明德厚學 Integrity Knowledge 海洋 1959 索海探新 Exploration Innovation

Third Institute of Oceanography
Minister of Natural Resource , China

14 November 2022

Dear Prof. Muhammad Zahir,

It is my great pleasure to announce that the **"Seminar on Beach Protection and Restoration around the South China Sea"** will be held from **1-2 December, 2022 in Xiamen, China**. The conference will allow for both physical and online participation of the attendees. Main topics of the conference are:

(1) Coastal erosion prevention and disaster mitigation
(2) Status and sustainable development of beach resources around South China Sea
(3) Beach resources protection and restoration technology

Due to your well-known academic reputation in beach protection and restoration, we sincerely invite you to give oral presentation (15min) . All contributions to the seminar would be acknowledged.

Please submit your report PPT by 25 November 2022 to our organizing committee at caochao@tio.org.cn , more details please visit the conference website: https://hy.tio-mcc.cn/.

Sincerely,

Prof. Dr. Feng Cai,

Director, Academic Committee of the Conference
Director General, Third Institute of Oceanography, MNR, China
Tel. +86 592 2195281, Email. caifeng@tio.org.cn

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178 University Road, Xiamen City, Fujian Province, China
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AGENDA

December 1st, 2022

Opening			
08:30-08:35	Opening remarks from SCOR China by Qiao Fangli		
08:35-08:45	Opening remarks from the TIO by Cai Feng		

Keynote Speech			
08:45-09:15	Beach-Inlet Interaction and Regional Sediment Management	Wang Ping	Liu Jianhui
09:15-09:45	Current coastal erosion and protection in Thailand	Cherdvong Saengsupavanich	
09:45-10:00	Tea/Coffee break & photo		
10:00-10:30	Coastal Hydrodynamics of coral reef-channel-lagoon system	Zheng Jinhai	
10:30-11:00	Features of typhoon activity and its impact on the South Central Vietnamese coast	Le Dinh Mau	
11:00-11:30	Sustainable Natural Architectural Design for Sand Dunes Restoration by Sand Trapping in Terengganu Coast	Effi Helmy Ariffin	
11:30-14:30	Lunch & Break		

Session 1: Coastal Morphodynamics			
14:30-14:45	Morphodynamic response of submerged artificial sandbar and its impacts on beach evolution	Zhang Chi	Yao Yu Zhang Chi
14:45-15:00	Dramatical hydro-sedimentary changes induced by bamboo fences over mangrove tidal flat of the largest delta in Beibu Gulf, Southwest China	Huang Zuming	
15:00-15:15	Study on the response mechanism of wave and current to the reef-type breakwaters	Zheng Yuhua	
15:15-15:30	Edge waves near a seawall over a concave bottom	Zhang Di	
15:30-15:45	Optimization and application of static bay-beach model	Zhu Jun	
15:45-16:15	Tea/Coffee break		
16:15-16:30	The morphodynamic change of reef islands under monochromatic waves	Yao Yu	
16:30-16:45	An experimental study on measuring wave transformation with LiDAR	Shi Jian	
16:45-17:00	Sand-mud transition dynamics at embayed beaches during a typhoon season in eastern China	Guo Junli	
17:00-17:15	Sediment source-to-sink process variations of sandy-muddy transitional beaches and their morphological indications	Zhao Shaohua	

December 2nd, 2022

Session 2: Coastal Protection, Restoration and Sustainable Developments			
08:30-08:45	Need for Speed in Indonesian Mangrove Rehabilitation through Integrated Mangrove Sowing System for Avicennia marina	Yaya Ihya Ulumuddin	Yaya Ihya Ulumuddin Liu Zhenghua
08:45-09:00	Effect of fence opening configuration on sand trapping	Ning Qingqian	
09:00-09:15	Coastal erosion threats and mitigation risks in shoreline adaptive management in Malaysia	Noraieni Haji Mokhtar	
09:15-09:30	Shoreline renovation and restoration project featuring beach nourishment in Shanhai Pass, Qinghuangdao	Han Xuejian	
09:30-09:45	Research on characteristics of beach erosion and restoration in headland bays	Feng Xi	
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10:15-10:30	New coastal protection measures in Thailand	Niran Chaimanee	
10:30-10:45	Study on the mechanism of estuarine siltation and system rehabilitation method of typical estuaries in sandy coast area	Li Xia	
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11:30-11:45	Coastal Resources management and Beach protection in west coast of Sri Lanka	Ranjana U K Piyadasa	
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Session 3: Investigation, Monitoring and Modelling Of Beach Process			
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15:15-15:30	Evaluation of the tidal flat change using multitemporal Landsat data and GIS technical in Hai Phong coastal zone	Nguyen Dac Ve	
15:30-15:45	Typhoon vs. cold wave: A comparative assessment of geomorphic response and boulder displacement using RFID technology	Li Lingbo	
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16:15-16:30	Tide-modulated wave characteristics and breaking regimes on a dissipative beach at South China Coast	Li Yuan	
16:30-16:45	Summary		

SYMPOSIUM ON BEACH PROTECTION AND RESTORATION AROUND THE SOUTH CHINA SEA, 2022

MANUAL

Xiamen China
December 2022

Chinese Scientific Committee on Oceanic Research
Third Institute of Oceanography, Ministry of Natural Resources

Introduction

The “Symposium on Beach Protection and Restoration around the South China Sea, 2022” is an international academic conference co-sponsored by Chinese Scientific Committee on Oceanic Research and Third Institute of Oceanography, Ministry of Natural Resources. The symposium encourages the publicity of the latest research results in the field of coastal zone resource protection and restoration, and promotes the development of coastal zone ecological civilization. Becoming one of the high-level and highly influential professional academic symposiums in the field of beach protection and restoration in China. The symposium is scheduled to be held in Xiamen, Fujian Province, China, in December 2022 and is organized by Third Institute of Oceanography, Ministry of Natural Resources.

With the theme of "Protection and Restoration of Beach Resources in Countries around the South China Sea", on the basis of cooperation with Southeast Asian countries in marine ecological protection, we have organized domestic and international academic seminars to discuss the coastal erosion disasters in countries around the South China Sea, to share the experiences and practices of various countries in coastal zone protection, focusing on the development, utilization and protection strategies of beach resources of various countries, and sorting out the key scientific issues in the protection of beach resources around the South China Sea. The symposium will benefit the China-ASEAN dialogue in disaster prevention and mitigation and ecological protection, enhance bilateral and multilateral cooperation between China and neighboring countries around the South China Sea, and provide a better international environment and necessary scientific and technological support for the Belt and Road cooperation Initiative.

Sponsor:	The Chinese Scientific Committee on Oceanic Research, SCOR China
Organizer:	Third Institute of Oceanography, Ministry of Natural Resources
Co-organizer:	Key Laboratory of Coastal Disaster and Protection (Hohai University), Ministry of Education, APEC Marine Sustainable Development Center
The academic committee:	Director: Feng Cai Members: Feng Cai, Jin-hai Zheng, Wichien Intasen, Effi Helmy Ariffin, Le Dinh Mau, Yaya Ihya Ulumuddin, Houjie Wang, Shenliang Chen, Dejun Dai, Chi Zhang, Hongshuai Qi, Zhenghua Liu.
Conference Organizing Committee:	Director: Feng Cai Deputy Directors: Hongshuai Qi, Zhenghua Liu, Jianhui Liu Secretariat: Hongshuai Qi (concurrently Secretary-General), Chao Cao, Shaohua Zhao, Gen Liu, Yangyang Liu, Wei Yang, Hui Xie, Yanyu He
Symposium Secretariat:	Secretary-general: Hongshuai Qi Secretary: Chao Cao, Shaohua Zhao, Wei Yang, Hui Xie, Gen Liu, Shasha Liu, Yanyu He

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Meeting number: 964 2737 6789, Password: 2022

Topic: INTERNATIONAL SYMPOSIUM ON BEACHPROTECTION AND RESTORATION AROUND THE SOUTH CHINA SEA, 2022

Attention: We will invite all speaker to test online at 1:00~8:00pm (UTC/GMT+08:00) on November 30th.

Location

Sea Rhyme Hall, Haiyue Hotel（海悦山庄，海韵厅）, 3999 Huandao South Road, Siming District, Xiamen City, China

Contact

Website: Conference Official Website: http://en.tio.org.cn/

Contact information: Mr/ Dr. Chao Cao: caochao@tio.org.cn, +86 18030085312
Mrs/ Dr. Yangyang Liu: liuyangyang@tio.org.cn, +86 18850187627

ABSTRACTS

SYMPOSIUM ON BEACH PROTECTION AND RESTORATION AROUND THE SOUTH CHINA SEA, 2022

ABSTRACTS

Xiamen China
December 2022

Chinese Scientific Committee on Oceanic Research
Third Institute of Oceanography, Ministry of Natural Resources

Outline

Abstracts

Edge waves near a seawall over a concave bottom

Zhang Di, Wang Gang

College of Harbor, Coastal and Offshore Engineering, Hohai University, Nanjing, Jiangsu Province, 210024, China

Abstract:

Vertical seawalls are commonly built on the shore, and their existence must influence the character of nearshore dynamics. Analytical solutions based on linear-shallow water equation are derived for edge waves on a concave exponential profile which may be used to idealize the actual bottom profile with a seawall at the shoreline. Moreover, an extensively validated Boussinesq wave model is used to conduct numerical experiments for edge waves induced by surface bumps. The numerical results are consistent with the proposed solutions, confirming the validity of the new analytical solutions.

Keywords:

Seawall, Edge waves, Boussinesq wave model, Concave profile

Optimization and application of static bay beach model

Zhu Jun, Wang Qing, Zhan Chao

Coastal Institute, Ludong University, Yantai, Shandong, 264025, China

Abstract:

A sandy coastline is rarely straight, and most of them may be gently curved. Headland-bay beach (HBB) is one of the most prominent physiographic features on the oceanic margin of many countries. Parabolic model proposed by Hsu has been widely used to quantify this ideal bay shape. However, the coefficients in the parabolic equations given in many articles are quite different. First, this paper reviews the progress on the research in parabolic bay shape equation. Secondly, the coefficients in the parabolic equations are further given from fitting the planform of 32 prototype bays. Thirdly, a software named Bay Beach is developed to improve the efficiency of application, which can be used to verify the stability of a HBB, optimization of beach nourishment projects and examine the effects of a new or existing wave diffraction point on the downdrift beach. At last, several practical examples are demonstrated for the stability verification of natural and man-made bay beach.

Keywords:

Headland-bay beach, Static bay beach, Static equilibrium planform, Bay Beach

An experimental study on measuring wave transformation with LiDAR

Zhang Lipeng[1], Shi Jian[1], Zhang Chi[1], Zheng Jinhai[1]

[1] College of Harbor, Coastal and Offshore Engineering, Hohai University, Nanjing, Jiangsu Province, 210024, China

Abstract:

Using laser scanner (LiDAR) to measure wave surface directly is a noval wave observing technology. Based on the operation principle of time of flight, LiDAR can capture the time-varying wave surface with high precision and spatial resolution on the surf zone and swash zone. In order to verify the accuracy of LiDAR, a flume experiment with a cement slope was conducted and test runs with different wave conditions were grouped. LiDAR is calibrationed by two different methods. One method is to use the least square method to determine tilt angle based on the static water surface point clouds. The other method is to use the improved Iterative Closest Point (ICP) algorithm to realize the real time and automatic calibration throughout the measurement process. Then, wave surface and terrain are reconstructed from the point clouds. Finally, runup is retrieved through the time series variance at every point and reflection intensity gradient on each thread. Compared with the wave gauge, runup obtained by LiDAR was very good agreement. The error of runup is less than 10%, showing the great potential of 3D LiDAR to be used to monitor wave transformation and runup in the field and laboratory.

Keywords:

LiDAR, runup, remote sensing, calibration

Sand-mud transition dynamics at embayed beaches during a typhoon season in eastern China

Guo Junli[1], Shi Lianqiang[1,2], Chen Shenliang[3], Castelle Bruno[4], Chang Yang[3], Cheng Wufeng[3]

[1] Second Institute of Oceanography, Hangzhou 310012, China

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[4] University of Bordeaux, Pessac 33600, France

Abstract:

Sand-mud transition (SMT) is an important boundary of the beach system, and its location and evolution have been increasingly studied in recent years. This study focuses on the location and migration of SMTs and their influencing factors on three representative embayed beaches on the east coast of Zhujiajian Island, Zhejiang Province, China, characterized by different levels of human interventions. Beach topographies, surficial sediment characteristics and nearshore hydrodynamic data were obtained through three field campaigns carried out during the early, middle and late stages of the 2019 typhoon season. This typhoon season included four typhoons with nearshore significant wave height Hs exceeding 3.71 m, and maximum Hs of 6.77 m (Super Typhoon Lekima). Results show that the three beaches were all impacted by the high-energy wave conditions, although with some different behaviors. Sediments of the three beaches all coarsened with worse sorting during the typhoon season, with the nearshore surficial sediments showing similar patterns. The SMTs of the three beaches were stable or migrated seaward during the typhoon season. During the typhoon season, offshore SMT migration was positively correlated with the beach profile volumetric loss at three embayed beaches in this study. The SMTs of beaches with less human intervention are more stable during typhoon season. By including 12 additional embayed beaches of eastern China in our analysis, we found that the SMT offshore distance increases with increasing nearshore average significant wave height, increasing headland offshore extent and decreasing tidal range. Our study suggests that SMT is a relevant indicator of beach sediment stability, which can help to increase the understanding of embayed beach dynamics and to guide coastal management and planning during typhoon seasons at such embayed beaches.

Keywords:

Embayed beaches; sand-mud transition (SMT); human intervention; typhoon season; beach stability

Sediment source-to-sink process variations of sandy-muddy transitional beaches and their morphological indications

ZHAO Shaohua[1,2,3*], CAI Feng[1,2,3*], QI Hongshuai[1,2,3], LIU Jianhui1, CAO Chao[1,2,3], LIU Gen1, LEI Gang[1,3]

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[3] Fujian Provincial Key Laboratory of Marine Ecological Conservation and Restoration, Xiamen 361005, China

Abstract:

The clay mineralogy of 28 sandy-muddy transitional beach (SMT-Beach) sediments and surrounding mountain river sediments along the coasts of southeastern China was systematically investigated to reveal the sediment source-to-sink process variations of such beaches and their morphological indications. The results show that clay mineral assemblages of these SMT-Beaches mainly comprise of almost equal illite (~30%), kaolinite (~28%), chlorite (~22%), and smectite (~20%) contents. From the surrounding mountain rivers to the SMT-Beaches, clay mineral assemblages show distinct spatial changes characterized by a large decrease (~40%) in kaolinite, whereas the other three clay minerals present relative increases, especially clear for smectite. The muddy sediments sources of SMT-Beaches inferred from the clay mineralogy are mainly derived from nearby mountain rivers coupled with long-distance transportation and penetration of the Yangtze River. The sandy sediments of these beaches are predominately sourced from nearby mountain rivers, weathering products of surrounding rocks in both mainland and island environments, and erosion of the ‘Old Red Sand’ and ‘Red Soil Platform’. However, the sandy sediment sources of the SMT-Beaches are largely reduced because of the remarkable decrease in the river fluvial supply associated with intensive human activities such as dam construction and coastal reclamation, leading to clear erosion in the sandy sections of SMT-Beaches. In contrast, the muddy sediment supply of SMT-Beaches is temporarily stable and relatively constant as before, resulting in landward migration of the mudflats with relative transgression or accumulation. These findings highlight that the natural evolution processes of SMT-Beaches evolution have been greatly reshaped by intensive human activities.

Keywords:

Sandy-muddy transitional beach, clay mineral, sediment source, human activity, fluvial discharge, morphological evolution

Need for Speed in Indonesian Mangrove Rehabilitation through Integrated Mangrove Sowing System for *Avicennia marina*

Safinah Surya Hakim[1], Maman Turjaman[1], Whitea Yasmine Slamet[1], Asep Hidayat[1], Virni Budi Arifanti[2], Aam Aminah[3], Aryanto[1], Ragil Setio Budi Irianto[1], Luciasih Agustini[1], Retno Prayudyaningsih[1], Sarah Asih Faulina[1], Laras Murni Rahayu[1], Tien Wahyuni[2], Yaya Ihya Ulumuddin[4*], Heru Gunawan[5], Muhamad Gunawan Budi Utama[6], Atriyon Julzarika[7], Sadli Le[8], Dwisuryo Indroyono[9]

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Abstract:

The Government of Indonesia has put an ambitious target on mangrove rehabilitation with 600,000 ha by 2024. Various techniques of mangrove rehabilitation have been implemented, including sylviculture approaches and ecohydrological techniques, but there is still a need to speed up the rehabilitation. Here, we proposed a new approach called the Integrated Mangrove Sowing System (IMSS), that offers speed and high survival rate of transplanted seedlings in the field. IMSS includes 1) seed preparation with a seedball technology, 2) site selection with remote sensing, and 3) direct planting of the seeds with drone. In this study Avicennia marina is selected because it has small seeds and naturally grow in seaward fringe with thick mud (>1 m), which rarely chosen for rehabilitation projects. Seedballs are coated seeds with mangrove mud, charcoal powder of coconut shells, and

rice husk. The key parameter in site selection is microtopography of mangrove habitat, an intertidal zone ranging from mean sea level (MSL) to highest high water level (HHWL). Drone with loading capacity of up to 15 kg or 1,200 of seeds can accelerate and ease planting in a thick mud habitat. Firing system of the drone can adjust the penetration depth of seedballs when they fall on the ground, enhancing its germination and survival rates. We found that seedballs placed on the soil surface are the highest germination rates (89%) in the laboratory. This information are used to adjust the firing system and choose the planting sites. In one location, our seeds are successfully germinated and survive with the rate of 72% (7,088 of 9800 seeds) at four month after planting and the seedling height reached 35 cm on average. In contrast, no seed germination was observed in the second location where there are mostly at below MSL, leading to the longer flooding period of the area which is unsuitable for germination. Accordingly, IMSS might be one of the future technique of rehabilitation that can speed up mangrove rehabilitation.

Keywords:

IMSS, A*vicennia marina*, seedballs, microtopography, drone

Effect of fence opening configuration on sand trapping

Ning Qingqian[1,2], Li Bailiang[2*], Zhou Changmao[3], He Hanyu[4], Liu Jianhui[5]

[1] West Anhui University

[2] Xi'an Jiaotong-Liverpool University

[3] Fuzhou University

[4] China Ocean University

[5] Third Institute of Oceanography, Ministry of Natural Resources

Abstract:

Fence installation is commonly considered as a better solution than the hard engineering infrastructure for coastal dune initiation and protection due to its low cost and close integration with ecosystem. The efficacy of sand trapping fence is to be investigated. We conducted a series of field experiments on the beach in Pingtan Island, Fujian Province to evaluate the effect of fence opening configuration on the efficiency of sand trapping. Six 50-cm tall, polywood fences with different opening configurations but similar porosity (around 50%) were organized as three pairs to examine the effects of opening orientation (vertical slat vs. horizontal slat), opening size (large square vs. small square), and porosity distribution (upper dense vs. lower dense). Results of these experiments show that two incipient dunes were formed at the beginning, with a larger dune in the leeward side and a much smaller dune in the windward side. They were gradually merged together with more trapped sand. Slat orientation, opening size and porosity distribution most affected the dune profile where $-5h < x < 5h$ (where x is the distance to the fence and h is the fence height, negative sign indicates upwind). Leeward dune is higher and closer to the fence for vertical slat than horizontal slat. Fence with larger opening size has slower sand trapping speed and its leeward dune is farther away compared to the fence with smaller opening size. The leeward dune is much closer to the upper dense fence than the lower dense fence but the trapping capacity appears independent of porosity distribution. The findings of this study can provide guidance on the fence design for dune protection and restoration.

Keywords:

Sand trapping, opening configuration, effect of fence

Research on characteristics of beach erosion and restoration in headland bays

Feng Xi1[*], Zhou Yingtao[2,3], Jiang Yuanshu[1], Zhu Yu[3,4], Feng Weibing[1]

[1] College of Harbor, Coastal and Offshore Engineering, Hohai University, Nanjing, 210098, China;

[2] Shanghai Urban Construction Design & Research Institute (Group) Co.,Ltd. Shanghai, 200125, China;

[3] Hainan Key Laboratory of Marine Geological Resources and Environment, Haikou, 570206, China;

[4] Marine Geological Survey Institute of Hainan Province, Haikou, 570206, China;

Abstract:

Headland sandy bay is one common type of coastal landforms. The headland of the curved coast protruding to the sea, where the wave energy converges and the wave dynamics are strong. Nearshore current is complex in the headland bay which leads to strong alongshore variation. The erosion and accretion processes are therefore much more complex than that associated with a straight coast. The restoration processes of storm profile under natural force are significant to beach protection, to prevention and mitigation of coastal disasters. In this study, based on the measurement data at Narrabeen beach, Australia and numerical models, series of studies have conducted to investigate the variability beach profile and shoreline variation spanning from weather time-scale to long term time-scale. The main findings are:

For the weather time-scale, as often a case for the Narabeen beach, storm-waves were from the southeast, which caused the sediment erosion in the south and sediment accretion in the north. The erosion rate of the beach backshore is controlled by the elevation of tidal-water-level during a storm event relative to the berm height. Moreover, the eroded sediment from the subaerial region was accumulated in the subtidal area and transport along with the alongshore current [1-2].

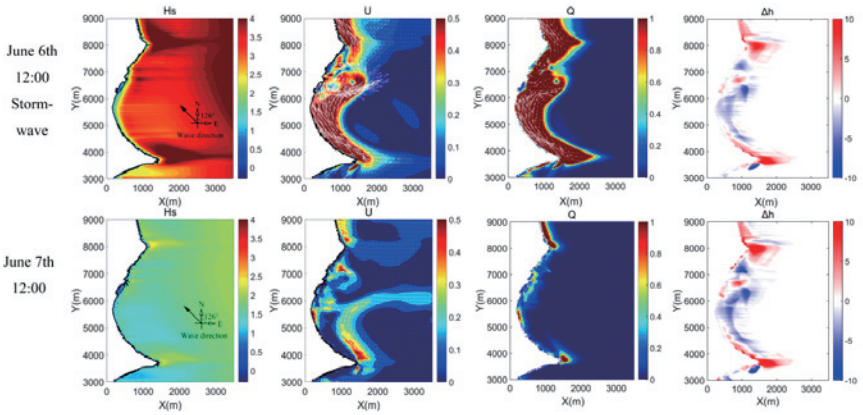

Fig. 2 Hydrodynamic analysis for a storm event (use NearCom model) (Feng et al., 2019) [1-2]

Downscaled hydrodynamic analysis to a beach profile revealed that wave is the main restoration force. The average onshore velocity caused by wave asymmetry brings the foreshore sediment to the backshore. In addition, tidal-water-level adjusts the

restoration processes particularly for the backshore part of a storm beach profile. During flood-to-high tide, the sediment flux generally moves shoreward, and the backshore beach surface becomes narrower and the sediment deposition increases. While during ebb-to-low tide, the sediment flux is seaward, the backshore beach surface becomes wider, and the berm moves toward the sea. The backshore of the beach profile gradually accumulates over tidal cycles.

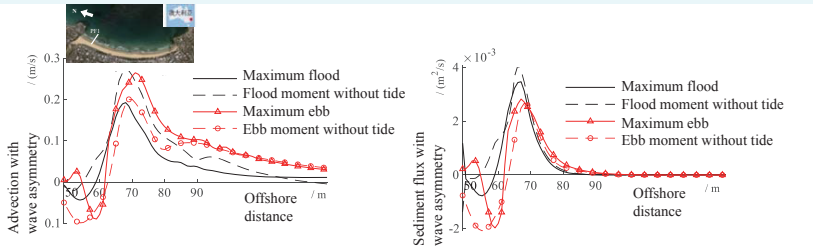

Fig3. Current and sediment flux over a tidal cycle (Feng et al., 2022) [2]

For long-term time scale, the yearly variability in the shoreline is found closely related to the Southern Oscillation Index (SOI), which by changing the wave climate thus leads to uneven sediment transportation and accretion during storm profile restoration processes.

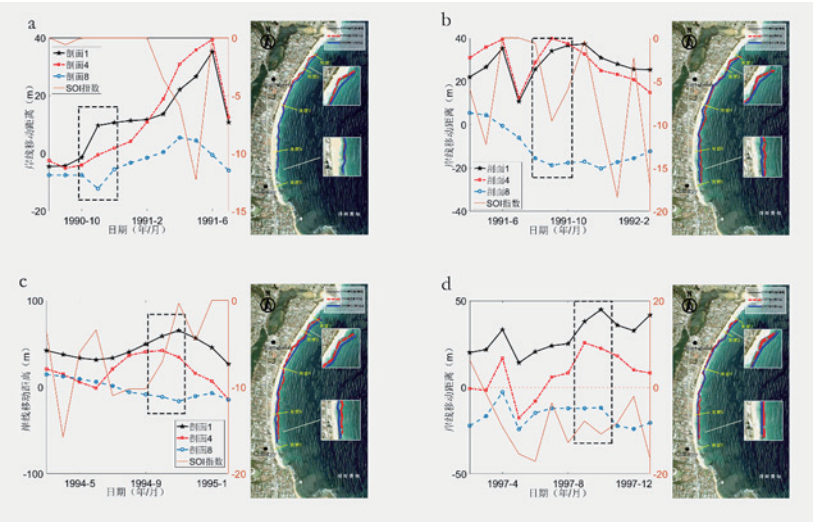

Fig.1 Beach rotation and SOI index (Zhou et al., 2019) [3]

Keywords:

Headland beach, beach erosion and restoration, Coastline Variation, Beach Rotation, alongshore sediment transport

Reference

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Coastal Erosion and its Adaptation with Climate Change in Thailand

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Abstract:

Climate change has been the significant phenomena globally. It has varied impacts in the different areas of Asia and the Pacific region, Development of coastal cities led to the degradation of coastal habitats, resources depletion and pollution. Currently, coastal erosion is the major threat on the coast of Thailand including tourism islands in both the Gulf of Thailand and the Andaman Sea. An approximately 730 kilometers distance of shoreline (35% of total areas) is facing an erosion problem. The coastal erosion problem will negatively impact not only to the economy and the local livelihood of the community, but also extend to the coastal change. The coastal change in Thailand had been assessed since 1996 particularly at the Upper Gulf of Thailand where Bangkok, the capital is situated. The effects of coastal erosion crisis within Bangkok clearly show directly impact the economy, the natural resources and the society as a whole of Thailand. Direct and indirect causes were proposed with some solutions for mitigation measures will be discussed. In Strategies and measures to solve the problem of coastal erosion, there are determined by causes of coastal erosion in the area, which consist of physical causes, environmental cause, community cause, legal issues, and management course. However, determinations of strategies and measures to solve the problem of coastal erosion in the affected areas must be in harmony with Strategic framework. The Thai government introduced the new law, Act Management of Marine and Coastal Resources in 2015. Master plan for coastal erosion mitigation and adaptation will be reviewed and assessed.

Keywords:

Climate change, coastal erosion, mitigation measure, Thailand’s coastal management

Study on the mechanism of estuarine siltation and system rehabilitation method of typical estuaries in sandy coast area

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Abstract:

The estuaries are easy to be blocked by the evolutional sand spit induced by active longshore sediment transport on the sandy coast area. The frequently dredging of the estuaries because of blocking causes flood disasters, the loss of beach sediment, the continuous erosion of the coast and the degradation of ecological environment. In this paper, a systematic rehabilitation method was proposed to reconstruct the tidal inlet and rehabilitate the stable relationship between the estuary and the sandy coast with bilateral or unilateral jetties in equilibrium and nonequilibrium longshore sediment transport conditions. The coastal evolution analysis, dynamic analysis and numerical simulation of beach evolution are used to validate and optimize the method. The results indicate that the method can stabilize the estuary and sandy coast and the ecological restoration using mostly natural forces with minimum artificial auxiliary measures. The rehabilitation method can provide reference for the ecological protection, coastal protection and rehabilitation, and disaster prevention and mitigation of similar estuaries and coasts.

Keywords:

Estuarine siltation sandy coast estuary tidal inlet jetty longshore sediment transport

Dramatic changes in horizontal structure of mangrove forests of the largest delta in northern Beibu Gulf, China

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Abstract:

The horizontal structure of mangrove forests is one of the important characteristics occurred along tropical and subtropical shorelines, reflecting significant signal for couplings between mangroves and external drivers. While loss and gain of mangroves has received widely concerns, little information is related about how the horizontal structure for mangrove forests from the seedling stage to maturity are varied due to impacts from deltaic biomorphodynamics. Here, a series of multi-year images, nutrient elements, sediments, and Aegiceras corniculatum vegetation parameters of the ecological quadrats along the Nanliu delta, the largest delta of the northern Beibu Gulf in China, are analyzed to reveal changes in horizontal structure and associated driven factors of mangroves. The results show that both discrete structure and agglomerate structure can be often found in A. corniculatum seedlings. However, seedlings with discrete structure will be gradually vanished by new seedlings filling with combination into agglomerate status and the corresponding agglomerate structure will be shaped into relatively stable, while the stage of A. corniculatum seedling was grown into maturity. Agglomerate structure of seedlings can enhance elevation beneath mangroves by trapping much more sediments than that of discrete structure, providing available space and conditions for seedlings to grow further. Furtherly, by catching fine sediments with enriching nutrients in agglomerate structure of mangrove forests, the survival rate of horizontal structure of agglomeration in A. corniculatum seedlings can be much larger than that of discrete structure. Our results highlight the significance of agglomeration in mangroves, which can be beneficial to coastal mangrove restoration and management.

Keywords:

Deltaic mangrove, Aegiceras corniculatum, horizontal structure, biomorphodynamic processes, Nanliu Delta

Using video imagery to reconstruct the 3D intertidal terrain along a beach with multiple cusps

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Laboratory of Ocean and Coast Geology, Third Institute of Oceanography, Ministry of Natural Resources, Xiamen 361005, China

Abstract:

A high frequency, high resolution shore-based video monitoring system (VMS) was installed on a macrotidal (tidal amplitude > 4 m) beach with multiple cusps along the Quanzhou coast, China. Herein, we propose a video imagery-based method that is coupled with waterline and water level observations to reconstruct the terrain of the intertidal zone over one tidal cycle. Furthermore, the beach cusp system (BCS) was precisely processed and embedded into the digital elevation model (DEM) to more effectively express the microrelief and detailed characteristics of the shoreline. During a field experiment conducted in January 2022, the reconstructed DEM was deemed satisfactory. The DEM was verified by RTK-GPS, and had an average vertical RMSE along corresponding RTK-GPS-derived intertidal profiles and the corresponding BCS points of 0.134 m and 0.065 m, respectively. The results suggest that VMSs are an effective tool for investigating coastal geomorphic processes.

Keywords:

Intertidal terrain; Beach cusp; Video monitoring system (VMS); Waterline method; Feature embedment

A coupled numerical model for wave-induced nonhomogeneous seabed response

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Abstract:

Wave-induced build-up of pore pressure may cause instability of seabed in the vicinity of marine structure foundations. In most previous studies, wave-induced seabed response was divided into two parts: oscillatory response and residual response. In fact, the above two mechanisms are coupled with each other. Most previous investigations were limited to the oscillatory response or residual response of a homogenous seabed, which ignores their coupling process and the non-uniform soil conditions. In a real environment, seabed is often composed of non-homogeneous soil which affects the wave-induced seabed response. In this study, a three-dimensional coupling model for seabed residual response in a non-homogeneous seabed is developed. Non-uniform distribution of soil parameters in a three-dimensional space is applied. Model validations are conducted by comparing the pore pressures between the existing analytical solutions, wave flume tests and the present numerical model. The validated model is applied to investigate the non-homogeneous seabed response with various wave conditions and soil conditions. Based on liquefaction criterion, the distribution law of max liquefaction depth and liquefaction zone is also discussed.

Keywords:

Build-up of pore pressure, non-homogeneous seabed, coupling effect, liquefaction

Evaluation of the tidal flat change using multitemporal Landsat data and GIS technical in HAI PHONG coastal zone

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Abstract:

The tidal flat is an area for important ecosystems such as mangroves, seagrasses, etc., which protect the coast against extreme weather conditions and provide an important environment for aquatic species. Moreover, this is also a vulnerable area under the influence of human activities. Remote sensing and GIS techniques have been widely used by many scientists in the world because they can quickly update useful information on land use and its changes. The aim of this study is to evaluate the change of intertidal area (tidal flat with vegetation and intertidal none vegetation) in the coastal area of Hai Phong city based on multi-temporal Landsat satellite data from 1987 to 2021. Steps were taken in this research: 1-Selecting satellite images; 2-Data preprocessing; 3-Classifying images by using Normalized Difference Vegetation Index (NDVI) and Normalized Difference Water Index (NDWI) algorithms; 4-Images classification by using threshold; 4-Converting data to GIS format; 5-Evaluation of multi-temporal change in the intertidal zone. The results showed that the total area of the intertidal zone with vegetation areas have been decreased sharply from 4683.78 ha to 3287.71 ha during 1987 - 1994 and increased slightly during 1994-2021. However, Tien Lang, Dai Hop, and Bang La tend to increase strongly to very strongly (80.97%, 162.53%, and 1464.79%, respectively), which relate mainly to the mangrove planting projects and good mangrove management at the local community level. In contrast, Trang Cat - Dinh Vu, Thuy Nguyen, and Cat Hai show from very extreme to extreme decreased values (830.78%, 208.79%, 97.24%, respectively), which are caused by increased socio-economic activities in these coastal areas (i.e., industrial parks, reclamation, sea-dike construction, etc).

Keywords:

Tidal flat, Hai Phong coastal, Remote Sensing, GIS, change detection

Typhoon vs. cold wave: A comparative assessment of geomorphic response and boulder displacement using RFID technology

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[2] Laboratory of Ocean and Coast Geology, Third Institute of Oceanography, Ministry of Natural Resources, Xiamen, China

[3] Key Laboratory of Marine Ecology Protection and Restoration, Fujian Province, Xiamen, China

Abstract:

Extreme storm events in coastal zones play a major role in shaping morphology of boulder beaches. However, characteristics of boulder displacement and geomorphological evolution of boulder beaches driven by different extreme storm events are still poorly understood. Thus, characteristics and control factors of boulder displacement on a boulder beach in Fujian, southeast of China were explored before-during-after cold wave event (2020.12.1~12.7) and before-after typhoon event (2021.7.19~7.27), respectively. This was achieved by tracking 42-tagged boulders distributed in intertidal and supratidal zones using Radio Frequency Identification (RFID). The results show obvious dissimilitude of boulder displacement in different geomorphic zones influenced by cold wave and typhoon events, mainly characterized by the difference of migration magnitude, extent, direction and mode of transport. Typhoon event led to rapid and substantial changes in overall morphology of the boulder beach, while cold wave event, only changed the intertidal morphology of the boulder beach to a small extent. Boulder displacement is controlled by a combination of factors. Boulder grain size structure and beach slope, elevation of its location jointly dominate its displacement under same extreme event. Hydrodynamic factors (effective wave energy, incident wave direction, water level) dominate boulder displacement during different extreme events. In terms of single event, the magnitude of boulder displacement influenced by typhoon was much greater than that of cold wave. However, considering the frequency and duration of cold waves in winter, for the study area, impact of multiple consecutive cold wave events on the geomorphology of the boulder beach cannot be ignored. This study can improve the understanding of the mechanism of boulder displacement and dynamic geomorphology on boulder beaches, and will be helpful for predicting the response of boulders to future storm events.

Keywords:

Boulder displacement, RFID, extreme events, boulder beach morphology

A deterministic prediction of extreme waves generated over bottom slopes

Fu Ruili

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Abstract:

Freak waves, which are much larger and steeper than the wave trains from which they arise, have caused considerable damage to marine structures and human life in coastal regions. A common definition of freak waves is $\eta c > 1.25Hs$ or $H > 2.0$ Hs, where Hs is the significant wave height, H is the wave height and ηc is the crest elevation relative to the mean water level. It is well-known that bottom non-uniformity can lead to an increased likelihood of freak waves. Therefore, to decrease the underlying catastrophic impact of freak waves, it is crucial to provide an effective approach to predict these large-amplitude waves. In the present study, a new predictor, the non-dimensionalized, maximum of the scaled non-uniformity wavelet power of a wave group is proposed to predict the occurrence of extreme waves over bottom slopes. After testing a large number of cases, it is found that the formulae predict most freak waves successfully and effectively.

Tide-modulated wave characteristics and breaking regimes on a dissipative beach at South China Coast

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[2] College of Harbour, Coastal and Offshore Engineering, Hohai University, Nanjing, 210024, China

[3] Third Institute of Oceanography, Ministry of Natural Resources, Xiamen, 361005, China

Abstract:

Waves propagating on sandy beaches are naturally affected by tides. A better understanding of tide-modulated wave characteristics and breaking regimes in the intertidal zone is important for beach protection and disaster mitigations. Here, field measurements are conducted in the intertidal zone on a dissipative beach. Wave characteristics are found to be highly modulated by changing tidal levels. Waves in the intertidal zone is depthcontrolled within water depths of 3 m. Measured wave data are used to verify and evaluate parametric wave breaking dissipation models. The model accounting for the ratio of wave height to depth which is neglected previously provides the best predictions. The breaking regimes change during a tidal cycle. The breaking dissipation is more rapid at low to medium tidal levels and the wave breaking is more saturated at medium to high tidal levels. This is because the region for breaking dissipation is highly modulated by tidal levels. Finally, it is found that the breaking dissipation should be large enough in relatively deep water to maintain a constant wave height to depth ratio in the intertidal zone, implying the previous definition of depth-limited breaking seems too strict for the present case.

Keywords:

Dissipative beach, intertidal zone, wave breaking, tidal modulation, entropy

Shoreline evolution analysis along Pahang Shoreline, Malaysia: An application using Digital Shoreline Analysis System (DSAS).

ABD.RAHMAN Muhammad Mazmirul[1], RAMLI Muhammad Zahir[1,2*], AB RAZAK Mohd Shahrizal[3], HIKMATULAH SAHIB Siti Ayishah Thaminah[1], AZMAN Muhammad Afiq[1]

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[3] Faculty of Engineering, University Putra Malaysia, 43400, Serdang, Selangor, Malaysia

Abstract:

Erosion can cause a major problem and has impacted the livelihoods of residents that reside along the coastline zone. Coastal erosion is known as a permanent loss of land or habitat. The use of Geospatial Information System (GIS) to understand changes can provide large scale understanding of the coastal dynamic along Pahang coastline. Shortwave Infrared 1 (SWIR 1) from Sentinel-2 MSI, Landsat 7 ETM and Landsat 5 TM has help in providing changes using shoreline delineation for the shoreline analysis from 2000 to 2022. Unsupervised classification has been used to extract the shorelines from the SWIR 1 from all the satellite imageries. The extracted shorelines were then processed using the Digital Shoreline Analysis System (DSAS) and the rate of changes were calculated statistically using Net Shoreline Movement (NSM), End Point Rate (EPR) Linear Regression Rate (LRR), and Weighted Regression Rate (WLR). The LRR results were fitted to determine the shoreline changes compared to other analyses. The normalized root means square errors were calculated for this study by comparing the coordinates taken along the shoreline with the coordinates from imagery from 2021. The LRR results were compared with the previous study conducted by the Department of Irrigation and Drainage Malaysia for the National Coastal Erosion Study (2015). The highly impacted areas are listed and recommendations are made according to decision matrix for each area, beneficial to policy makers in future decision making.

Keywords:

Shoreline evolution, shoreline delineation, Sentinel, Landsat, Digital Shoreline Analysis System (DSAS)

Fates of the embayed beaches on the muddy and sandy coasts in China

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Abstract:

Storm conditions, beach geology and human activities affect the abundance and distribution of sandy materials on embayed beaches located on naturally occurring or man-made headlands. This article examines the shoreline evolution as well as the vulnerability of 9 beaches in China (5 beaches in Zhejiang – mud dominated coast in Southern part of China and 4 beaches in Qingdao – rock dominated coast in Northern part of China) to erosion based on the inherent geomorphic characteristics and nearshore hydroclimatic factors of the beaches.

The result of the shoreline analysis indicates that all the studied beaches have been eroding in the long term. Erosion is more severe in Zhejiang than in Qingdao. In the short term, Zhejiang beaches experienced severe erosion between 1998 and 2011 compared to other years in the last 5 decades. In Qingdao, the beaches recorded severe erosion in the period 1973 to 1998. Of the 9 beaches, the most eroded location was at Dasha in Zhejiang (LRR: -5.315 m/y; EPR: -5.671 m/y; NSM: -141.94 m) between 1974 and 1998.

In summary, beaches in Zhejiang are more vulnerable to erosion than those in Qingdao. In Zhejiang, the coast favors the deposition of muddy beach material on tidal flats. Moreover, there has been a shortage in the supply of sediment from the Yangtze river-derived sediment to the coast. The primary source of beach material for the studied beaches in Zhejiang region has been the regular storm condition on the coast. For Qingdao beaches, the primary factor responsible for the vulnerability and beach modification includes a shortage in the natural supply of beach material and storm activities, however, recent beach nourishment and coastal protection procedures are gradually stabilizing the beaches.

Ultimately, the outcome of this research is suitable for beach management procedures on the Chinese coast.

Keywords:

China coast; storm surge erosion; Zhejiang sandy beach; Qingdao shoreline; sand mud transition

Nearly five decades of changing shoreline mobility along the densely developed Lagos barrier-lagoon coast of Nigeria: A remote sensing approach

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Abstract:

Lagos is the old capital and largest port city in Nigeria. There are increased ecological and environmental problems around this coastal area with fast-growing industrialization and a population of 14 million in 2020. In this study, we utilized satellite images to study the shoreline evolution of Lagos Lagoon Barrier coast, Nigeria from 1973 to 2019. The Lagos Lagoon Barrier coast is divided into three sections: Section I (Marginal Lagos), section II (Eko Atlantic City), and section III (Lekki peninsula). Section I coast was stable compared to other sections with around 77% of the section experiencing erosion with the averaging rate of - 1.73 m/yr, and the remaining 23% accreting at the rate of +0.57 m/yr throughout the study period. Around 92% of Section II was eroded at the rate of - 3.59 m/yr, and 8% of this section accreting at the rate of +4.46 m/yr from 1973 to 2008, with a serious erosion rate of - 11.79 m/yr from 1986 to 1999. After the Eko Atlantic City project from 2008 to 2019, Section II experienced advancement up to +92.16 m/yr (53%) and a retreat of up to - 6.50 m/yr (47%). Along section III, erosion dominates with around 90% of this section being eroded at the averaging rate of - 3.55 m/yr with only 10% accreting at the averaging rate of +1.10 m/yr for the study period. Along the westernmost edge of section III, intense erosion up to +7.10 m/yr dominates and continues eastward of Victoria Island from 2012 to 2019. Furthermore, we recorded shoreline erosion up to - 11 m/yr along the Ibeju-Lekki axis and Lagos Free Trade Zone (eastern fringe of section III) from 1999 to 2012. Extrapolating the responsible factors for the shoreline fluctuations along the Lagos Lagoon Barrier coast, this study has identifed a combined impact of sea-level rise, limited sediment supplied by longshore current from adjacent rivers due to construction of dams along the several tributaries in the Bight of Benin, hard coastal engineering procedure such as the Eko Atlantic City (section II) and Lekki deep seaport projects, and intensified population along the coastline to have contributed to the erosion feature observed along the study area. Moreover, this study has revealed that Eko Atlantic City may have contributed to the eroding coast along section III. Our fnal deduction shows that section I is dominated by natural shoreline change patterns and therefore primarily responded to the effect of sea-level rise. Section III is influenced by both natural and human forces while section II is influenced by human intervention through coastal protection as a result of reverse-engineering the effect of climate change and sea-level rise. Conclusively, this study has recommended that current coastal management policies and plans in Lagos State need to be reconsidered and revised to ensure the sustainable use of the coastal zone.

Keywords:

Shoreline changes; Coastal erosion and accretion; Human activities; Lagos lagoon barrier coast

Study on erosion characteristics and influencing factors of lay straight-cape bay transitional beach

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Abstract:

The transitional beach of lay straight and cape bay has become a hot research object of beach dynamic geomorphology and coastal erosion because of its wide distribution, strong plane morphology and complex distribution of beach surface morphology and sediment distribution affected by waves. In this study, apply aerial survey, RTK-CORS and sand particle size test were used to monitor the coastline, topography profile and sediment distribution in eight periods, including summer and winter, and before and after typhoon, of Gulei Peninsula beach, the largest tectonic lagoon sand dam in the coastal area of South China. The results show that, (1) the beach in Futou bay of Gulei town can be divided into two types. The first type is mainly developed in the middle part of the peninsula, and the narrow and long arc beach is ne-n trending. The beach profile type is mainly dissipative, accompanied by the transition form of low tide terrace. The second type is developed in the end of the peninsula, NE trending cape bay coast, beach profile type is mainly dissipative type, low tide terrace type beach is locally developed. (2) The average amount of erosion along the coastline is about 1.5m/a, and the amount of erosion at the top of the bay is larger than that at the corner, and the amount of erosion in some areas is 6-10m. (3) As a whole, the beach presents a state of erosion in winter and siltation in summer. With the change of monsoon wind direction, the longitudinal sediment transport (coastal sediment transport) of the beach also changes. The coastal sediment transport changes from north to south in winter and from south to north in summer. (4) The erosion effect of typhoon on beach is mainly presented in the topographic form of up-down erosion in intertidal zone, and has little influence on backshore erosion and beach sediment redistribution. However, the erosion state varies greatly in different longitudinal positions of beach. The headlands and structures of the beach have certain hindrance to sediment transport.

Keywords:

Coastal erosion, Transitional typic beach, Seasonal characteristic, Storms, Profile form

Study on estuary coastal erosion and siltation disasters and rehabilitation method of estuary-coast system in active longshore sand transport area

Cao Chenglin[1], Li Xia[1], Hu Zejian[1], Zhu Zichen[1]

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Abstract:

The estuaries are easy to be blocked by the evolutional sand spit on the sandy coast with active longshore transport. The frequently dredging of the estuaries because of blocking causes flood disasters, the loss of beach sediment, the continuous erosion of the coast and the degradation of ecological environment. In this paper, a systematic rehabilitation method was proposed to recover the tidal channel of the estuary and reconstruct the stable relationship between the estuary and the coast based on four sandy estuary coasts consist of both bilateral or unilateral diversion sand barriers, as well as balanced and imbalanced coastal longshore transport. The evolution analysis, dynamic analysis and numerical simulation of beach evolution are used to validate and optimize the method. The results indicate that the method can stabilize the estuary and coast and balance the ecological restoration using mostly natural forces with minimum artificial auxiliary measures. The rehabilitation method can provide reference for the ecological protection, coastal protection and rehabilitation, and disaster prevention and mitigation of similar estuaries and coasts.

Keywords:

Sandy coast estuary; estuary tidal inlet; diversion sand barriers; longshore sand transport

Automated sensing of wave overwash processes on an artificial sandy beach

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Abstract:

Wave overwash represents one of the common Storm Impact Regimes of sandy beach during storm events. When the maximum wave runup elevation exceeds the dune or berm crest, overwash regime occurs and it will transport the eroded sediment from foreshore into backshore. This process has, in previous studies, been considered as an important driver that forces onshore sediment transport, which might even affect the evolving trend of newly nourished beach. Once the uprushing bore overtops the berm crest, the overwashing water propagates along the back slope, and the depth and velocity of the bore front decreases, controlled by bed infiltration, bed friction and lateral spreading. Although there exists cross-shore models for the center-line of overwash event, very little knowledge on overwash hydrodynamics is obtained from field observation, leaving the traditional model remained to be validated. This is mainly due to the difficulty associated with deploying in-situ instruments during storm events, as well as the demand on large spatial extent of the measurement data. Video-based remote sensing technique serves as a convenient tool to deal with continuous monitoring of wave shoaling, breaking and swash processes. However, video-based field observation of overwash process is relatively scarce, primarily due to the highly variable optical signature of inundated backshore, and the very different frequency of overwash compared to incident wave. The high frequency nature of overwash and surf remains a challenge as to automated sensing of these processes. This study focuses on overwash process on an artificial beach in Rizhao coast occuring in the first month after completion in June 2019. An automated image processing algorithm is proposed for tracking individual overwashing front propagation based on cross-shore pixel timestack, and allocating the detected cross-shore overwash into discrete overwash events based on merged along-berm pixel timestack. The procedure internally assembles and adapts image processing technique such as cross-camera merging, edge detection, colour quantisation and pixel clustering, through which one can easily analyze each overwash event in terms of their alongshore distribution and cross-shore velocity evolution of the overwashing bore front. This novel algorithm facilitates efficient analysis of event-by-event hydrodynamics of overwash processes. In particular, the controlling factors of alongshore distribution of overwash events and backshore hydrodynamics, such as overtopping width and lateral spreading, may be easily investigated, which are often ignored in previous studies based on single or limited cross-shore timestacks.

Keywords:

Overwash, beach nourishment, video technique

Estimating alongshore sediment transport rate along the Gulf of Thailand

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Abstract:

Estimating alongshore sediment transport rate and understanding hydrodynamic condition at a jetty are crucial for successful downdrift erosion management. The alongshore transport rate estimated by numerical simulations can contain great errors. This research investigated 3 major jetties in Thailand (Cha Am jetty, Krai jetty, and Na Saton jetty) that protrude across the surf zone and completely intercept alongshore sediment transport. Sub-aerial and inter-tidal field surveys by Real Time Kinematic (RTK) technique were undertaken between 2019 to 2020. The collected data was processed and overlaid to calculate the amount of sediment deposition at the updrift jetty. From the results, we found that the Cha Am jetty trapped approximately 38,187 cu.m/yr of the alongshore sediment. While the Krai jetty intercepted approximately 34,170.1 cu.m/yr of the alongshore drift, approximately 65,951.1 cu.m of longshore sediment transport was blocked by the Na Saton jetty annually. Such estimated amounts of the deposited sediment are the quantities that should be bypassed at each jetty. Budget and implementation plans can be prepared. Decision makers can decide whether sand bypassing is the appropriate management option.

Keywords:

Coastal erosion, Beach survey, Sediment deposition, Beach management, Jetty

Numerical Modelling of WABCORE breakwater structure using SPH-based DualSPHysics model

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Abstract:

Coastal erosion is an extremely concerning issue as it affects various aspects of a coast. Extreme sea conditions would aggravate the rate of erosion for a coast. Coastal structures are implemented along the coasts as measures to counter the issue of coastal erosion and the detrimental effects caused by sea waves. A structure in concern, the breakwater, protects the coast by reducing the height of incoming waves into smaller transmitted waves. The structure focused on this study is the Wave Breaker Coral Restoration (WABCORE) that has been developed by the National Hydraulics Research Institute Malaysia (NAHRIM). The structures are stacked together to form a simple trapezoidal design similarly to a breakwater. Additionally, two (2) different arrangement of structures are investigated, broad width and narrow width. Forces exerted on the structure and wave transmission under two (2) different wave conditions are measured. Numerical approach is achieved using DesignSPHysics, a new addition to the open-source code named DualSPHysics. Results signifies that, the wave transmission for the narrow structure is greater than that of the broad structure. On the contrary, the force was measured at the broad structure is greater than that of the narrow structure. The WABCORE structure is seen to be effective in reducing the height of incoming waves despite the various arrangement done.

Keywords:

WABCORE, Coastal Structures, Overtopping, DualSPHysics, Smoothed Particle Hydrodynamics, Numerical Modelling

Study on the response of deflection rip currents to wave height and wave direction in inter-headland bays

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Abstract:

The coast of South China is dominated by inter-headland bays. Due to the effects of headlands and topography, the hydrodynamic conditions of the beaches are complex and the characteristics of rip currents are significant, which poses a huge threat to the lives of tourists. Taking Jinsha Bay in Shenzhen as an example, the Xbeach wave model was used to study the variation of nearshore flow field and the occurrence of rip currents in the headland area under different wave conditions. The study found that the headland had a certain obstacle to the propagation of wave energy. Compared with the non-headland area, the wave height of the headland area was relatively low under the same wave conditions. Deflection rip currents were generated at the headland, and the intensity of the rip currents was positively correlated with the incident wave height. Increasing the inclination angle between the incident wave direction and the coast was conducive to the generation of deflection rip currents, which is the opposite of the type of rip currents generated on open coasts. The research results of this paper initially reveal the response of the deflection rip currents in the headland area to different wave conditions, which will help beach managers and the public to understand the characteristics of the rip currents in the headland area, and provide some references for the utilization and management of beach resources in South China.

Keywords:

Inter-headland, deflection rip currents, XBeach, beach resource management

Distribution features of wave characteristics along South Central Vietnamese coast under the affected of typhoon Damrey (11/2017)

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Abstract:

This paper presents the computed results on the features of wave fields along South Central Vietnamese coast under the affected of typhoon Damrey (11/2017) using WAM cycle 4.5 model. Wind data were obtained from 6 hourly NCEP/NCAR reanalysis data, USA with resolution of $\Delta X = \Delta Y = 0.250$ during typhoon Damrey crossed the South Central Vietnamese coast (4/11/2017). Study results show that at 4h/4/11/2017 maximum wind speed (Vmax) was 23m/s, maximum significant wave height (Hs) was 9,3m and wave period (T) was 11.5s occurred in the offshore region of Khanh Hoa - Phu Yen Provinces coast. During this time, along Southern Khanh Hoa Province coast (on the left side of typhoon moving direction) were lightly affected by wave action with HS ≈ 3-5m. Meanwhile, along the coast of Northern Khanh Hoa Province and Southern Phu Yen Province (in the right side of typhoon moving direction) were strong affected by wave action with HS ≈ 7-8m. But in the meantime, Khanh Hoa Province coast were strongest affected by swell component with Hsw ≈ 2-3m, whereas, Phu Yen Province coast has Hsw ≈ 1-2m. The distribution features of wave fields during typhoon cross the coastal region helps to decide a reasonable measure for coastal protection.

Key words:

Significant wave height (HS), swell (Hsw), wind wave (Hw), Damrey, South Central Vietnamese coast

Regional Differentiation and Sediment Provenance Analysis of Luerhuan River Semi-closed Bay Sediments in Qinzhou Bay, Guangxi

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Abstract:

The bay is a semi closed geomorphic unit with special sedimentary environment. The sedimentation of the bay is affected by the superposition of seabed erosion and deposition, dynamic conditions and sand source supply. Since the completion of Sandun Bridge in 2010, the Luer Huanjiang Bay was further closed, and the dynamic environment in the Bay changed dramatically. It is urgent to explore the short-term rapid response process and influencing factors of the sedimentary environment under the influence of human activities. Based on the end-member analysis of the sediments at 24 stations inside and outside the Luerhuan River Bay, and combined with the synchronous tidal dynamic test at 8 stations, this paper discusses the regional differentiation characteristics of the sediments in the semi closed Bay, the change of material supply and its response to human activities. The sediments in the Luerhuan river area of Qinzhou Bay, Guangxi are mainly fine silt type, narrow kurtosis and negative skewness. The seabed erosion and deposition presents the regional differentiation law of the coexistence of total weak deposition and local rapid deposition. From 2013 to 2020, the average siltation thickness of the bay is 0.14-0.29m, and the average siltation thickness in the west and south of Malantou is land is 3.20m. It is mainly marine source end-member deposition, and the material source is mainly the sediment supply through the bay mouth rising tide, accounting for 60% of the sediment source of the bay. The maximum suspended sediment flux into the Bay during the tidal cycle is 3022kg. Consistent with the change of erosion and deposition, the sedimentation rate of Dazhao estuary and bay top area is large, with an average of 1.62cm/a, which is the end-member deposition of river source. This is related to the small amount of river sediment transport and beach erosion, accounting for only 15% and 25% of the sediment sources of the Bay, respectively. This study reveals the dynamic mechanism of rapid siltation in Luerhuan River Bay under the intervention of human activities, which is helpful to clarify the sedimentary model of the Bay and is of great significance to the protection of mangrove habitat in the bay.

Keywords:

Qinzhou Bay, Luerhuan River, seabed erosion and deposition, sediment tracing, end-member analysis

Experimental study on multi-modal resonance in a rectangular port

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Abstract:

Harbor resonance can produce damaging surging in some harbors, yaw and sway ships at berth and impair harbor operations. The resonant period and associated modal structures are the fundamental property of a particular harbor, which depend on its layout and bathymetry. For the rectangular port, its resonant mode is (*n, m*), where the numbers *n* and *m* denote the number of nodal lines across and along the basin, respectively. When the modes (n_1, m_1) and (n_2, m_2) have similar resonant frequencies, two resonant modes may coexist in the harbor. However, energy transformation between these two modes induced by the shared resonant frequency has not been examined. this paper conducted physical experiments to investigate the multi-modal resonant phenomenon in the rectangular harbor forced by bichromatic short waves. Modes (0, 2) and (3, 1) of the port used in the experiment share the close frequency. The results show that bound long waves generated by short wave groups excite harbor resonance, and the energy of low-frequency oscillations changes periodically, that is, the modes (0, 2) and (3, 1) appear alternately during the continuous energy input. For the response phase, the long-period energy mainly dominates in the mode (0, 2). As the wave continues to enter, the mode (3, 1) gradually emerges and exceeds the mode (0, 2), then gradually decreases with mode (0, 2) emerging slowly. For the damp phase, mode (3, 1) disappears quickly and energy dominates in mode (0, 2) and lasts for a long time.

Keyword:

Harbor oscillation, physical experiment, bichromatic short wave, wave theory

Nearly five decades of changing shoreline mobility along the densely developed Lagos barrier-lagoon coast of Nigeria: A remote sensing approach

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Abstract:

Lagos is the old capital and largest port city in Nigeria. There are increased ecological and environmental problems around the coastal area with fast-growing industrialization and a population of 14 million in 2020. In this study, we utilized satellite images to study the shoreline history of Lagos Lagoon Barrier coast, Nigeria from 1973 to 2019. Our 46 years analysis showed both shoreline advancement (20%) and retreat (80%) along the entire Lagos State coastline. The Lagos State coast is divided into three sections: Section I (Marginal Lagos), section II (Eko Atlantic City) and section III (Lekki peninsula). Section I coast was stable compared to other sections with around 77% of the section experiencing erosion with the averaging rate of -1.73 m/yr, and the remaining 23% accreting at the rate of +0.57 m/yr throughout the study period. Section II experienced obvious advancement due to human activities with the rate exceeding +31.39 m/yr. Along section III, erosion dominates with around 90% of this section being eroded at the averaging rate of -3.55 m/yr with only 10% accreting at the averaging rate of +1.10 m/yr for the study period. Along the westernmost edge of section III, intense erosion up to +7.10 m/yr dominates and continues eastward of Victoria Island from 2012 - 2019. Furthermore, we recorded shoreline erosion up to -11 m/yr along the Ibeju-Lekki axis and Lagos Free Trade Zone (eastern fringe of section III) from 1999-2012. Extrapolating the responsible factors for the shoreline fluctuations along the Lagos Lagoon Barrier coast, this study has identified a combined impact of sea-level rise, limited sediment supplied by longshore current from adjacent rivers due to construction of dams along the several tributaries in the Bight of Benin, hard coastal engineering procedure such as the Eko Atlantic City (section II) and Lekki deep seaport projects, and intensified population along the coastline to have contributed to the erosion feature observed along the study area. Moreover, this study has revealed that the current Eko Atlantic City may have contributed to the new eroding coast flanking the ocean reclaimed city along Lekki phases I & II (in section III). Our final deduction shows that section I is dominated by natural shoreline change patterns and therefore primarily responded to the effect of sea-level rise. Section III is influenced by both natural and human forces while section II is influenced by human intervention through coastal protection as a result of reverse-engineering the effect of climate change and sea-level rise. Conclusively, this study has recommended that current coastal management policies and plans in Lagos State need to be reconsidered and revised to ensure the sustainable use of the coastal zone.

Keywords:

Shoreline changes, coastal erosion and accretion, human activities, Lagos Lagoon Barrier coast, Nigeria

Coastal Resources management and Beach protection in west coast of Sri Lanka

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Abstract:

Water is becoming contaminated as a result of the growing population, industrialization, the use of compost in agricultural production, and man-made activities Surface water and groundwater are the prime water source for household and drinking uses in coastal areas. The flow of seawater into freshwater aquifers is known as saltwater intrusion, and it can lead to groundwater quality contamination, including drinking water. Due to the extremely severe hydraulic interface between groundwater and seawater, saltwater intrusion can happen naturally in coastal aquifers. The aim of the study is to examine the status of seawater intrusion within the study region of the Waikkala area in west coast of Sri Lanka. The physiochemical parameters of 18 groundwater samples and cations and anions were studied to identify seasonal variation. sea water intrusion were identified in the area and most of the well water above the WHO standards. Water was consumable in 77.78% of the locations and unsatisfactory in 22.22%. Furthermore, groundwater quality in the study region is deteriorating due to significant coastal erosion, making it critical to maintain a comprehensive groundwater management strategy to promote sustainable water consumption. Other suggested measures include augmenting rainfall recharge by natural or artificial means, and the physical control of seawater intrusion by installing artificial subsurface barriers in coastal areas.

Keywords:

Coastal Resources management, Beach protection, west coast of Sri Lanka

Application of the Coastal Hazard Wheel for coastal multi-hazard assessment and management in the Guang-Dong-Hongkong-Macao Greater Bay Area

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Abstract:

The coasts of Guangdong-Hong Kong-Macao Greater Bay Area (GBA) are facing threats and challenges from rising sea levels, frequent extreme events and human intervention. This study is the first to use the Coastal Hazard Wheel (CHW) to assess hazard vulnerability in the study area of China. The CHW was used to classify the coasts of GBA, assess its changes in hazard risk from 2010 to 2020, identify hazards hotspots and explore available coastal management options. The results show that the coastal types of GBA in 2010 and 2020 are consistent, with delta/low estuary island and hard rock slope as the main types. GBA is vulnerable to ecosystem disruption, saltwater intrusion, gradual inundation and flooding hazards. Compared with 2010, the high risk proportion of each hazard in 2020 decreased significantly, but the high risk of flooding increased slightly. All kinds of hazards are interdependent and influenced by each other. The Pearl River Estuary, the east bank of Yamen Waterway, the west bank of Huangmao Sea and Dapeng Bay show very high risk, and the flooding risk is the highest. Soft measures such as coastal zoning, tsunami warning systems, wetland restoration and hazard simulation are most widely used in coastal management. CHW is applicable to GBA's coastal hazard vulnerability assessment, which provides a case study for coastal risk assessment of GBA and has certain reference significance for hazard management and sustainable development for the Bay Area.

Keywords:

Coastal hazard assessment, coastal hazard wheel (CHW), coastal management, Guangdong-Hong Kong-Macao greater bay area (GBA)

Heavy Metal Contamination in Beach Sediments as the Result of swage outlet and waste residue dumping in Qingdao, China

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Abstract:

Heavy metal pollution on beaches caused by human activities has received attention in recent years. In this study, heavy metal contents were studied on four beaches based on marine sediment quality standards, the background values of the upper crust, Geoaccumulation and the Nemerow index. The results show that the enrichment levels of heavy metals from lowest to highest were No. 1 beach < No. 2 beach < Shilaoren Beach < No. 3 beach. The overall degree of heavy metal pollution in each beach was low, No. 1 beach is not polluted, probably due to the low content of heavy metals in the sewage discharged from the rainfall. No. 2 beach shows slight pollution of Cr, Zn and Fe at a few locations, mainly due to the outfall source. Some samples of No. 3 beach are slightly to severely polluted with Cr, Ni, Zn and Fe, which is caused by sewage outlets and coal cinder dumping. Some samples from Shilaoren Beach exhibit mild-moderate pollution with Cr, Ni, As, Pb and Fe, and the main sources are sewage discharge, electroplating plants, fertilizer plants and pesticides. The surface distribution of heavy metals is controlled not only by pollution sources but also by hydrodynamics, there are high heavy metal contents near high or low tide lines due to the control of waves and tides. Contamination may occur at certain depths or throughout the profile due to vertical diffusion of heavy metals. The distribution of heavy metals over ten years showed that most sediments transport of beaches are limited within the bay in the cape-bay coast.

Keywords:

Beach sediments; Heavy metals; Evaluation and sources; Sediment transport; China

Conflicts among coastal environment, human activities and management: case study in Chanthaburi, Thailand

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Abstract:

The Sustainable Development Goals (SDGs) is one of the most important issues in recently. It seems a real challenge for all coastal countries including Thailand. To understand the nature, context and factor of each places are the essential point to analyze and solve the problem on the spot. Thailand has totally 23 coastal provinces, one of the most tourist destination, not only the Andaman sea but also the Gulf of Thailand. Chanthaburi is located in the eastern part of the Gulf of Thailand. It is a unique province due to its various types of coastal morphology, many tourist attraction sites and tourism activities. Chanthaburi hosts valuable and important coastal resources consisting of mangroves, coral reefs, seagrasses, and rare marine species. These coastal resources are significant resources that play an essential role and indicate the abundant and highly productive areas for marine life.

This research focuses on the coastal environmental status and coastal utilization based on the analysis of key problems in Chanthaburi. To ensure the coastal resources and environmental situation and the opinion of the local people in Chanthaburi's coastal area about the coastal status and development. The questionnaire field survey has been conducted during June-July 2018. The survey chose 5 coastal districts respondents on the basis of random sampling considering with the population and area. The result from the closed-ended questions were analyzed by percentage and priority issues. For the analysis only some questionnaire would be used for support the results. Moreover, pressure-state-response analysis of the coastal environmental conflicts in Chanthaburi has been done with related factors.

The coastal environmental problems and conflicts in Chanthaburi Province involve two main aspects: conflict between the coastal environment and human activities and conflict between different human activities. The former includes the conflict among mangrove resources, shrimp farming, and urbanization, conflict between coral reef and seagrass resources and tourism activities, conflict among rare marine animals, fishery activities, and marine debris and conflict between fishery resources and fishery activities. The latter includes the conflict between local and commercial fisheries, the conflict between the government, the fishermen and entrepreneurs and conflict between the authorities of different government agencies. Perceptions of respondents about the coastal habitats and marine resources are varied. It depends on what kind of coastal resources and involving persons. Each area has their own different problem. If considered the pressure of the conflicts mostly caused by human activities. The coastal resources and environment have been deteriorated from the anthropogenic activities from time to time. The way to response sometime has the successful solution and some problems still occurred. Lesson learn from the last implementation would teach us for the next solution. How to balance the human requirements for the suitable utilization and conservation the coastal resources and environment at the same time. Coastal knowledge management is a necessary thing as a long term solution to enhance local people awareness. It is the challenge in the coastal management not only Chanthaburi province but also all of the coastal provinces in Thailand. That is the reason why we need the coastal utilization planning with the marine spatial planning concept. To reduce the coastal environmental problems and conflicts. Furthermore, to repeat that the existing laws could solve the problems or it need a specific law for an effective coastal zone management.

Keywords:

Coastal utilization, Coastal environmental conflicts, Sustainable development, Chanthaburi, Thailand

Linkage between tidal channel extinction and mudflat morphodynamics in a meso-tidal estuary

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Abstract:

Understanding the morphodynamic process of mudflat-channel system is important for the conservation of tidal environments. In this study, we use monthly Lidar data, surveyed between Nov., 2014 and May, 2017, to study the development of an open-coast mudflat on the southern Changjiang Delta in response to the shrinkage and extinction of a tidal channel. Results show that the moprhodynamics of mudflats and tidal channels are tightly coupled and illustrate that internal system dynamics such as tidal channel extinction can be as important as external drivers for the evolution of the whole system. Over the channel-shrinkage stage, the mudflat keeps a stable topographic zonation, though the lower intertidal flat experiences an accretion of 0.5 m, resulting from a local increase in sediment availability triggered by stronger waves and higher riverine sediment input during spring. Over the channel-extinction stage, the mudflat suffers a decrease of 19×103 m3 in volume due to a banded erosion exceeding 0.3 m in the middle intertidal flat, and the lower intertidal flat encroaches landward significantly with an increase of 62×103 m2 in area. Over the channel-absence stage, the mudflat shows dynamic topographic zonation undergoing winter-deposition and autumn-erosion up to the point of a final quasi-equilibrium state, dominated by seasonally changed wind direction and mean tidal level. This study shows a regime shift of mudflat morphodynamics induced by internal system dynamics and provides important implications for tidal environment management.

Keywords:

Morphodynamics, Lidar, Tidal channel, Mudflat, Changjiang Estuary

Assessing tsunami-induced building damage considering the impacts of various floating objects

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Abstract:

In many coastal cities across the world, tsunamis pose a great threat to people's lives and their properties. Post-event field investigations indicate that building damage induced by tsunamis is mainly attributed to dramatic wave dynamics and the impact of large objects carried along by the waves. However, most of the current tsunami research is based on the assumption of "clean" water and the current models or approaches for assessing building damage rarely consider the effect of floating objects. The types of potential floating objects and the induced impacts on buildings have not been well explored and understood. This work presents and applies a two-way dynamic coupled model based on a 2D finite volume shock-capturing hydrodynamic model and a discrete element method (DEM) model to simulate the floating objects and induced building damage during a tsunami event. The proposed numerical model use the hydraulic characteristics of water flow to quantify the hydrostatic and dynamic forces of fluid on debris and on structures, breaking the limitation of traditional approaches related to empirical parameter. A linear viscoelastic contact model is adopted in DEM model to calculate the forces between debris particles and the impact of debris on buildings. The maximum loading on buildings combined by fluid and floating objects is then automatically recorded by the coupled model and used to assess large-scale building damage by a deterministic approach. The model is used to simulate a hypothetical 1000-year tsunami event in the City of Seaside, Oregon, USA. Different damage maps are produced by considering three representative types of objects and the combination of them, i.e. cars, wood log and containers. The proposed numerical model and approach would provide a robust and integrated modelling tool for the simulation and risk assessment of tsunami disaster in coastal area.

Keywords:

Building damage assessment, tsunami, floating objects, impact force, coupled model

Reflection characteristics of oyster reef submerged embankment based on Bragg Resonance

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Abstract:

Oyster reef is one of the important measures to realize the synergy between coastal zone ecology and disaster reduction due to its ecological and wave dissipation functions. In order to improve the wave dissipation effect of oyster reef, the form of oyster reef submerged dike based on Bragg resonance is proposed. The effects of void ratio, relative width, relative height and section shape of submerged dike on Bragg resonance reflection characteristics are studied by flume experiment. The experimental results show that the reflection coefficient with Bragg resonance is significantly higher than that without Bragg resonance. There is a negative correlation between the void fraction and the Bragg resonance dominant frequency reflection coefficient. With the increasing void ratio of submerged dike, the Bragg resonance dominant frequency reflection coefficient decreases. When the relative width of submerged dike is 0-0.3, the relative width is positively correlated with the reflection coefficient of Bragg resonance dominant frequency. With the increase of the relative width of submerged dike, the Bragg resonance dominant frequency reflection coefficient increases. When the relative height of the submerged dike is in the range of 0-0.4, the relative height is positively correlated with the Bragg resonance dominant frequency reflection coefficient. With the increase of the relative height of the submerged dike, the Bragg resonance dominant frequency reflection coefficient increases. In submerged dikes with rectangular, triangular and trapezoidal sections, the wave reflection effect of rectangular submerged dike is the best with a reflection coefficient of 0.152, trapezoidal submerged dike is relatively poor with a reflection coefficient of 0.133, and triangular submerged dike is the worst with a reflection coefficient of 0.107.

Keywords:

Reflection coefficient, oyster reef submerged dike, Bragg resonance, flume experiment, regular wave

Video-based shoreline and intertidal beach topography measurement using optical flow

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Abstract:

The high-frequency high-resolution coastal Video Monitoring System (VMS) can continuously monitor the nearshore area, providing waterlines of an entire tidal cycle, the waterlines are associated with the tidal level, which makes it possible to reconstruct the topography of intertidal beach, and the critical step is to detect the location of the waterlines from imagery products. The mainstream methodology was based on nearshore wave dissipation, including identifying a visible high light intensity caused by wave breaking from Timex-images, or detecting the absolute pixel intensity differences in swash zone from variance-images. However, the method did not work well when nearshore wave conditions were too weak to reflect changes in pixel intensity. In this study, we import a new algorithm suitable for detecting waterlines from time series snap-images, the method called optical flow, is capable of detecting insignificant swash movements or oscillations of fluids near the waterline. The coastal video monitoring system has been installed on a low-energy macro-tidal beach of Fujian, China, and field experiments verified the effectiveness of the proposed method. The reconstruction results of the intertidal beach topography were satisfactory. Our results demonstrate the potential of time series snap-images in the study of coastal geomorphology monitoring.

Keywords:

Intertidal topography, Shoreline detection, Swash zone, Video monitoring, Optical flow

Research on the change of beach resource quality based on natural attributes and development level: A Case Study of Fujian province, China

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[2] Third Institute of Oceanography, Ministry of Natural Resources, Xiamen, China

Abstract:

As a valuable natural resource, beach plays an important role in coastal protection, ecological function and coastal tourism. Beach quality is an important indicator of whether a beach system maintains its function. A beach quality evaluation system that focuses on the natural attributes of beaches and takes into account the development level of a total of 73 evaluation indicators was established in this paper, and to evaluate the beach resource quality of 50 major beaches in Fujian province and its change from 2013 to 2018. The results show that 62% of the beaches presented declining natural quality, and only 2% of them have improved. The beaches that maintain their natural state or have not been developed for tourism still account for a considerable proportion. For beach development quality, only 14% of the beaches showed the better development level, and 68% of the beaches remained the same evaluation results, and most of them were rated "Poor". Overall, within five years, nearly half of the beaches' comprehensive quality have deteriorated, reflecting the declining trend of beach resource in Fujian. Affected by natural and human activity factors and the social and economic development of the area where the beach is located, the natural environment and utilization status of the beach are generally in a state of constant change. Coastal erosion, degradation of natural coastline attributes, and drifting garbage are the key factors leading to universal degradation of beach natural quality. The situation of extensive mode of beach tourism development has not changed, and regional social and economic development is the decisive factor affecting beach development quality.

Keywords:

Beach quality, beach management, dynamic change

Geomorphological response of sandy beach to tropical cyclones with different tracks

Yu Yue[1], Wang Yongzhi[2*], Qiao Lulu[1,4*], Wang Nan[3], Li Guangxue[4], Tian Ziwen[2], Zhong Yi[5]

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[2] Coastal Science and Marine Policy Center, First Institute of Oceanography, Ministry of Natural Resources, Qingdao 266061, China

[3] College of Oceanic and Atmospheric, Ocean University of China, Qingdao 266100, China

[4] Key Laboratory of Submarine Sciences and Prospecting Techniques, MOE, Ocean University of China, Qingdao 266100, China.

[5] Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Qingdao 266071, China

Abstract:

The response of beaches to a single tropical cyclone has been well reported, however, few studies have been conducted on comparing the responses of the same beach to tropical cyclones with different tracks. Haiyang Beach is located on the southern coast of the Shandong Peninsula, China. Its geomorphological responses to the tropical cyclones Lekima (No. 1909) and Bavi (No. 2008) which passed through the west and east sides of the study area, respectively, were studied. Beach profiles were investigated before and after the two tropical cyclones. A high-resolution model based on FVCOM was established to simulate hydrodynamic responses. The beach exhibited erosion at the upper foreshore and minor deposition near the mean high water level (MHW) as the result of both of these tropical cyclones. After Cyclone Lekima, subaqueous sandbars were formed in the nearshore zone, whereas the beach showed little change after Cyclone Bavi. Significant storm surge and seaward bottom current induced by landward wind of the tropical cyclones passed through the west side of the study area should responsible for the beach profile change during Lekima. Negligible storm surge rise and seaward bottom current related to the seaward wind of eastern path tropical cyclones can only result in little change of the beach. Swell contributes most to the wave height while makes little sense to the beach change. In this study, we conclude that the effects of tropical cyclones on beaches are primarily dependent on the cyclone track.

Keywords:

Sandy beach, tropical cyclones with different tracks, geomorphological response

Complicated responses of beach morphological and sediment to consecutive typhoons in Weizhou Island, Guangxi

Zhang Daheng[1], Shi Lianqiang[1,2], Gong Zhaohui[1,3], Guo Junli[4]

[1] Second Institute of Oceanography, Ministry of Natural Resources, Hangzhou 310012, China

[2] Guangxi Key Laboratory of Beibu Gulf Marine Resources, Environment and Sustainable Development, Fourth Institute of Oceanography, Ministry of Natural Resources, Beihai 536000, China

[3] Ministry of Education Key Laboratory for Coast and Island Development, Nanjing University, Nanjing 210023, China

[4] State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai 200241, China

Abstract:

In recent decades, Weizhou Island has faced with a very serious problem of beach erosion, this situation is strengthen because of the frequent typhoons.Therefore, this paper analyzed the morphological and sediment characteristics change of Weizhou Island beach by collecting the topographic elevation and sediment samples before and after successive typhoons ,Lionrock and Kompasu. Meanwhile, the influence of typhoon on short-term beach erosion and deposition change was explored by combining with numerical simulation method. The results showed that the overall change of the Nanwan beaches is relatively small after typhoons, the beaches had experienced various degrees of erosion and coastline retreat in other sections, and multi-level beach berm had appeared in some areas; The sediments of most beaches were relatively coarsened in the higher beach positions, and the average particle size of the most middle and low beach areas was also relatively coarsened in Shiluo River port section, but the position of middle and lower beaches in other beach had a trend of refinement. The study can deepen the understanding of beach erosion and deposition changes under extreme marine conditions, which is beneficial to the protection and sustainable development of island beach resources.

Keywords:

Typhoons, morphological and sediment variations, numerical simulation, Weizhou Island

Preliminary investigation and evaluation of beachgoers' perception of beach safety

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[1] School of Electronics and Information Engineering, Guangdong Ocean University, Zhanjiang 524088, China

[2] School of Chemistry and Environment, Guangdong Ocean University, Zhanjiang 524088, China

Abstract:

With the rapid development of coastal tourism, there are also frequent beach safety accidents, among which rip current is the main reason for drowning accidents. To study the cognition of beachgoers to coastal hazards in China, for the first time, this study conducted a survey on tourists from four aspects (demographic characteristics, swimming ability, beach visiting information and coastal hazards knowledge) through a combination of web questionnaire and field questionnaire. Chi-square test and logistic regression model were used to analyze the survey results. Results showed that, (1) 72.19% of web respondents and 64.05% of field respondents had never heard of rip currents. Only 7.68%(field) and 20.59%(web) respondents had seen rip current signs. 49.44% of respondents can swim, while 58.82% of respondents who have ever entered into the water, indicating that at least 9.38% of respondents who couldn't swim but went into the water, which reflects that most of beachgoers lack the recognition of rip currents and safety awareness. (2) Among all 15 factors, two factors (frequency of beach visiting and whether they had seen rip current signs) affected participants' judgment of basic structure; Four factors (age, swimming ability, frequency of beach visiting, and whether they had seen rip current signs) influenced participants' choice to the direction of escaping route. These results will help enhance the public's awareness of rip currents, and it is suggested that the beach management departments strengthen safety management, and strengthen the publicity and education of rip currents knowledge.

Keywords:

Beach safety, rip currents, hazards, preliminary investigation, model test

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AN INTERNATIONAL AWARD-WINNING INSTITUTION FOR SUSTAINABILITY

SENSITIVITY ANALYSIS AND APPLICATION OF XBEACH AT CHEROK PALOH BEACH, PAHANG, MALAYSIA

MR. MUHAMMAD MAZMIRUL BIN ABD RAHMAN, IIUM
ASSOC. PROF. DR. MUHAMMAD ZAHIR BIN RAMLI, INOCEM, IIUM
DR. MOHD SHAHRIZAL BIN AB RAZAK, UPM

CONTENT

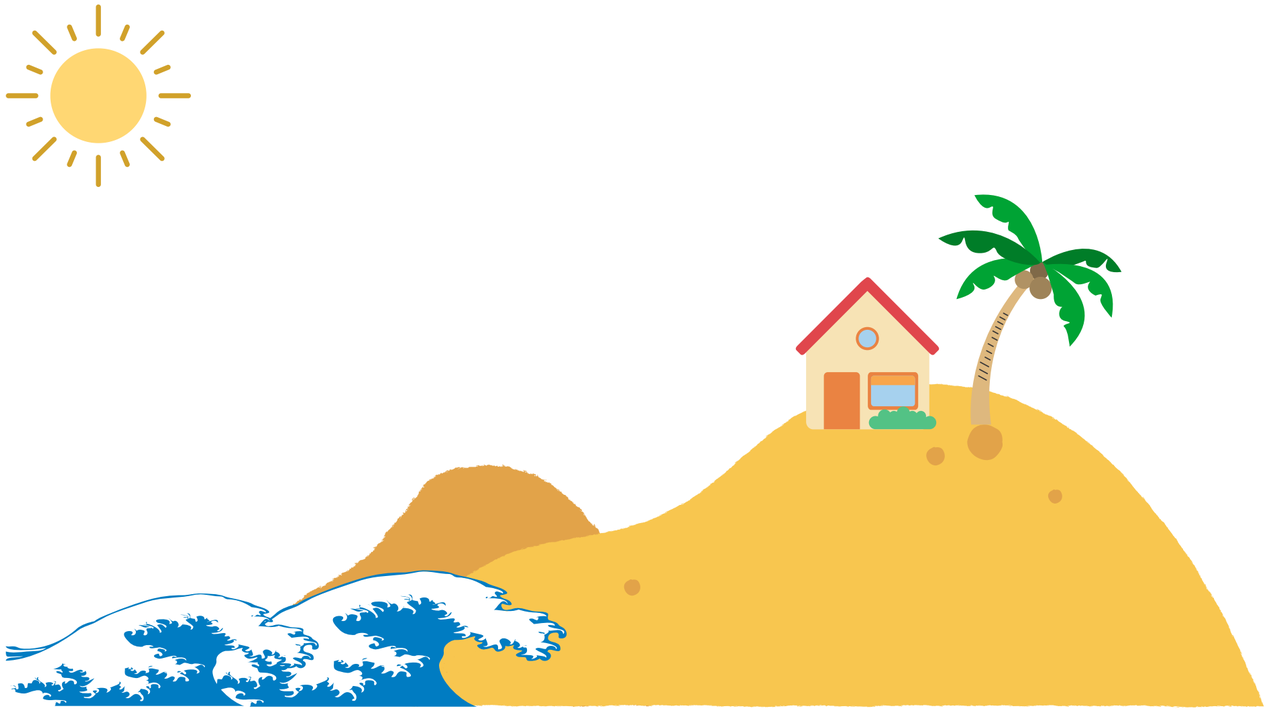
INTRODUCTION

XBeach is an open-source numerical model to simulate the **hydrodynamic** and **morphodynamic** processes and the impact on sandy beaches.

2DH-based model solution for wave propagation, long wave and mean flow, sediment transport, and **morphological changes nearshore**, beaches, and **dunes** due to **storms**.

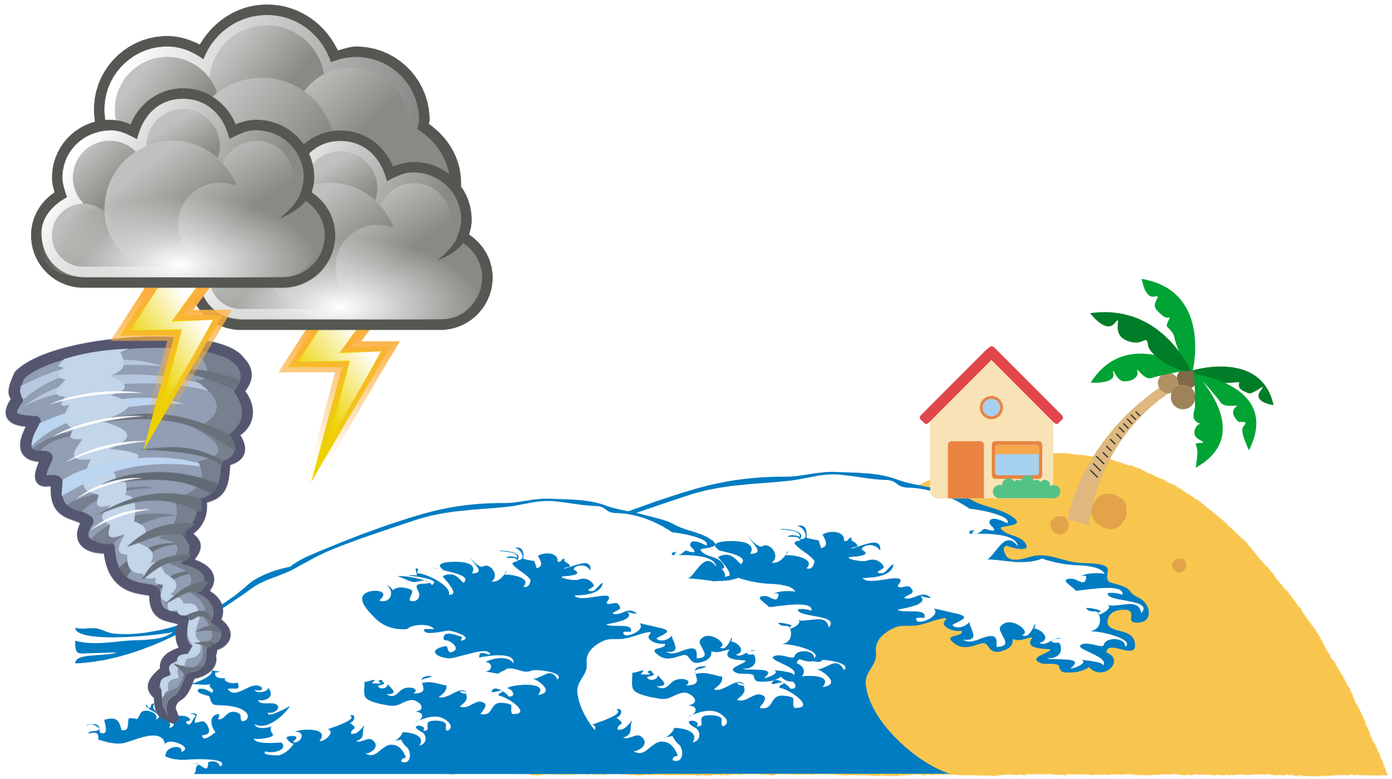
Developed by **Delft University of Technology** and University of Miami

INTRODUCTION

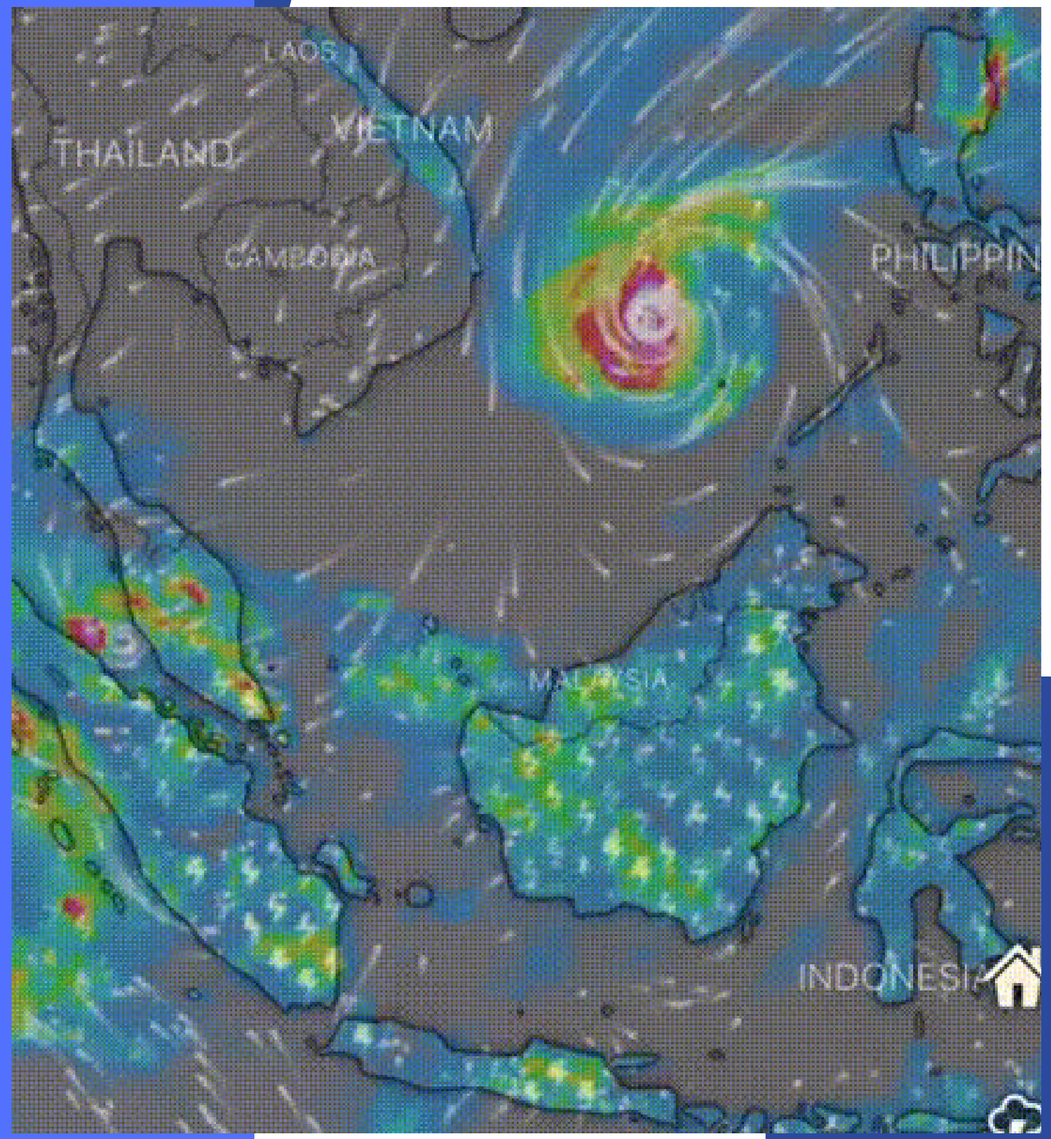


Storm surge is an **abnormal rise of water** generated by a **storm**, over and above the **predicted astronomical tide**.

INTRODUCTION



Storm surge is caused primarily by the **strong winds** in a **hurricane** or **tropical storm**.



PROBLEM STATEMENT

SUPER TYPHOON RAI
(ODETTE)

11 DEC 2021 - 21 DEC 2021
(16 DEC 2021)

- Wind Speed : 267km/h
- Diameter: 185km/h
- Eye: 56km
- Air pressure : below 915mbar
- Saffir-Simpson scale : Cat 5

PROBLEM STATEMENT

1 **TROPICAL DEPRESSION 29**

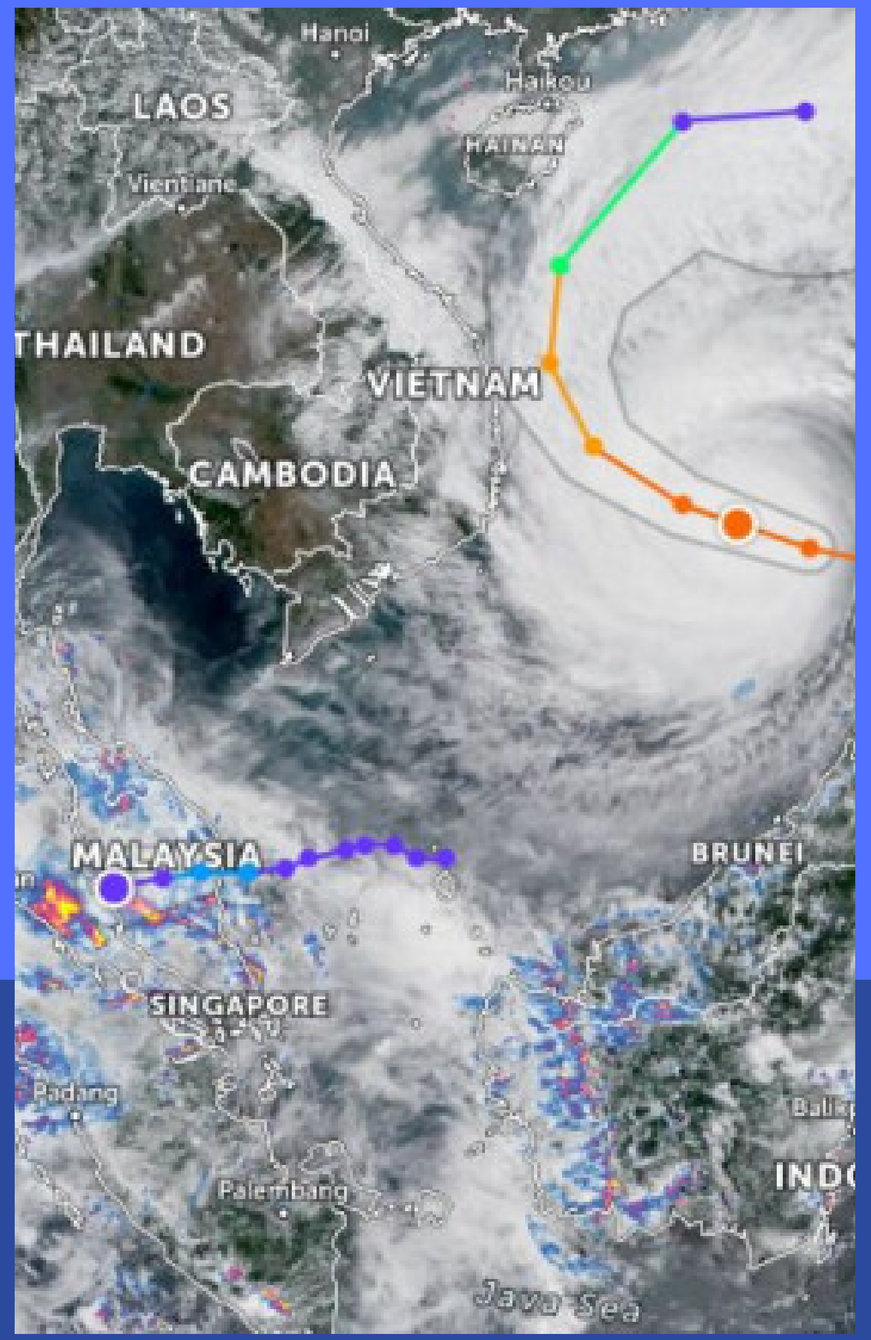
*Categorized as a **rapidly rotating storm** system commonly referred to as a **tropical cyclone***

2 **WIND**

*Sustains between **50km/h to 60 km/h***

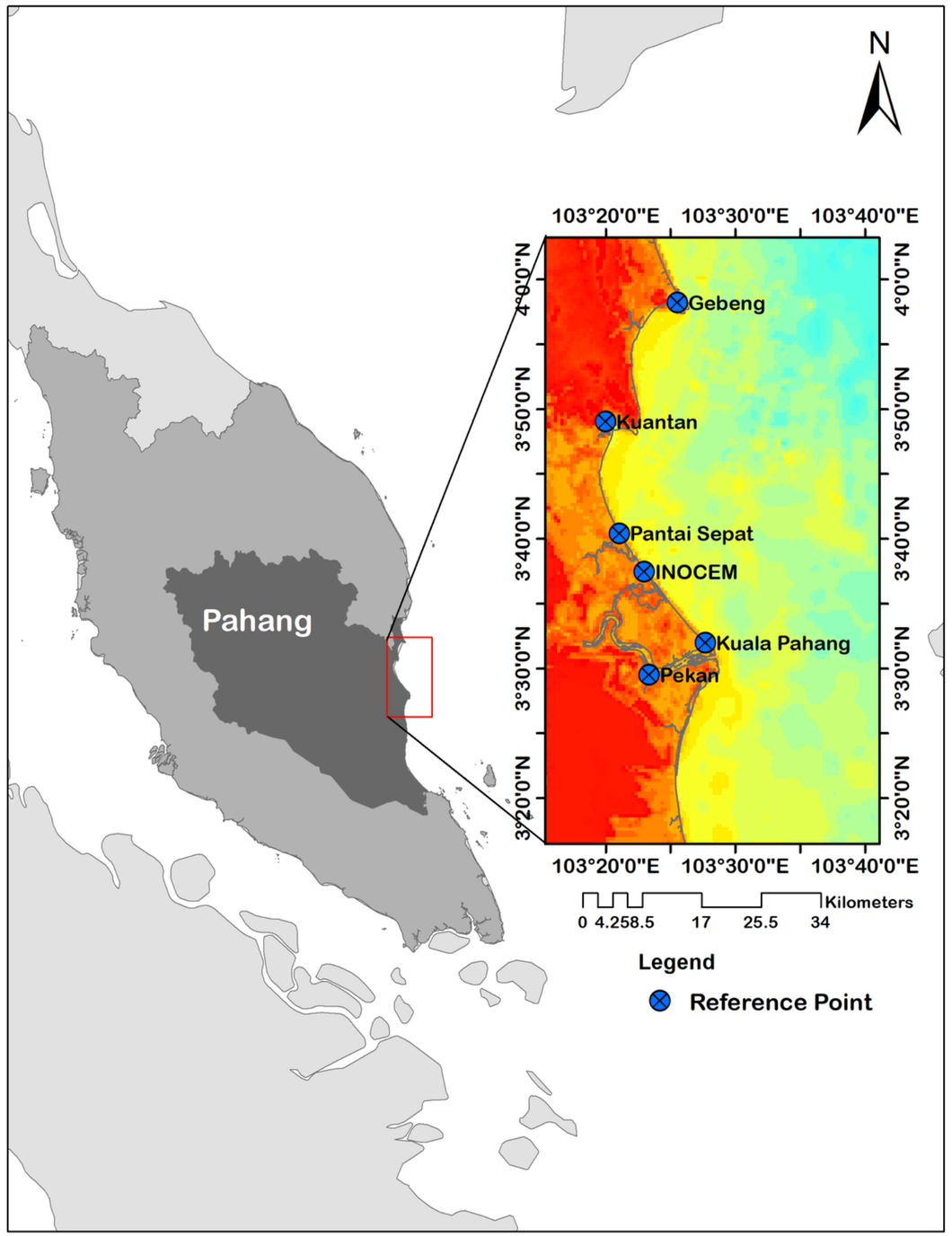
3 **PATHWAYS**

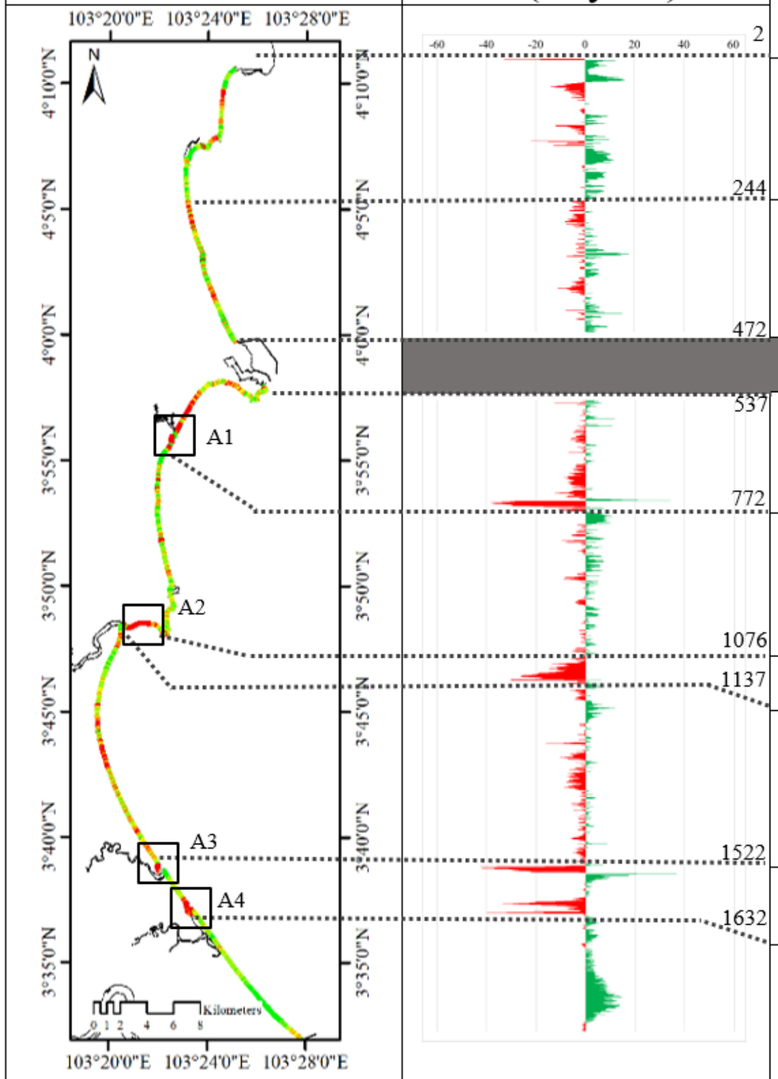
*Make landfall at **Terengganu coast** and move to Straits of Malacca*



STUDY AREA

CHEROK PALOH
20 KM SOUTH OF KUANTAN
LOCATION OF INOCEM



Northern sector	Rate of change, LRR (m/year) Tr#	Zone & (shoreline length, km)	LRR (m/ year) mean	Remark
		N1 (12.10)	+1.53	Action required
		N2 (11.40)	+0.27	Stable
				Kuantan Port
		N3 (11.75)	-1.24	Action required
		N4 (15.15)	-0.16	Stable
		N5 (2.90)	-10.39	Action required
		N6 (19.25)	-0.75	Stable
		N7 (5.40)	-5.97	Action required
		N8 (12.20)	+4.05	Dredging required

DSAS
DIGITAL SHORELINE ANALYSIS SYSTEM

- Preliminary erosion study using DSAS

METHODOLOGY

Field Observation

Bathymetic Survey

5 Dec 2021

- Echo sounder

Pre-Storm profile

6 Dec 2021

Post-Storm Profile

21 Dec 2021

- Total station

Numerical Modelling

SWAN - XBeach Coupling Model

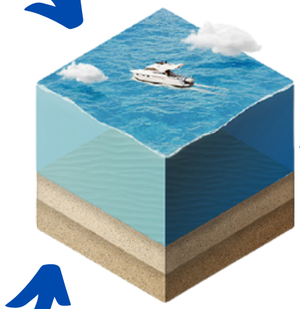
- Secondary data (Copernicus Marine)
- Bed level data (Field sampling)

SWAN – XBeach Coupling Model

SWAN

Wave & Wind

Copernicus Marine Service



Bathymetry

Secondary Data

Delft-Flow
Delft-Wave

Delft-3D

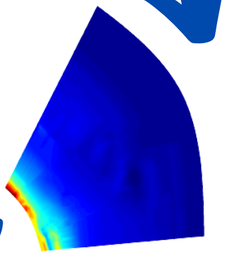
Validation

In-Situ Data

XBeach

Topography

Bathymetry



Insitu Depth Data

Output

Wave Height
Wave Direction
Wave Period

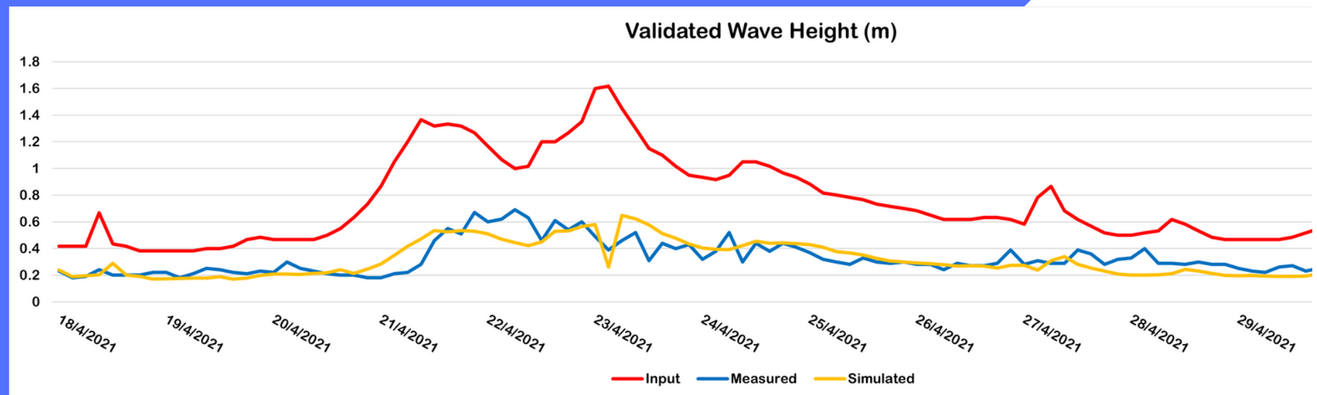
XBeach

Morphological Output

WAVE VALIDATION

RMSE =0.08m

Index of agreement = 0.86



METHODOLOGY

1 D

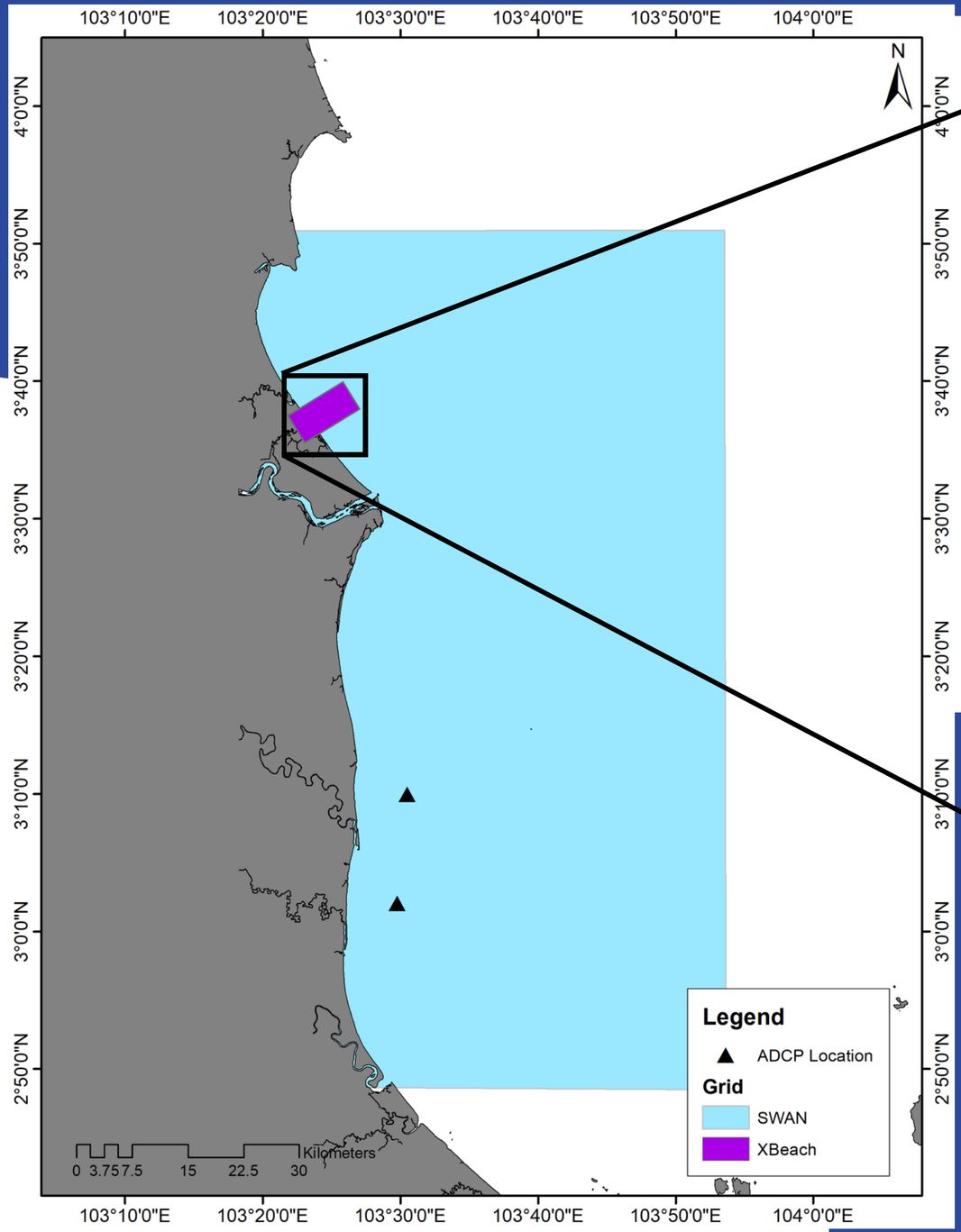
- Calibration of XBeach numerical model
- Calibrated parameter are analised using Brier Skill Scoring Analysis
- BSS Value Closer to 1 are best fitted.

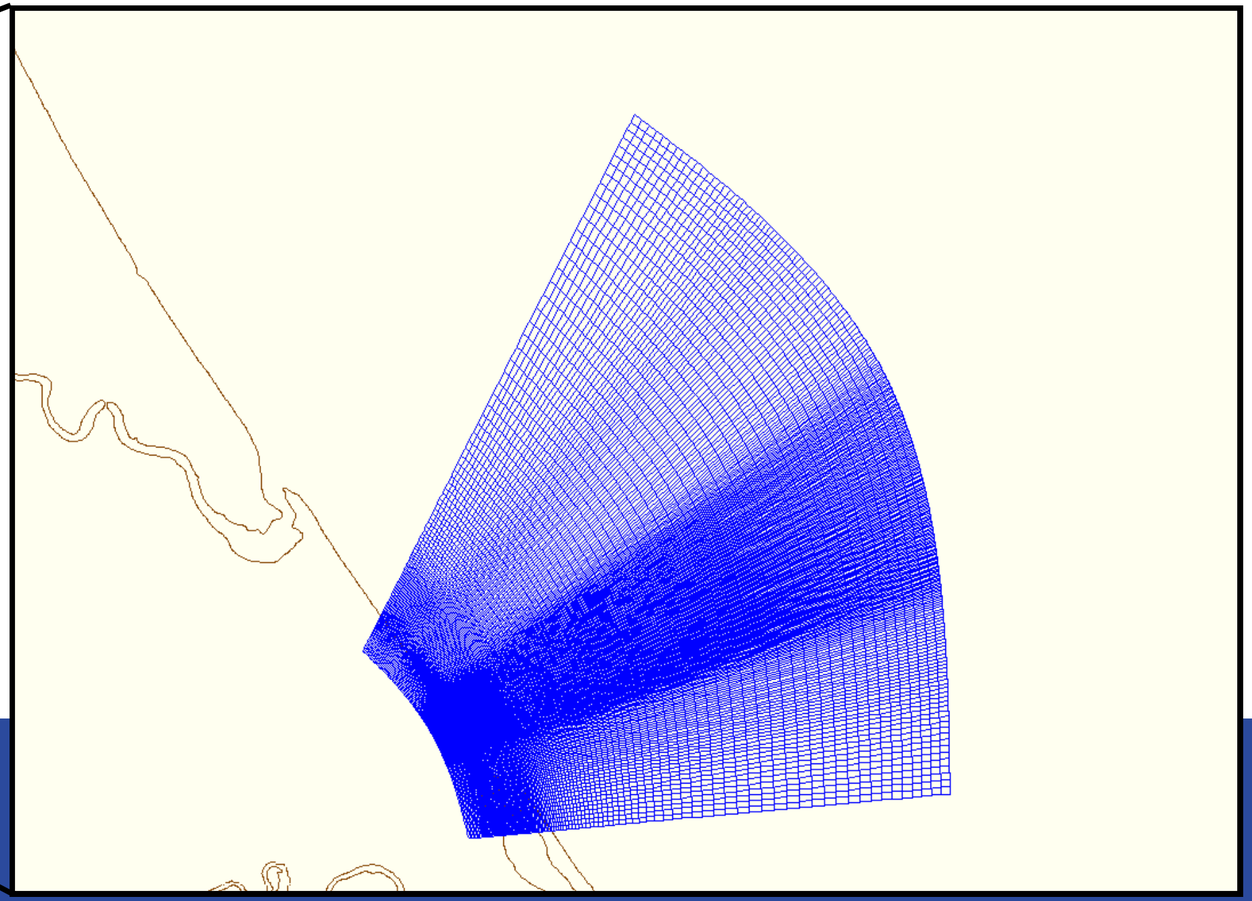
$$BSS = 1 - \frac{\sum(S_f - XB_f)^2}{\sum(S_f)^2}$$

Geomorphology Parameter

Parameters	Description	Default Value	Range Value	Used Value
Dryslope	Critical avalanching slope above water	1.0	0.1 – 2.0	0.9
Wetslope	Critical avalanching slope under water	0.3	0.1 – 1.0	0.4
Facua	Calibration factor time averaged flows due to wave skewness and asymmetry	0.1	0.0 – 1.0	0.2

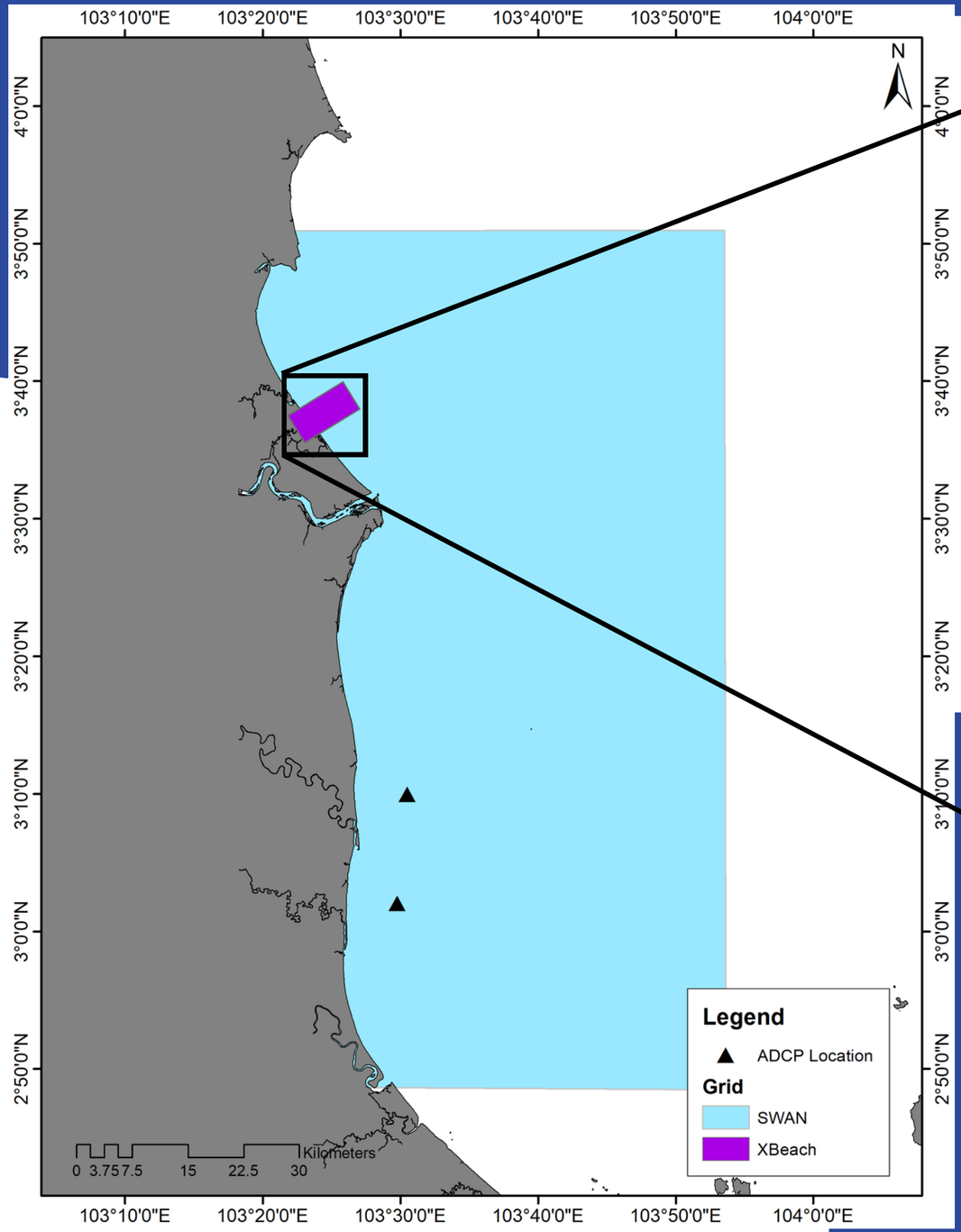
- Calibrated value for 1D is used in 2D

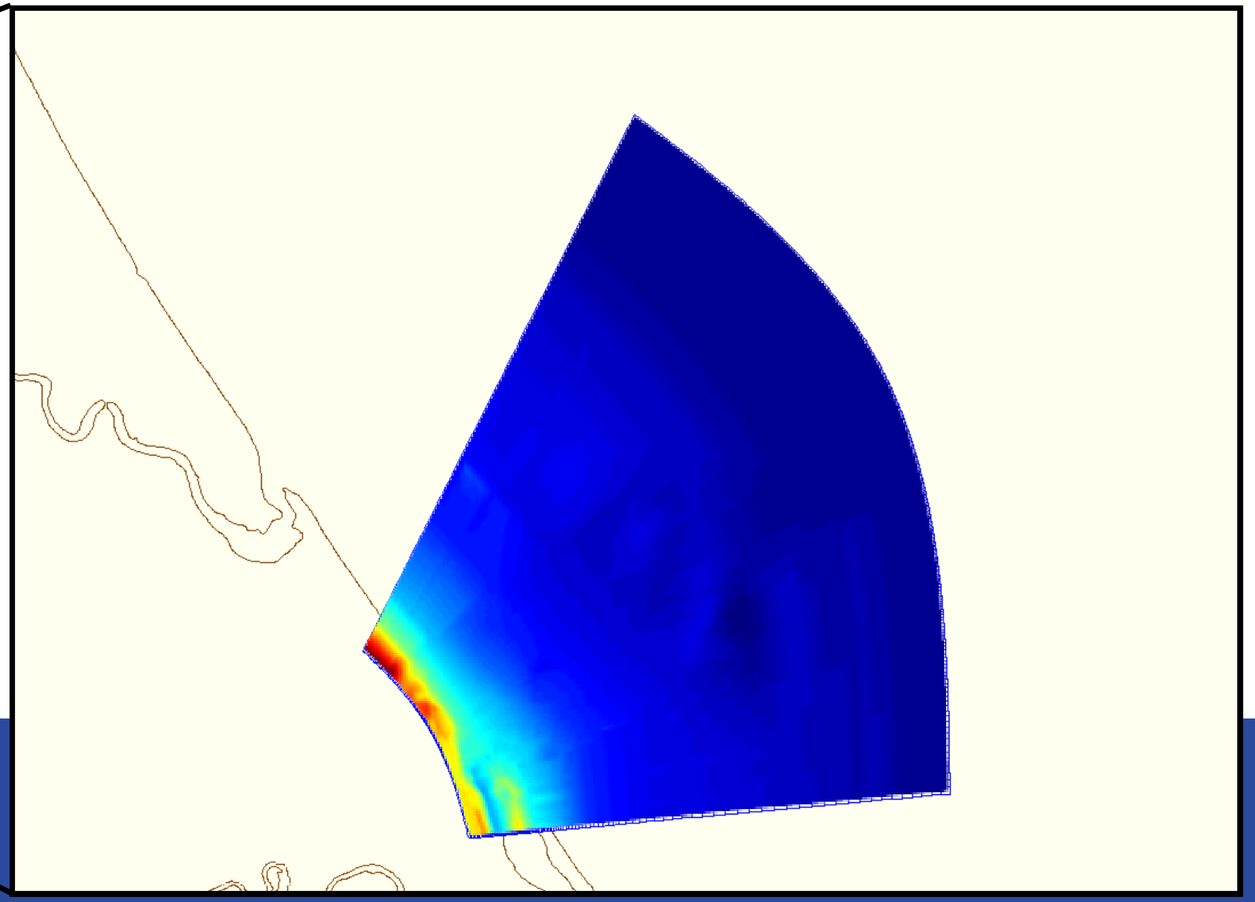




XBeach Grid

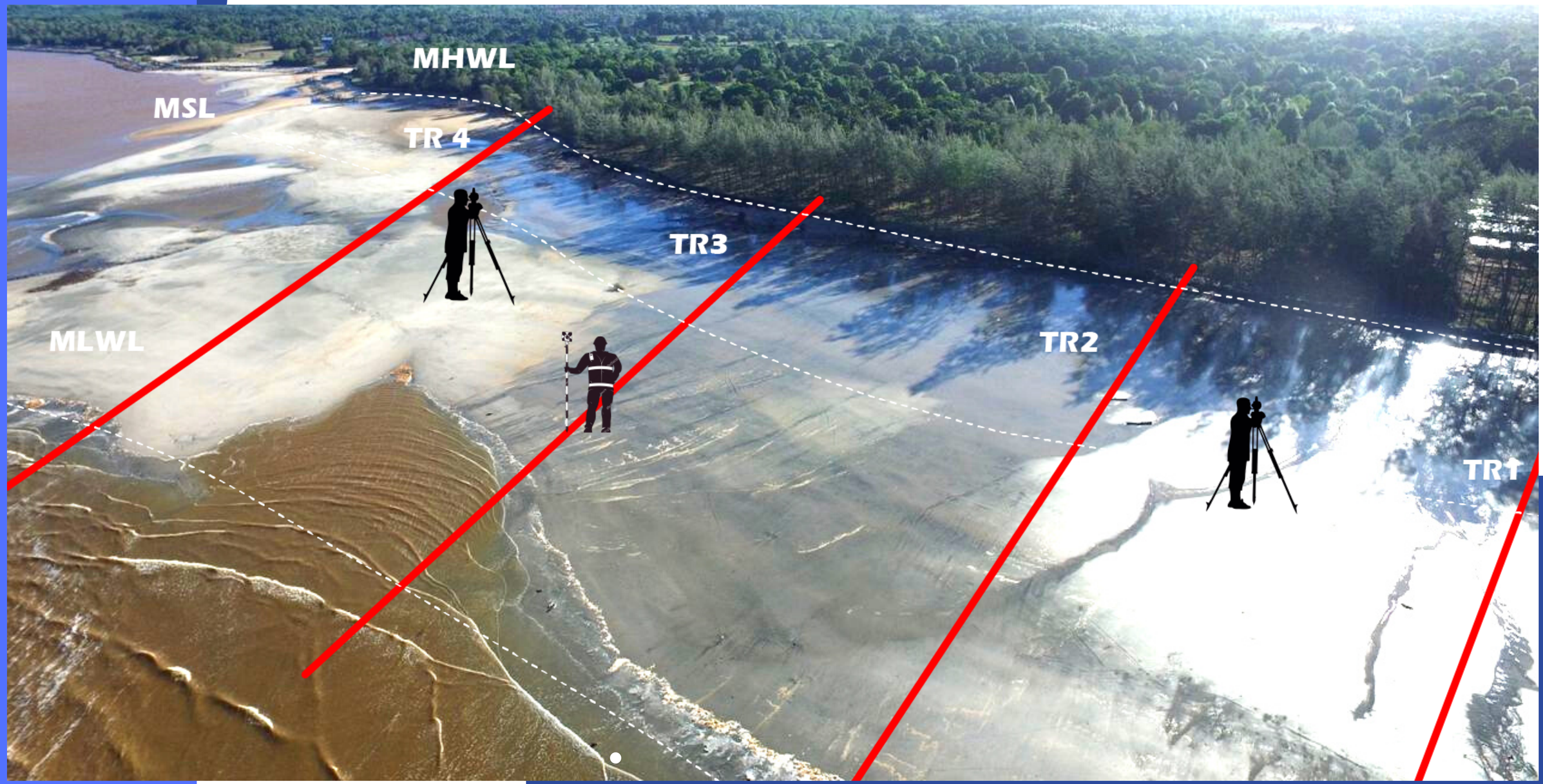
- Grid Size varying (5m to 100 m)
- Finer at the study area.





XBeach Bedlevel

- Bedlevel (7m to -11m)
- Water depth at boundary required more than 10 m

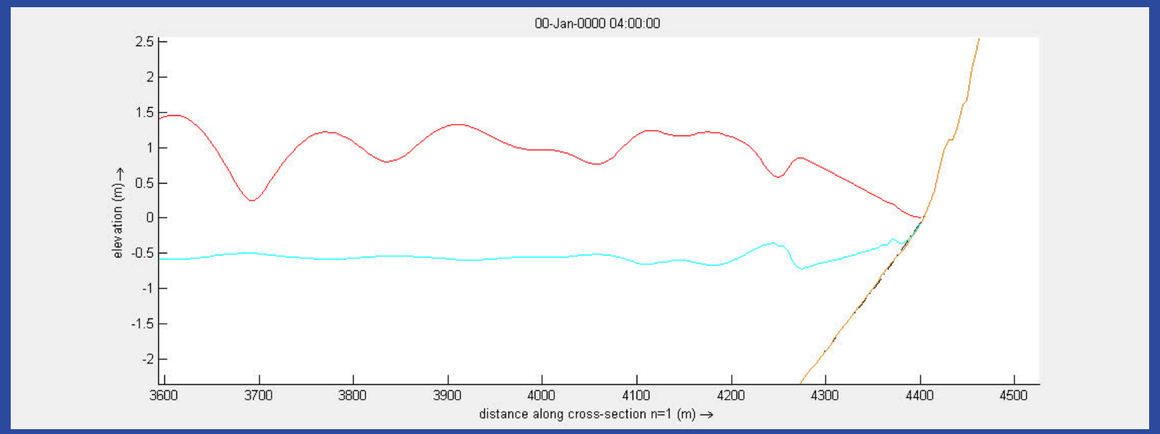


- Drone Imagery of Transect Location

RESULT

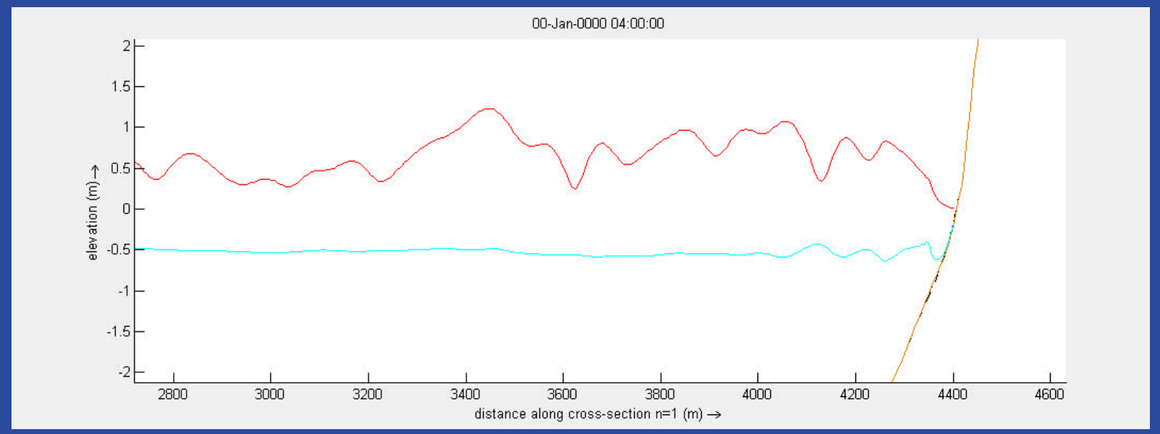
TR 1

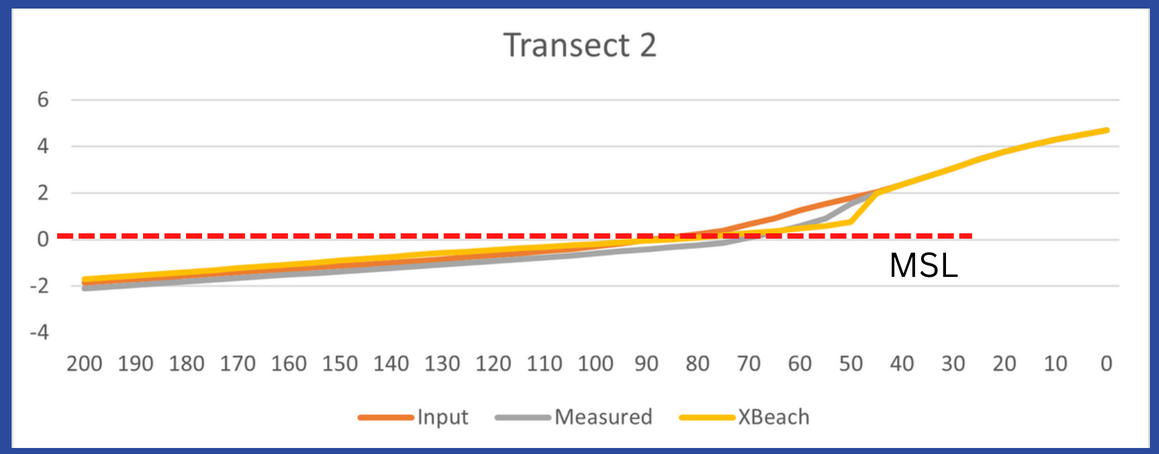
BSS = 0.976



TR 2

BSS = 0.968

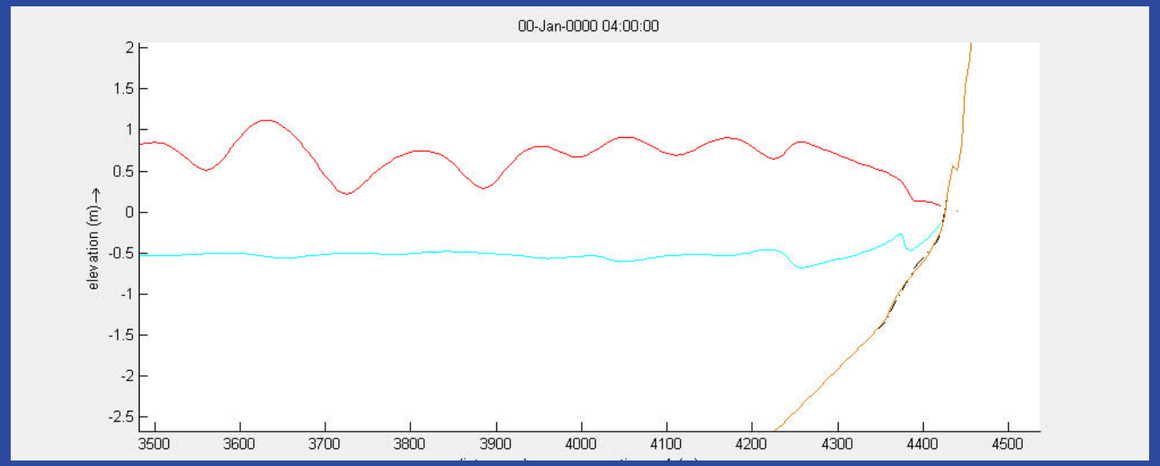


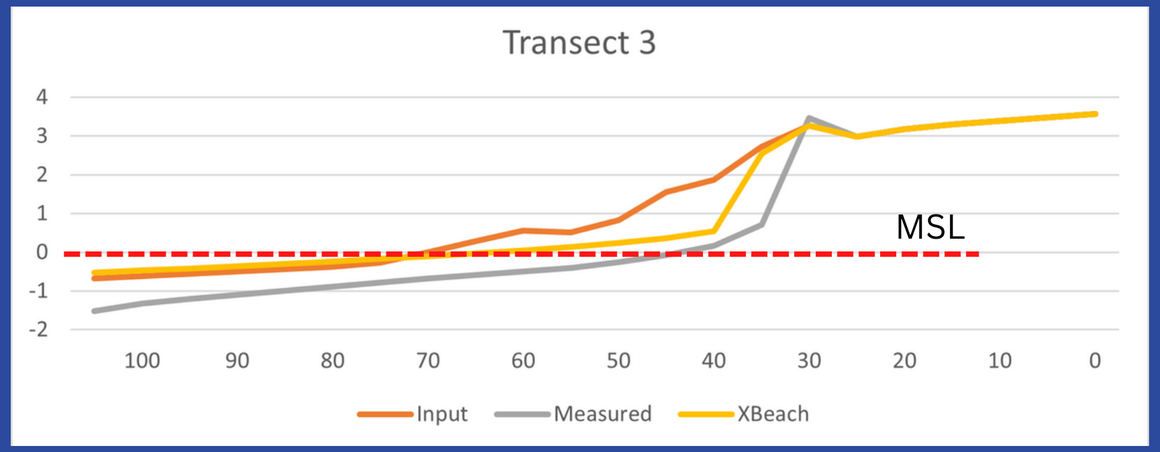


RESULT

TR 3

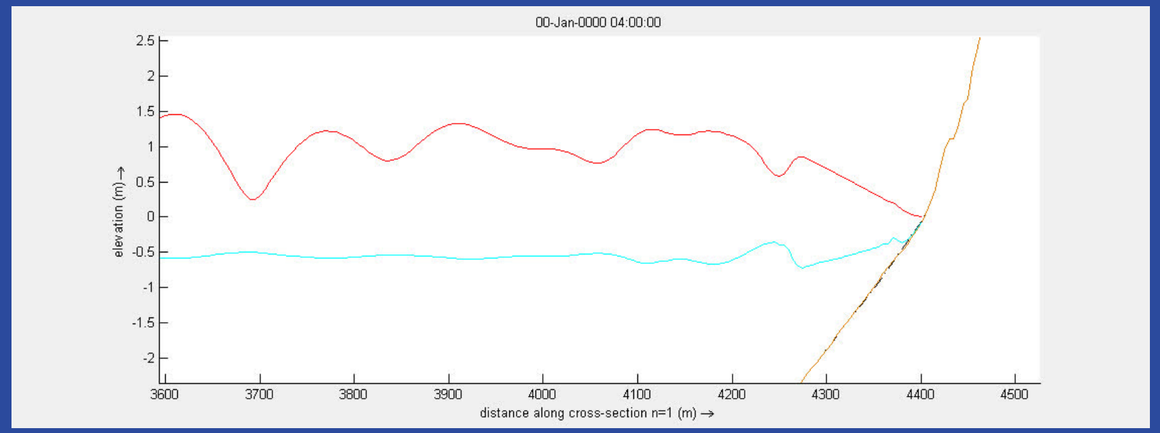
BSS = 0.825





TR 4

BSS = 0.968

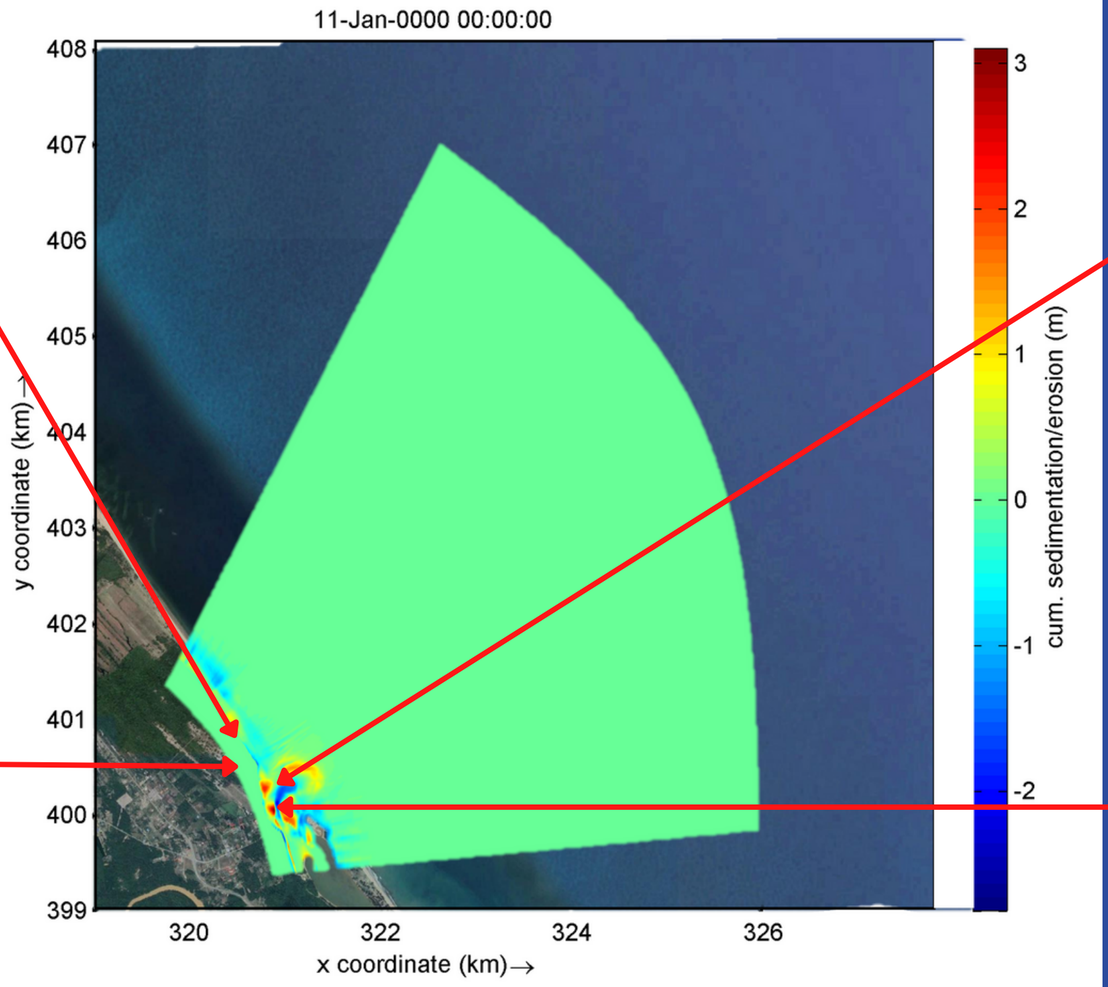


RESULT

EROSION SIMULATION

23 Dec 2021 TR 2

23 Dec 2021 TR 3

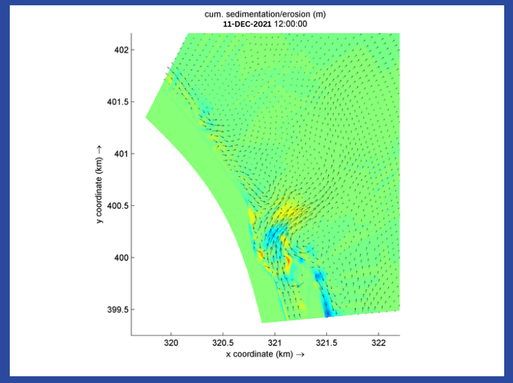


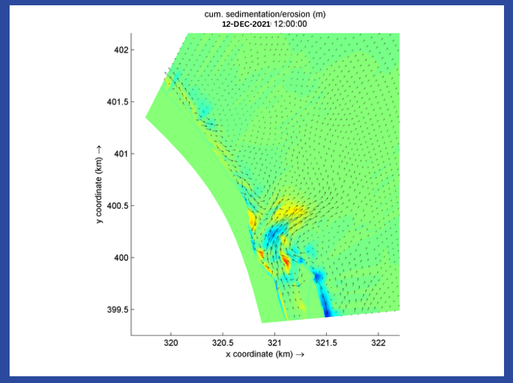
3 Jan 2022

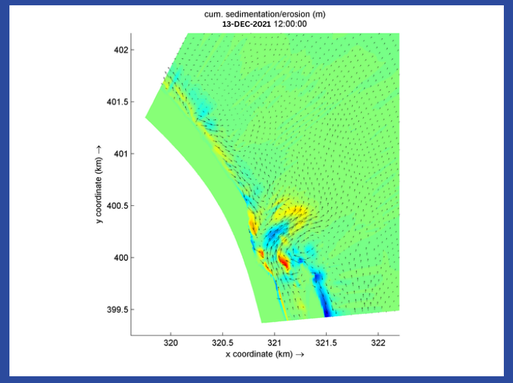
3 Jan 2022

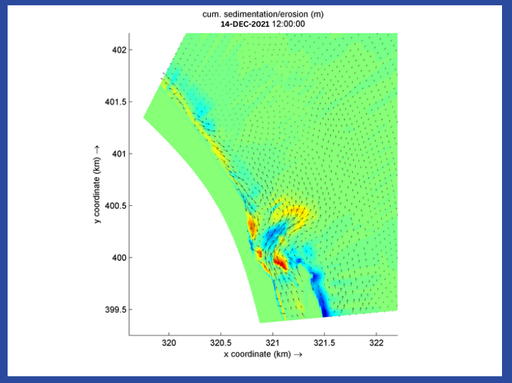
RESULT

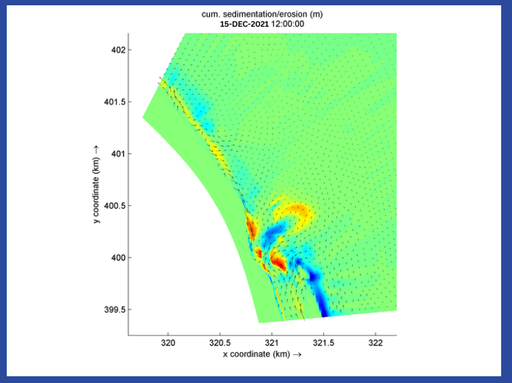
EROSION SIMULATION

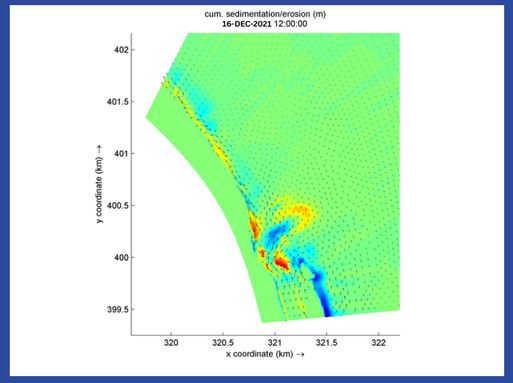


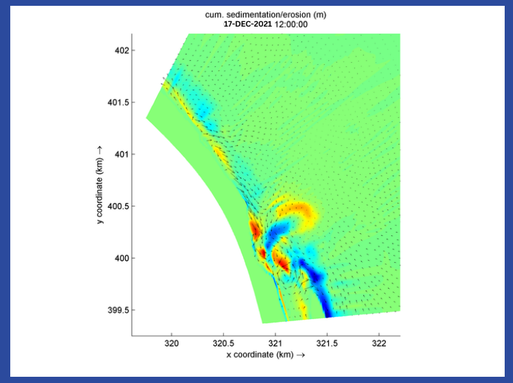


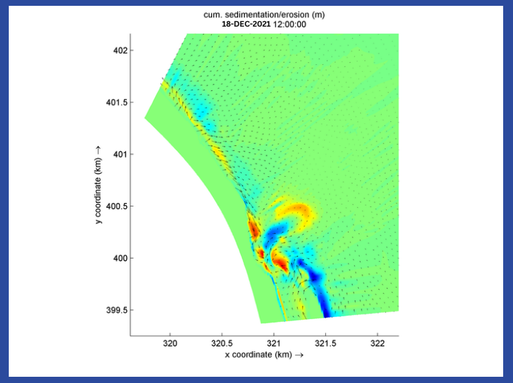


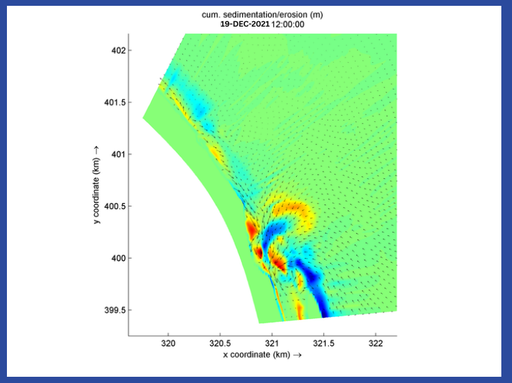


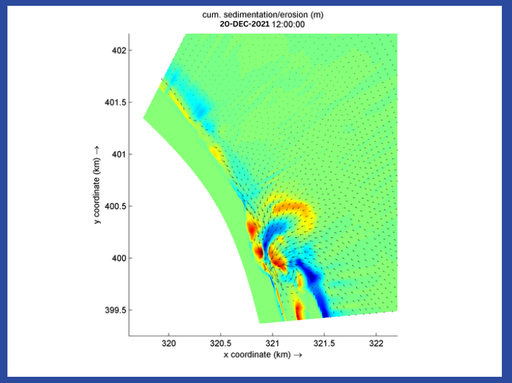


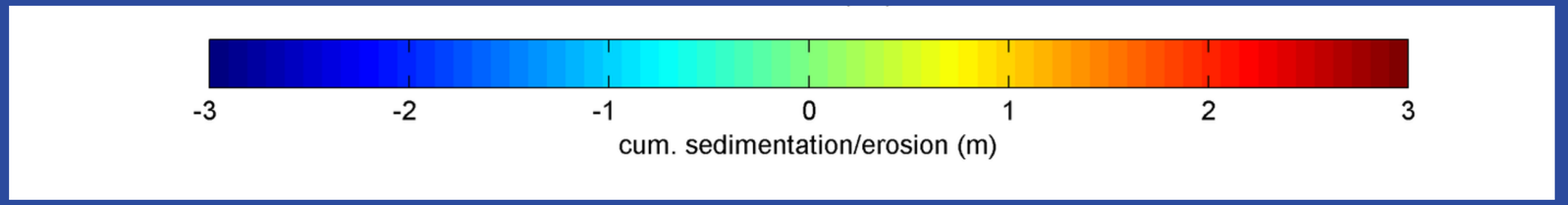








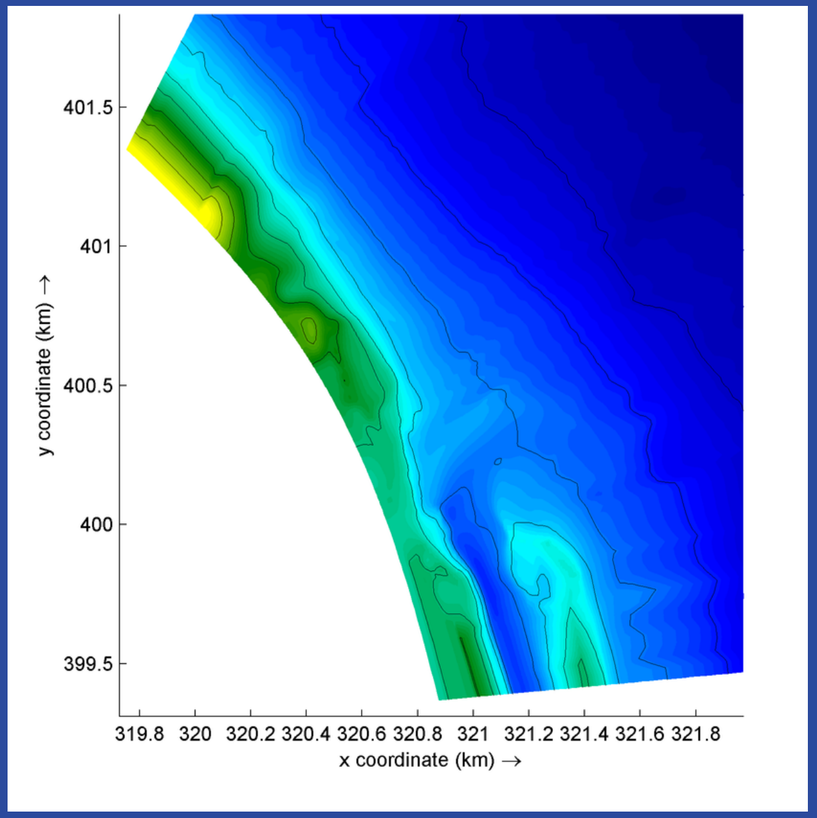


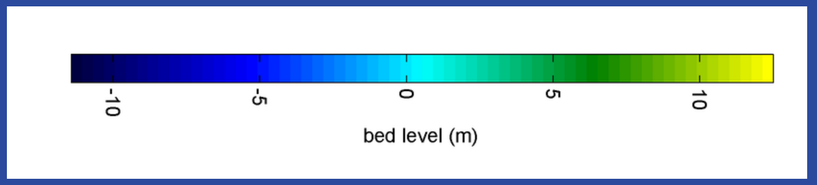


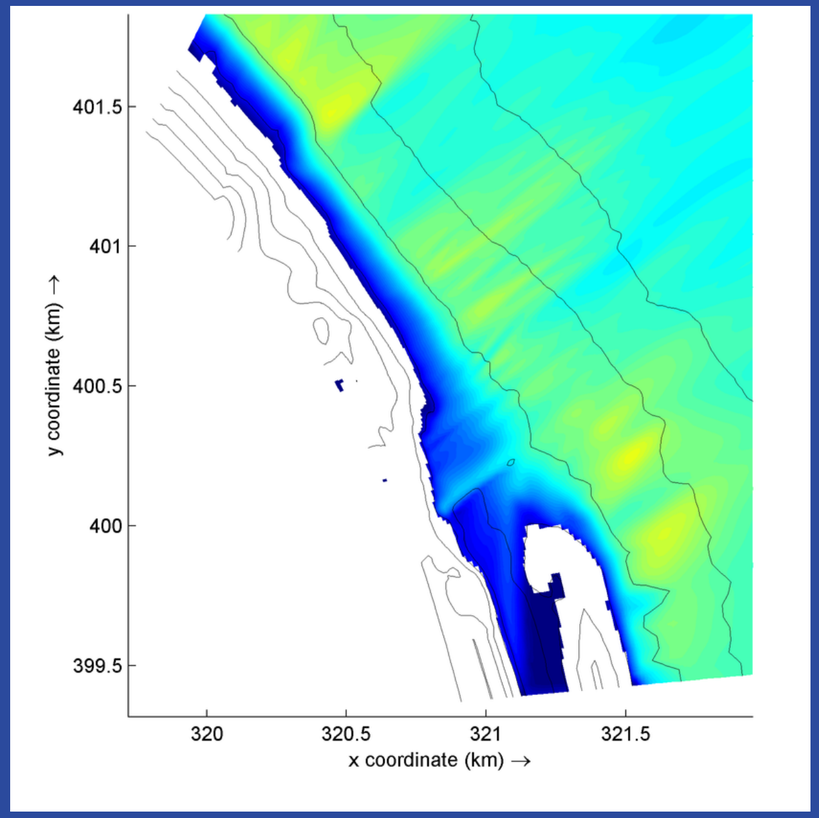
RESULT

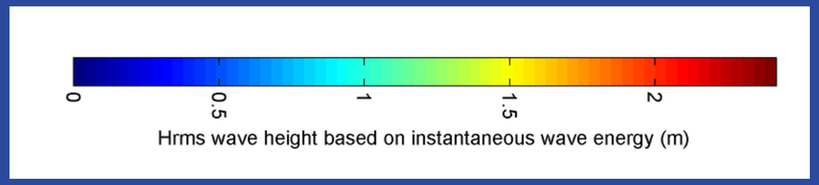
INITIAL TIME

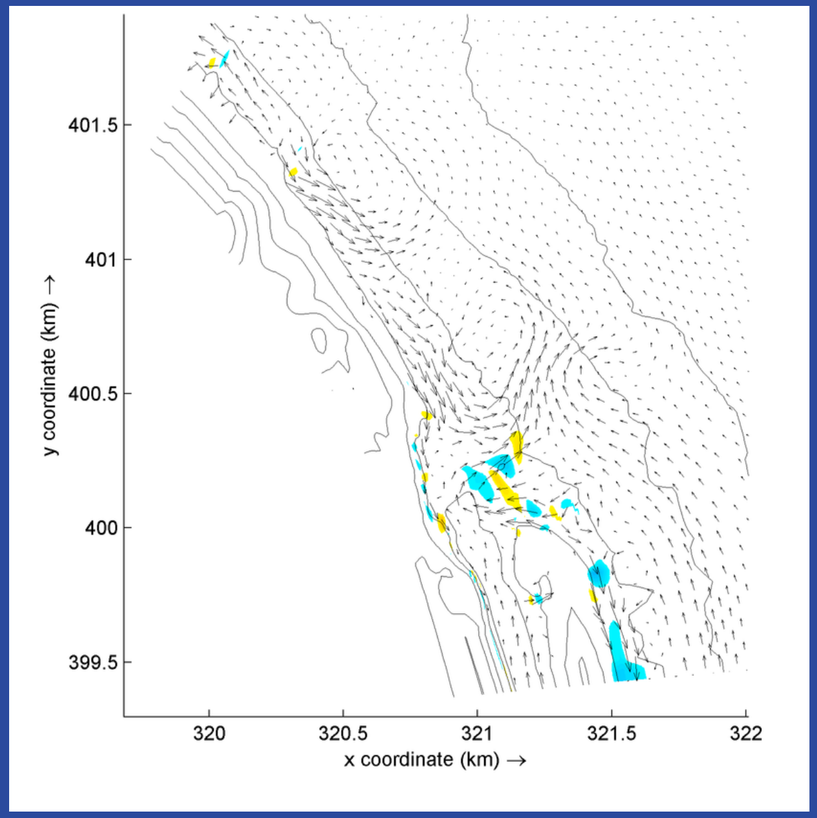
10-DEC-2022 12:00:00

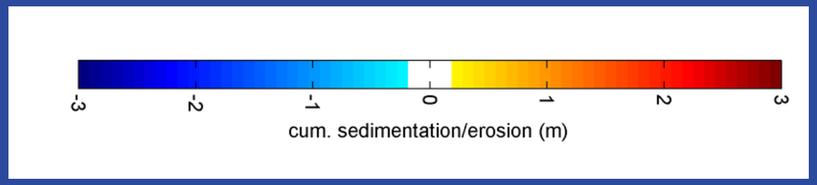








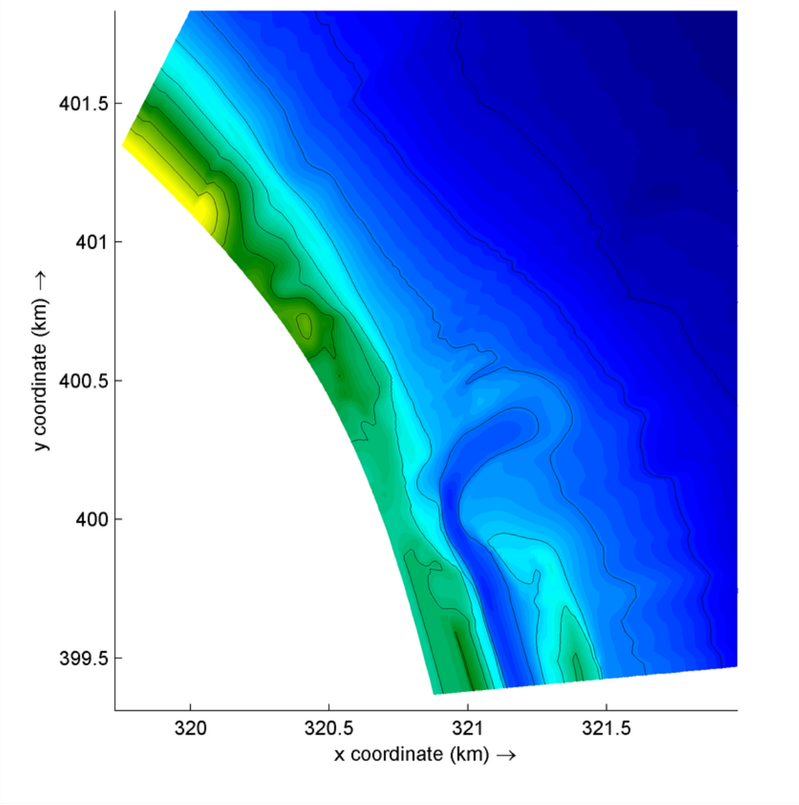


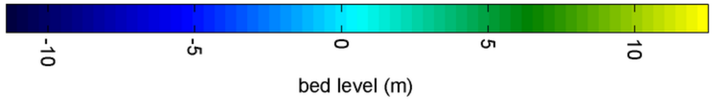


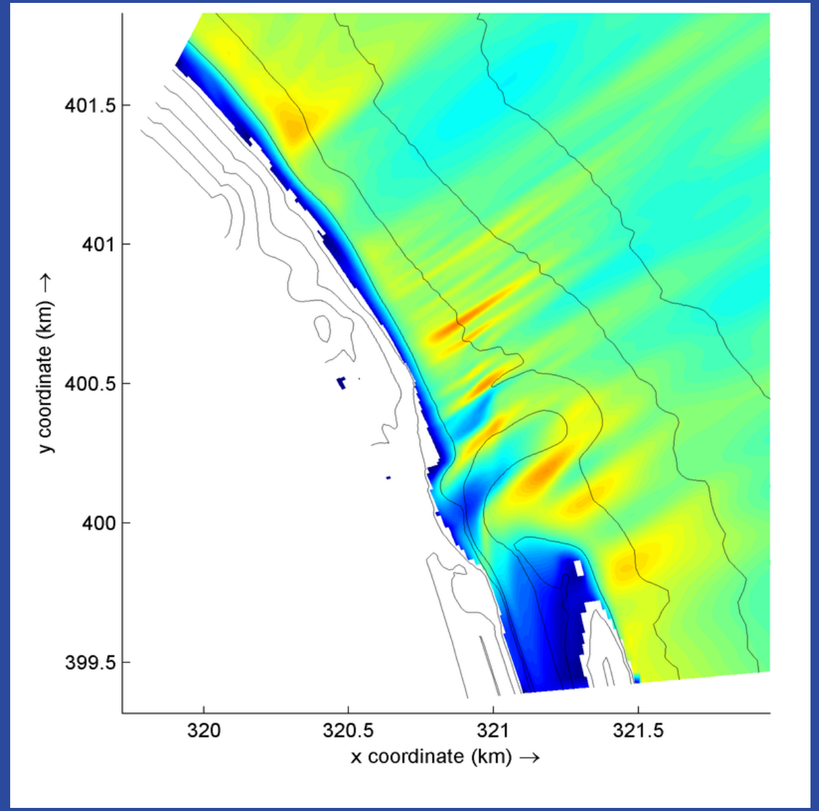
RESULT

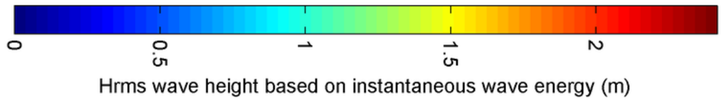
CRITICAL TIME

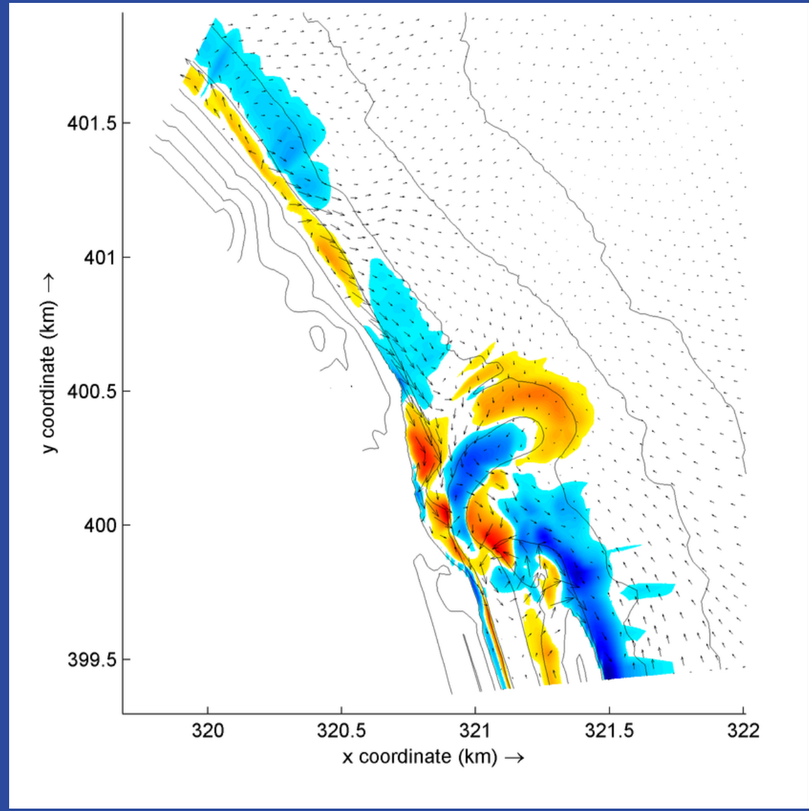
18-DEC-2022 12:00:00

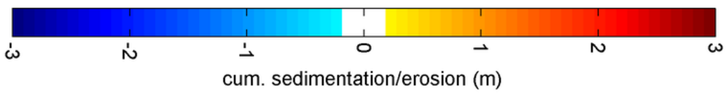












DISCUSSION

1 NUMERICAL MODEL

The setup of XBeach for Cherok Paloh beach is calibrated accordingly and the BSS score signifies that is sufficient to be replicated in other areas.

The Simulation is in line with the preliminary study that identifies the area to be experiencing coastal erosion with a rate of greater than 5 m.

2 RECOMENDATION

Required a wave calibration and validation for XBeach,

Thank You

Ts. Dr. Muhammad Zahir Ramli
Mazmirul abd Rahman