

THE 14th SCIENTIFIC CONFERENCE AT THE UNIVERSITY OF SCIENCE, VNU-HCM
OCEANOGRAPHY, HYDROLOGY AND CLIMATE CHANGE

Conference Date: November 11, 2024

Location: Room I42, University of Science, VNU-HCM

No. 227 Nguyen Van Cu Street, Ward 4, District 5, Ho Chi Minh City

**SESSION 3A: INTERNATIONAL COOPERATION
AND MULTI-DISCIPLINARY RESEARCH**

Chairman: Assoc. Prof. Vo Luong Hong Phuoc

Dr. Le Dinh Mau

| Abstract's number | Time | Abstract's Title | Authors | Note |
|--------------------------|---------------|---|--|-------------|
| | 10:15 – 10:20 | OPENING CEREMONY | Head of Oceanology, Meteorology and Hydrology Department - Assoc. Prof. Vo Luong Hong Phuoc | |
| 213 | 10:20 - 10:35 | An application of machine learning to analyze relationship between frontogenesis and coastal hotspots of floating marine debris. A case study on the northeast coast of the USA | Le Tran Duy Phuc | Online |
| 214 | 10:35 - 10:50 | Trends in Coastal Ocean Fronts | Andrew M Fischer, Le Tran Duy Phuc | Online |
| 220 | 10:50 - 11:05 | Is it time to retire the CLAW hypothesis? | Sohiko Kameyama | Online |

| | | | | |
|--------------|---------------|---|---|--|
| AO3-01 | 11:05 - 11:20 | Mapping of groundwater potential zone using electrical resistivity survey at Xeno area (Savannakhet province, Laos) | Sounthone Singsoupho , Sackxay Sompaserth, Nyphonh Volachack, Thiengsamone Xouansouandao, Phetnakhone Xaysondeth, Khanthong Southivong | |
| VO3-05 | 11:20 - 11:35 | Climate change, earth magnetic pole reversal and consequences | Tam Nguyen Duc | |
| 92 | 11:35 - 11:50 | Developing a Water Quality Monitoring System Using IoT Technologies | Hong Phuoc Vo Luong , Viet Hai Le Dinh, Hoa Tien Le Nguyen, Xuan Tien Nguyen Vinh | |
| LUNCH | | | | |

SESSION 3B: CLIMATE CHANGE AND ENVIRONMENT

Chairman: Assoc. Prof. Dang Truong An

Dr. Bui Thi Ngoc Oanh

| Abstract's number | Time | Abstract's Title | Authors | Note |
|--------------------------|---------------|---|---|-------------|
| | 12:45 - 13:30 | POSTER DISCUSSION | | |
| VO3-07 | 13:30 - 13:45 | Evaluating influence of rainfall frequency and precipitation on landslide susceptibility: a case study in Lam Dong, VietNam | Nguyen Van Toan , Tran Dang An, Nguyen Van Hai | |

| | | | | |
|---------------------|---------------|---|--|--|
| AO3-02 | 13:45 - 14:00 | The Application Of Geosynthetic Materials In Sustainable Development In Vietnam: A Bibliometric Analysis And Literature Review | Truc T.T. Phan, Tan V. Nguyen, Thang Q. Pham, Cuong K. Nguyen and Khanh B. Le | |
| VO3-03 | 14:00 - 14:15 | Microplastics distribution in surface sediment at Can Gio beach, Ho Chi Minh city | Pham Van Thuyen, Le Nguyen Hoa Tien, Vo Luong Hong Phuoc | |
| VO3-04 | 14:15 - 14:30 | Distribution and characteristics of microplastics in surface water and sediments of lower Mekong river (VietNam) in the southwest monsoon | Tran Thi Chung, Le Nguyen Hoa Tien, Lam Van Hao, Pham Van Thuyen, Nguyen Thanh Minh, Piotr Zieliński, Nguyen Hoang Phong, Vo Luong Hong Phuoc | |
| 63 | 14:30 - 14:45 | Evaluating the trend of water level fluctuations in the Mekong Delta under the impact of human activities and climate change | Nguyen Dam Quoc Huy, Tran Thi Kim, Dang Truong An | |
| 85 | 14:45 - 15:00 | Evaluating the potential for marine aquaculture of the Binh Thuan province | Pham Vu Phuong Trang, Phan Manh Hung, Le Nhat Minh | |
| COFFEE BREAK | | | | |

SESSION 3C: HYDROLOGY AND OCEANOLOGY

Chairman: Dr. Vu Tuan Anh

Dr. Nguyen Cong Thanh

| Abstract's number | Time | Abstract's Title | Authors | Note |
|-------------------|---------------|--|---|------|
| VO3-01 | 15:30 - 15:45 | The influence of roughness coefficient on hydrodynamic simulation results: A case study at the Co Chien estuary, Vietnam | Nguyen Thi Kim Thao , Vo Luong Hong Phuoc, Le Van Tuan | |
| VO3-02 | 15:45 - 16:00 | Calculation of meteocean parameters for designing wind farms in the southern coastal region of VietNam | Nguyen Truong Thanh Hoi , YongLin Liu, Le Duc Vinh, Mai Duc Mai, Doan Ngoc Tay, Nguyen Chi Cong, Nguyen Duc Thinh, Nguyen Van Tuan | |
| 84 | 16:00 - 16:15 | Estimation of rip current characteristics in Tam Thanh beach, Quang Nam province, VietNam | Dinh Mau Le , Nguyen Chi Cong, Nguyen Truong Thanh Hoi, Nguyen Van Tuan, Tran Van Binh, Nguyen Thi Thuy Dung | |
| 76 | 16:15 - 16:30 | Formation mechanism of sand bar in thu bon river mouth | Tuan Anh Vu | |
| VO3-06 | 16:30 - 16:45 | Characteristics of hydrodynamics in mangrove forest, a case study in Cu Lao Dung, Soc Trang, VietNam | Trần Xuân Dũng , Lê Nguyễn Hoa Tiên, Võ Lương Hồng Phước | |

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| 228 | 16:45 - 17:00 | Water level changes in the Vietnamese Mekong Delta | Nguyen Cong Thanh, Nguyen Nghia Hung, Dang Truong An, Phung Thai Duong | |
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POSTER PRESENTATION

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| P3-01 | VP3-01 | Calculation of wave characteristics at An Binh island, Ly Son district for the design of wave power plant | Nguyen Truong Thanh Hoi, Liu Yong Lin, Le Dinh Mau, Nguyen Chi Cong, Bui Duc Linh, Nguyen Duc Thinh, Nguyen Van Tuan |
| P3-02 | VP3-02 | Trend analysis of precipitation and temperature (1981–2020) in the Srepok river basin of VietNam | Pham Thi Loi, Nguyen Thi Bay, Nguyen Thi Huynh Mai, Pham Thi Thao Nhi |
| P3-03 | 29 | Calculate the wave attenuation in the mangrove forest using the Delft – 3d model | Nguyen Hoang Phong |
| P3-04 | 30 | Increasing ENSO events in the context of climate change induced the shifts in seasonal rainfall characteristics in the Mekong Delta region. | Bui Minh Thien, Dang Truong An |
| P3-05 | 46 | Irrigation water potential for rice cultivation regions in the plain of reeds under the enhancing impacts of climate change | Nguyen Thi My Huyen, Dang Truong An, Phung Thai Duong, Huynh Thi Kieu Tram |

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ORAL SESSION

AN APPLICATION OF MACHINE LEARNING TO IDENTIFY COASTAL HOTSPOTS OF FLOATING MARINE DEBRIS IN RELATION TO OCEAN FRONTS

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Abstract

Floating marine debris (FMD) has considerable influence on ecologically and biologically important coastal areas. Thus, predicted FMD accumulation can help to protect marine life and valuable marine resources from marine debris pollution. Frontal zones (water convergence) are found driving FMD accumulation in coastal regions. To predict coastal FMD hotspots, logistic regression methods were applied to find out the correlation between physical processes of frontal formation and FMD accumulation zones, using the Gulf of Maine and Nantucket Shelf (northeast USA) as a case study. This study used a floating debris dataset collected by the Sea Education Association (North Atlantic) from 2002 to 2012 and applied remote sensing to derive sea surface temperature (SST) fronts from a 10-year MODIS SST dataset (2002–2012). Two logistic regression techniques applying to different classification levels of FMD density were compared. Both regression models identified FMD hotspots in the coastal zone and show a significant influence of frontogenesis on the accumulation zones of FMD density above 500 pieces/km². Results highlight the applicability of machine learning to locate FMD hotspots in coastal regions, which are areas of high biodiversity value around the globe.

TRENDS IN COASTAL OCEAN FRONTS.

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Abstract

Coastal ocean fronts, the transitional zones between distinct water masses, are key features in marine ecosystems, influencing biological productivity, nutrient distribution, and oceanographic processes. Recent trends in coastal ocean fronts are driven by a combination of climate change, anthropogenic influences, and natural variability. Rising sea surface temperatures and altered wind patterns have intensified and shifted the locations of many coastal fronts, leading to changes in stratification and mixing processes. Enhanced monitoring through satellite imagery, in-situ observations, and advanced modelling techniques has improved our understanding of the temporal and spatial dynamics of these fronts. Notably, shifts in fronts have been linked to changes in primary productivity, fish migration patterns, and coastal upwelling systems. Future research must focus on how these trends impact coastal economies and ecosystems, particularly in the context of climate adaptation and management strategies for fisheries and coastal communities. Understanding these trends is crucial for predicting future changes in marine biodiversity and ecosystem services in coastal regions.

IS IT TIME TO RETIRE THE CLAW HYPOTHESIS?

Sohiko Kameyama

Hokkaido University

Abstract

An organic sulfur gas, dimethylsulfide (DMS) plays potential roles in atmospheric chemistry and hence Earth's climate regulation. DMS is produced in marine environments via biogeochemical processes and a part of the DMS is emitted from the ocean to the atmosphere at a rate of 15–40 TgS yr⁻¹. After CLAW hypothesis proposed in 1987, investigators have confirmed whether the cooling effect can control on-going global warming, and it has been concluded that the global contribution is too small to regulate the global warming. However, recent studies pointed out the local-scale effect of CLAW feedback especially in remote area from anthropogenic activities. Furthermore, over 35 years after the CLAW hypothesis, related research fields and techniques have been improved drastically. In this presentation, I review the DMS-related sulfur cycle in surface ocean including the recent DMS research progresses and the future perspectives.

MAPPING OF GROUNDWATER POTENTIAL ZONE USING ELECTRICAL RESISTIVITY SURVEY AT XENO AREA (SAVANNAKHET PROVINCE, LAOS)

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Abstract

Groundwater is one of the most essential natural resources that sustains life on earth. Water supply production without exploration is challenging; thus, the geophysical method is a tool of importance for groundwater investigation to define groundwater potential. The present study was conducted using a two-dimensional electrical resistivity tomography (2D-ERT) technique to characterize subsurface structures and map the groundwater potential zone for water supply production planning in the Xeno area, Savannakhet province, Laos. A total of 11 ERT profiles in two areas (5 profiles in area-1 and 6 profiles in area-2) was performed using a Wenner array with electrode spacing ranging from $a = 5$ to 100 m, and each profile is 1000 m long. There are 11 vertical inverted resistivity model sections and horizontal resistivity maps in depths of 3.8, 6.4, 12.4, 19.7, 24.0, 33.7, 45.9, and 52.4 m used to define and characterize subsurface structures relating to the groundwater layer. Relatively high resistivity values greater than 100 ohm-m in shallow depth are dry soil and clay. In area 1, the low resistivity at depths of 19.7 to 52.4 m ranging from 6 to 63 ohm-m indicates the high groundwater capacity associated with fractured red-brown sandstone confirmed by borehole data. Relatively high resistivity values greater than 100 ohm-m are interpreted as dry sandstone with a lower capacity of groundwater. In area-2, we also found clearly the boundary of the high groundwater potential zones that shows low resistivity approximately 8 to 80 ohm-m at depths of 20 to 53 m. This study could create maps of high groundwater potential zones associated with fractured red-brown sandstone.

Key words: Groundwater potential, ERT, sandstone, Laos.

CLIMATE CHANGE, EARTH MAGNETIC POLE REVERSAL AND CONSEQUENCES

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Abstract

1. Eight cycles of marine transgression occurred in Vietnam throughout the Quaternary, one of which was "recent marine sea transgression caused by climate change-glacier on earth".
2. One of the world's major places with ideal conditions for apes to become humans was Southeast Asia, which included the main land and a sizable continental shelf in the pass.
3. "Climate changes-sea level rise" and "recent sea transgression-sea level rising" are primarily the result of a new climate cycle, to which man is somewhat responsible by adding atmospheric greenhouse gases to the atmosphere.
4. Reversal of the Earth's magnetic pole. The earth is actually made up of several layers, each of which has its own unique magnetic field. These layers also rotate in the same direction but at different rates in each of its corners, which causes the layers' individual magnetic fields to interact with one another. However, these interactions mostly cause changes to the earth's overall common magnetic fields rather than the complete reversal of those fields. Accordingly, "complete pole reversal of the earth's common magnetic fields is just one particular case."

As a result of the earth's layering and layers rotating at different corner speeds, light (C, H, O, S, and so on) gradually separated from the magma of layers (S) and, due to the intense heat and pressure at the bottom of the earth, transformed into gas and oil (CH), diamond (C), and most importantly, water (H₂O), forming "underground oceans" that eventually migrated to the surface to form oceans on the surface. This phenomenon was observed in the island at the dormant volcano from 800 years ago. When they collide with volcanoes, they have the potential to erupt outside with material from the volcano (including gas and oil).

Key words: Quaternary, transgression, climate change, glacial, Southeast Asia, the ape turned into humans, greenhouse gases, Earth magnetic pole reversal, fluctuation of magnetic field, complete pole reversal of common magnetic fields, diamond, underground oceans.

DEVELOPING A WATER QUALITY MONITORING SYSTEM USING IOT TECHNOLOGIES

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Abstract

Water is essential for human survival and ecosystem health. Therefore, robust mechanisms must be implemented to monitor drinking and environmental water quality. Timely warnings about water contamination are critical for protecting public and environmental health. The study aims to develop a smart water quality monitoring system for remote measurement of key parameters and timely alerts. The system will monitor temperature, salinity, pH, dissolved oxygen, and turbidity using Internet of Things (IoT) technology. The procedure involves calibrating equipment, building an integrated sensor system with web and mobile interfaces, installing a monitoring station, and conducting a 14-28 day trial in the Mekong Delta region. The main objectives are to enable remote water quality monitoring and implement an early warning system. By providing real-time, continuous measurement of multiple parameters, the smart monitoring approach has potential applications in environmental protection, aquaculture, and agriculture. The project aims to demonstrate the feasibility and benefits of IoT-enabled water quality monitoring for effective water resource management and ecosystem protection.

Keywords: Water Quality, Smart Monitoring System, IoT, remote sensing, early warning system

EVALUATING INFLUENCE OF RAINFALL FREQUENCY AND PRECIPITATION ON LANDSLIDE SUSCEPTIBILITY: A CASE STUDY IN LAM DONG, VIETNAM

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Abstract

Landslide susceptibility analyzing and mapping approaches have evolved significantly, incorporating advances in remote sensing and GIS techniques, machine learning algorithms, big data analytics, and interdisciplinary approaches. However, the challenge of studying landslide susceptibility involves random and uncertain factors about topographical, geological, hydrological morphology, and hydrometeorology. In recent decades, the situation of landslides in Vietnam in particular, and in the world in general is at an alarming level. Geohazards induced by extreme rainfall events have considerably affected Vietnam. The hazards of rainfall-induced landslides differ according to the catchment owing to differences in rainfall behavior. This study aims to evaluate the influence of rainfall frequency and precipitation on landslide susceptibility in Lam Dong, Vietnam; by using machine learning algorithms and adapting the Analytic Hierarchy Process (AHP) to produce landslide susceptibility indexes. Crucial impact factors were considered and analyzed in different rainfall scenarios. Landslide susceptibility maps developed correspond to frequency scenarios of antecedent rainfall data. The results of the Area Under the Curve (AUC) index indicate that the AHP model performs feasibly. The key findings revealed a significant influence of rainfall conditions on the landslide susceptibility in Lam Dong. In zones having complex slope conditions, unsaturated soils subjected to extreme rainfall have a very high risk of landslides.

Keywords: Antecedent rainfall, Landslide susceptibility, Machine learning algorithms, Precipitation, Rainfall frequency, Vietnam

THE APPLICATION OF GEOSYNTHETIC MATERIALS IN SUSTAINABLE DEVELOPMENT IN VIETNAM: A BIBLIOMETRIC ANALYSIS AND LITERATURE REVIEW

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Abstract

This paper explores the diverse applications of geosynthetics in sustainable development, focusing on two significant aspects: reducing carbon emissions and mitigating natural disasters. Geosynthetics, including geotextiles, geogrids, geocomposites, and other engineered materials, offer versatile solutions to address environmental challenges and promote sustainable practices. In this paper, the bibliometric analysis was conducted on this application and provided a crucial guideline in the identification of relevant papers and research trends, and a series of conclusions were presented regarding the reducing carbon emissions and mitigating natural disasters. The data were obtained from the Scopus platform and processed by VOSViewer v1.6 software. 100 relevant papers from 1990 to 2024 were selected for this research. The findings from this study contribute to the growing body of knowledge on the utilization of geosynthetics as a sustainable solutions and effective approach in sustainable development in Vietnam.

Keywords: Geosynthetic materials, natural disasters, carbon emissions, bibliometric analysis

MICROPLASTICS DISTRIBUTION IN SURFACE SEDIMENT AT CAN GIO BEACH, HO CHI MINH CITY

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Abstract

The aim of the study is to identify characteristics of microplastics such as abundance and shape in surface sediment samples at Can Gio Beach, Ho Chi Minh City. Established methodological approaches including organic matter digestion, density separation, sample filtration, and microscopic observation were applied. Surface sediment samples were collected in April 2023 along two transects perpendicular to the shoreline (from sample CG-1 at low tide to CG-5 at highest tide) and parallel to the shoreline (from sample CG-6 to CG-9). Results indicate that perpendicular to the shoreline, the average microplastic abundance is 6.28 ± 0.16 particles per gram of sediment. Microplastic abundance tends to increase towards the shore, with the highest abundance at sample CG-5 (17.97 particles per gram) and the lowest at CG-1 (0.46 particles per gram). Microplastic shape includes fragments, fibers, foams, and films, with fragments comprising the highest proportion at 74.46%. Along the shoreline, the average microplastic abundance reaches 21.60 particles per gram of sediment. The results of the analysis of the relationship between microplastics and sediment particle size showed that microplastics were concentrated in the “medium sand”, “coarse sand” and “very coarse sand” types.

Keywords: microplastics, surface sediment, density separation method, sediment particle size, Can Gio

Distribution and Characteristics of Microplastics in Surface Water and Sediments of Lower Mekong River (Vietnam) in the Southwest Monsoon

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Abstract

The study analyzes the distribution and composition of microplastics at 16 stations along the Tien and Hau Rivers in the Mekong Delta region during the Southwest Monsoon season (April 2024). Microplastic samples were collected from both surface water and bed sediments. Optical microscopy was employed to observe and identify microplastic morphology, while Fourier-transform infrared spectroscopy (FTIR) was used to analyze polymer composition. Preliminary results indicate that microplastic distribution at the monitoring stations depends on various factors, including geographical location, degree of urbanization, surrounding industrial and agricultural activities, as well as the river's hydrological characteristics. Higher microplastic densities were found in areas near major urban centers and industrial zones. The most common microplastic shapes were fibers and fragments. FTIR analysis revealed polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET) as the predominant polymer types. Comparison between surface water and sediment samples showed significantly higher accumulation of microplastics in sediments with different shapes, but more fragments in surface water. The study provides an overview of microplastic pollution in the Mekong Delta River system, serving as a foundation for further research on environmental impacts and proposing appropriate management measures.

Key words: Microplastics, Vietnamese Mekong Rivers, Southwest Monsoon, Optical microscopy, FTIR

O3-11

EVALUATING THE TREND OF WATER LEVEL FLUCTUATIONS IN THE MEKONG DELTA UNDER THE IMPACT OF HUMAN ACTIVITIES AND CLIMATE CHANGE

Nguyen Dam Quoc Huy, Tran Thi Kim, Dang Truong An

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Abstract

The Mekong Delta, the largest rice-producing area in Vietnam, is facing numerous natural and anthropogenic challenges. This study evaluates the trend of water level fluctuations in the Mekong Delta under the influence of hydrodynamic factors from upstream and rising sea levels, based on data from 7 national monitoring stations. Using non-parametric statistical methods, the study finds that the water level at Tan Chau is decreasing due to upstream influences, while Can Tho and My Thuan show an increasing trend due to rising sea levels.

Keywords: Climate change, rise water levels, Pettit's test, Mann-Kendall

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EVALUATING THE POTENTIAL FOR MARINE AQUACULTURE OF THE BINH THUAN PROVINCE

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Abstract

The research presents the results of calculations, analysis, and assessment of the marine dynamics of the coastal waters of Binh Thuan province under various scenarios (current conditions, appearance of tropical depressions, and hurricanes) by the two-dimensional model Mike 21/3 FM. This results serve as a basis for zoning potential areas for marine aquaculture.

The results indicate that the wave height in the study area is less than 1 meter, and the current velocity ranges from 0.01-1.3 m/s, increasing gradually from North to South along the province's coastline when the wind is below level 4. Furthermore, based on marine dynamics and depth criteria for marine aquaculture activities, coupled with the results of hydrodynamic simulations for the entire area, the research has identified potential mariculture zones with a total area of approximately 203,655 hectares, including the waters around Phu Quy Island (3,021 hectares) and near the mainland (200,634 hectares).

Additionally, the research reveals that when a hurricane makes landfall in the potential mariculture areas of Binh Thuan province, most areas experience wave heights exceeding 2 meters, surpassing mariculture standards. While the sections with less than 1 m/s of flow speed decrease. However, due to the shelter of capes such as La Gan, Mui Yen, Mui Ne, and Mui Ke Ga, many coastal areas within the curving bays maintain wave heights and flow velocities within the acceptable limits.

Key words: mariculture, marine dynamics, waves, currents, hurricanes,...

THE INFLUENCE OF ROUGHNESS COEFFICIENT ON HYDRODYNAMIC SIMULATION RESULTS: A CASE STUDY AT THE CO CHIEN ESTUARY, VIETNAM

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Abstract

Numerical modeling plays an indispensable role in studying and analyzing hydrodynamic regimes in coastal and estuarine areas. The reliability of simulation results heavily depends on the accurate determination of input parameters, among which the roughness coefficient is a crucial parameter. In coastal and estuarine areas, determining the value of the roughness coefficient is challenging due to the complex topography and dynamic factors influenced by the combined effects of waves, currents, and tides. This study aims to assess the impact of the roughness coefficient (Manning's M- inverse of Manning's n) on simulation results using the MIKE 21/3 Coupled Model FM at the Co Chien Estuary- one of the main branches of the Mekong River. By setting up simulation scenarios with different Manning's M values, the results show that changes in Manning's M have varying impacts on different study areas, including the estuary, nearshore, and offshore coastal regions. This study initially identifies a suitable range of Manning's M values for the study area, contributing to improving the reliability of numerical models.

Key words: Numerical modeling, Manning roughness coefficient, Co Chien estuary, Mekong River

CALCULATION OF METEOCEAN PARAMETERS FOR DESIGNING WIND FARMS IN THE SOUTHERN COASTAL REGION OF VIETNAM

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Abstract

To serve the design of the Ca Mau Wind Farm located in the southern sea of Vietnam, the calculation of meteorological and hydrological parameters is necessary. The calculations are based on field survey data in the areas of Vung Tau, Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau and historical data collected over 30 years at hydro-meteorological stations from Vung Tau to Ca Mau and re-analyzed data from NOAA. The calculated parameters include: Highest astronomical tide (HAT), lowest astronomical tide (LAT), mean tidal level (MSL), tidal amplitude (TR), storm surge, highest sea level fluctuation (HSWL), lowest sea level fluctuation (LSWL), sea water temperature, salinity, wave parameters according to the return period, current velocity, wind speed distribution.

In general, the meteocean conditions in this area are mainly influenced by the two northeast and southwest monsoons. The current is strongly influenced by regional tides. The main design calculation parameters (for the back 100-year cycle) are: Maximum current velocity is 1.48 m/s, maximum wave height is 3.9 m with period $T = 4.1$ seconds. High waves in typhoon LIDA (1996) ranged from 3 to 5 m, storm surge was 1.5 m.

Keywords: wind power, tide, wave, current, wind, design calculations

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O3-15

ESTIMATION OF RIP CURRENT CHARACTERISTICS IN TAM THANH BEACH, QUANG NAM PROVINCE, VIETNAM

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Abstract

For swimming beach safety, rip current characteristics (speed, moving direction etc.) in Tam Thanh beach, Quang Nam province, Vietnam were estimated by Mike 21 model corresponding to different hydrodynamical conditions (waves, tides etc.). In addition, tested modeling to reduce the rip current intensity by apply different breakwater model were carried out. Study results show that, in Tam Thanh beach often occurs of 02 main rip current places corresponding to 02 main beach rescue stations. Strongest rip current intensity occurred corresponding to NE incident wave direction, in case of stronger wave action, the outside region of breaker occurs strong current system flows from North to South with $V \approx 0,5\text{m/s}$. With incident wave direction from E, SE will forming a not clear rip current system, however, current system flow from South to North with $V \approx 0.4\text{-}0.5\text{m/s}$. In general, Tam Thanh beach is under wave action from different directions, gently slope, therefore, rip current occur with strong intensity and varied causing the danger for swimmers especially in North-East monsoon and transition seasons. In South-West monsoon season at low tide phase, current system in Tam Thanh beach are very complicated, inside of breaker current flow from South to North and vice versa outside of breaker. Therefore, Tam Thanh beach is danger for swimmers especially in summer season.

Keywords: rip current, wave, current, tide, Tam Thanh beach

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O3-16

FORMATION MECHANISM OF SAND BAR IN THU BON RIVER MOUTH

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Abstract

The Thu Bon River (Cua Dai) delta is only classified Cuspate delta in Viet Nam. The flood from November 4 to 7, 2017, with the average daily discharge measured at Nong Son hydrological station from 2520 to 5200 m³s⁻¹, the maximum value reaching 9790 m³s⁻¹, transported about 3220000 m³ of sand to deposit outside the river mouth and created a subaqueous bar with a height of 1.5 to 2 m, located about 1.4 to 2 km from the river mouth. This subaqueous bar emerged from the sea at in March 2018, and then continued to grow. Obviously, this is an anomalous phenomenon in the evolution of cuspate delta. What causes the bar have been emerging from the water?

Wind statistics show that the northeast monsoon field in the period 2017 - 2018 is smaller than the multi-year average value, resulting in weak wave fields in this period. The results of calculating sediment movement due to the interaction of river flows, tidal currents and waves from November 2017 to March 2018, with data: deep water waves with a height of 0.6m, direction of 90 degrees; The river flow is calculated with the discharge of Nong Son hydrological station and the results were: Outside the river mouth, on an area of 1.2 km², about 25700 m³ of sediment was eroded in an area of 0.5297 km², the average erosion level was -0.04855 m, the maximum value was -0.66213 m; And 26300 m³ of sediment was deposited in an area of 0.6758 km², the average deposition level reached 0.03895 m, the maximum was 0.71327 m. This deposition caused the subaqueous bar to develop. Thus, the weak northeast wave field in the period 2017 - 2018 is the reason of the subaqueous bar emerging above the sea. Will the bar has been continuing to grow or destroying during the evolution of a cuspate delta? These are interesting scientific masters.

Keywords: subaqueous bar, cuspate delta, sediment, erosion, deposition, currents, waves.

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O3-17

CHARACTERISTICS OF HYDRODYNAMICS IN MANGROVE FOREST, A CASE STUDY IN CU LAO DUNG, SOC TRANG, VIETNAM

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Abstract

Mangrove forests are among the most diverse and productive ecosystems in the world, providing habitats for a wide variety of terrestrial and aquatic species. They act as natural shields, helping stabilize and protect coastlines while also contributing significantly to the socio-economic livelihoods of coastal communities. Therefore, the existence and development of mangrove forests play a crucial role in coastal zones. The Cu Lao Dung mangrove forest, located in the lower reaches of the Hau River in Soc Trang Province, Vietnam, is a typical area. With its unique position at the river mouth and in an area affected by tidal fluctuations from the East Sea, the Cu Lao Dung mangrove forest represents a zone where riverine and marine environments converge. The interaction between these two systems has created a relatively complex and diverse hydrodynamic regime. Field surveys in this area have revealed distinctive characteristics of the asymmetry of water level and tidal current, as well as the mangrove forest's capacity to dissipate waves and retain sediment.

Key words: Hydrodynamic, tidal asymmetry, mangrove forest, Cu Lao Dung

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O3-18

WATER LEVEL CHANGES IN THE VIETNAMESE MEKONG DELTA

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Abstract

The Mekong Delta is the most important agricultural and aquacultural production region in Vietnam. This region is challenged by adverse effects of climatic and anthropogenic factors causing severe environmental changes and affecting social-economic developments. Such changes including upstream river damping, over exploitation of sand in the river channels and groundwater, and climate changes and sea-level rises have put the Vietnamese Mekong Delta at risk. This study aims to identify and quantify changes in flood peak levels as well as tidal characteristics based on an analysis of water level data for the period 1980-2023. Our results reveal that the mean water levels and flood peak levels at upstream locations have significantly declined, particularly since the year 2010s when several large dams in the upper Mekong River have been operated. Most stations experienced a strong decline in lower low water levels and a significant increase in tidal ranges which indicate that the amplifications of tides from the East Sea have stronger intruded further inland. These results imply more severe tidal inundations, and saline intrusions will frequently happen, especially under some extreme climatic conditions (e.g. storms, droughts). The adverse effects of these changes would threaten agricultural production as well as the livelihoods of about 17 million inhabitants.

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POSTER SESSION

CALCULATION OF WAVE CHARACTERISTICS AT AN BINH ISLAND, LY SON DISTRICT FOR THE DESIGN OF WAVE POWER PLANT

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Abstract

To design the Ly Son Wave power plant Project located in the coastal area in Ly Son island district, with a capacity of 50kW, the calculation of wave parameters is important. Calculations are based on 1-month field survey data and more than 30 years of historical data collected at Ly Son and Son Tra stations, and reanalyzed data from NOAA. The parameters are calculated using the TELEMAC model, managed by the Marine Science and Technology Center, France (CETMEF). The simulation results were re-verified and compared with the data collected in the field, which were quite consistent with the operating trends of the Northeast and Southwest monsoon periods. In Ly Son sea, waves strongly affected the east coastal area of An Binh Island. In the wind field of level 4 ($v = 7$ m/s), the wave height in the coastal area ranges from 0.25 - 0.75 m. . In the wind field of level 6 ($v = 13$ m/s), the northeast region of An Binh island is strongly affected by breaking wave energy with a height of 0.75 - 2.5 m. From the results of calculation of wave propagation in different conditions, it can be seen that Ly Son and An Binh islands play an important role in the distribution of wave energy in the seawaters in coastal of Quang Ngai province. Wave height in Ly Son sea area affected by LingLing in November 2001, with maximum wave height ranging from 5 to 7m.

Keywords: Wave power, tides, waves, currents, design calculations

TREND ANALYSIS OF PRECIPITATION AND TEMPERATURE (1981–2020) IN THE SREPOK RIVER BASIN OF VIETNAM

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Abstract

Climate change is happening on a global scale, altering the climate patterns in various regions worldwide. Among the most affected climate factors are rainfall and temperature, which are of particular concern due to their direct impact on human activities. The Srepok River basin, a major water source for the Central Highlands of Vietnam, has climate factors that are significantly impacted by climate change. Droughts, a common manifestation in the Central Highlands, severely affect the local economy. Therefore, analyzing and evaluating trends in temperature and rainfall is crucial for policymakers to propose effective measures to address the impacts of climate change in the region. The study examines changes in temperature and rainfall from 1981 to 2020 using methods such as the Mann-Kendall statistical test, Sen's Slope analysis, and ITA trend analysis. Understanding the trends in rainfall and temperature changes can assist managers in developing policies and strategies for sectors affected by climate change.

Key words: ITA, rainfall, Srepok River Basin, temperature, trend analysis

CALCULATE THE WAVE ATTENUATION IN THE MANGROVE FOREST USING THE DELFT – 3D MODEL

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Abstract

Delft3D model is used to calculate wave propagation in mangrove forests. The research method is based on the changes of Collins bottom coefficient (1972) and the Chezy roughness coefficient (Baptis, 2005). They depend on the characteristics of the mangrove forest as density, height of tree, trunk diameter and hydrodynamic parameters. This study was applied to estimate wave height dissipation in the first 500 m forest from shore at Can Gio mangrove forest. The results show that the wave height reduction depends on initial wave height, cross-shore distances, and mangrove forest structures. In particular, with 1.0 m initial wave height, 1.0 tree/ m² forest density and 1.0 m water level, significant wave height is 0.92 m (8% reduction), 0.43 m (57% reduction), 0.29 m (71% reduction), 0.22 m (78% reduction), 0.18 m (82% reduction) and 0.15 m (85% reduction) away from the edge forest 10 m, 100 m, 200 m, 300 m, 400 m and 500 m respectively.

Keywords: Delft3D, Collins bottom coefficient, Chezy roughness coefficient, mangrove forest.

P3-04

INCREASING ENSO EVENTS IN THE CONTEXT OF CLIMATE CHANGE INDUCED THE SHIFTS IN SEASONAL RAINFALL CHARACTERISTICS IN THE MEKONG DELTA REGION

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Abstract

The Vietnamese Mekong Delta (VMD) is widely recognized as Vietnam's rice bowl, contributing over 50% of the nation's rice production and playing a crucial role in ensuring national food security. However, this delta has faced mounting challenges due to the impacts of climate change, particularly drought and saltwater intrusion, which threaten agricultural productivity and the livelihoods of local communities in recent years. This study investigates the influence of the ENSO on onset date, duration, and cessation date of the rainy season in the VMD. Utilizing daily rainfall data from 12 national standard meteorological stations spanning the period from 1985 to 2022, the research examines shifts in rainfall patterns. Preliminary findings indicate a trend towards an earlier DRSO and DRSC, resulting in an overall LRS across the study area.

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IRRIGATION WATER POTENTIAL FOR RICE CULTIVATION REGIONS IN THE PLAIN OF REEDS UNDER THE ENHANCING IMPACTS OF CLIMATE CHANGE

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Abstract

Plain of Reeds, one of the two crucial rice-producing regions within the Mekong Delta, faces escalating challenges posed by climate change. These challenges are projected to exacerbate irrigation water scarcity, jeopardizing agricultural productivity. This study utilizes the FAO-Aquacrop model (Version 7.0) to project irrigation water requirements (IWR) for the Plain of Reeds. By integrating factors such as soil properties, crop varieties, local farming practices, and climate conditions, the study simulates optimal sowing schedules under both current climate conditions and future climate scenarios based on Representative Concentration Pathways (RCPs) 4.5 and 8.5. Results indicate an increase in projected IWR during the crucial growth stages of the winter-spring and summer-autumn rice crop seasons across all future climate scenarios. Conversely, the autumn-winter season exhibits a projected decrease in IWR, ranging from 3.7% to 12.6% compared to future climate scenarios. These findings underscore the need to adjust crop sowing schedules to optimize irrigation practices and adapt to the evolving climate realities of the Plain of Reeds.

APPLYING THE EXPERIMENTAL FORMULAS TO CALCULATE THE SIGNIFICANT WAVE HEIGHT IN THE OFFSHORE AREA OF PHU QUY ISLAND, BINH THUAN PROVINCE

Nguyen Thanh Nam, Le Nguyen Hoa Tien

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Abstract

The study collected wind data to analyze the wind regime and calculate the significant wave heights in the offshore area of Phu Quy Island, Binh Thuan province, in 2009. The experimental formulas SMB, Wilson, and SPM were used to calculate the hourly significant wave height. The calculated wave heights were compared with the observed data. The results show that the SPM method correlated strongly with the observed data ($r^2 = 0.89$). Additionally, the SPM and Young methods were used to calculate the wave height during Storm Usagi in 2018. The average calculated wave height was about 15.82 m using the SPM method and 6.46 m using the Young method. Therefore, the Young method was suggested to improve the accuracy of wave height predictions during storms.

Keywords: the significant wave heights, SMB experimental formulas, Wilson experimental formulas, SPM experimental formulas, Young experimental formulas

STUDY OF THE FUJIWHARA EFFECT

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Abstract

The phenomenon of binary storms was studied by the Japanese meteorologist Fujiwhara in 1921. Later, the interaction between binary storms became known as the Fujiwhara Effect. The mutual interaction between two storms makes forecasting binary storms very challenging, as the movement and intensity of both storms continuously change. In addition to presenting knowledge related to the phenomenon of binary storms, the study relied on the distance conditions where binary storm interactions occur to collect data on two storms: Parma - Melor (Northwest Pacific, 2009) and Hilary - Irwin (Northeast Pacific, 2017). These are two typical examples of enhancement and dissipation cases when two storms interact with each other.

Keywords: binary storms, Fujiwhara effect, Parma - Melor, Hilary - Irwin

APPLICATION OF REMOTE SENSING AND GIS TO MONITOR THE URBANIZATION PROCESS IN BINH DUONG PROVINCE

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Abstract

Binh Duong province has been undergoing rapid industrialization and urbanization since 1997, contributing to an increase in impervious surface area. This study has applied remote sensing and GIS to monitor the urbanization process in Binh Duong province from 1995 to 2023 through impervious surfaces. In addition, the study also analyzed the correlation between urbanization with land surface temperature and normalized difference vegetation index. The results showed that urban development strongly and gradually expanded to the North, Northeast, and Northwest in Binh Duong province. The impervious surface area increased by 9.9% (26442.6 hectares) in the period 1995 - 2023. In addition, the study also found a positive correlation between urbanization and surface temperature and a negative correlation between urbanization and normalized difference vegetation index.

Keywords: Binh Duong province, remote sensing, GIS, urbanization, land surface temperature.

ANALYSIS AND ASSESSMENT OF SALTWATER INTRUSION IN DOWNSTREAM OF TIEN AND HAU RIVERS

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Abstract

Saltwater intrusion is becoming increasingly complicated downstream of Tien and Hau Rivers. Therefore, the study of saltwater intrusion plays an important role in socio-economic development in this area. The study uses in situ salinity in 2010, 2014, 2016, 2019, and 2020 at 23 stations along four branches such as Cua Dai and Cua Tieu, Ham Luong, Co Chien, and Hau river to analyze and evaluate the saltwater intrusion process. The results showed that the salinity tended to decrease gradually from the estuary to the inland, and the salinity gradually increased from January, peaked in February, March, or April, and then gradually decreased. According to 4ppt salinity isolines, the deepest saltwater intrusion extended approximately 80 km inland at the Ham Luong branch and the others are similar with 56 km inland. Over the years, salinity penetrated the deepest at the Co Chien branch in 2016 and the others in 2020.

Keywords: Saltwater intrusion, Tien river, Hau river, salinity, branch.

ANALYSIS AND ASSESSMENT OF THE CHANGES OF SALINITY AND PHYSICAL FACTORS IN TIEN RIVER, BEN TRE PROVINCE

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Abstract

Salinity is one of the important factors in assessing water quality and issuing warnings about the impacts of saltwater intrusion. The study aims to analyze and evaluate the variations in salinity and the physical factors, including temperature, turbidity, dissolved oxygen concentration, and pH along Hàm Luông and Cỏ Chiên Rivers in Bến Tre province. The analysis of salinity variation in 2023 was carried out at three stations An Thuận, Mỹ Hóa, and Chợ Lách, along Hàm Luông River in 2023. The results show that the strongest saltwater intrusion occurred in March, affecting An Thuận and Mỹ Hóa stations especially highest salinity in An Thuan is 27.3‰. However, Chợ Lách station was not affected by saltwater intrusion 0.1‰. Additionally, the analysis of the salinity profile and physical factors such as turbidity, dissolved oxygen concentration, and temperature in Cỏ Chiên River was conducted using the Yoda Profiler from May 19, 2015, to May 21, 2015. The measurement results during the high tide and mid-range tide showed that the dissolved oxygen concentration and temperature decreased with depth, while turbidity and salinity increased with depth. Meanwhile, during low tide, all the physical factors are evenly distributed from the surface to the bottom layer. The data indicates that the water quality in the area is suitable for agricultural and rice cultivation purposes.

INITIAL DEVELOPMENT OF WATER LEVEL FORECASTING MODEL USING ARTIFICIAL INTELLIGENCE (AI)

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Abstract

The study focuses on developing an accurate and reliable water level forecasting model using artificial intelligence (AI), specifically machine learning and deep learning techniques. The research process includes collecting and preprocessing historical water level data from WXTIDE in Vung Tau station for one year. The results show that the forecasting model has initially achieved positive results. This study not only demonstrates the potential of AI in improving water level forecasting but also opens up development directions for integrating satellite data, building early warning systems and expanding applications to other river basins, promising to contribute significantly to water resources management and flood risk reduction.

ANALYSIS OF WAVE CLIMATE ALONG THE COAST OF THE MEKONG DELTA USING WAVEWATCH III MODELED DATA

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Abstract

Coastal wave climate and the characteristic of wave parameters are one of the primary factors driving coastal hydrodynamics and coastal erosion and/or deposition processes. However, wave observation data along the coast of the Mekong Delta are often scarce due to a lack of long-term monitoring stations. The objective of this study is to assess the accuracy of the model by validating WaveWatch III data with measured data with a duration of 15 days from two stations during the southwest and northeast seasons for each season. Compared with the observed data, modeled results from WaveWatch III show a similar variation in wave heights and wave directions, which demonstrate the possibility in using modeled improving predictive capabilities in the region. Model data reveal a clear distinction in the wave regime between the northeast and southwest seasons as well as and the different in wave parameters in the east coast and the west coast of the Mekong Delta. During the northeast monsoon, wave height values are higher compared to those wave heights during the southwest monsoon. The lowest values of wave heights usually occur during the transitional periods between two seasons. Along the coast of the Mekong Delta, these data also indicate that northwesterly wave fields are strongly affected by the east coast, whereas southwesterly wave fields are directly influenced by the west coast.