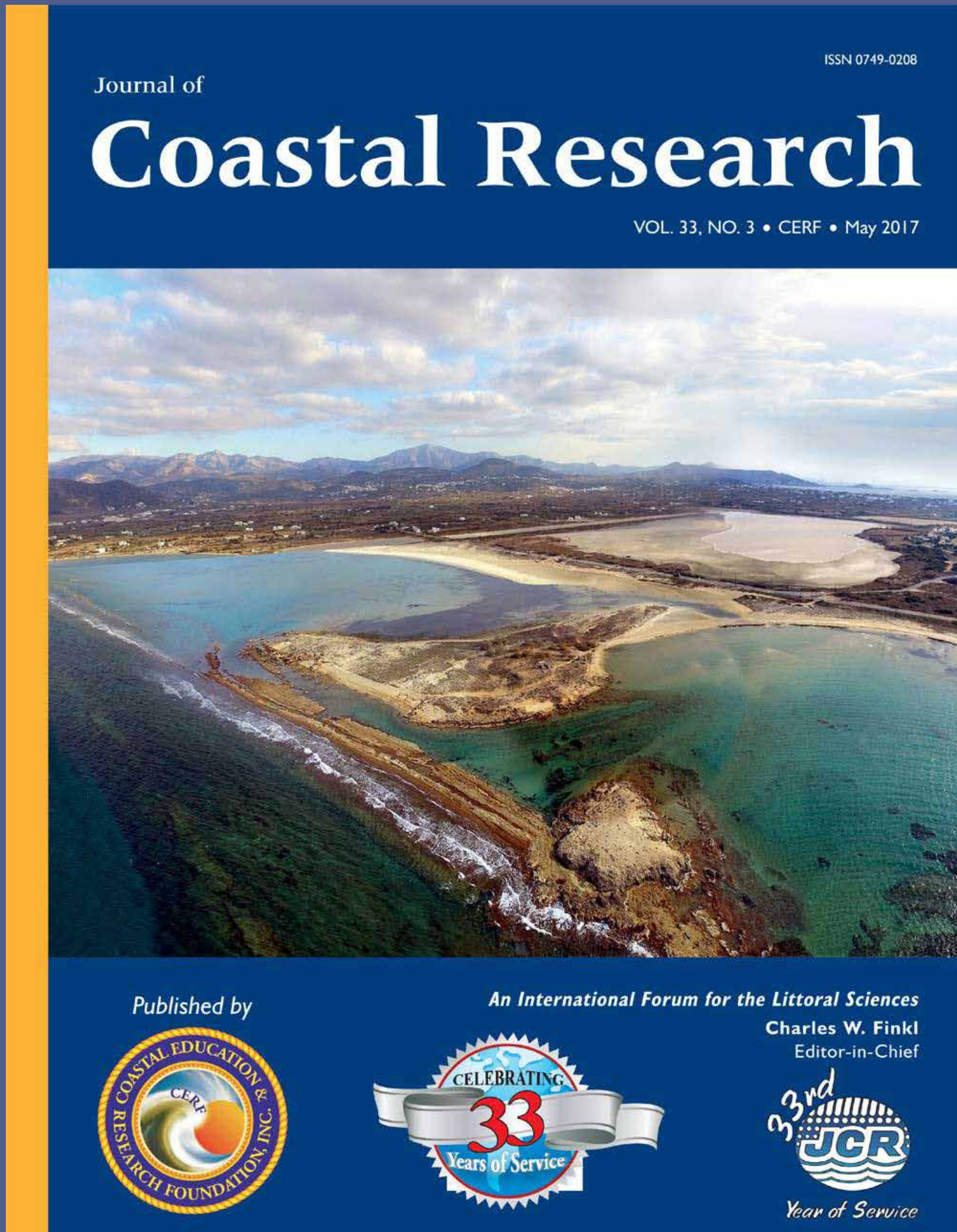

COVER PHOTOGRAPH:
ST. GEORGIOS BAY, NAXOS ISLAND, GREECE

Naxos is the largest island (around 429 km^2) of the Greek Cyclades Archipelago in the Aegean Sea. In addition to being the center of archaic Cycladic culture and an abundant source of emery deposits, Naxos is one of the most fertile islands within the Cyclades. It has a good supply of water in a region where water is usually lacking. Mount Zeus (at approximately 1,004 m) is the highest peak in the Cyclades, and tends to trap the clouds, permitting greater rainfall. This has made agriculture an important economic commerce, with various vegetable and fruit crops, as well as cattle breeding. Naxos is well known within Greece for its cheese, potatoes, and Kitron, a local lemon-citrus spirit.

The climate found on Naxos Island is typical Mediterranean, with relatively mild winters and very warm summers. The Köppen Climate Classification subtype for this climate is Csa. This dry climate, in combination with the coastal marine and aeolian processes, have shaped the recent landscape of the western coast of Naxos island. Around 6000 years BP, St. Georgios Bay was protected by an elongated coastline, which extended almost parallel to the present day shore. The analysis of sediments and microfaunal content revealed that at least from 6144 yrs BP until 232 yrs BP, this area used to be an active lagoon. The embayment was actively changing from a pure coastal environment to a system that frequently alternated between shallow marine (with some fresh water input) and brackish mesohaline (Evelpidou *et al.*, 2010, 2012). The bay shown in the photo has now periodically allowed seawater into a lagoon beside the sand dune beach. This large shallow bay was probably used as a harbor to access the Yria archaeological site, which contains several worship centers and a temple dedicated to the god Dionysus. (Photograph taken by Niki Evelpidou, National and Kapodistrian University of Athens, Greece).

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*
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