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**XXth RENCONTRES
DU VIETNAM**
Gặp gỡ Việt Nam lần thứ 20

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QUY NHON
VIETNAM

USTH
VIETNAM FRANCE UNIVERSITY



THE 4TH INTERNATIONAL VIETNAM CONFERENCE ON EARTH AND ENVIRONMENTAL SCIENCES

 **QUY NHON, VIETNAM**

UGU
Vietnam-German University

APN
ADVANCED PROGRAM FOR
NORTH-AMERICAN
GLOBAL CHANGE RESEARCH

**CARE OF SEA
MEGACITIES**
Coastal, Urban, and Regional
Climate Change Research
Coastal Urban and Regional
Climate Change Research

**WCRP
CORDEX**
Coordinated Regional Climate Downscaling Experiment

Conference Program and Abstracts



The 4th *international* Vietnam Conference on Earth and Environmental Sciences 2024 (iVCEES-2024)

November 26 – November 29, 2024

International Centre for Interdisciplinary Science and Education

Quy Nhon, Viet Nam

SCIENTIFIC COMMITTEES

OF THE IVCEES-2024 CONFERENCE

Scientific committee

- Assoc. Prof. **Ngô Đức Thành**, University of Science and Technology of Hanoi (USTH), Vietnam: chairman
- Dr. **Faye Cruz**, Manila Observatory, Philippines
- Assoc. Prof. **Nguyễn Thuỳ Dương**, VNU University of Science (HUS)
- Dr. **Đỗ Xuân Hồng**, Nong Lam University – Ho Chi Minh City (NLU)
- Assoc. Prof. **Hoàng Thị Thu Hương**, Hanoi University of Science and Technology (HUST)
- Dr. **Ngô Thị Thuý Hương**, Phenikaa University (PU)
- Dr. **Trần Lê Lưu**, Vietnamese German University (VGU)
- Prof. **Nguyễn Ngọc Minh**, VNU University of Science (HUS)
- Dr. **Trần Bá Quốc**, Duy Tân University (DTU)

Organizing committee

- Prof. Jean **Trần Thanh Vân**, Rencontres du Vietnam
- Assoc. Prof. **Ngô Đức Thành**, University of Science and Technology of Hanoi
- Dr. **Trần Thanh Sơn**, International Centre for Interdisciplinary Science Education (ICISE)
- Ms. **Nguyễn Thị Trà**, University of Science and Technology of Hanoi

PREFACE

On behalf of the Organizing Committee, I am very pleased to extend a warm welcome to nearly 150 participants from 14 countries attending the 4th *international* Vietnam Conference on Earth and Environmental Sciences (iVCEES-2024) at the International Centre for Interdisciplinary Science Education (ICISE), Quy Nhon, Vietnam.

I would like to highlight that the primary goal of the iVCEES conference series is to provide a premier interdisciplinary forum for researchers, students, and practitioners to present and discuss the most recent innovations and advances in the fields of Earth and Environmental Sciences. Additionally, by bringing together diverse areas, the conference aims to foster networking and collaboration among participants, thereby promoting research and developmental activities in Earth and Environmental Sciences. iVCEES will be held annually to make it an ideal platform for people to share views, experiences, and other related ideas.

We acknowledge the Association Rencontres du Vietnam, the International Centre for Interdisciplinary Science Education (ICISE), the University of Science and Technology of Hanoi (USTH), the Vietnamese German University (VGU), the World Climate Research Programme (CORDEX-WCRP), the Asia-Pacific Network for Global Change Research (APN) via the project CARE for SEA Megacities for their generous support, without which the conference would not be able to happen.

Finally, we are extremely grateful to Prof. Jean Tran Thanh Van — President of the Association Rencontres du Vietnam, Dr. Tran Thanh Son — Vice Director of ICISE, Dr. Faye Cruz — Manila Observatory, the members of the Scientific Committee, Ms. Nguyen Thi Tra — USTH, and the organizing team for their tireless support and local organizing and hosting this workshop in the wonderful ICISE venue.

On behalf of the Organizing Committee,

Thanh Ngo-Duc, chairman of iVCEES-2024's committee
University of Science and Technology of Hanoi
Vietnam Academy of Science and Technology

GENERAL AGENDA (Session Information)

Plenary Session <i>Meeting room:</i> Conference Hall 1	Tuesday, 8:30–12:00 Wednesday–Friday, 8:30–10:00
S1: Solid Earth Sciences <i>Meeting room:</i> Conference Hall 2	Tuesday, 14:00–15:40 & 16:10–17:30 Thursday, 10:00–12:00
S2: Atmospheric Sciences <i>Meeting room:</i> Conference Hall 2	Wednesday, 10:30–12:30 Wednesday 13:30–15:30 (poster)
S3: Aquatic Sciences <i>Meeting room:</i> Conference Hall 1	Wednesday, 10:30–12:30 Wednesday, 13:30–15:30 (poster) Thursday, 13:30–15:00
S4: Environment and Sustainable Development <i>Meeting room:</i> Conference Hall 1	Wednesday, 16:00–18:00 Wednesday 13:30–15:30 (poster) Thursday, 10:00–12:00
S5: Emerging technologies & Interdisciplinary topics <i>Meeting room:</i> Conference Hall 2	Wednesday, 16:00–18:00 Wednesday 13:30–15:30 (poster)
Special session S6: Contaminants of Emerging Concern (CECs) in Environment <i>Meeting room:</i> Conference Hall 1	Tuesday, 14:00–15:40 & 16:10–17:30 Wednesday 13:30–15:30 (poster)
Special session S7: CARE for SEA Megacities and CORDEX-SEA <i>Meeting room:</i> Conference Hall 3	Tuesday, 14:00–17:30 Wednesday, 10:30–12:30 & 14:00–18:00 Thursday, 10:00–12:00 & 13:30–15:00

AGENDA

Time: November 26 – November 29, 2024

Venue: International Centre for Interdisciplinary Science and Education (ICISE), Quy Nhon

GENERAL CALENDAR

Monday, November 25th

All day	Arrival to QuyNhon	All participants
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Tuesday, November 26th

Time	Title	Presenter
8:30 – 9:00	Registration	All participants
9:00 – 12:00	Plenary Session (1) Meeting room: Conference Hall 1 Chair: Dr. Thanh Nguyen-Xuan, University of Science and Technology of Hanoi	
9:00 – 9:30	Welcoming remarks	Assoc. Prof. Ngo Duc Thanh <i>Chairman of the iVCEES's Scientific Committee</i>
	Welcoming remarks: ICISE	Dr. Tran Thanh Son <i>Deputy Director of the ICISE</i>
	Opening remarks: USTH	Dr. Vu Thi Thu <i>Deputy Director, Direction of Research, Innovation & Technology transfer, University of Science and Technology of Hanoi</i>
	Opening remarks: VGU	Dr. Ha Thuc Vien <i>Vice Rector, Vietnamese German University</i>
	Opening remarks: CARE for SEA Megacities & CORDEX-SEA	Dr. Faye Cruz <i>Manila Observatory, Philippines</i>
9:30 – 10:00	GROUP PHOTO & COFFEE BREAK	
10:00 – 10:30 	Keynote: Looking back and looking forward: Reflections from CORDEX Southeast Asia	Dr. Faye Cruz <i>Manila Observatory, Philippines</i>
10:30 – 11:00	Keynote: Seismic broadband observations and earthquake hazard assessments in Vietnam – The twenty years of earth science cooperation from Taiwan	Prof. Huang Bor-Shouh <i>Institute of Earth Sciences, Academia Sinica, Taiwan</i>
11:00 – 11:20	Hypolimnetic Hypoxia in the Dam Reservoir in Vietnam	Hoang Thi Thu Huong <i>Hanoi University of Science and Technology, Hanoi</i>

11:20 – 11:40	Implementing a Complete Regional Forecast System: Experience and Insights from Red Sea Modeling Efforts	Thang Luong <i>King Abdullah University of Science and Technology (KAUST), Saudi Arabia</i>
11:40 – 12:00	Developing A New Machine Learning Based Approach to Quantify Uncertainty of Gridded Precipitation using Vietnamese Rainfall Data	Do Xuan Hong <i>Nong Lam University - Ho Chi Minh City</i>
12:00 – 14:00	LUNCH	
14:00 – 15:40	Parallel Session S1 (1): Solid Earth Sciences Meeting room: Conference Hall 2 Chair: Assoc. Prof. Nguyen Thuy Duong, VNU University of Science, Hanoi	
14:00 – 14:20	The Study of Site Effect in Hanoi Area Using Microtremor Survey	Wen Kuo-Liang <i>National Central University, Taiwan</i>
14:20 – 14:40	High-resolution crustal imaging across the Red River Shear Zone, Northern Vietnam using Markov-Chain Monte-Carlo Joint Inversion with Multiple Seismic Data Types	Ha Vinh Long <i>National Central University, Taoyuan City, Taiwan</i>
14:40 – 15:00	Characteristics of the 2022 Tonga eruption shock wave across Taiwan from multiple sensor observations	Huang Bor-Shouh <i>Institute of Earth Sciences, Academia Sinica, Taiwan</i>
15:00 – 15:20	The 2019 ML 5.0 Cao Bang – Jingxi Earthquake Sequence and Implications for Regional Tectonics	Nguyen Van-Duong <i>Institute of Geophysics, Vietnam Academy of Science and Technology, Hanoi, Vietnam</i>
15:20 – 15:40	Development of Web Data Service for Seismology after the 1999 M7.6 Chi-Chi, Taiwan Earthquake: Taiwan Earthquake Research Data Center (TECDC)	Liang Wen-Tzong <i>Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan</i>
14:00 – 15:40	Parallel Session S6 (1): Contaminants of Emerging Concern (CECs) in Environment Meeting room: Conference Hall 1 Chair: Assoc. Prof. Tran Le Luu, Vietnamese-German University	
14:00 – 14:20	A study on influence of synthesis conditions on properties and structure of g-C ₃ N ₄	Vo Vien <i>Quy Nhon University</i>
14:20 – 14:40	Investigating Role of Microplastics on Trace Metal Accumulation and Biofilms	Le Thanh Thao, Tran Thi Hoa <i>Phenikaa University</i>
14:40 – 15:00	Assessment of the presence of per-/polyfluoroalkyl substances (PFAS) in surface water in Binh Duong and its relationship with physicochemical parameters	Dao Van Tri <i>Vietnamese-German University</i>
15:00 – 15:20	Performance of DHS-USB system for textile wastewater treatment under high salinity conditions	Phan Nhu Nguyet <i>University of Science, VNU-HCM</i>

15:20 – 15:40	Advanced Thermal Hydrolysis for Sewage Sludge Pre-treatment: Integrating Oxidation for Enhanced Biogas Production	Ngo Phuong Linh <i>Nha Trang University</i>
14:00 – 15:40 	Parallel Session S7 (1): CARE for SEA Megacities and CORDEX-SEA Meeting room: Conference Hall 3 Chair: Dr. Patama Shringruck; Rapporteur: Dr. Jing-Xiang Chung	
14:00 – 14:10	Introduction/Welcome remarks	Faye Cruz <i>Manila Observatory (Philippines)</i>
14:10 – 14:25	Update on the downscaling experiments by Malaysia	Juneng Liew <i>Universiti Kebangsaan Malaysia (Malaysia)</i>
14:25 – 14:40	Update on the downscaling experiments by Thailand	Jerasorn Santisirisomboon <i>Ramkhamhaeng University (Thailand)</i>
14:40 – 14:55	Update on the downscaling experiments by Philippines	Julie Mae Dado <i>Manila Observatory (Philippines)</i>
14:55 – 15:10	Update on the downscaling experiments conducted by Vietnam	Long Trinh-Tuan <i>Vietnam Academy for Water Resources (Vietnam)</i>
15:10 – 15:25	Assessment of 25-km Precipitation Simulation of Downscaled CMIP6 CORDEX-SEA over Indonesia: Preliminary study	Donaldi Permana <i>BMKG (Indonesia)</i>
15:25 – 15:40	Fine resolution climate simulations over Southeast Asia using CCAM	John McGregor <i>CSIRO (Australia)</i>
15:40 – 16:10	COFFEE BREAK	
16:10 – 17:30	Parallel Session S1 (2): Solid Earth Sciences Meeting room: Conference Hall 2 Chair: Prof. Wen Kuo-Liang, National Central University, Taiwan	
16:10 – 16:30	Slab tearing and lithospheric structures in Luzon island, Philippines: constraints from P- and S-wave local earthquake tomography	Nguyen Cong-Nghia <i>Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan</i>
16:30 – 16:50	The experiment of a near-real-time shakemap using ground motion prediction equations for an earthquake early warning system: the case study of the M5.0 event in the Kontum province	Tran An-Nguyen <i>Institute of Geophysics, Vietnam Academy of Science and Technology, Ha Noi, Vietnam</i>

16:50 – 17:10	A high-resolution aftershock catalog following the 2023 Kahramanmaraş Earthquake Sequence and the associated fault zone structures using ultra-dense nodal recording	Mach Phuc <i>Georgia Institute of Technology, USA</i>
17:10 – 17:30	An introduction to earthquake rapid information system for Local and Regional Scales in Vietnam: Two commissioning test systems in Kon Tum province and Northwestern Vietnam	Nguyen Le Minh <i>Institute of Geophysics (IGP), Vietnam Academy of Science and Technology (VAST), Ha Noi, Vietnam</i>
16:10 – 17:30	Parallel Session S6 (2): Contaminants of Emerging Concern (CECs) in Environment Meeting room: Conference Hall 1 Chair: Assoc. Prof. Tran Le Luu, Vietnamese-German University	
16:10 – 16:30	Microplastics as Carriers of Persistent Organic Pollutants in the Red River Delta: Occurrence, Distribution and Ecological Implications	Thuong Nguyen Thi Hoai <i>Phenikaa University</i>
16:30 – 16:50	Potential application of novel ternary mixed metal oxide (Ti/SnO ₂ -Nb ₂ O ₅ -Sb ₂ O ₅) electrodes for textile wastewater treatment and reuse	Nguyen Thi Nhan <i>Vietnamese-German University</i>
16:50 – 17:10	Assessing the Economic and Environmental Impact of Plastic Waste from Fishing Gear: A Survey of Fishermen in Khanh Hoa Province, Vietnam	Nguyen Van Nhi Tran <i>Nha Trang University</i>
17:10 – 17:30	Treatment of per-/polyfluoroalkyl compounds (PFAS) in surface water by electrochemical Fenton process	Huynh Do Hieu Nhu <i>Vietnamese-German University</i>
16:10 – 17:30 	Parallel Session S7 (2): CARE for SEA Megacities and CORDEX-SEA Meeting room: Conference Hall 3 Chair: Dr. Patama Shringruck; Rapporteur: Dr. Jing-Xiang Chung	
16:10 – 16:25	Impact of benchmarking global climate models on dynamically downscaled regional climate model outputs	Phuong Loan Nguyen <i>CCRC, UNSW (Sydney)</i>
16:25 – 16:40	Assessing the Impact of Bias Correction of Precipitation and Temperature Simulated by Regional Climate Models on Drought Characteristics	Tan Phan-Van <i>VNU University of Science (Vietnam)</i>
16:40 – 16:55	Collaborative efforts on climate modeling to support Vietnam	Rebecca Sawyer <i>The Met Office (UK)</i>
16:55 – 17:10	Projected Extreme Precipitation based on bias-corrected in CORDEX-SEA 5km simulation over Java Island	Ummu Marufah <i>BMKG (Indonesia)</i>
17:10 – 17:30	Observation/CMIP5-based Analysis of Compound Climate Events in Thailand	Atsamon Limsakul

		<i>Department of Climate Change and Environment (Thailand)</i>
17:30 – 18:30	DINNER	

Wednesday, November 27th

Time	Title	Presenter
8:30 – 10:00	Plenary Session (2) Meeting room: Conference Hall 1 Chair: Prof. Phan Van Tan, VNU University of Science	
8:30 – 9:00	Keynote: Toward air-sea high-resolution regional coupling to better understand and forecast the Southeast Asia Climate	Dr. Marine Herrmann <i>LEGOS, Research Institute for Development (IRD), Toulouse, France</i>
9:00 – 9:30	Keynote: Agricultural Soils as Climate Regulators	Prof. Georg Guggenberger <i>Institute of Soil Science, Leibniz University Hannover, Germany</i>
9:30 – 10:00	Keynote: Unlocking Colonial-Era Weather Data from Indochina: A Key to Understanding Climate Change in Southeast Asia	Dr. Frédéric Thomas <i>UMR SENS, IRD, Cirad, Montpellier University, France</i>
10:00 – 10:30	COFFEE BREAK	
10:30 – 12:10	Parallel Session S3 (1): Aquatic Sciences Meeting room: Conference Hall 1 Chair: Assoc. Prof. Hoang Thi Thu Huong, Hanoi University of Science and Technology	
10:30 – 10:50	Mangrove flora in the coastal municipalities of Sultan Kudarat province, Philippines	Rande B. Dechaevz <i>Sultan Kudarat State University, Philippines</i>
10:50 – 11:10	Occurrence of Antibiotic Resistance in Bacteria Isolated from <i>Holothuria atra</i>	Mary Grace Ereguero <i>Mindanao State University -Iligan Institute of Technology, Philippines</i>
11:10 – 11:30	Water Quality and Algal Biodiversity in Hòa Bình Reservoir: Eutrophication Management	Doan Thi Thai Yen <i>Hanoi University of Science and Technology</i>
11:30 – 11:50	New records and rare marine fishes from Mindanao Island, Philippines	Girley Gumanao <i>Davao del Norte State College, New Visayas, Panabo City, Philippines</i>
11:50 – 12:10	Systematics and Diversity Freshwater Crabs of Genus <i>Isolapotamon</i> Bott, 1968 (<i>Brachyura</i> , <i>Potamidae</i>) of Mindanao Island, Philippines	Nickel Jean Lagare-Sastine <i>Davao del Norte State College, Philippines</i>
10:30 – 12:10	Parallel Session S2 (1): Atmospheric Sciences Meeting room: Conference Hall 2 Chair: Dr. Tran Ba Quoc, Duy Tan University	

10:30 – 10:50	Dynamical downscaling of ERA5 precipitation in Ho Chi Minh city, Vietnam	Nguyen Duy Tung <i>Oxford University Clinical Research Unit, Ho Chi Minh City, Vietnam</i>
10:50 – 11:10	Evaluation the high-resolution dynamical climate model simulations for Vietnam with CMIP6-GCM driven data and proposing reasonable bias-correction methods for National Climate Changes Projection 2025	Kien Truong-Ba <i>IMHEN, Vietnam</i>
11:10 – 11:30	Why is the El Niño–East Asian summer monsoon relationship strongest during the combination of the positive phase of PDO and negative phase of the Victoria mode?	Dzung Nguyen-Le <i>REMOSAT Laboratory, USTH, VAST, Hanoi, Vietnam</i>
11:30 – 11:50	Changes in Temperature Extremes in Vietnam at Progressive Global Warming Levels from 1.5°C to 4°C	Quan Tran-Anh <i>Faculty of Environment, Hanoi University of Mining and Geology (HUMG), Hanoi, Vietnam</i>
11:50 – 12:10	A Comparative Study on the Combined Effects of COVID-19 and Meteorological Factors on PM2.5 Reduction in Ho Chi Minh City, Vietnam: Analysis of 2016–2019 versus 2020–2021	Cong Thanh Tran <i>University of Science, Vietnam National University Ho Chi Minh City, Vietnam</i>
10:30 – 12:30 	Parallel Session S7 (3): CARE for SEA Megacities and CORDEX-SEA Meeting room: Conference Hall 3 Chair: Assoc. Prof. Juneng Liew; Rapporteur: Dr. Donald Permana	
10:30 – 10:45	Preliminary Study of Land Surface Physics-based Downscaling of Greater Jakarta for April 2024	Danang Eko <i>BMKG (Indonesia)</i>
10:45 – 11:00	Enhancing Climate Projections for Southeast Asian Megacities Using City-scale Urban Modeling: Preliminary Results from Hanoi, Vietnam	Thanh Nguyen-Xuan <i>University of Science and Technology of Hanoi (Vietnam)</i>
11:00 – 11:15	Preliminary Study for Urban Heat Island Analysis in Jakarta City using a Land Surface Physics-based Downscaling Method	Trinah Wati <i>BMKG (Indonesia)</i>
11:15 – 11:30	Performance Evaluation of Land Surface Physics-based Downscaling with High-Resolution Land Data Assimilation System (HRLDAS) during April 2024 over Metro Manila, Philippines	Jennifer Tibay <i>Manila Observatory (Philippines)</i>
11:30 – 11:45	Simulating City Scale Surface Temperature in Greater Kuala Lumpur, Malaysia using High-Resolution Land Data Assimilation System (HRLDAS)	Jing Xiang Chung <i>Universiti Malaysia Terengganu (Malaysia)</i>
11:45 – 12:00	Preliminary Study of Surface Temperature in Bangkok, Thailand Using High-Resolution Land Data Assimilation System (HRLDAS)	Wongseeree Waranyu <i>Ramkhamhaeng University (Thailand)</i>

12:00 – 12:15	Land-Surface-Physics-Based Downscaling (LSP-DS) as a Novel Downscaling Approach for Urban Climate	Lingbo Xue <i>University of Tsukuba (Japan)</i>
12:15	Group Photo	
12:30 – 13:30	LUNCH	
13:30 – 15:30	POSTER SESSION	
S2-Poster 1	A study on distribution and trends of extreme cold day in Vietnam for the period of 2011 - 2021	Ngo Thi Thanh Huong <i>National Centre for HydroMeteorological Forecasting (NCHMF), Vietnam Meteorological Hydrological Administration</i>
S2-Poster 2	Projected changes in heatwaves across Vietnam and Southeast Asia	Ly Pham <i>University of Science and Technology of Hanoi (USTH)</i>
S2-Poster 3	Climatological Characteristics of the Northeast Monsoon Rainfall Over the Eastern Coast of the Philippines	Yves Sheldon Ella <i>Ateneo de Manila University, Quezon City, Philippines</i>
S2-Poster 4	Comparison of different methods in detecting and tracking of tropical depressions in the Philippines sea using NCEP-GFS forecast model	Pe Timothy Kyle <i>Ateneo de Manila University, Metro Manila, Philippines</i>
S2-Poster 5	Unveiling the Interplay of Greenspace and Anthropogenic Components in Air Quality Regulation	Nguyen Quang Viet <i>University of Sciences, Hue University</i>
S3-Poster 1	Metabarcoding of fish species using environmental DNA (eDNA) in mangrove nursery grounds: A tool for conservation and fish stock assessment	Tricksie Balatero <i>MSU-Iligan Institute of Technology, Philippines.</i>
S3-Poster 2	Diatom Morphology in Lake Buluan: Implications for Water Quality, Aquaculture, and Potentials for Sustainable Future	Claudine Ann M. Nakila <i>MSU-Iligan Institute of Technology, Philippines.</i>
S3-Poster 3	Species Diversity of Mangrove Associated Crabs (Crustacea:Brachyura) of Davao Gulf, Mindanao Island, Philippines	Nickel Jean S. Lagare-Sastine <i>Institute of Aquatic and Applied Sciences, Philippines</i>
S3-Poster 4	The Role of Hydropower Dams in Northern Vietnam During the Great Flood of 2024	Hong Xuan Do <i>Nong Lam University - Ho Chi Minh City</i>
S3-Poster 5	Morphometric characteristics of sea hare (<i>Dolabella auricularia</i>) collected in Pujada Bay, Davao Oriental	Chency Grace O. Liguez <i>Molecular Systematics and Conservation Genomic Studies, Philippines</i>
S3-Poster 6	Species Composition, Diversity, and Distribution of Intertidal Marine Macroalgae in Sacol Island, Zamboanga City, Philippines	Kimberly Jane A. Adrias <i>University-Iligan Institute of Technology, Philippines</i>

S3-Poster 7	Diatom species assessment in two marine sanctuaries in Lanao del Norte, Philippines using high-throughput sequencing of the 18S rRNA V4 Region	Grazzette Anne N. Dablo <i>Mindanao State University- Iligan Institute of Technology, Philippines</i>
S3-Poster 8	Ranking relevant biophysical factors for sustainable ecological mangrove rehabilitation in aquaculture ponds in Macajalar bay, Misamis Oriental, Philippines	Arianne Kay O. Liguez <i>Mindanao State University- Iligan Institute of Technology, Philippines</i>
S4-Poster 1	Electrostatic interaction of basalt powder with ciprofloxacin antibiotic: An environmental implication	Thu T.M. Nguyen <i>VNU University of Science</i>
S4-Poster 2	Enhanced denitrification process in sponge-membrane bioreactor coupled with iron scraps for municipal wastewater treatment: Performance and microbial community shifts	Ngo Hoang Long <i>School of Chemical and Environmental Engineering, International University, Ho Chi Minh City</i>
S4-Poster 3	Perspectives on microbial community in membrane bioreactor with focus on performance and biofouling: A systematic review	Nguyen Tran Gia Bao <i>Faculty of Environment, University of Science, Ho Chi Minh City</i>
S4-Poster 4	Evaluation of nitrogen treatment efficiency in mbr model supplemented with biochar substrate made from rice husks	Nguyen Thi Mai Phuong <i>University of Science, Vietnam National University (VNU-HCM)</i>
S4-Poster 5	Determination of black carbon emission factors from coal-fired power plants and evaluation of emission dispersion around plants in Northern Vietnam	Ly Trinh Thi Phuong <i>Hanoi University of Science and Technology</i>
S4-Poster 6	Enhanced pig farming wastewater treatment in a down-flow hanging filter reactor containing coconut fiber media	Nguyen Thien Tai <i>University of Science, Vietnam National University (VNU-HCM)</i>
S4-Poster 7	Household Commitment to Waste Classification: Lesson learnt from Tuy Hoa City, Vietnam	Thi Tuyet Dung Trinh <i>Institute for Sustainable Development of Regions, Vietnam Academy of Social Sciences</i>
S4-Poster 8	Promoting Gas-Phase Remediation via Surface Plamonic Effects on Perovskite-Based ZnSn(OH) 6 Microcubes	Hoang Phuong Nguyen <i>HUTECH University</i>
S4-Poster 9	A review of membrane bioreactor incorporating biocarriers from a microbial perspective	Nguyen Thi Kim Ngan <i>University of Science, VNU-HCM</i>
S5-Poster 1	Analysis flood dynamics alterations in the Vietnamese Mekong Delta from Earth observations	Ho Ngoc Nhu Y <i>Vietnamese-German University</i>
S5-Poster 2	Integrating Environmental Data into Artworks: Case Studies in Internet of Things and Interactive Design	Hoang Pham Gia Khang

		<i>School of Information Technology, King Mongkut's University of Technology Thonburi</i>
S5-Poster 3	Sluice gates operation to optimaize sediment deposition in agricultural land in An Giang	Luc Anh Tuan <i>Vietnamese-German University</i>
S5-Poster 4	Assessment of Dam Impacts on water level in the Sai Gon-Dong Nai River Basin, Vietnam	Nguyen Gia Khiem <i>Vietnamese German University</i>
S6-Poster 1	Enhanced treatment of per-/polyfluoroalkyl substances (PFAS) in water using persulfate-catalyzed electrocoagulation	Tran Le Luu <i>Vietnamese-German University</i>
14:00 – 15:40 	Parallel Session S7 (4): CARE for SEA Megacities and CORDEX-SEA Meeting room: Conference Hall 3 Chair: Dr. Dodo Gunawan; Rapporteur: Dr. Thanh Nguyen-Xuan	
14:00 – 14:15	Generation climate projections at high resolutions using the WRF model	Srivatsan Raghavan <i>National University of Singapore (Singapore)</i>
14:15 – 14:30	Examining the Effectiveness of Heat Mitigation Strategies Over Urban Area in Singapore	Nguyen Thanh-Hung <i>National University of Singapore (Singapore)</i>
14:30 – 14:45	WRF-UCM extreme heat simulations and urban impact in Metro Manila	Angela Monina Magnaye <i>Graduate School of Life and Environmental Sciences, University of Tsukuba (Japan)</i>
14:45 – 15:00	Exploring Potential Mitigation of Urban Resilience by Reducing Urban Heat Island Phenomenon & Calculating Normalized Difference Vegetation Index (NDVI) in Jakarta	Nadia Agni Sheila <i>Regional Planning and Development Agency of Jakarta (Indonesia)</i>
15:00 – 15:15	Microclimate-Induced Urban Water Challenges And Their Mitigation in Greater Kuala Lumpur: A Case Study of Urbanization Signature on Hourly Rainfall Extremes	Nirwani Devi Miniandi <i>Universiti Teknologi Malaysia (Malaysia)</i>
15:15 – 15:30	<i>Stakeholder Workshop</i>	
15:40 – 16:10	COFFEE BREAK	
16:00 – 18:00	Parallel Session S4 (1): Environment and Sustainable Development Meeting room: Conference Hall 1 Chair: Prof. Nguyen Ngoc Minh, VNU University of Science	
16:10 – 16:20	Study on the treatment of exhaust gases containing aromatic VOCs (benzene and toluene) using Cu (Co)-MnOx catalysts	Tran Hien <i>Quy Nhon University</i>
16:20 – 16:40	Activated Commercial Bentonite by Potassium Hydroxide to Enhance the Adsorption Capacity of Methylene Blue	Nguyen Quoc Tuan <i>VNU University of Science</i>

16:40 – 17:00	The Emerging Danger: extended-spectrum Beta-lactamase (ESBL)-producing bacteria on microplastics in Vietnamese waters	Vo Hoai Hieu <i>Phenikaa University</i>
17:00 – 17:20	Metal-Organic Frameworks materials for efficient photocatalytic degradation of organic dye contaminants in wastewater	Tran Nguyen Tien <i>Duy Tan University</i>
17:20 – 17:40	Applying the Waste Flow Diagram to Estimate Plastic Leakage from Tuy Hoa & Solid Waste Management System into the Aquatic Environment, Vietnam	Nguyen Thi Hanh Tien <i>Phenikaa University</i>
17:40 – 18:00	Unveiling Vietnam's Trade Dynamics: The Perspective of Virtual Water on Agricultural Products Trade with partners for Sustainable Water Resource Management	Ngoc Trinh Phuong <i>Faculty of Agriculture, Forestry and Fisheries, Tan Trao University</i>
16:10 – 18:00	Parallel Session S5: Emerging technologies and Interdisciplinary topics <i>Meeting room: Conference Hall 2</i> Chair: Dr. Do Xuan Hong, Nong Lam University – Ho Chi Minh city	
16:00 – 16:20	Development of boosting algorithms in machine learning for the assessment and control of industrial wastewater effluent ecotoxicity	Duc Viet Nguyen <i>Centre for Green Chemistry and Environmental Biotechnology</i>
16:20 – 16:40	Reconstruction of drought events from AD 1347 based on <i>Fokienia hodginsii</i> at Tay Giang forest, Quang Nam province, Vietnam	Nguyen Thi Oanh <i>School of Interdisciplinary Studies and Arts, VNU</i>
16:40 – 17:00	Coastal Circulation Along the Middle-Southern Coasts of Vietnam Characterized by HF Radar and Modelling	Thanh Huyen Tran, Alexei Sentchev <i>Laboratory of Oceanology and Geosciences, CNRS</i>
17:00 – 17:20	Assessing Hanoi Subsidence for Sustainable Development: Long-term Monitoring and Risk Management through Satellite Observation	Minh Nguyen <i>Earth System Science, Taiwan International Graduate Program, Academia Sinica, Taiwan</i>
17:20 – 17:40	Experimental Application of the μ -GA Approach to Optimize the Configuration of Physical Parameterizations for Predicting Summer Rainfall Using RegCM5	Thanh Nguyen-Xuan <i>University of Science and Technology of Hanoi (USTH), Hanoi, Vietnam</i>
17:40 – 18:00	Quantifying mangrove functional diversity leveraging remotely sensed biochemical variables	Nguyen An Binh <i>Ho Chi Minh City Institute of Resources Geography, VAST</i>
16:00 – 18:00 	Parallel Session S7 (5): CARE for SEA Megacities and CORDEX-SEA <i>Meeting room: Conference Hall 3</i> Chair: Dr. Faye Cruz; Rapporteur: Dr. Thanh Nguyen-Xuan	
16:10 – 17:30	Stakeholder Workshop	

17:30	Group Photo	
18:00 – 20:00	GALA DINNER	

Thursday, November 28th

Time	Title	Presenter
8:30 – 9:30	Plenary Session (3) Meeting room: Conference Hall 1 <i>Chair: Assoc. Prof. Hoang Thi Thu Huong, Hanoi University of Science and Technology</i>	
8:30 – 9:00	<i>Keynote:</i> Phosphorus Attenuation in Lake Water and Sediment Using Geotextile Filtration and Air-Induced Sediment Resuspension	Prof. Catherine Mulligan <i>Concordia University, Montreal, Canada</i>
9:00 – 9:30	<i>Keynote:</i> Lagrangian dispersion in the Red River plume region from drifting buoy observations and modeling	Prof. Alexei Sentchev <i>Université du Littoral - Côte d'Opale, France</i>
9:30 – 10:00	COFFEE BREAK	
10:00 – 12:00	Parallel Session S1 (3): Solid Earth Sciences Meeting room: Conference Hall 2 <i>Chair: Assoc. Prof. Nguyen Thuy Duong, VNU University of Science, Hanoi</i>	
10:00 – 10:20	Preliminary geochemical results of ophiolitic rocks in Northern Vietnam: implications for the tectonic evolution of Southeast Asia	Tran Thi-Duyen <i>Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan</i>
10:20 – 10:40	A time-series of heavy metal geochemistry in sediments of the Tien Hai nature reserve in the Ba Lat estuary, Vietnam	Nguyen-Thuy Duong <i>University of Science, Vietnam National University, Hanoi, Vietnam</i>
10:40 – 11:00	Frictional behavior of illite-bearing gouge during experimental seismic slip under fluid drainage condition	Nguyen Thi Trinh <i>National Central University, Taoyuan, Taiwan</i>
11:00 – 11:20	Ground Motion Model for Estimating the Site Amplification in Northern Vietnam	Phung Van-Bang <i>Institute of Earth Science, Academia Sinica</i>
11:20 – 12:00	Networking discussions/activities for S1	
10:00 – 12:00	Parallel Session S4 (2): Environment and Sustainable Development Meeting room: Conference Hall 1 <i>Chair: Prof. Nguyen Ngoc Minh, VNU University of Science</i>	
10:00 – 10:20	Advancing Sustainable Plastic Waste Management: Integrating Hydrothermal Carbonization and Catalytic Pyrolysis towards Circularity	Clovis Awah Che <i>Ghent University Global Campus Korea</i>

10:20 – 10:40	Enhancing bioethanol production from water hyacinth (<i>Eichhornia crassipes</i>) by microwave heating with dilute acid pretreatment	Nguyễn Phước Hiếu <i>University of Science, VNU-HCM</i>
10:40 – 11:00	Bentonite/iron impregnated biochar aerogel as a novel matrix for control release of phosphorus and potassium	Lai Quang Trung <i>VNU University of Science</i>
11:00 – 11:20	Spatial and Seasonal Variations of Trace Metal Accumulation on Microplastics in the Red River Delta	Tran Thi Hoa <i>Phenikaa University</i>
11:20 – 11:40	Developing a synergistic approach for bioremediation of aged Dioxin contaminated soils in Vietnam	Nguyen Khoi Nghia <i>Can Tho University</i>
11:40 – 12:00	Characteristics of heavy metal contamination in road dust from a central city in Vietnam: contrasting distributions linked to industrial activities	Tran Ba Quoc <i>Duy Tan University</i>
10:00 – 12:00 	Parallel Session S7 (6): CARE for SEA Megacities and CORDEX-SEA <i>Meeting room: Conference Hall 3</i> Chair: Faye Abigail Cruz and Thanh Ngo-Duc; Rapporteur: Jennifer Tibay	
10:00 – 10:15	Updates from IPCC	Edvin Aldrian IPCC WGI Vice-Chair BRIN (Indonesia)
10:15 – 10:30	WCRP Academy: Addressing climate training needs starting with the Global South	Ma. Laurice Jamero WCRP Academy Support Unit/ Manila Observatory (Philippines)
10:30 – 12:00	Planning/discussions for CORDEX-SEA	
12:00 – 13:30	LUNCH	
13:30 – 14:50	Parallel Session S3 (2): Aquatic Sciences <i>Meeting room: Conference Hall 1</i> Chair: Assoc. Prof. Hoang Thi Thu Huong, Hanoi University of Science and Technology	
13:30 – 13:50	Sea-level rise storylines to inform coastal adaptation planning for the UK, Southeast Asia and beyond	Jennifer Weeks <i>Met Office and University of Bristol, UK</i>
13:50 – 14:10	Survey of Water Quality Adaptation Strategies Under Climate Change in Vietnam and a Case Study on Brescia use of Real-Time Data	Tran Thi Kim Hoan <i>Brescia University</i>
14:10 - 14:30	Using Optimization to Investigate Adaptive Operation of Reservoir under the Context of Climate Crisis	Nguyen Thi Thuy Hang <i>Faculty of Environment, University of Science, Ho Chi Minh, Vietnam</i>
14:30 - 14:50	Comparison of Synthetic Aperture Radar Sentinel-1 and ALOS-2 observations for lake monitoring	Pham Duc Binh <i>University of Science and Technology of Hanoi (USTH)</i>

13:30 – 15:00 	Parallel Session S7 (7): CARE for SEA Megacities and CORDEX-SEA <i>Meeting room: Conference Hall 3</i> <i>Chair: Faye Cruz and Thanh Ngo-Duc; Rapporteur: Jennifer Tibay</i>	
13:30 - 15:00	Planning/discussion for next activities for CARE for SEA megacities	
15:00 – 15:30	COFFEE BREAK	
15:30 – 17:00	Visit Explorascience QuyNhon (https://explorascience.vn/)	
17:30 – 18:30	DINNER	

Friday, November 29th

Time	Title	Presenter
Plenary Session (4) Meeting room: Conference Hall 1 <i>Chair: Assoc. Prof. Thanh Ngo-Duc, University of Science and Technology of Hanoi</i>		
8:30 – 9:00	The Hidden Dangers of Microplastics: Microbial Communities and Antibiotic Resistance	Dr. Ngo Thi Thuy Huong <i>Phenikaa University, Ha Noi, Viet Nam</i>
9:00 – 9:30	Planning/discussion for next activities	
9:30 – 10:00	Networking Coffee break	
10:00 – 12:00	Closing	

KEYNOTE SPEAKERS



Dr. Faye Cruz

Manila Observatory, Philippines

9:30 – 10:00: Tuesday, November 26th

Looking back and looking forward: Reflections from CORDEX Southeast Asia

Dr. Faye Cruz is a climate scientist and Head of the Regional Climate Systems Laboratory at the Manila Observatory in the Philippines. She is actively involved in atmospheric and climate research in the Philippines and in Southeast Asia, where she is currently Co-Chair of CORDEX–SEA (Coordinated Regional Climate Downscaling Experiment–Southeast Asia). She leads the group’s latest APN-funded project titled “Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities” (CARE for SEA megacities). She is also a member of the Asia-Pacific Scientific and Technology Advisory Group (AP-STAG) of UNDRR. Her projects with scientists and various stakeholders involve the application of regional climate modelling and data analysis to provide enhanced climate change information for climate change adaptation and disaster risk reduction.



Prof. Huang Bor-Shouh

Institute of Earth Sciences, Academia Sinica, Taiwan

9:30 – 10:00: Tuesday, November 26th

Seismic broadband observations and earthquake hazard assessments in Vietnam – The twenty years of earth science cooperation from Taiwan

Dr. Bor-Shouh Huang is a senior scientist at the Institute of Earth Sciences, Academia Sinica, Taiwan. His research focused on the rupture processes of earthquakes using dense seismic arrays. Based on the strong motion observations, his studies dedicated for the source rupture and wave propagation of the Taiwan earthquakes. From 2005, he moved his works to deploy broadband seismic arrays in Vietnam, Laos, Philippines and Solomon Islands to investigate regional structures and seismic hazards. Currently, the cooperation to deploy seismic stations surrounding the South China Sea for the earthquake and Tsunami warning and to promote related research is his major task. He worked also on rotational seismology, earthquake related acoustic wave propagations and the total electronic content of the ionosphere response from earthquakes. More information on Dr. Bor-Shouh Huang can be found from <https://www.earth.sinica.edu.tw/member/detail/24>



Dr. Marine Herrmann

LEGOS, Research Institute for Development (IRD),
Toulouse, France

8:30 – 9:00: Wednesday, November 27th

**Toward air-sea high-resolution regional coupling to better
understand and forecast the Southeast Asia Climate**

Dr. Marine Herrmann is a senior scientist at the French Research Institute for Development (IRD), LEGOS (Laboratory of Space Geophysical and Oceanographic Studies) in France. She is currently the co-director of the LOTUS international Joint Laboratory at the University of Science and Technology of Hanoi (USTH), Vietnam, and Head of the ECOLA (Open sea – coasts exchange) team at LEGOS. Her main interest concerns the understanding of regional marine systems, based on the development and use of regional ocean hydrodynamic models, coupled with biogeochemical, atmospheric, and sediment transport models, and used jointly with in-situ and satellite observations.



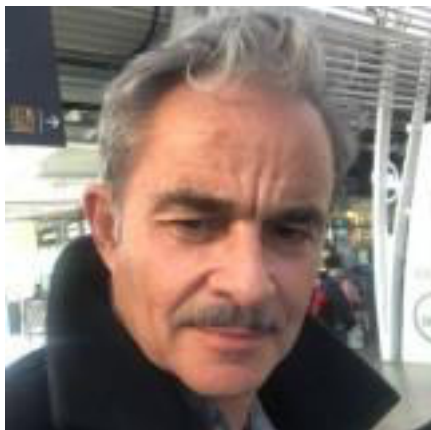
Prof. Georg Guggenberger

Institute of Soil Science, Leibniz University Hannover,
Germany

9:00 – 9:30: Wednesday, November 27th

Agricultural Soils as Climate Regulators

Georg Guggenberger is a trained geoecologist and soil scientist and holds the Chair of Soil Science at Leibniz University Hannover. In soils of many regions of the world, from the Arctic to boreal and temperate and steppe zones to the subtropics and tropics, he investigates fundamental processes of biotic and abiotic factors on the formation and stabilization of soil organic matter. Another important aspect of his work is the role of biodiversity in ensuring the various soil functions. Much of his work is performed in collaborative projects, where he seeks to overcome disciplinary boundaries in order to sustain soil health by identifying and adopting sustainable land use practices. From 2015 to 2018 he was highly cited scientist (Web of Science), and he has received national and international awards (e.g., Duchaufour medal of the EGU). He was president of the German Soil Science Society and is currently member of the senate of the German Research Foundation.



Dr. Frédéric Thomas

UMR SENS, IRD, Cirad, Montpellier University, France

9:30 – 10:00: Wednesday, November 27th

Unlocking Colonial-Era Weather Data from Indochina: A Key to Understanding Climate Change in Southeast Asia

Dr. Frédéric Thomas is a historian of science and an environmental historian. His research has always focused on the history of the relationships between scientific knowledge and local knowledge in environmental management from the colonial period to the present day. He has studied these relationships in various fields: forest management, genetics and plant improvement, intellectual property on living organisms, the arrival of biotechnology in the production systems of developing countries, and more recently, climate change and sciences for sustainability. His research methods and tools are situated within several schools: environmental history (Grove), social studies of science (Latour, Callon, Pestre...), anthropology of nature (Descola), ethics of nature (Larrère, Callicott), archaeology of knowledge, and governmentality (Michel Foucault). He has also been interested in theories of collective action (Ostrom, Shlager, Hess) and theories of justice (Rawls, Sen) and environmental justice (Dobson). He has spent many years on assignment in Vietnam as part of the scientific cooperation between IRD and various research institutes of the Vietnamese Academy of Agricultural Sciences (VAAS), and laboratories of the University of Science and Technology of Hanoi (USTH). He published a lot of books and articles, notably *Genes, power and profits. Public Research and Regime of Knowledge from Mendel to GMO*, Quae, 2009, 619 p.; *The power of biodiversity. Neoliberalisation of nature in the emerging countries*, Quae, 2015, 295 p. (with important chapters analyzing the Vietnamese policy of biodiversity conservation); and, directly related to Vietnamese climate history, the chapter 2 of the GEMMES Report to COP 26 in Glasgow “Climate change and adaptation in Vietnam, Contribution from environmental history” <https://www.afd.fr/en/ressources/climate-change-vietnam-impacts-and-adaptation>.



Prof. Catherine N. Mulligan

Concordia University, Montreal, Canada

8:30 – 9:00: Thursday, November 28th

Phosphorus Attenuation in Lake Water and Sediment Using Geotextile Filtration and Air-Induced Sediment Resuspension

Catherine N. Mulligan, PhD. is a Distinguished Research Professor at Concordia University in Montreal. She is the founder and Director of the Concordia Institute of Water, Energy and Sustainable Systems. Her research involves the treatment of soil, water, sediments and mining wastes. She has published more than 130 refereed journal papers and 8 books, in addition to Sustainable Practices in Geoenvironmental Engineering to be published as a third edition in 2025. She has supervised more than 75 graduate students to completion. She is a Fellow of the Canadian Society for Civil Engineering, Engineering Institute of Canada, Canadian Academy of Engineering and Royal Society of Canada (RSC) and recent winner of the RSC's Mirosław Romanowski Medal for environmental accomplishments.



Prof. Alexei Sentchev

Université du Littoral - Côte d'Opale, France

9:00 – 9:30: Thursday, November 28th

Lagrangian dispersion in the Red River plume region from drifting buoy observations and modeling

Alexei Sentchev is Professor of Physical Oceanography at the University of Littoral Cote d'Opale, in France. He received his PhD degree in Appl. Mathematics in 1991 from P.P.Shirshov Institute of Oceanology, Acad. Sci of Russian Federation, and then, Habilitation to steer researchers (HDR) in 2010, in France. He has been studying coastal ocean dynamics for over 30 years and gone on to develop advanced expertise in modeling, observations of ocean dynamics and merging the data from observations with model outputs. He is one of the leading researchers using the remote sensing of surface currents by HF radars for characterizing the coastal circulation variability with the emphasis on practical applications such as transport and dispersion of materials in seawater or marine renewable energy. He has published over 60 research papers in peer-reviewed journals. He does editorial work, supervises PhD students (including Vietnamese PhD students) and does regular teaching at USTH, in Vietnam.

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SEISMIC BROADBAND OBSERVATIONS AND EARTHQUAKE HAZARD ASSESSMENTS IN VIETNAM – THE TWENTY YEARS EARTH SCIENCE COOPERATION FROM TAIWAN

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Abstract

As part of a collaborative project CREATE (Comprehensive Research on East Asia Tectonic Evolution) within Vietnam and Taiwan, a broadband seismic array and a dense linear array across the Red River Fault Zone were installed in northern Vietnam with the aim of acquiring a wide dynamic range of seismic data at a high spatial density since 2005. The stations were designed to image and interpret crustal and mantle structures beneath northern Vietnam, including information that would help to reconstruct the geodynamic evolution of the Red River Fault Zone and the assessment of seismic hazards of Vietnam. Since its deployment, the array has recorded significant local, regional, and teleseismic events. The high-quality distance and azimuth coverage of available events have been used to answer questions regarding the nature of deep seismic structures beneath the array and the regional tectonic evolution. Those stations are promoted to enable the real-time transmission of data for earthquake monitoring and earthquake hazard assessments, tsunami warnings for the South China Sea in the near future. During the past 20 years or so, some key scientific results have been archived. Most importantly, a firm cooperative relationship between Taiwanese and Vietnamese scientists has been built up over the years. Many young graduated students from Vietnam and Taiwan whom were trained in this project later became research scientists of institutes or universities. Likewise, some subproject PIs have been promoted to leading positions in scientific organizations both in Vietnam and Taiwan. The fascinating scientific stories and significant academic achievements from this project will be shared in this symposium.

Keywords: CREATE, seismic arrays, the Red River Fault Zone, earthquakes, hazard assessments

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Abstract

The hypolimnetic hypoxia phenomenon, a significant issue in dam reservoirs, has been found to cause water quality problems downstream. The decrease in oxygen concentration leads to an increase in metal ions in the water columns, with various impacts on biodiversity, the hydrological regime, and the recent eutrophication problems in large dams. The associated CH₄ greenhouse gas emissions further underscore the importance of this research. Anaerobic conditions at the bottom of the dams also significantly affect water quality, particularly the presence of heavy metal ions in a reducing environment. This research studied the changes in water quality in streams receiving water discharged from the dams.

To investigate the impacts of anaerobic conditions at the bottom of hydropower dams, monitoring, sampling, and analysis were performed in the Huong Dien and the Binh Dien hydropower dams, Thua Thien Hue, and several points along two river systems receiving water from dams (the Bo and the Huong rivers). Continuous measurements were conducted at the dams for DO, pH, water temperature, turbidity, conductivity, and ORP from the surface until the bottom. Water samplings were taken at 3 points: surface (0.5m from the surface), middle layer, and bottom (0.5m from the bottom) to identify the Fe and Mn contents. The same parameters had been measured and analyzed at downstream monitoring points along the Bo and Huong rivers.

Measurement results also proved clear stratification along the depth of the dam. Temperature decreased to stable, and DO decreased to a critical value at the depth of 20-25m. Results on conductivity and ORP showed that the water condition transferred from oxidation to reduction at the depth of 20m. It proved that below 20m, the reduction environment improved the dilution of metal ions, especially Fe²⁺ and Mn²⁺. Metal analysis performed in situ also showed extremely high at the bottom of the dam.

Since the dam went into operation, the Huong River's water quality has changed dramatically. The content of Fe and Mn in river water at the surface has increased by ten times. The same situation was observed in the Bo River after the operation of the Huong Dien HPP. The content of Fe and Mn changed along the depth and was significantly high at the bottom of the river.

The deep aeration system was tested to improve these problems and was installed, for the first time in Vietnam as a pilot project, into Trong Dam Reservoir in Hoa Binh Province. After continuous investigation of the hypolimnetic hypoxia phenomenon in Trong Dam Reservoir for one year and evaluated the effect of the deep aeration system against the hypolimnetic hypoxia phenomenon. The results showed the restoration of DO concentration from less than 2mg/L to higher than 6mg/L. The

concentration of Fe and Mn tested in the area has significantly decreased in depths from 6mg/L and 3mg/L to 0.3mg/L and 0.1mg/L, respectively. This field study showed the deep aeration system's effectiveness in improving hypolimnetic hypoxic conditions in a dam reservoir and water quality downstream.

Keywords: *Oxygen depletion, deep aeration, GHG water quality improvement*

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The research had been supported by Nikken Sekkei Civil Engineering Ltd.

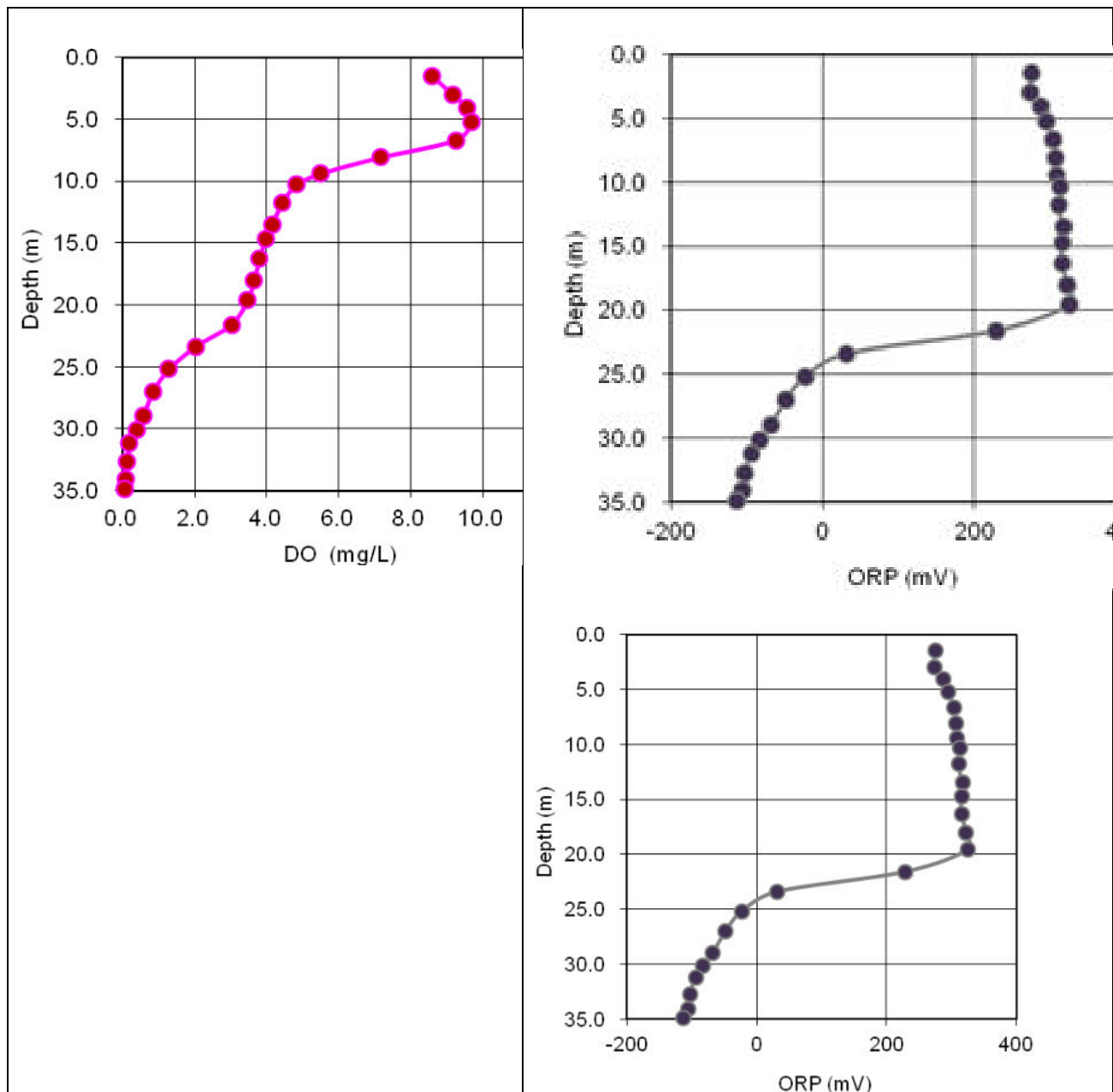


Fig 1. *Vertical Distribution of Water Quality in Binh Dien HP Dam Reservoir*

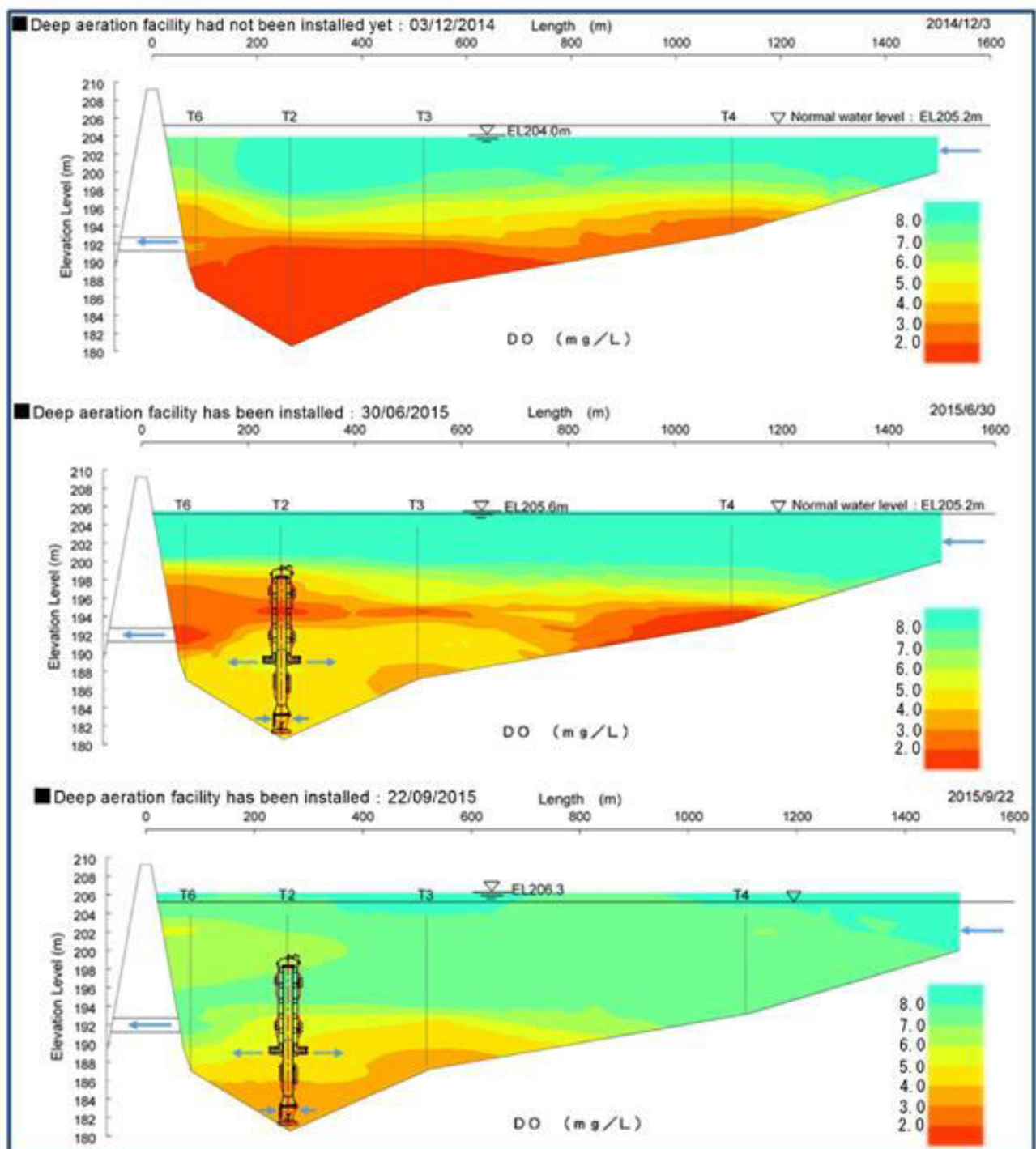


Fig 2. Comparison between DO distribution in the reservoir before/after installation of the deep aeration facility

IMPLEMENTING A COMPLETE REGIONAL FORECAST SYSTEM: EXPERIENCE AND INSIGHTS FROM RED SEA MODELING EFFORTS

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Abstract

Founded in 2009 on the Red Sea's shores, KAUST serves as a research hub focused on the region's biological, physical, and geological aspects. We have invested heavily in studying the Red Sea to preserve its fragile ecosystem while supporting local resource management. Alongside extensive observational efforts, our group, in collaboration with international organizations, has developed an integrated modeling and prediction system to monitor and forecast atmospheric and oceanic phenomena. This regional system, combining models of circulation, waves, pollution, dust, and biogeochemistry, has made significant progress in just a decade. Contributions to science and industry from this system include studies of regional circulation, climate, and ecosystem, ultra-detailed modeling for mega-developments, and regional forecasting applications. In 2021, the first Red Sea operational system was launched online, offering weekly forecasts of basin-wide atmospheric (WRF), oceanic (MITgcm), and wave (WWIII) conditions at resolutions of 4, 2, and 1 km, respectively.

To continue this decade-long effort, the system is extending its forecasting range to sub-seasonal-to-seasonal scales. In the first phase, a pioneering 20-year WRF sub-seasonal reforecast at convection-permitting scale was successfully tested, forecasting up to 4 weeks ahead using forcing data from the ECMWF S2S ensemble. WRF extends forecast skills by an additional week beyond ECMWF, outperforming ECMWF forecasts by 64% in winter, demonstrating its value in simulating winter mesoscale convective systems. Currently, in the second phase, we are downscaling the first-ever convection and eddy-permitting regional coupled model for the Arabian Peninsula at 4 km for the atmosphere and 2 km for the ocean using ECMWF's SEAS5 seasonal forecasts. Early results indicate that the model effectively captures seasonal patterns of surface temperature and rainfall. Thus, a seamless forecast system that integrates a range of resolutions and forecast lengths across timescales from days to seasons will no longer be out of reach and could be ready for application in both academia and industry by late 2025.

Keywords: *Saudi Arabia, regional modeling, coupled ensemble system*

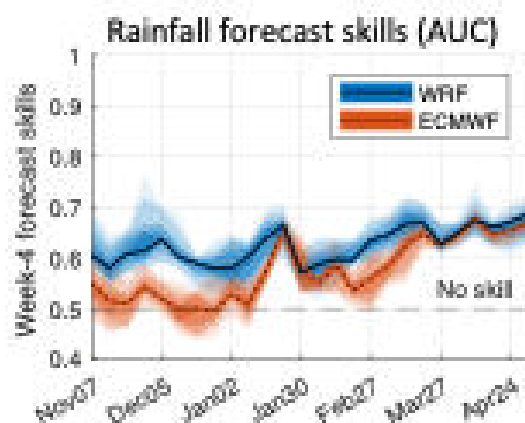


Fig 1. Evaluation of the predictability and forecast skill of sub-seasonal precipitation over Saudi Arabia using a first-of-its-kind 20-year reforecast at convection-permitting resolution. The results demonstrate that the regional WRF model significantly improves forecast accuracy compared to the global ECMWF model, enhancing skill by 64% in winter and 10% in spring.

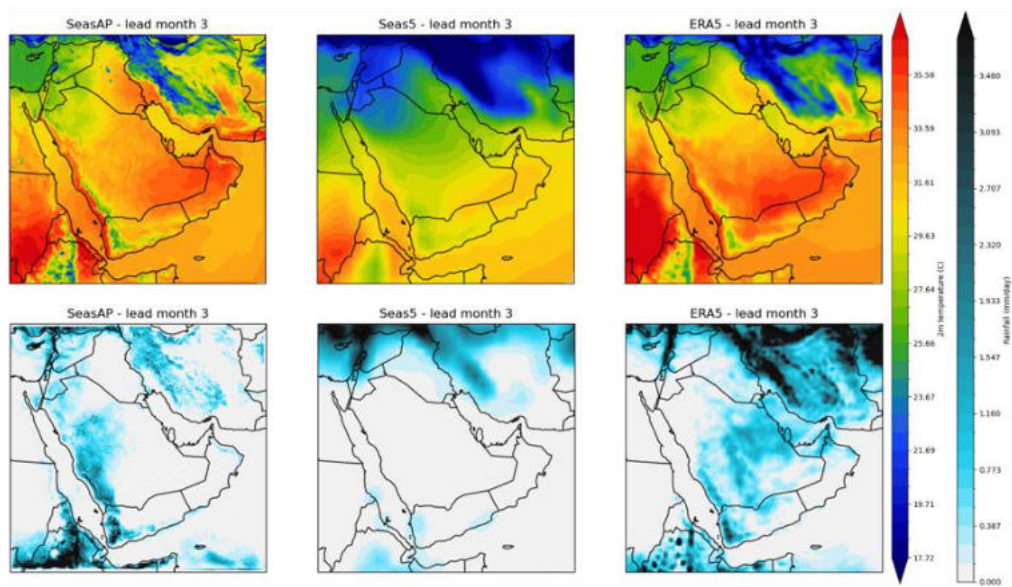


Fig 2. Twenty-year monthly mean of 2-meter temperature ($^{\circ}\text{C}$) and rainfall (mm/day) for April (lead month 3) over the Arabian Peninsula. Results are shown for the downscaled coupled model (SeasAP, left column), its forcing data (Seas5, middle column), and the reference dataset (ERA5, right column). The regional model (SeasAP) significantly enhances seasonal forecasting, accurately capturing the mean patterns.

DEVELOPING A NEW MACHINE LEARNING BASED APPROACH TO QUANTIFY UNCERTAINTY OF GRIDDED PRECIPITATION USING VIETNAMESE RAINFALL DATA

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Gridded precipitation datasets have been a crucial asset in many hydrological applications, especially in data-sparse regions, owing to their strength in providing homogeneous spatial and temporal information. Quantifying the uncertainty of these products, however, remains a long-standing issue as most employed methods are deterministic, offering no readily available mechanism to represent the underlying uncertainty. To tackle this challenge, we propose a new machine-learning approach to create an improved precipitation product with uncertainty quantification. Specifically, the extreme gradient boosting (XGB) and quantile regression were used to merge precipitation estimates available through gauge-based records and multiple satellite-based datasets across Vietnam, a country featured by spatially heterogeneous rainfall characteristics, to create a high-resolution (0.1°) daily precipitation from 2001 to 2010. The resulting dataset, VNpu (Vietnam Precipitation with Uncertainty), provides spatiotemporally varying uncertainty ranges, with larger uncertainties in sparse gauge coverage areas. This study highlights the value of machine learning approaches in new hydro-climatic applications over data-scarce regions across the globe. It also indicates the need to quantify the uncertainty associated with gridded precipitation estimates.

Keywords: *Gridded precipitation product, uncertainty quantification, machine learning, merged precipitation.*

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THE STUDY OF SITE EFFECT IN HANOI AREA USING MICROTREMOR SURVEY

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Abstract

Hanoi, the capital of Vietnam, is one of the fastest-growing cities in Southeast Asia. The surface geology is mostly sand and clay sedimentary of the Holocene or Pleistocene. These soft deposits under the Hanoi region may increase earthquake damage because of ground motion amplification and duration extension. In this two-phase study, the seismic site effect and near-surface shear-velocity structure of the Hanoi region were analyzed using microtremor measurements, including over eight hundred dense single-station measurements and seven arrays. In the first phase, seventy-five single measuring points and four arrays were conducted in the downtown region of Hanoi for the preliminary survey. The horizontal-to-vertical spectral ratios (HVSr) in the region show high site amplification with dominant frequencies between 0.8 and 2.0 Hz. Furthermore, the dispersion curve inversions of four microtremor arrays and the simulations of the microtremor HVSr reproduce the near-surface shear-wave velocity (V_s) structure. The two main interfaces of the sites with high dominant frequency in the north are noticeably shallower than the sites in the east and south. The first interface ($V_s > 0.5$ km/s) changes from 23 m to 58 m, and the second interface ($V_s > 0.8$ km/s) changes from 84 m to over 100 m from north to south. The soft near-surface deposits with high-velocity basement in Hanoi results in the significant dominant frequency of site response. For further understanding of the details of the site effect, an expanding and dense microtremor survey, including over 700 microtremor single-station measurements and another four microtremor arrays, was conducted around Hanoi City in the second phase. The detailed site response and near-surface V_s structure of the Hanoi area based on the microtremor measurements agree well with the surface geology and allow us to establish Hanoi's seismic microzonation and V_{s30} map. All the results will benefit the ground motion simulation, seismic hazard assessments, and seismic design for the city in the future.

Keywords: Hanoi, Site effect, Microtremor, Horizontal-to-Vertical Spectral Ratio, Dominant Frequency, Shear-Wave Velocity

HIGH-RESOLUTION CRUSTAL IMAGING ACROSS THE RED RIVER SHEAR ZONE, NORTHERN VIETNAM USING MARKOV-CHAIN MONTE-CARLO JOINT INVERSION WITH MULTIPLE SEISMIC DATA TYPES.

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Abstract

The Aialoshan-Red River Shear Zone is a renowned geological feature in Southeast Asia, known for accommodating the extrusion motion resulting from the rigid Indian plate's indentation into the Eurasia plate. It is traditionally considered the boundary separating the Indochina and South China Blocks. Consequently, illuminating the crustal and uppermost mantle structures across the shear zone is of great importance in improving our understanding of the tectonic evolution in this region. For this reason, a northeast-southwestward linear array comprising 25 broadband stations across Northern Vietnam from 2013 to 2018 was strategically deployed to intersect most of the major faults in the region. In this study, we utilize the data of the array to extract the Rayleigh wave phase velocity and ellipticity through the ambient noise cross-correlations and beamforming analysis. The receiver function, which is more sensitive to crustal and Moho discontinuities, are also analyzed. We then conduct the Markov-Chain Monte-Carlo joint inversion of these three types of data to construct 1-D shear-wave velocity (V_s) profiles at each station and form a 2D crustal image along the linear array. The preliminary results show detailed crustal structures across the Red-river shear zone and crustal thickness variation along the linear array. Our new imaging is general consistent with previous studies that used single data type for the same region but reveal further details of cross-fault structures.

Keywords: Surface wave tomography, Rayleigh wave ellipticity, Receiver function, MCMC inversion, Northern Vietnam, Red River Shear Zone, Crustal heterogeneity.

References

- [1] Ammon C., 1991. The isolation of receiver effects from teleseismic P waveforms, Bull. seism. Soc. Am., 81, 2504–2510. <https://doi.org/10.1785/BSSA0810062504>.
- [2] Berg, E. M., Lin, F.-C., Allam, A., Qiu, H., Shen, W., & Ben-Zion, Y. (2018). Tomography of

Southern California via Bayesian joint inversion of Rayleigh wave ellipticity and phase velocity from ambient noise cross-correlations. *Journal of Geophysical Research: Solid Earth*, 123(11), 9933–9949. <https://doi.org/10.1029/2018jb016269>.

[3] Lin, F.-C., Tsai, V. C., & Schmandt, B. (2014). 3-D crustal structure of the western United States: Application of Rayleigh-wave ellipticity extracted from noise cross-correlations. *Geophysical Journal International*, 198(2), 656–670. <https://doi.org/10.1093/gji/ggu160>.

[4] Liu, C.-N., Lin, F.-C., Huang, H.-H., Wang, Y., Berg, E. M., & Lin, C.-H. (2021). High-resolution 3-D shear wave velocity model of Northern Taiwan via Bayesian joint inversion of Rayleigh wave ellipticity and phase velocity with Formosa array. *Journal of Geophysical Research: Solid Earth*, 126, e2020JB021610. <https://doi.org/10.1029/2020JB021610>.

[5] Rost, S., and Thomas, 2002. C., Array seismology: Methods and applications, *Rev. Geophys.*, 40 (3), <https://doi.org/10.1029/2000RG000100>.

CHARACTERISTICS OF THE 2022 TONGA ERUPTION SHOCK WAVE ACROSS TAIWAN FROM MULTIPLE SENSOR OBSERVATIONS

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Abstract

On 15 January 2022, a large underwater violent volcano erupted at Tonga with volcanic ash and gasses reaching into the air. A surface-wave magnitude (M_s) of 5.8 has been estimated by USGS. The eruption was well captured from space to send tsunami wave rippling across the Pacific Ocean. A number of places around the globe have reported perturbation in local air pressure following this event. Theoretically, a violent earth near-surface explosion expected to send many types of waves through Earth's atmosphere: infrasound waves, Lamb waves, acoustic-gravity waves, and signals from tsunamis across the globe. However, it is never recorded as strong as this event. The multiple earth system responses and its interactive mechanism from each observed specific phenomenon provide an opportunity to examine it in detail. Taiwan island is located at western Pacific with distance about 8500 km far from the explosion source. The main and its surrounding islands have equipped various instruments to monitor regional weather, earthquake, tsunami and loads of environment with high spatial density. During this volcano eruption, the fast variation of earth system is well monitoring. Evidences have been recorded to demonstrate a regional detail response of this unique event. Observations have recorded from air, water and solid ground. In this study, we collected the data from the air pressure gauges, costal tidal gauges, ocean bottom hydro-pressure gauges, infrasound sensors, digital microphone and seismometers. We analyzed those instrument records to document individual observed phenomenon and to interpret its interaction. Results of this study indicated a special tsunami wave created by the Tonga explosion induced shock wave. It followed a different mechanism for its travel time and wave high from a classic tsunami which is derived by a sudden displacement of the sea floor by an earthquake or underwater landslide.

Keywords: *Underwater volcano, Lamb waves, infrasound, air pressure, tsunami.*

THE 2019 M_L 5.0 CAO BANG – JINGXI EARTHQUAKE SEQUENCE AND IMPLICATIONS FOR REGIONAL TECTONICS

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Abstract

On November 25, 2019, an M_L5.0 earthquake struck the Cao Bang-Jingxi border region. Following the mainshock, a series of aftershocks occurred within the epicentral devastation zone, approximately 20 km x 20 km, centered along the Vietnam-China border, with powerful tremors propagating over hundreds of kilometers. The affected region is characterized by several moderate and minor fault systems, with two significant fault lines running in the northwest-southeast and northeast-southwest directions. The northwest-southeast fault system dominates the tectonic pattern in northeastern Vietnam, while the northeast-southwest system is more active in southeastern Guangxi province and nearby areas. The Cao Bang-Jingxi earthquakes occurred at the intersection of these two fault systems, where the intense deformation zone from Tibet meets the weaker deformation zone of the South China block. Moment-tensor inversions were conducted to determine the focal mechanism parameters of the earthquake sequence. The results indicate that the mainshock and four aftershocks were characterized by reverse faulting along a northeast-southwest orientation. Additionally, a minor normal fault was aligned in a similar northeast-southwest direction within the rupture zone of the two largest earthquakes, at shallow depths. The strike-slip faulting observed in two aftershocks suggests a northwest-southeast orientation. The local stress field of the earthquake sequence showed compression in the northwest-southeast direction, with the P-axis nearly horizontal, and extension along the sub-meridional plane, gradually shifting toward the northeast-southwest and sub-latitudinal directions with relatively steep dip angles. The focal mechanism and local stress field of the earthquakes are consistent with the regional contemporary tectonic movement, where the Tibetan block move faster than the Yangtze block to the east.

Keywords: Cao Bang – Jingxi earthquake, Northern Vietnam tectonics, focal mechanism, moment-tensor inversion

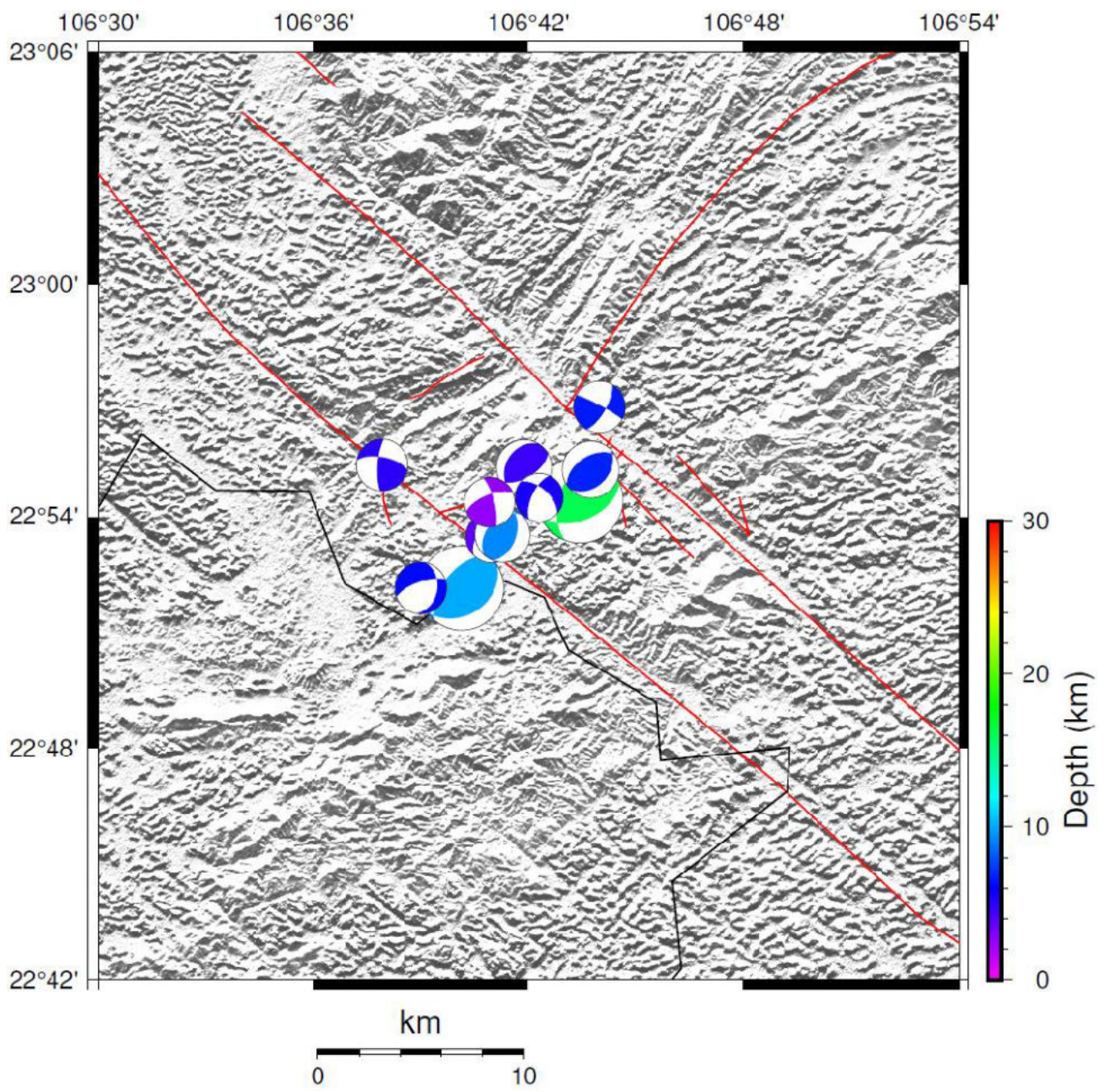


Fig 1. Focal mechanism results of 11 studied earthquakes from November 25, 2019, earthquake sequence as obtained from inversion technique

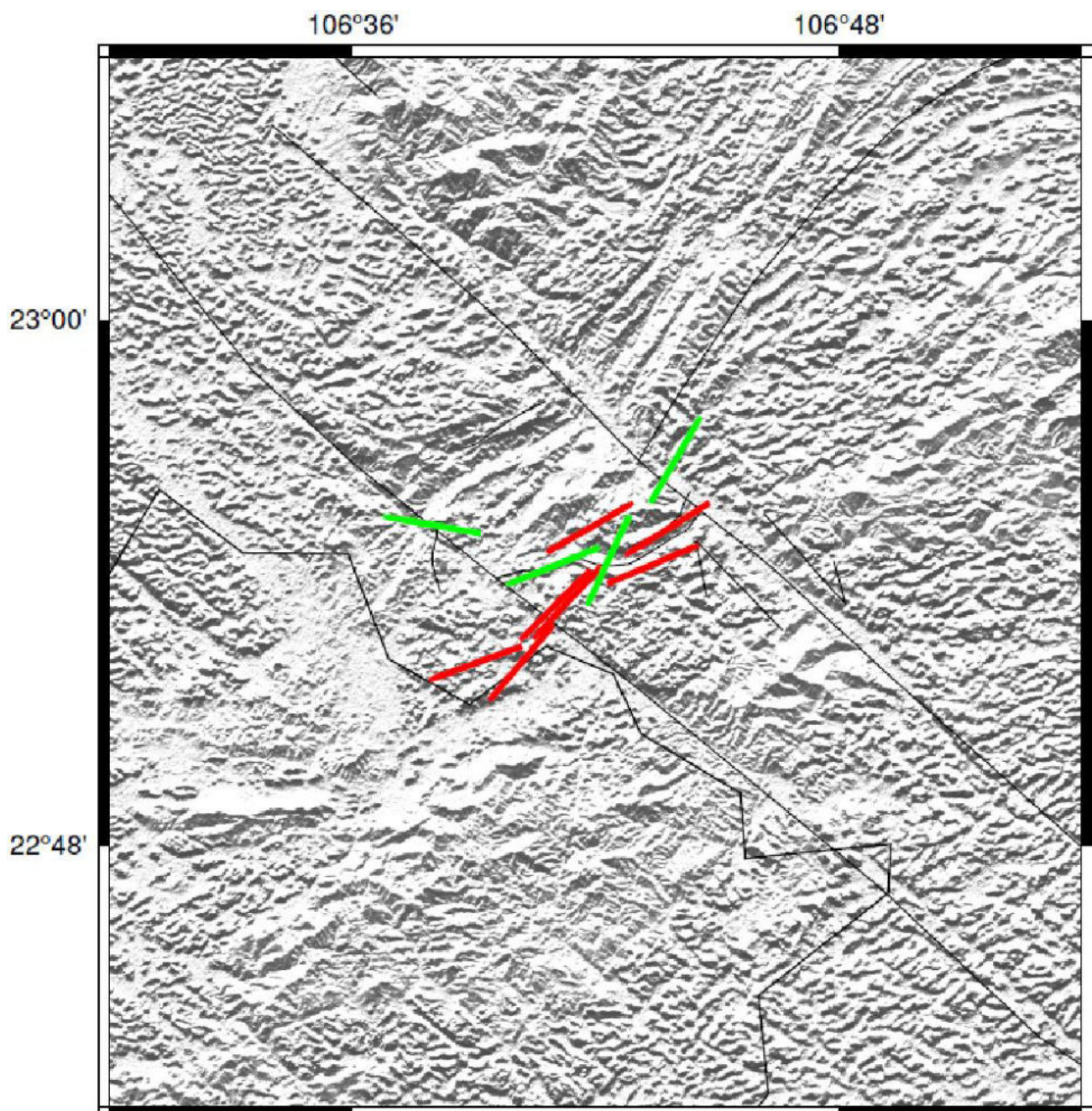


Fig 2. Nodal planes of 11 focal mechanism solutions indicating faulting in the NE-SW direction.

DEVELOPMENT OF WEB DATA SERVICE FOR SEISMOLOGY AFTER THE 1999 M7.6 CHI-CHI, TAIWAN EARTHQUAKE: TAIWAN EARTHQUAKE RESEARCH DATA CENTER (TECDC)

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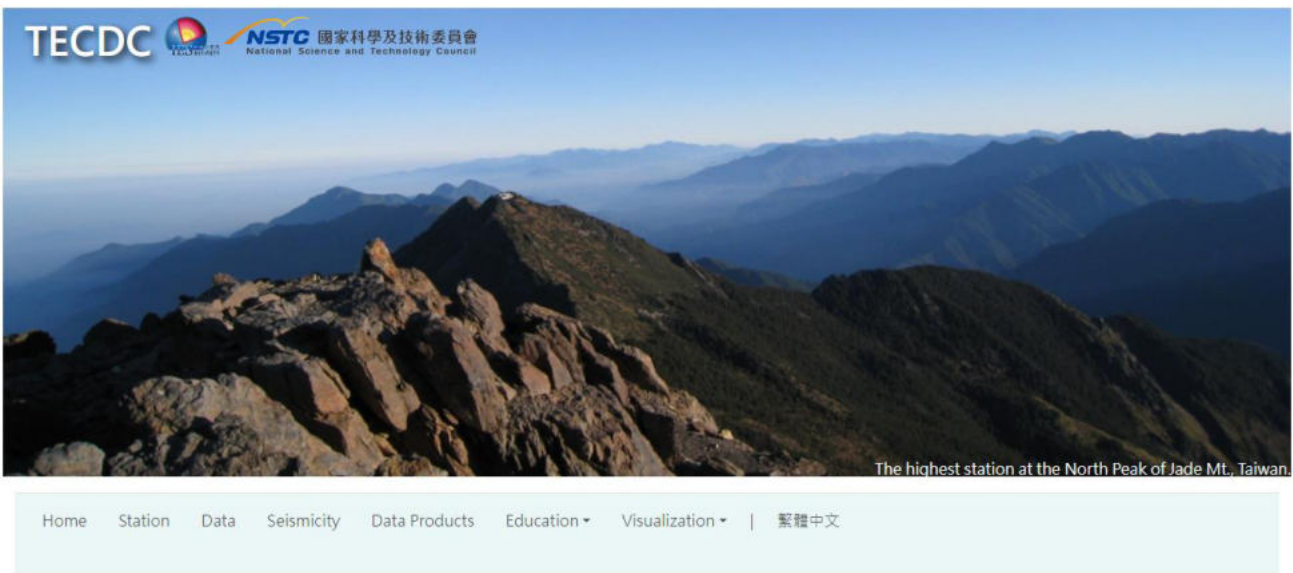
Abstract

The disastrous M7.6 Chi-Chi Earthquake struck central Taiwan on September 21, 1999 (UTC+8) and left a huge impact on the Taiwan society. After 25 years, another M7.4 earthquake hit eastern Taiwan on April 3rd, 2024, caused less damage to the Hualien area. Obviously, the progress on earthquake research, engineering, disaster management and community resilience has enabled Taiwan well prepared for a big one. The Taiwan Earthquake Research Data Center (TECDC) has been sponsored by the National Science and Technology Council (NSTC) and executed by the Institute of Earth Sciences, Academia Sinica (IESAS) since 2005. The main mission of TECDC is to integrate all available seismic data on one united platform and to support data management of large-scale seismological experiments conducted by Taiwanese researchers. In addition, we have also dedicated ourselves to developing real-time seismology, including automated, real-time regional moment tensor inversions and rapid shakemap visualization. To promote tectonic interpretation and seismogenic structure identification, we have established several online interactive systems to display regional research outcome from the research community, such as AutoBATS moment tensor catalog, Taiwan velocity model (TVM), Taiwan crustal model (TCM) and Taiwan geodetic model (TGM). In the past 5 years, we have been collaborating with Central Weather Administration (CWA) to establish the Taiwan Seismological and Geophysical Data Management System (Taiwan GDMS) for sharing the data recorded by CWA seismographic network (CWASN), Taiwan strong motion instrumentation program (TSMIP) network and the Taiwan geophysical network for seismology (TGNS). With the support of this core infrastructure (TECDC) developed in the past two decades, we believe the constant progress of basic seismological research and the seismic hazard assessment will help develop a culture of preparedness and mitigate future earthquake hazard in Taiwan.

Keywords: TECDC, Realtime seismology, BATS, P-Alert, GDMS

Acknowledgement:

We thank for the great support from the National Science and Technology Council (NSTC), the Institute of Earth Sciences, Academia (IESAS) and the Central Weather Administration (CWA) of Taiwan. The web services developed by software engineers in the IES Data Management Center (IESDMC) are greatly appreciated.



Welcome to TECDC

The TEC Data Center (Taiwan Earthquake Research Data Center) is aimed to provide users an integrated on-line web service for requesting data/information on earthquake research, education and outreach.



Latest Earthquake

4.4

2024-09-15 22:51:40 (UTC +8)

22.01 °N, 121.54 °E

Highlights

- Taiwan 3D tomographic models (TVM) web services are open to the public. Users are able to view the results in section profile, horizontal slices, or 1D models at assigned location. [see [Data Products](#)]

Fig 1. The homepage of the Taiwan Earthquake Research Data Center (TECDC). The TECDC integrates all available seismic data for seismological research, education and outreach in Taiwan. (<https://tecdc.earth.sinica.edu.tw>)

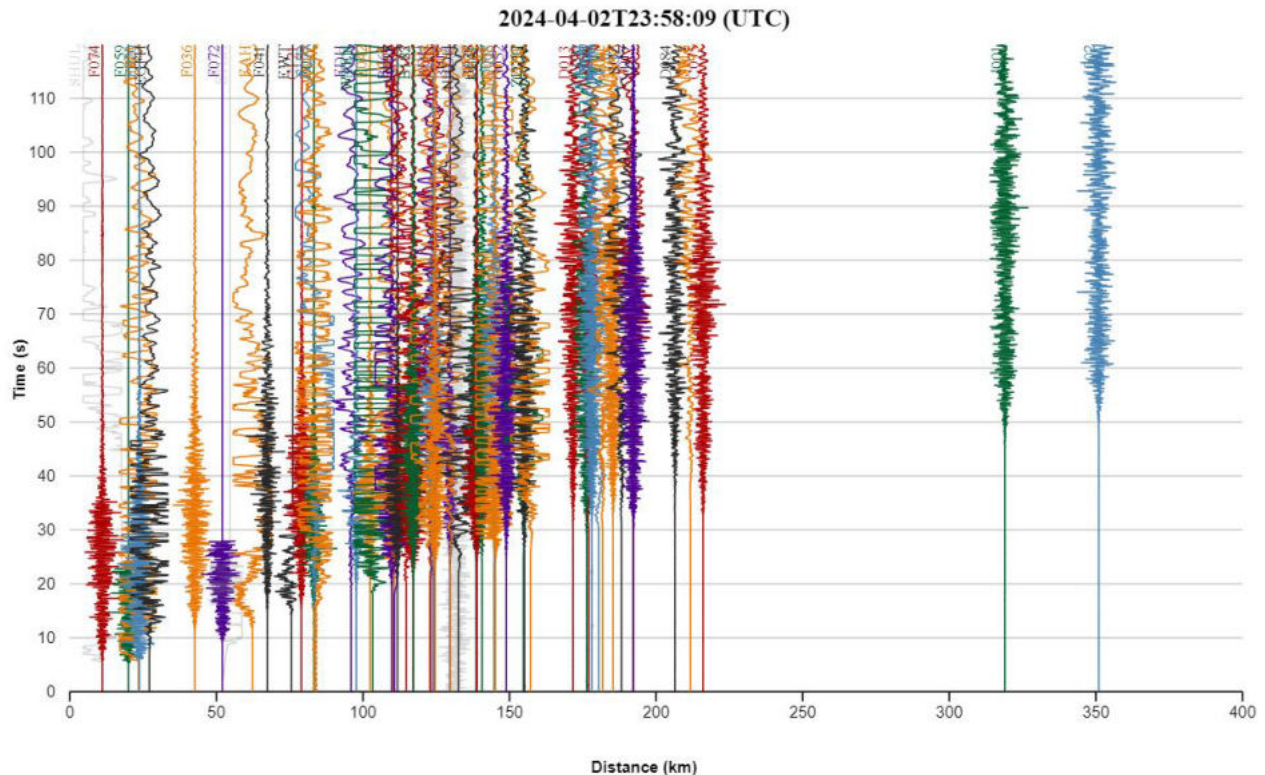


Fig 2. The traveltime waveform plot for the 2024-04-03 M7.4 Hualien Earthquake (UTC+8) from the GDMS. The GDMS will prepare both CWASN and TSMIP waveform data in the homepage automatically for any earthquakes with ML larger than 6.0. (<https://gdms.cwa.gov.tw>)

A STUDY ON INFLUENCE OF SYNTHESIS CONDITIONS ON PROPERTIES AND STRUCTURE OF G-C₃N₄

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Abstract

Recently, g-C₃N₄ has emerged as a potential material with many applications in various fields due to its unique properties. Usually, the structure, properties and therefore the applicability of g-C₃N₄ are greatly influenced by the material source and synthesis conditions. In this paper, we report the influence of precursors, including urea, melamine and thiourea on the products. On the other hand, the influence of temperature and time is also investigated. The results show that the best product was prepared from urea at temperature 550 °C for 1 hour. The obtained results showed that the ·OH radical and the photogenerated hole h⁺ were the main active radicals for the degradation of RhB dye. The present work may provide new insights into selecting proper precursors for synthesizing g-C₃N₄ materials and a deeper understanding of the microstructure-dependent photocatalytic activity of g-C₃N₄.

Keywords: urea, melamine, thiourea, g-C₃N₄, photocatalysis

Acknowledgement:

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Abstract

In aquatic habitats, plastic waste absorbs chemical pollutants from the surrounding water, potentially modifying the fate of toxins within the ecosystems. The potential impact of plastic as a transport medium for environmental toxins in conjunction with biofilm interaction is inadequately comprehended. This study examined the concentration of microplastics in sediment from urban and suburban rivers in relation to various wastewater sources, including the Kim Nguu River (HN1 – hospital wastewater; HN2 – upstream of the wastewater treatment plant), Set River (HN3 – urban domestic wastewater), and Nhue River (HN4 – suburban domestic wastewater). The study determined the MiP levels in the following order: HN2 (18.9 mg kg⁻¹ of wet sediment) > HN1 (13.6 mg kg⁻¹ of wet sediment) > HN3 (10.5 mg kg⁻¹ of wet sediment) > HN4 (3.7 mg kg⁻¹ of wet sediment). Multiple toxic trace metals (TM), including As, Ni, Cd, and Pb, were identified in microplastics extracted from the aforementioned areas. The TMs were arranged in the following order: Pb > Cd > Ni > As. The highest concentrations of TM were recorded in HN1 (55 x 10⁻³, 17.1 x 10⁻³, 1 x 10⁻³, 0.3 x 10⁻³ µg/ g of MiP for Pb, Cd, Ni and As respectively) and HN2 (17.8 x 10⁻³, 10.8 x 10⁻³, 1.4 x 10⁻³, 0.8 x 10⁻³ µg/ g of MiP for Pb, Cd, Ni and As respectively). Furthermore, Pb and Cd exhibited a robust association with microbial concentration derived from the biofilm on the MiP surface, with Spearman rank correlations of 0.95 and 0.82, respectively. Additionally, bacteria resistant to Pb and Cd were isolated on selective media, along with the identification of metal-resistance genes, including *copA*, *recG* and *dpsA*. This study demonstrates the potential of microplastics to act as carriers for trace metals in urban and suburban river environments through the formation of biofilm. The presence of trace metals and resistant bacteria on microplastics highlights the environmental and health risks associated with microplastic pollution.

Keywords: microplastic, trace metal, biofilm, metal resistance bacteria/ gene

Acknowledgement:

This research is funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 105.99-2023.32.

ASSESSMENT OF THE PRESENCE OF PER-/POLYFLUOROALKYL SUBSTANCES (PFAS) IN SURFACE WATER IN BINH DUONG AND ITS RELATIONSHIP WITH PHYSICOCHEMICAL PARAMETERS

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Abstract

In recent years, Binh Duong (Vietnam) has become one of the main causes of per-/polyfluoroalkyl substances (PFAS) emissions into the environment due to the strong development of fluorinated chemical industry. These compounds are very stable, hard to biodegrade and cause many negative impacts on ecological health, especially when exposed to polluted water sources for a long time. This study focuses on assessing the presence of 8 main PFAS groups in Binh Duong water quality, thereby assessing the level of pollution as well as the correlation between the two seasons and available physical and chemical parameters via the R language. Total 28 surface water samples were collected during the dry and rainy seasons at 14 locations near residential areas, surface water intakes, and industrial parks. The results showed that the 2 groups of perfluoroalkanesulfonates (PFASs) and perfluoroalkylcarboxylic acids (PFCAs) recorded the highest concentrations of 137.76 and 136.11 ng/L, respectively, while the remaining groups had lower concentrations with perfluoroalkanesulfonamides (FASAs) 4.08 ng/L, telomer sulfonates (FTSs) 4.20 ng/L, F-53B 2.75 ng/L, perfluorooctansulfonamidoacetic acids (FOSAAs) 0.29 ng/L, GenX and sodium dodecafluoro-3H-4,8-dioxanonoate (DONA) undetected (less than 0.20 and 0.13 ng/L, respectively). The seasonal variation between these groups was also shown with large differences in PFAS concentrations between the dry and rainy seasons, except for F-53B. Furthermore, the correlation analysis results indicated a moderate correlation between PFCAs and chemical oxygen demand (COD) ($r = 0.56$, $p < 0.05$), weak correlations between telomer sulfonates (FTSs) and perfluoroalkanesulfonamides (FASAs) with iron (Fe) ($r = 0.40$ and 0.23 in turn, $p < 0.01$). In conclusion, the results of monitoring PFAS contamination fluctuations can be used as a reference for developing future pollution control and management plans in the research area.

Keywords: PFAS, water quality, seasonal variation, statistical correlation.

Acknowledgement:

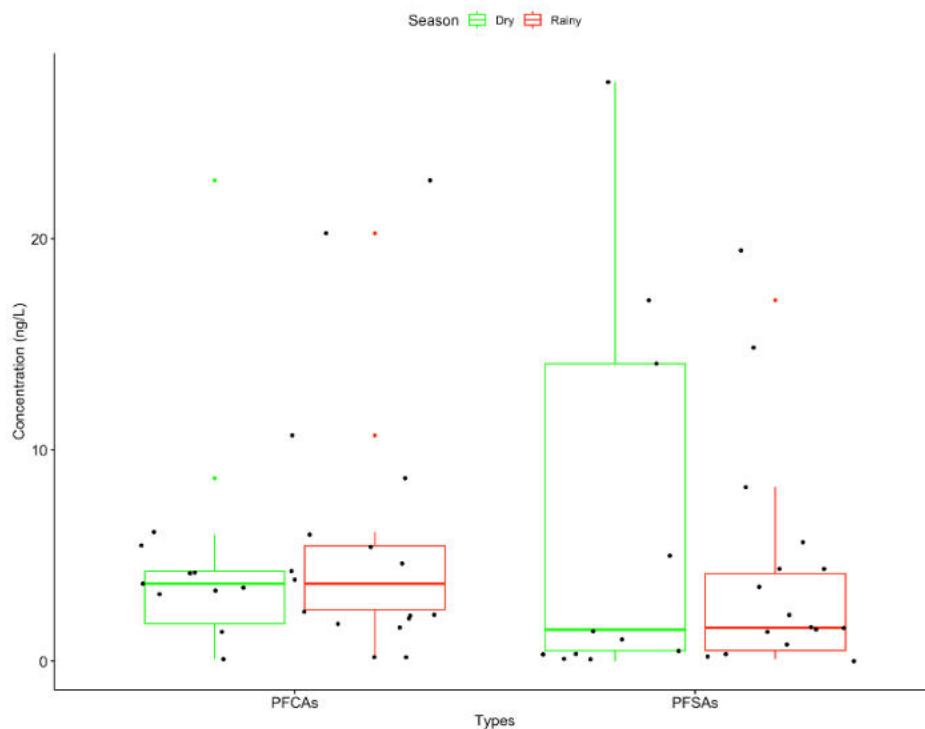


Fig 1. Seasonal variation of PFASs and PFCAs

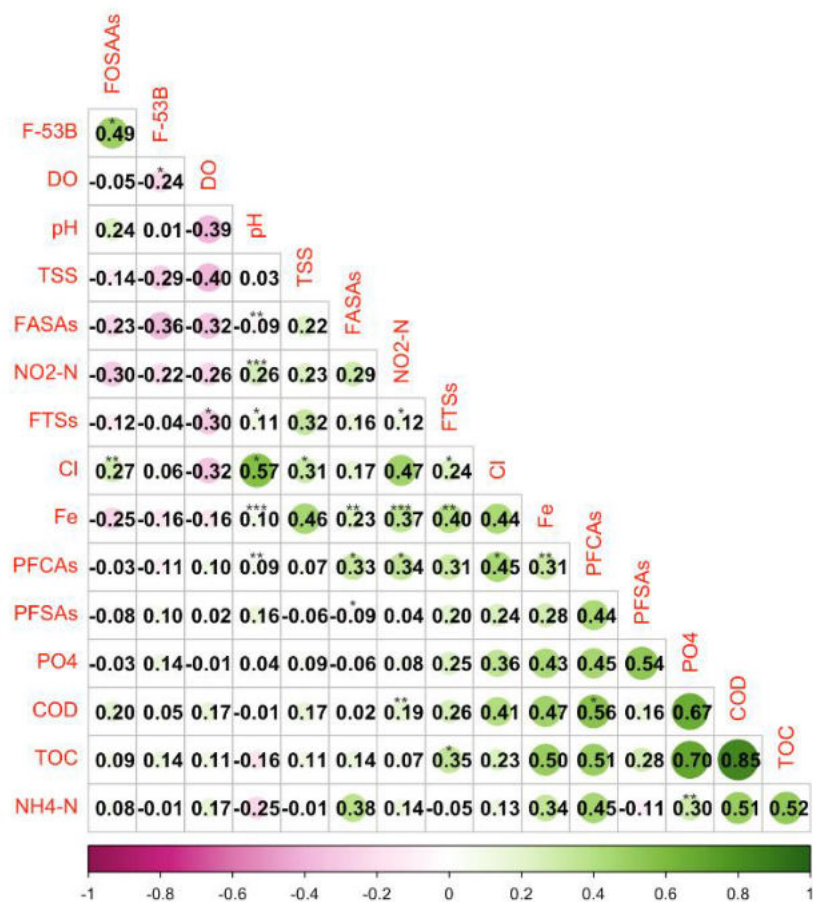


Fig 2. Spearman's correlation analysis between PFAS groups and physico-chemical parameters

PERFORMANCE OF DHS-USB SYSTEM FOR TEXTILE WASTEWATER TREATMENT UNDER HIGH SALINITY CONDITIONS

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Abstract

The high salinity in textile wastewater may undermine the biological treatment processes. This study evaluated the impact of salinities on the removal of organics, nitrogen and color in a downflow hanging sponge (DHS) configured upflow sludge blanket (USB) system for textile wastewater treatment. The DHS-USB system was operated for 138 days at various salinity of 10‰, 20‰ and 30‰ in three phases of the operation period. Results indicated that higher salinity led to the lower COD and color removal efficiency. The highest COD and total nitrogen removal efficiency was 92% and 76%, respectively, at the salinity of 10‰. Nevertheless, the DHS-USB system could exert nitrogen removal under changing salinity conditions resulting in the stable of nitrogen concentration in the effluent at 3 phases of operational period. Additionally, the microbial community analyses confirmed the relative abundance of salinity-sensitive microbes including *Methanobacterium* (18.2%–21.7%) and *Propionibacterium* (14.6%–22.2%) under alternating salt conditions.

Keywords: Textile wastewater; High salinity; *Propionibacterium*; *Methanobacterium*

ADVANCED THERMAL HYDROLYSIS FOR SEWAGE SLUDGE PRE-TREATMENT: INTEGRATING OXIDATION FOR ENHANCED BIOGAS PRODUCTION

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Abstract

The increasing production of sewage sludge poses significant environmental challenges for wastewater treatment plants. This study explored advanced thermal hydrolysis, a method that combines thermal hydrolysis with oxygen, to boost biogas production and address the drawbacks of traditional thermal hydrolysis, such as sludge discoloration, high energy demands, and elevated ammonia levels in the treated sludge. A blend of 55% primary sludge and 45% waste activated sludge was pre-treated using advanced thermal hydrolysis at temperatures of 100, 115, 130, and 145 °C, with treatment times ranging from 5 to 30 minutes and oxygen pressures between 10 and 30 bar, prior to anaerobic digestion. The optimal condition for the highest biogas yield (439.6 mL/g VS added) was achieved at 145°C, 15 minutes, and 20 bar of oxygen. Under these conditions, the concentrations of ammonia nitrogen and propionic acid in the treated sludge were low enough (approximately 302 mg/L and 559.7 mg/L, respectively) to minimize negative impacts on anaerobic digestion.

Keywords: *Advanced thermal hydrolysis; Anaerobic digestion; Hydrothermal processing; Sludge pre-treatment; Wastewater.*

Acknowledgement:

The authors would like to thank Watercare New Zealand for providing samples and Mr Raymond Hoffmann and Dr Matthew Sidford (Department of Chemical & Materials Engineering, the University of Auckland) for technical assistance and helping with the chemical analyses.

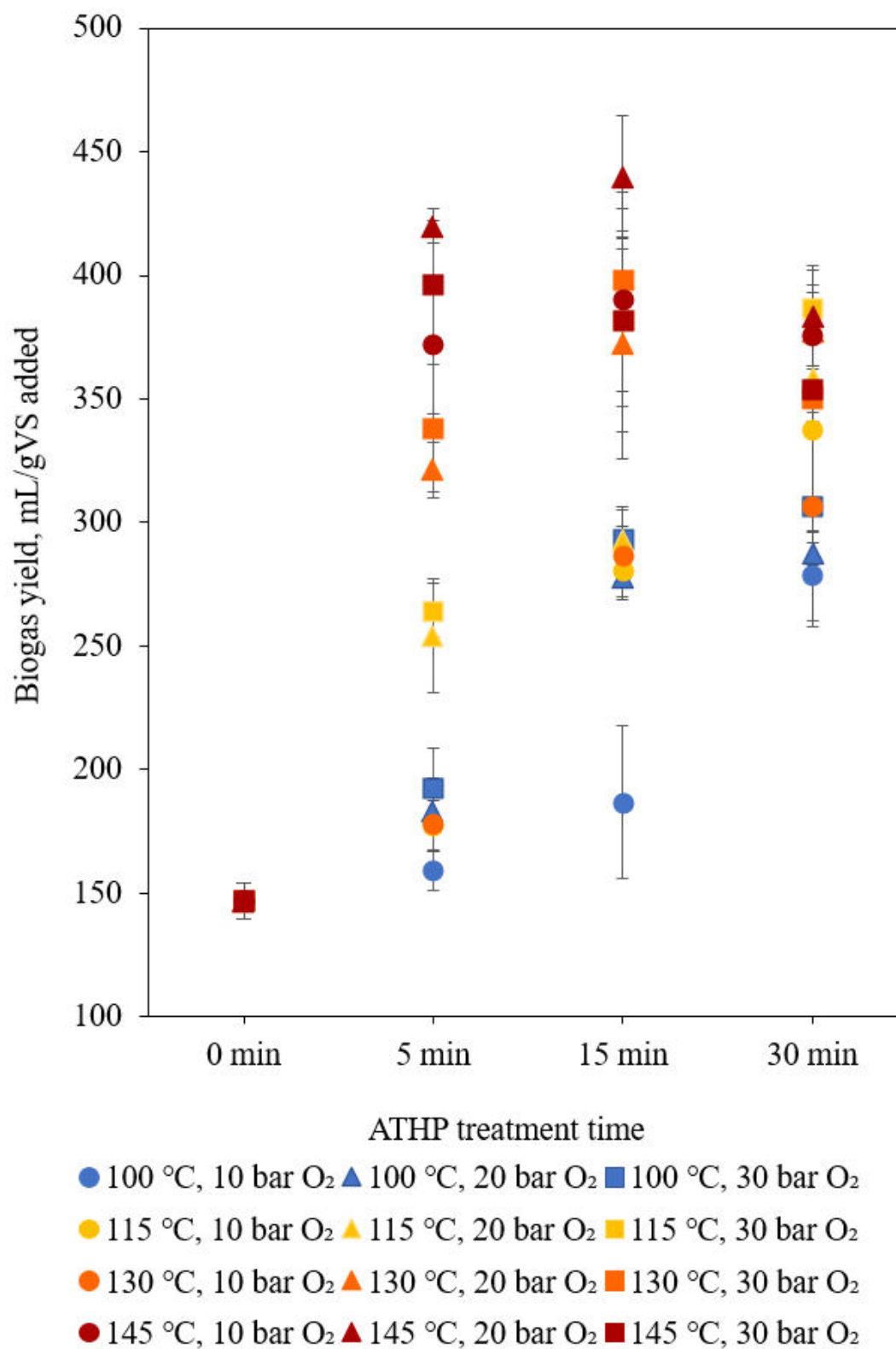


Fig 1. The biogas yield of sludge after being treated at different ATHP conditions.

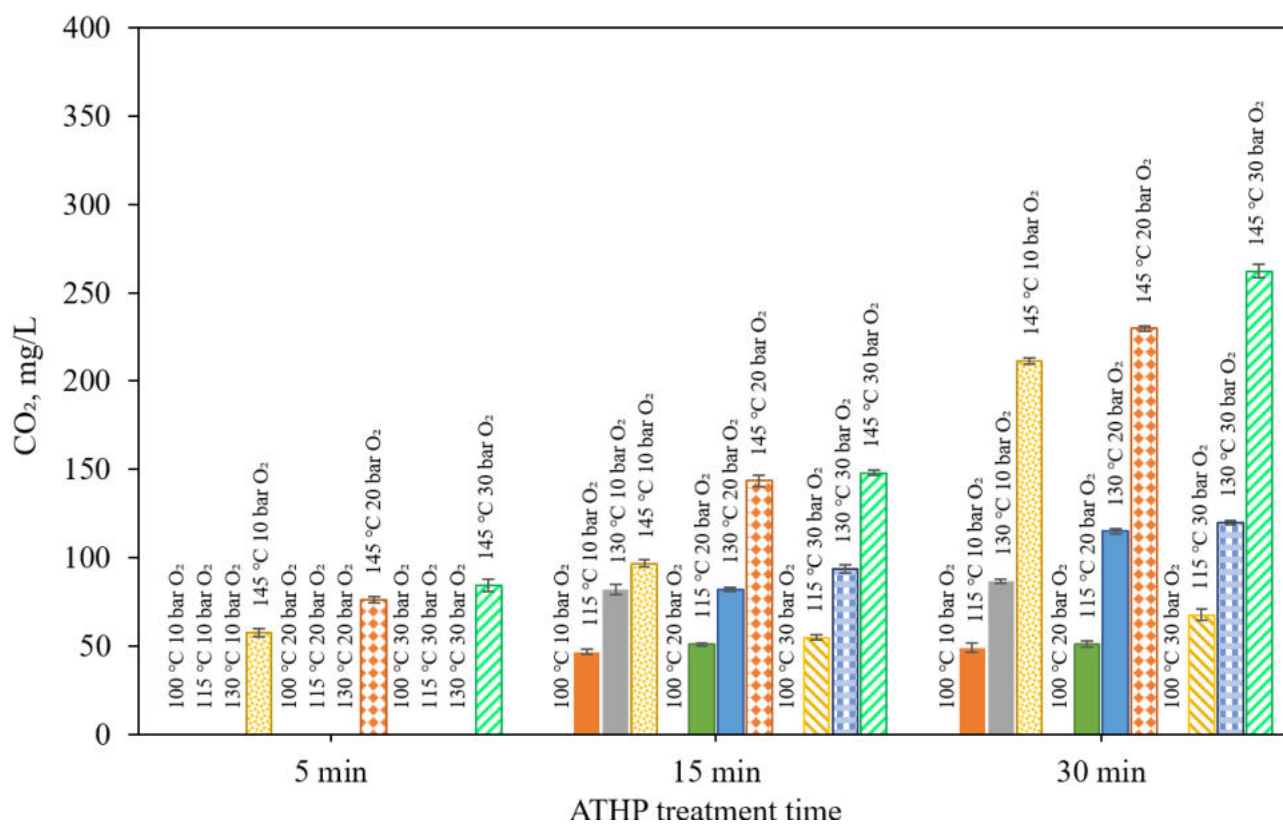


Fig 2. CO₂ content in the off-gas after ATHP.

UPDATE ON THE DOWNSCALING EXPERIMENTS CONDUCTED BY VIETNAM

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Abstract

The “Climatic Hazard Assessment to Enhance Resilience Against Climate Extremes for Southeast Asian Megacities (CARE for SEA Megacities)” project is the latest initiative under the Southeast Asia Regional Climate Downscaling / Coordinated Regional Climate Downscaling Experiment Southeast Asia (SEACLID/CORDEX-SEA) collaboration. CARE for SEA Megacities aims to provide city-scale climate hazard information for major Southeast Asian cities, including Bangkok, Hanoi, Jakarta, Kuala Lumpur, and Manila, under various Shared Socioeconomic Pathway (SSP) scenarios, to inform policy-making and strengthen urban resilience in a warming global climate.

As a key contributor to the project, the Vietnamese research team comprises members from three institutions: University of Science and Technology of Hanoi (USTH), VNU Hanoi University of Science (HUS), and the Vietnam’s Institute of Meteorology, Hydrology, and Environment (IMHEN). The team is responsible for conducting three downscaling simulations for CORDEX-SEA, utilizing CMIP6 data. Their primary task is to simulate both historical and future climate projections up to the year 2100 using the Regional Climate Model (RegCM), driven by multiple global climate models (GCMs) and varying parameterization schemes. To date, the majority of these experiments have been successfully completed. In this presentation, we will provide an update on the downscaling experiments conducted by the Vietnamese team, offer a preliminary assessment of the primary results, and discuss proposals for future research directions.

Keywords: CORDEX-SEA, RegCM, CMIP6, Climate projection, downscaling

Acknowledgement:

The study is funded by the Asia-Pacific Network for Global Change Research (APN)

ASSESSMENT OF 25-KM PRECIPITATION SIMULATION OF DOWNSCALED CMIP6 CORDEX-SEA OVER INDONESIA : PRELIMINARY STUDY

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Abstract

This preliminary study assesses the performance of 25-km downscaled of three General Circulation Models (GCMs) CMIP6 in modeling precipitation and temperature using RegCM4-NH across Indonesia within the framework of the Coordinated Regional Climate Downscaling Experiment-Southeast Asia (CORDEX-SEA). Historical data from three different forcing GCMs, namely MIROC-ES2L, CNRM-ESM2-1, and NorESM2-MM, was compared to observation data derived from MSWEP during period of 1981 to 2015. The results indicate that, over the southern part of Indonesia, the mean precipitation have a high wet bias compared to observation. Meanwhile, the mean precipitation showed a dry bias over the northern part of Indonesia. All three downscaled model outputs have good performances with a low bias in June - August (JJA) over Java Island, which is associated with dry season. Spatially, precipitation from all forcing GCMs has a high wet bias over mountainous areas. Monthly mean precipitation showed a clear seasonal pattern in monsoonal and anti-monsoonal areas including some major cities such as Jakarta, Bandung, Yogyakarta, Denpasar, and Makassar. A similar analysis was conducted for temperatures over Indonesia as well.

Keywords: Indonesia, CMIP6, CORDEX-SEA, precipitation, temperature

Acknowledgement:

This research is funded by APN through Project CRRP2023-08MY-Cruz of CARE for SEA megacities and SEACLID/ CORDEX SEA project as well as BMKG fund.

Mean Seasonal Rainfall of Indonesia between 1981 and 2015

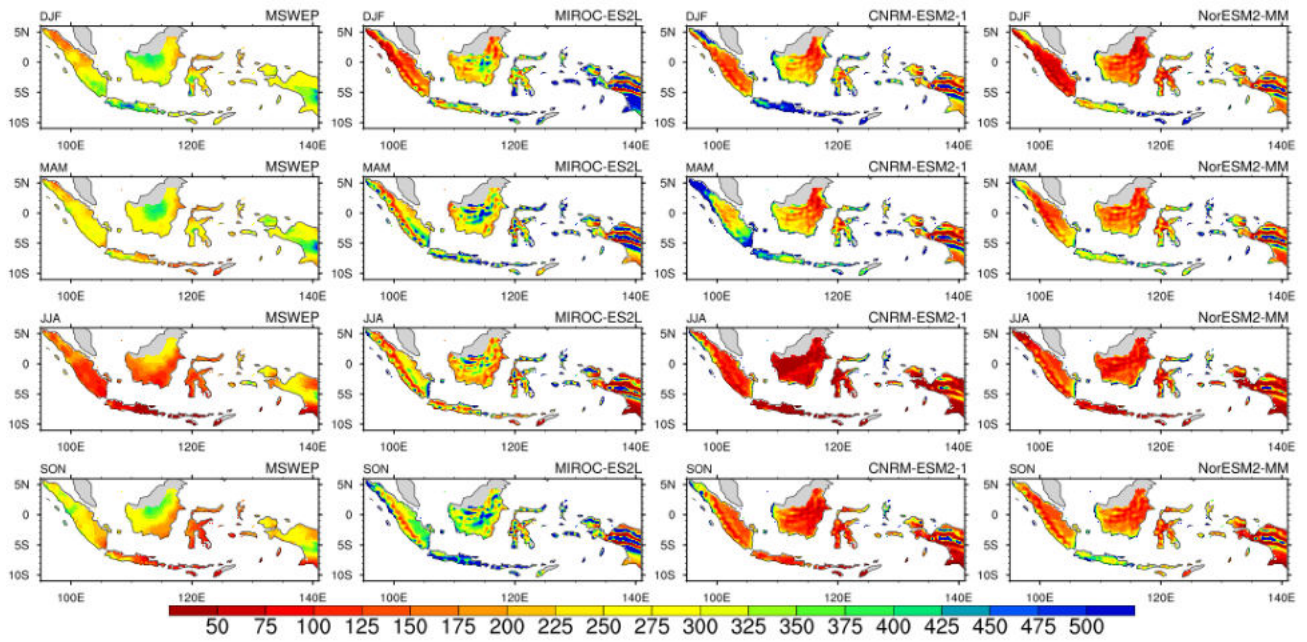


Fig 1. Mean Precipitation of observation (MSWEP) and three downscaled GCMs CMIP6 between 1981 - 2015.

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Abstract

Fine resolution climate simulations have been carried out at CSIRO using the global, variable-resolution Conformal Cubic Atmospheric Model (CCAM), for the CORDEX-SEA project. The methodology involves running global 100 km simulations from 1960 to 2070, driven by the sea-ice and bias-corrected SSTs of two CMIP6 CGCMs: ACCESS-CM2 and GFDL-CM4. The historical period is covered, followed by the evolving SSP370 scenario for greenhouse gas emissions. The simulations are then downscaled from 100 km to 25 km resolution over the Southeast Asia domain.

A further simulation downscales directly from the 100 km simulation to a 5 km grid over Indochina. The CSIRO urban scheme is included in this simulation to provide improved detail over several megacities.

The presentation will describe the CCAM model and the downscaling methodology. A selection of results will be shown.

Keywords: Downscaling, Variable-resolution

SLAB TEARING AND LITHOSPHERIC STRUCTURES IN LUZON ISLAND, PHILIPPINES: CONSTRAINTS FROM P- AND S-WAVE LOCAL EARTHQUAKE TOMOGRAPHY

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Abstract

Luzon Island is a complex setting of seismicity and magmatism caused by the subduction of the South China Sea lithosphere and the presence of a major strike-slip fault system, the Philippine Fault. Previous studies of the structure of this subduction zone have suggested that a ridge subduction system resulted in a slab tearing along the ridge. On the other hand, the Philippine Fault plays an important role in understanding how major strike-slip faults deform and displace at a continental scale. To constrain the lithospheric geological structure in the area and refine the slab tearing model, we performed a P- and S-wave seismic tomography travel time inversion using local earthquakes. The dataset has been combined from seismic phases reported by the International Seismological Centre and new pickings from six broadband seismic stations in northern Luzon. The three-dimensional P- and S-wave velocity models in Luzon Island were analyzed by applying the LOTOS package with a one-dimensional velocity model obtained from the VELEST program. Our tomographic images indicate contrasting velocity structures across the Philippine Fault to a depth of 60 km. Therefore, we suggest that the Philippine Fault might be a lithospheric structure that displaces both the crust and the upper mantle. The results also indicate regions of low-velocity slab windows from a depth of 40 km, which are interpreted as the sites of slab tearing. Compared with focal mechanisms and earthquake occurrence in this region, we propose that slab tearing extends from the fossil ridge and creates regional kinematic perturbations. The tearing produces shallow upwelling magma to stay in the chambers beneath the crust, which is in contrast to the magmatic system observed in other regions.

Keywords: Luzon, tomography, slab tearing, magmatic system, the Philippine Fault

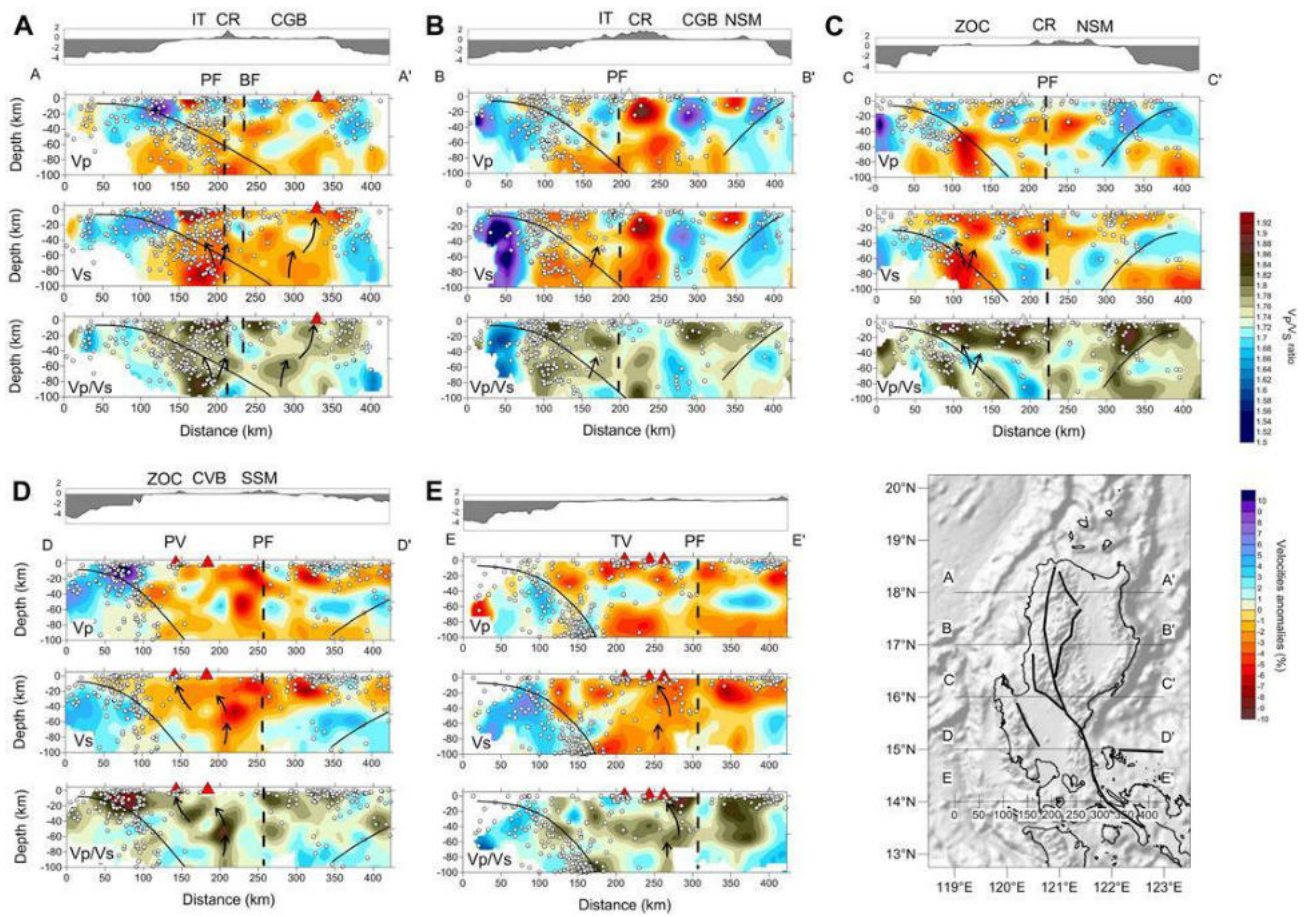


Fig 1. P- and S-wave velocity perturbations and V_p/V_s for selected profiles along 18°N , 17°N , 16°N , 15°N , and 14°N (a-e). The locations of these profiles are in Fig. 1. The black arrows indicate the migration path of magmas or melts from the mantle wedge. Red triangles denote the active volcanoes while white triangles denote inactive volcanoes. Dots indicated the locations of the relocated earthquakes.

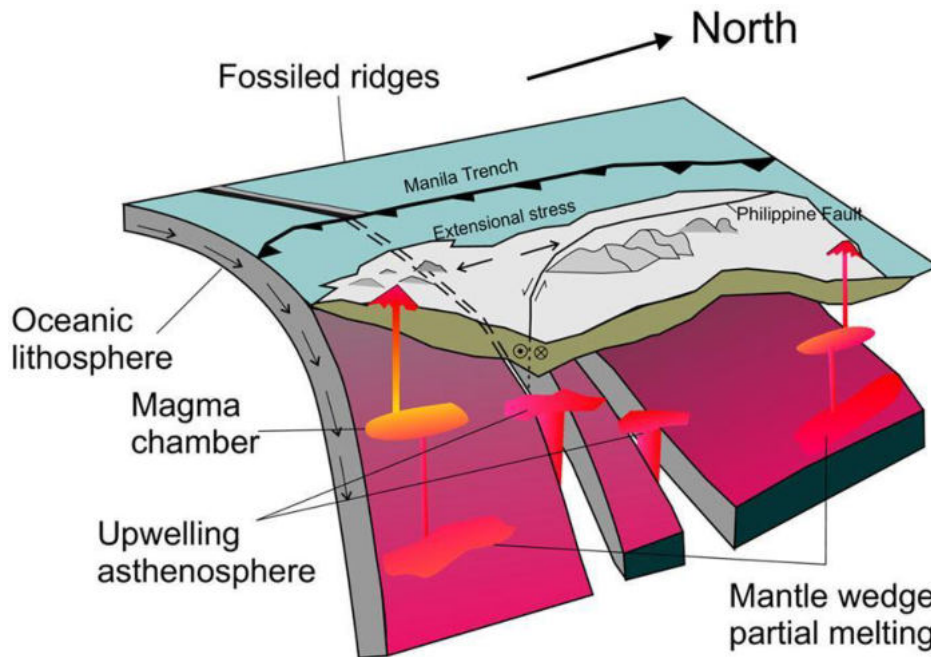


Fig 2. Tectonic model of Luzon Island showing the magma formation source from both the mantle wedge melting and asthenosphere upwelling from slab tear sites. The slab tearing occurs in the region where the fossil ridge is subducted. In the central, the Philippine Fault cuts through the whole crust and offsets the upper mantle.

THE EXPERIMENT OF A NEAR-REAL-TIME SHAKEMAP USING GROUND MOTION PREDICTION EQUATIONS FOR AN EARTHQUAKE EARLY WARNING SYSTEM: THE CASE STUDY OF THE M5.0 EVENT IN THE KONTUM PROVINCE.

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Abstract

ShakeMap is a tool that plays a crucial point in rapid earthquake response, seismic hazard analyses, risk assessment, and earthquake engineering applications. It provides near-real-time maps of ground motion and shaking intensity of significant earthquakes based on the earthquake parameters and ground motion prediction equation (e.g., GMPEs). However, the traditional ShakeMap commonly generated non-directional shaking maps due to limitations of the GMPEs equations that did not well-considered the earthquake directivity.

In this study, we introduce the data-driven method that updates the traditional GMPEs during the earthquake by near-real time modifying the ground motion magnitude based on the earthquake early warning system data. Thereby simultaneously changing the shape of the peak ground motion map as well as gradually clarifying the directivity of earthquakes along with the new data update. The output of the shakemap is then compared with several field surveys after the quake. The study's outcome showed the well-correlated between the final report of the shakemap and the earthquake intensity map from the field survey.

Keywords: Vietnam earthquake, earthquake early warning, earthquake rapid information, Kontum, NorthWestern Vietnam.

Acknowledgement:

This study was supported by the Ministry of Science and Technology of Vietnam under grant number ĐTĐL.CN-50/21. We are deeply grateful for their commitment to advancing scientific knowledge and their support throughout the duration of this project. Their investment has significantly contributed to the successful completion of our study.

References

- [1] Andrea Mianoa, Fatemeh Jalayera, Giovanni Forteb, Antonio Santo; Generating Shake Maps: Conditional GMPE-based Ground Shaking Fields with Site Effects, Atti del XVIII Convegno ANIDIS L'ingegneria Sismica in Italia : Ascoli Piceno, 15-19 settembre 2019.
- [2] Avigyan Chatterjee, Nadine Igonin, Daniel T. Trugman; A Real-Time and Data-Driven Ground-Motion Prediction Framework for Earthquake Early Warning. Bulletin of the Seismological Society of America 2022;; 113 (2): 676–689. doi: <https://doi.org/10.1785/0120220180>
- [3] Erfan Firuzi, Anooshirvan Ansari, Kambod Amini Hosseini & Ehsan karkooti; Developing a customized system for generating near real time ground motion ShakeMap of Iran's earthquakes. Journal of Earthquake Engineering Volume 26, 2022 - Issue 7. Pages 3680-3702. <https://doi.org/10.1080/13632469.2020.1814450>
- [4] Wu, Y. M., & Teng, T. L. (2002). A virtual subnetwork approach to earthquake early warning. Bulletin of the Seismological Society of America, 92(5), 2008-2018.
- [5] Wu, Y. M., & Kanamori, H. (2005). Experiment on an onsite early warning method for the Taiwan early warning system. Bulletin of the Seismological Society of America, 95(1), 347-353.

A HIGH-RESOLUTION AFTERSHOCK CATALOG FOLLOWING THE 2023 KAHRAMANMARAŞ EARTHQUAKE SEQUENCE AND THE ASSOCIATED FAULT ZONE STRUCTURES USING ULTRA-DENSE NODAL RECORDING

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Abstract

The 2023 Kahramanmaraş earthquake doublet in Southeastern Türkiye started with a Mw 7.8 earthquake at Sakçagöz-Narlı Fault rupturing the East Anatolian Fault (EAF) for more than 300 km. Nine hours later, a Mw 7.5 earthquake occurred near Ekinözü, rupturing nearly 100 km along the adjacent Çardak fault. Both events triggered numerous aftershocks along the faults and surrounding areas in the complex Maras triple junction. We deployed approximately 200 SmartSolo nodal stations and 16 broadband/strong motion seismic stations across the rupture for nearly four months starting in May 2023 to better map the ongoing aftershock sequence. These SmartSolo nodal stations are set with a sampling rate of 500 Hz to record higher-quality waveforms from smaller aftershocks, compared with a 100 Hz sampling rate from existing broadband stations. We applied a deep-learning phase picker called EQTransformer and a phase association method called PyOcto to the continuous nodal records to build a deep-learning catalog with calculated magnitude. The preliminary results show there were more than 7 million picked phases associated with nearly 19,000 events. The same method is simultaneously applied to the continuous records from newly deployed broadbands and the existing stations from AFAD and TUBITAK to add additional results to the deep-learning catalog and the continuous waveforms database. The deep-learning catalog and the obtained AFAD catalog are compared and combined to form a better catalog containing more template events used for subsequent matched-filter detection (MFD). Waveform-based relocation methods and magnitude estimations are then applied to all detected events to generate a more complete catalog. With this higher-resolution catalog, the main and secondary faults activated by the mainshock along the EAF, and large aftershocks can be identified and better imaged. We also identify fault zone heads and trapped waves to image the bi-material interface and low-velocity damage zones associated with the M7.8 ruptures. Through our comprehensive study, we hope to better understand the physical processes that drive the evolution of seismicity and the interplay between fault zone structures and seismic behaviors in Southeastern Türkiye.

AN INTRODUCTION TO EARTHQUAKE RAPID INFORMATION SYSTEM FOR LOCAL AND REGIONAL SCALES IN VIETNAM: TWO COMMISSIONING TEST SYSTEMS IN KON TUM PROVINCE AND NORTHWESTERN VIETNAM.

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Abstract

The Earthquake Early Warning (EEW) systems worldwide have significantly advanced seismic hazard mitigation and public safety by providing real-time alerts that enable individuals, organizations, and infrastructure systems to take protective actions. These systems provide critical warnings seconds to minutes before the arrival of destructive seismic waves, allowing decision-makers to take precautionary measures that can reduce casualties and limit damage to infrastructure. EEW systems have been implemented in various seismically active regions, including Japan, Mexico, Taiwan, and the United States, each achieving varying levels of success depending on technological advancements, governmental support, and public awareness. During the economic rising in Vietnam, many complex industrial and transportation infrastructures (e.g., protection sites) are rapidly developing in urban areas with high seismic hazard. Therefore, accurate information on earthquake information and early warning of potential damage from a specific earthquake to the protection site area is required.

In this study, we introduce the first phase of the Earthquake Early Warning System in Vietnam, which is applied from the earthquake early warning system in Taiwan, called earthquake rapid information that aim to rapidly detect and calculate the earthquake information for a local (Kontum province) and regional (NorthWestern Vietnam) areas. Two parallel systems have been operating and optimized from 2022 up to now with modules of data collection, data calculation (e.g., earthquake location and magnitude), and rapid information. The generated reports that including roughly information of an earthquake will be sent to registered users and Tsunami Warning Center, Institute of Geophysics – Vietnam Academy of Science and Technology through email and mobile app. The system well-performed on earthquake signal detection within 1~5 seconds after the earthquake occurred, with the first report generated 20~30 seconds after the earthquake. The earthquake's output parameters in the final report are relatively close to the results of research-grade processing systems. The results suggest that it is possible to apply the current system for the entire territory of Vietnam and to upgrade to earthquake early warning system for some regions with high seismic hazard in Vietnam.

Keywords: *Vietnam earthquake, earthquake early warning, earthquake rapid information, Kontum, NorthWestern Vietnam.*

Acknowledgement:

This research was funded by the Ministry of Science and Technology of Vietnam, with grant number DTDL.CN-50/21. We extend our sincere gratitude for their dedication to promoting scientific advancement and their unwavering support throughout the course of this project.

References

- [1] Allen, R. M., & Melgar, D. (2019). Earthquake early-warning: Advances, scientific challenges, and societal needs. *Annual Review of Earth and Planetary Sciences*, 47, 361-388.
- [2] Chung, A. I., Meier, M. A., Andrews, J., Böse, M., Crowell, B. W., McGuire, J. J., & Smith, D. E. (2020). ShakeAlert earthquake early warning system performance during the 2019 Ridgecrest earthquake sequence. *Bulletin of the Seismological Society of America*, 110(4), 1904-1923.
- [3] Hoshiba, M., Kamigaichi, O., Saito, M., Tsukada, S., & Hamada, N. (2008). Earthquake early-warning starts nationwide in Japan. *Eos, Transactions American Geophysical Union*, 89(8), 73-74.
- [4] Wu, Y. M., & Teng, T. L. (2002). A virtual subnetwork approach to earthquake early warning. *Bulletin of the Seismological Society of America*, 92(5), 2008-2018.
- [5] Wu, Y. M., & Kanamori, H. (2005). Experiment on an onsite early warning method for the Taiwan early warning system. *Bulletin of the Seismological Society of America*, 95(1), 347-353.

MICROPLASTICS AS CARRIERS OF PERSISTENT ORGANIC POLLUTANTS IN THE RED RIVER DELTA: OCCURRENCE, DISTRIBUTION AND ECOLOGICAL IMPLICATIONS

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Abstract

Microplastics are becoming prominent environmental pollutants, serving as carriers for persistent organic pollutants (POPs) in aquatic environments. This research examined the prevalence, distribution, and relationships of microplastics with polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) in the Red River Delta, Vietnam. Water and sediment samples were obtained from 15 locations spanning riverine, estuarine, and marine ecosystems. Microplastics have been isolated using density separation and characterized via FTIR spectroscopy, while associated persistent organic pollutants (POPs) were extracted and quantified using high resolution gas chromatography-mass spectrometry (HRGC-MS). The findings indicated a substantial accumulation of PAHs and PCBs on the surfaces of microplastics. Maximum quantities of 200,901 ng/g for PAHs and 3.79 ng/g for PCBs were detected in aquaculture regions. Eight PAH congeners (Benzo[b]Fluoranthene, Benzo[g,h,i]Perylene, Chrysene, Fluoranthene, Fluorene, Pyrene, and Phenanthrene) and six dioxin-like PCB congeners (PCB77, PCB105, PCB118, PCB156, PCB157, PCB167) were found, indicating potential ecological risks.

Spatial distribution research revealed hotspots next to industrial zones and urban areas, indicating anthropogenic causes. These results emphasize the complex links between microplastics and POPs in the Red River Delta. This work demonstrates that microplastics act as vectors for PAHs and PCBs in the Red River Delta, potentially enhancing their bioavailability and ecological danger. The results highlight the immediate necessity for specific pollution management techniques to mitigate the combined impacts of microplastics and related persistent organic pollutants on environmental and human health.

Keywords: Microplastics, Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), Red River Delta, Ecological risk.

Acknowledgement:

This work was funded by the project 'Sources, Sinks and Solutions for Impacts of Plastics on Coastal Communities in Viet Nam' - NE/V006088/1 sponsored by UKRI-GCRF via the programme 'Reducing the Impacts of Plastic Waste in Developing Countries'.

POTENTIAL APPLICATION OF NOVEL TERNARY MIXED METAL OXIDE (Ti/SnO₂-Nb₂O₅-Sb₂O₅) ELECTRODES FOR TEXTILE WASTEWATER TREATMENT AND REUSE

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Abstract

Water pollution, particularly from textile wastewater, poses a fundamental and critical challenge to both human health and the environment. It remains one of the most serious risks and difficulties faced today due to the presence of refractory organic pollutants. In recent years, electrochemical oxidation has emerged as an effective method for removing these contaminants, with the choice of electrode materials playing a crucial role in expanding the applications of new materials in wastewater treatment. This study developed a novel ternary mixed metal oxide electrode (Ti/SnO₂-Nb₂O₅-Sb₂O₅) aimed not only at treating textile wastewater but also facilitating wastewater reuse. The prepared electrode was characterized using scanning electron microscopy (SEM), energy-dispersive spectroscopy (EDS), x-ray diffraction (XRD), brunauer-emmett-teller (BET) surface analysis, and linear sweep voltammetry (LSV). It was found that the SEM images showed typical cracking structures of mixed metal oxide electrodes. Through XRD analysis, the presence of metal oxide peaks of SnO₂, Nb₂O₅, Sb₂O₅, and Ti was also observed. In addition, the specific surface area of Ti/SnO₂-Nb₂O₅-Sb₂O₅ electrodes ranged from 42.1 m²/g (Sb₂O₅:SnO₂:Nb₂O₅ = 1:6:3) to 108.9 m²/g (Sb₂O₅:SnO₂:Nb₂O₅ = 2:2:6), indicating the material had the potential to absorb the contaminants. The electrochemical properties of the electrodes show a high oxygen evolution potential with the generation of free radicals, including HO[•], H₂O₂, O₃, and Cl₂. It demonstrated that the Sb₂O₅:SnO₂:Nb₂O₅ component, with a mole ratio of 2:2:6, was optimal for textile wastewater treatment. When considering electrochemical treatment as a pretreatment stage in the overall process, chemical oxygen demand (COD) and color removal efficiencies could exceed 45% and 50%, respectively, with an applied current density of 5.8 mA/cm² after 120 minutes of electrolysis. For tertiary treatment applications, removal rates for COD and color were over 90%. With low or undetectable concentrations of byproducts during the electrochemical process, the generated electrode has a wide range of applications for pollutant removal in textile wastewater treatment, as well as the possibility for water reuse.

Keywords: ternary mixed metal oxides, electrochemical oxidation, textile wastewater, water reuse.

ASSESSING THE ECONOMIC AND ENVIRONMENTAL IMPACT OF PLASTIC WASTE FROM FISHING GEAR: A SURVEY OF FISHERMEN IN KHANH HOA PROVINCE, VIETNAM

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Abstract

The accumulation of plastic waste from fishing activities is posing an increasing threat to marine ecosystems, contributing significantly to the deterioration of oceanic environments. This waste, comprising nets, lines, and traps, has a significant impact on ecological, economic, and social consequences. The degradation of these materials into microplastics further exacerbates environmental issues. Vietnam, identified as one of the major contributors of marine plastic pollution, lacks comprehensive data on the sources and quantities of plastic waste in coastal areas, particularly regarding plastic originating from fishing activities. The survey was conducted to collect information on the quantities and physical condition of lost, abandoned or discarded fishing nets as well as the socio-economic and socio-cultural context. This research presents findings from a comprehensive survey of 525 fishermen and fishery enterprises in Khanh Hoa province, Vietnam, focusing on four main areas: economic costs associated with fishing gear, the use-phase of fishing nets, end-of-life management practices, and the perceived environmental impacts of discarded or lost fishing gear. The fishermen interviewed represented various fishing methods, including trawl fishing (43,05%), gillnet fishing (25,14%), light fishing for triggerfish (14,1%), purse seine fishing (7,81%), and others (9,9%). The results indicated that the economic burden of replacing and repairing fishing gear varied significantly across fishing methods. Purse seine fishing incurred the lowest gear-related costs, accounting for only 0,72% of the total annual operating costs, while other methods experienced costs exceeding 2%. Key causes of gear loss were identified as bad weather (33,33% for both trawling and light fishing), interactions with wild animals (30,16% for light fishing), entanglement with bottom obstructions (52,45% for trawling), and technical failures (23,91% for seine fishing). The average lifespan of nets also varied greatly among different fishing methods. Purse seine nets had the longest lifespan of 36 months, followed by gillnets (35 months), light fishing nets (25 months), and trawl nets (22 months). After a considerable period of utilisation, old nets are typically sold at a low cost as scrap. In terms of net loss, gillnet fishing recorded the highest annual losses at 130 kg, followed by purse seine fishing (117 kg), while trawling and light fishing experienced lower losses (33 kg and 31 kg, respectively). Material loss was calculated as the sum of additional plastic onshore and on the sea voyage. The majority of fishermen surveyed recognized the environmental risks posed by plastic waste from lost fishing gear, particularly in terms of economic losses, reduced fish stocks, threats to maritime traffic, and impacts on tourism. However, a small minority (8,67%) expressed minimal concern over the environmental consequences of abandoned fishing gear. These findings underscore the need for effective management strategies, including gear recycling programs, improved retrieval systems for lost gear, and increased awareness among the fishing community to mitigate the adverse impacts of plastic waste on marine ecosystems.

Keywords: *fishing gear, economic costs, gear loss, average lifespan, environmental awareness.*

Acknowledgement:

This is part of the result of the REVFIN project within the framework of the Marine Litter Prevention Program of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection of the Federal Republic of Germany (BMUV). The project is implemented by Osfalia University (Germany) in collaboration with Nha Trang University and partners in Vietnam.

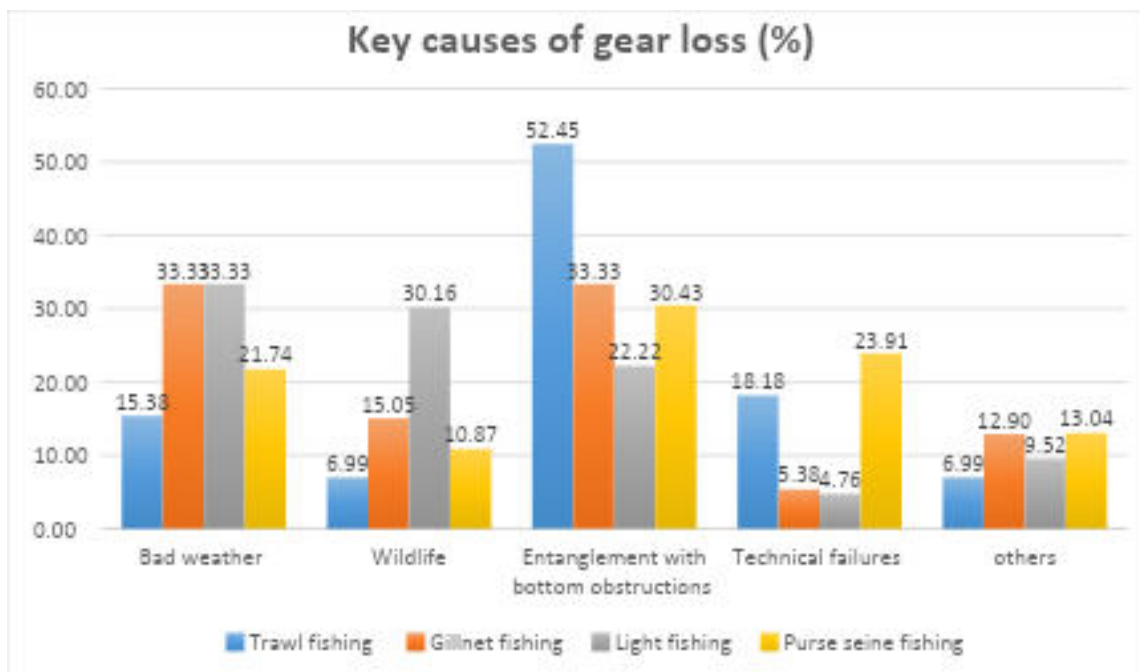


Fig 1. *Main causes of gear loss.*

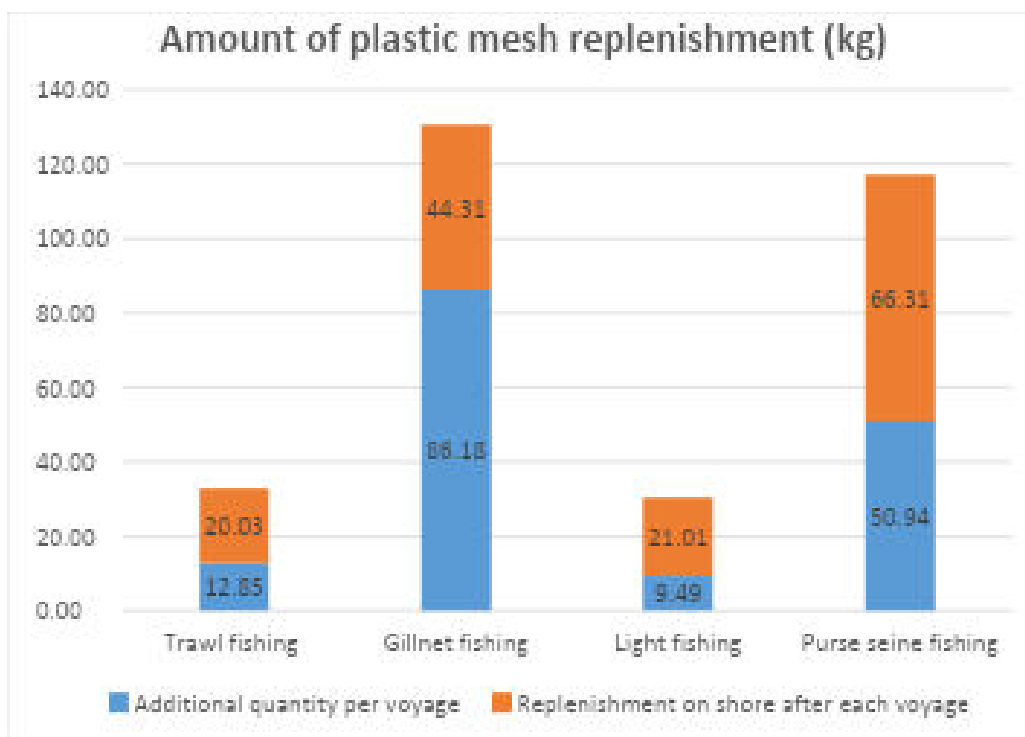


Fig 2. *Annual fishing gear loss by different methods.*

TREATMENT OF PER-/POLYFLUOROALKYL COMPOUNDS (PFAS) IN SURFACE WATER BY ELECTROCHEMICAL FENTON PROCESS

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Abstract

Per-polyfluoroalkyl compounds (PFAS) are of widespread concern because they persist in water and resist conventional treatment processes, which may pose risks to human health and the environment. Therefore, this study focused on investigating the effectiveness of the electro-Fenton (EF) process combined with a Pt cathode and two anodes (Ti/BDD and Ti/IrO₂) to treat 29 PFAS compounds (8 groups) in a simulated wastewater model based on the surface water content evaluated and quantified by liquid chromatography-tandem mass spectrometry (LC/MS-MS). EF is an electrochemical method that generates hydroxyl radicals from the reaction between hydrogen peroxide generated in the solution on the cathode and a heterogeneous Fe₃O₄ catalyst, which can decompose organic pollutants, providing a potential solution for PFAS removal. The effects of operating parameters that directly affect the treatment process, such as electrolysis time, current density, stirring speed, electrolyte, and catalyst concentration, were optimized to find the best PFAS removal conditions. Experimental results showed that the Ti/BDD anode had higher degradation efficiency, optimizing time, materials, and energy consumption than the Ti/IrO₂ anode. The optimal operating conditions at the Ti/BDD anode were: [NaCl] 2 g/L, [Fe₃O₄] 0.5 mM, pH 2.5-3, applied current density 5 mA/cm², stirring speed 200 rpm, electrolysis time 120 minutes removed 86.1-100% of PFAS in water. The optimal operating conditions at the Ti/IrO₂ anode were: [NaCl] 2 g/L, [Fe₃O₄] 1 mM, applied current density 15 mA/cm², pH 3, stirring speed 200 rpm, electrolysis time 180 min, removing 54.5-98.1% PFAS. With low formation and the ability to remove intermediates throughout the process, EF is a viable method for reducing PFAS contamination in surface water, a sustainable and effective alternative to conventional treatment methods.

Keywords: *Electro-Fenton, Per-/polyfluoroalkyl (PFAS), surface water, simulated wastewater, degradation.*

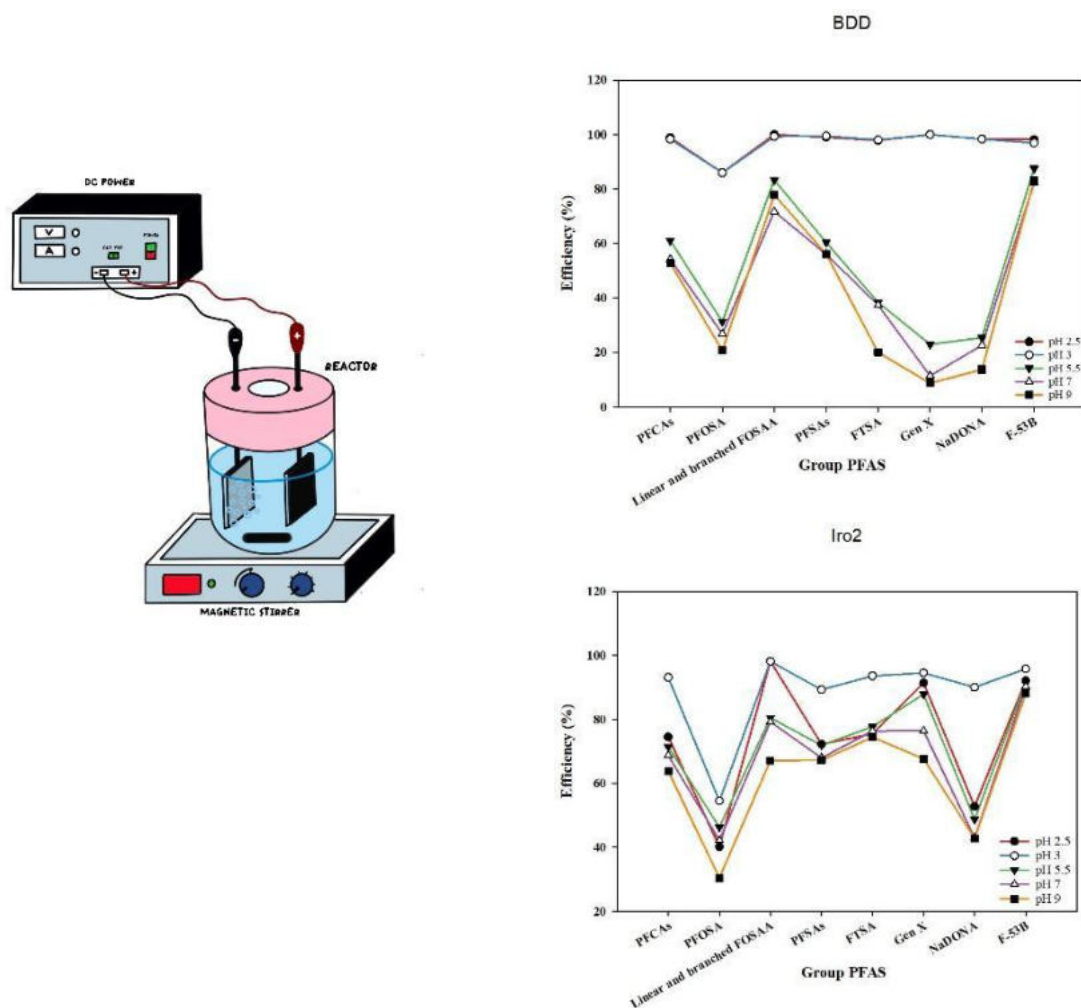


Fig 1. Experimental model of electro-Fenton method and results of two electrodes Ti/BDD and Ti/IrO₂

IMPACT OF BENCHMARKING GLOBAL CLIMATE MODELS ON DYNAMICALLY DOWNSCALED REGIONAL CLIMATE MODEL OUTPUTS

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Abstract

Downscaling global climate models (GCMs) provides crucial, high-resolution data needed for informed decision-making at regional scales. Over Southeast Asia (SEA), observations are sparse and have large uncertainties, complicating GCM selection, especially for rainfall. To guide this selection, we apply a standardised benchmarking framework to select CMIP6 GCMs for dynamical downscaling over SEA, addressing current observational limitations. This framework identifies fit-for-purpose models through a two-step process: (a) selecting models that meet minimum performance requirements in simulating the fundamental characteristics of rainfall (e.g., bias, spatial pattern, annual cycle, and trend) and (b) selecting models from (a) to further assess whether key precipitation drivers (monsoon) and teleconnections from modes of variability are captured [El Niño-Southern-Oscillation (ENSO) and Indian Ocean Dipole (IOD)]. Additional assessment on model independence, data availability, and future climate change spread led to a final selection of two independent groups: EC-Earth3-Veg/EC-Earth3 and ACCESS-CM2/UKESM1-0-L. One model from each group (EC-Earth3-Veg and ACCESS-CM2) is chosen for dynamical downscaling over SEA using the Conformal Cubic Atmospheric Model (CCAM). Following the downscaling process we assess whether the output from the chosen GCM-forced Regional Climate Models (RCMs) meet the performance expectations established during the GCM selection process. We will present these results along with how other RCMs perform when forced with the same GCM.

Keywords: GCMs, RCMs, benchmarking framework, CCAM.

Acknowledgement:

This work was supported by the Australian Research Council (ARC) Grant FT210100459. LVA is also supported by ARC grant CE17010023. The research was undertaken with the assistance of resources and services from the National Computational Infrastructure (NCI), which is supported by the Australian Government.

ASSESSING THE IMPACT OF BIAS CORRECTION OF PRECIPITATION AND TEMPERATURE SIMULATED BY REGIONAL CLIMATE MODELS ON DROUGHT CHARACTERISTICS

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Abstract

In this study, we quantified and compared meteorological drought characteristics derived from the 12-month Standardized Precipitation Evapotranspiration Index (SPEI), calculated using precipitation and temperature data simulated by Regional Climate Models, both with and without bias correction. The experiments were conducted using downscaled data from six model outputs of the Coordinated Regional Climate Downscaling Experiment for Southeast Asia (CORDEX-SEA) for the period 1976 to 2005, with Quantile Mapping (QM) employed as the bias correction (BC) technique. The drought characteristics were examined include frequency, duration, severity, intensity, and geographical extent. The results indicated a wet bias in precipitation and a moderate cold bias in temperature in the uncorrected climate models. These uncorrected models also showed an overestimation of water balance

estimates, likely due to the dominance of the wet bias in precipitation over the cold bias in temperature. After applying QM to model precipitation and temperature, the corrected data for both variables showed significant improvements with minimal biases. Consequently, the water balance estimates were much closer to observed values, demonstrating good alignment. When assessing drought characteristics, the application of QM led to moderate improvements in estimating drought intensity and geographical extent. However, QM only resulted in marginal improvements for drought duration and severity, and did not perform well in reproducing the number of drought events. These findings underscore the limited benefits of bias correction in climate projections for computing drought characteristics in Southeast Asia, which raises important considerations regarding the application of bias correction when projecting future changes in drought conditions.

Keywords: Bias correction, Quantile Mapping, drought characteristics, Regional Climate Models, CORDEX-SEA

Acknowledgement

This research is supported by the Vietnam National University, Hanoi (VNU) under grant no. QG.22.81.

COLLABORATIVE EFFORTS ON CLIMATE MODELLING TO SUPPORT VIETNAM

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Abstract

The primary objective of WISER Asia Pacific is to improve quality, access, and use of weather and climate information services to strengthen the resilience of vulnerable people. As part of this, the UK Met Office and Vietnam Institute of Meteorology Hydrology and Environment (IMHEN) have partnered to produce regional climate modelling (RCM) downscaling experiments within the CORDEX Southeast Asia framework as part of IMHEN's role to produce the "National Climate Change and Sea Level Rise Projections for Vietnam 2025" report. This is required by law every 5 years and is part of Vietnam's contribution to the UNFCCC COPs process. We have downscaled three CMIP6 models using the UK Met Office HadREM3-GA7.05 regional model.

Based on the best-practice framework for sub-selection of CMIP6 model for Euro-CORDEX, we evaluated 24 CMIP6 models for the Southeast Asia CORDEX region based on their performance of the northeast and southwest monsoons and annual cycle of temperature. SST was also considered in the tropical cyclone genesis region and as a driver of variability.

Following on from this evaluation exercise, we ran CMIP6-driven regional climate model experiments, and we will contribute the output to CORDEX SEA, making it available to the wider Southeast Asian climate community and contribute to national climate scenarios. We wish for our downscaling work to complement other work in the region. We finalised our choice of three models to be UKESM1-0-LL, EC-Earth3-Veg and NorESM2-MM. Our initial results suggest that our regional model simulations are consistent with the driving GCMs and work is on going to analyse the output. Given that the model's simulation is based on an assumption, we need to evaluate and bias correction before projecting a future climate. The Met Office and IMHEN will work together to evaluate and propose a reasonable bias technique.

There is increasing recognition of the need for higher resolution climate information particularly over urban areas. We are using the output from the 12km RCM simulations to carry out experimental Convection Permitting Modelling experiments at 4.4km resolution over Vietnam using one CMIP6 GCM (UKESM1-0-LL) for the historical and SSP370 periods. We are representing urban tiles using MORUSES (Met Office-Reading Urban Surface Exchange Scheme). The model domain includes Hanoi, Ho Chi Minh and Bangkok. These runs are still in progress, but we will present our results so far.

To disseminate these climate model projections, we have been collaborating with IMHEN through visiting scientist's placements and science and stakeholder workshops. We also have plans to collaborate on analysis relevant to sector and policy priorities that will also help to identify key areas of concern,

such as agriculture, water resources, and coastal management, which are critical to Vietnam's economy and society, for example the analysis of climate related impacts using the CLIMADA risk tool.

Keywords: climate change, regional climate modelling, CORDEX, climate risk

Acknowledgement

This work is funded by the Weather and Climate Information Services (WISER) Programme. WISER is funded with UK International Development from the UK government and led by the Met Office in the UK.

PROJECTED EXTREME PRECIPITATION BASED ON BIAS-CORRECTED IN CORDEX-SEA 5 KM SIMULATION OVER JAVA ISLAND

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Abstract

This study examines the changes of future precipitation extremes over Java Island, Indonesia utilizing the high-resolution (RCM-5 km) simulation of three downscaled General Circulation Models (GCMs) CMIP5 within the framework of the Coordinated Regional Climate Downscaling Experiment-Southeast Asia (CORDEX-SEA). Model output from three different forcing Global Climate Models (GCMs), including EC-Earth, HadGEM, and MPI is bias-corrected using observation data of MSWEP with the Quantile Delta Mapping (QDM) technique. Bias-corrected dataset was used to calculate four rainfall indices to assess future precipitation extremes including maximum one-day precipitation (RX1day), consecutive dry days (CDD), consecutive dry days (CWD), and extremely wet day rainfall (R99p). Future precipitation over Java is expected to drier than today. Bias-corrected future precipitation is expected to have a less steep decreasing annual rainfall trend than the uncorrected one. Decreasing rainfall of bias-corrected RCM-5km is about -5.29 mm/year for RCP 4.5 and -6.08 mm/year for RCP 8.5. In the future, extreme rainfall potentially exposes western and central part of Java Island. The drier period is potentially longer in the Late Century over eastern Java under the RCP8.5 scenario. Meanwhile, wet period has not changed significantly compared to the historical dataset.

Keywords: QDM technique; GCM; RCM; MSWEP

Acknowledgement

This research is funded by APN through Project CRRP2023-08MY-Cruz of CARE for SEA megacities and SEACLID/ CORDEX SEA project as well as BMKG fund.

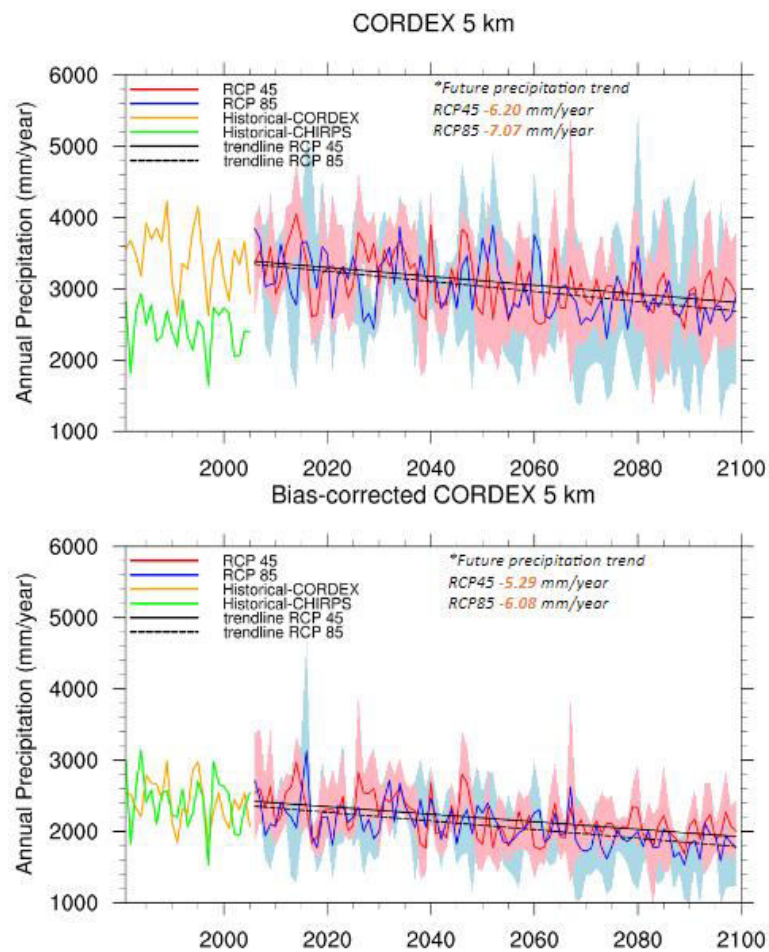


Fig 1. Yearly spatial average rainfall in Java Island from CORDEX ensemble of three GCMs for period 1981-2005 (history) and 2006-2099 (projection)

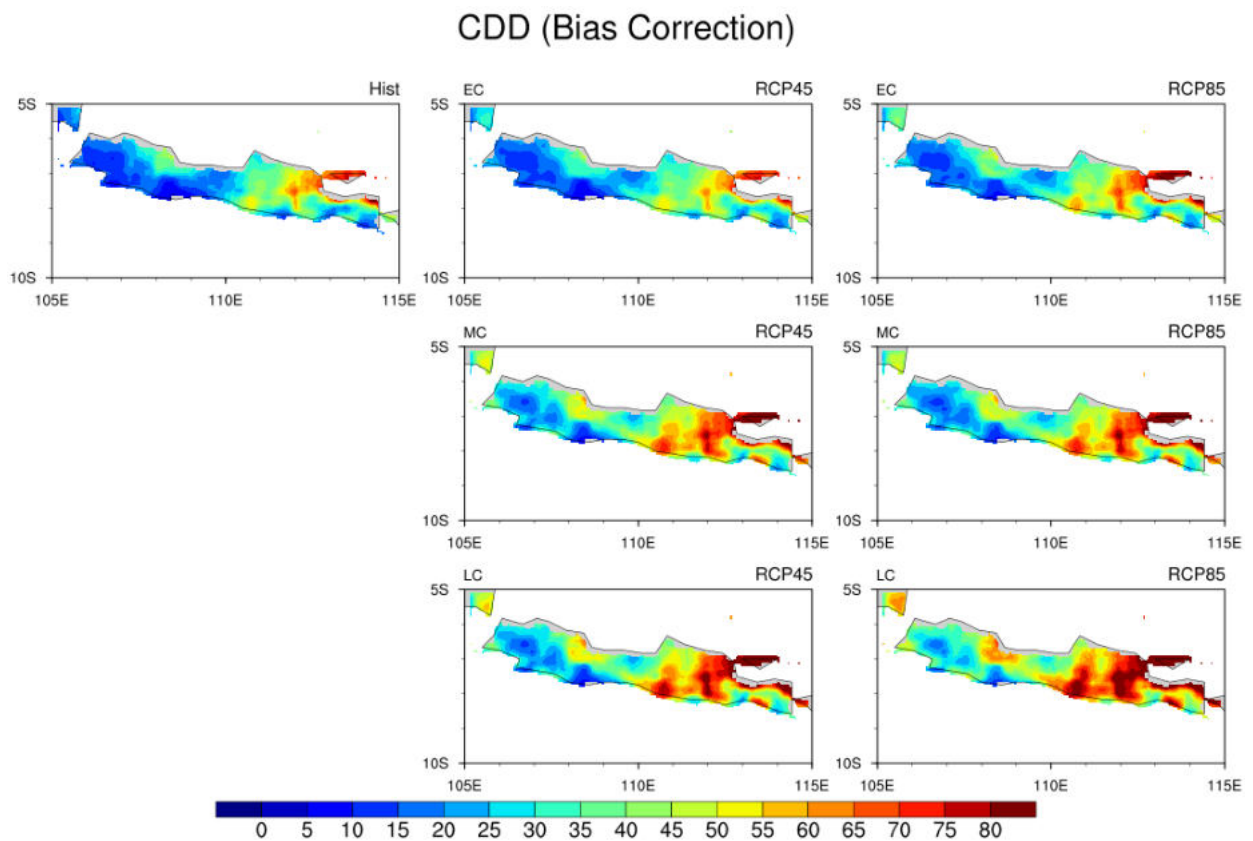


Fig 2. CDD from ensemble of three GCMs for period 1981-2005 (history), Early Century (2011-2040), Middle Century (2041-2070), Late Century (2071-2099).

TOWARD AIR-SEA HIGH RESOLUTION REGIONAL COUPLING TO BETTER UNDERSTAND AND FORECAST THE SOUTHEAST ASIA CLIMATE

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Abstract

South East Asia (SEA) has a unique geographical configuration at the interface between two oceans, comprising a mosaic of basins, straits and more than 22,000 islands. One-tenth of the world's population lives in these coastal regions, which are exposed to a wide range of natural and anthropogenic hazards at multiple scales, in particular related to multiple modes of atmospheric and oceanic variability, from extreme events to global change. SEA also plays a key role in the global climate as a site of intense convective activity and as a transfer zone for the surface branch of the thermohaline circulation between the Pacific and Indian Oceans. The functioning of SEA climate also involves a wide range of air-sea interactions at different scales (typhoons, monsoons, ENSO). This complexity of the SEA climate system makes it one of the most challenging regions to model, both from an atmospheric and oceanic perspective, and to date very few regional coupled models, which are essential to understand and account for the air-sea coupled processes involved in SEA climate, have been implemented in this area.

To improve our understanding of the processes involved in the functioning and variability at different scales of the coupled ocean-atmosphere dynamics of the SEA regional climate system, its role in the global climate and its evolution in response to climate change, we have therefore developed and improved a high-resolution regional ocean-atmosphere coupled model. Several developments have been carried out to optimise the performance of the model.

First, we significantly reduced the spurious numerical mixing often observed in ocean models in regions subject to strong internal tides and the resulting erosion of the salinity profile. To do this, we introduced a new advection scheme into the SYMPHONIE (Marsaleix et al. 2009, Trinh et al. 2024) oceanic model, which now realistically represents the characteristics of the ocean water masses over the area on multiannual scales, in terms of both surface distribution and vertical profiles of temperature and salinity (Figure 1, Garinet et al. 2024). Second, we implemented a coupling between SYMPHONIE and the atmospheric model RegCM (Giorgi et al. 2012), which is widely used by the CORDEX-SEA community (Tangang et al. 2021, Herrmann et al. 2022, Ngo-Duc et al. 2024). Based on the ranking method developed by Desmet and Ngo-Duc (2021), we analysed an ensemble of 36 simulations to optimise the representation of heat fluxes at the air-sea interface, reducing the SST bias observed in the first coupled simulation performed to a much more acceptable bias (Figure 2, Desmet 2024).

We will present the details of those results, and our future projects.

Keywords: *Southeast Asia climate ; regional ocean-atmosphere coupled modeling ; internal tide mixing ; high frequency air-sea interaction*

Acknowledgement:

This study belongs to the framework of LOTUS international joint laboratory (lotus.usth.edu.vn) funded by IRD, and was funded by the CNES research project program TOSCA (SEASTERS project). Numerical simulations were performed using CALMIP HPC facilities (project nos. P13120 and P20055) and the cluster OCCIGEN from the CINES group (project no. DARI A0080110098). The authors would like to thank the SIROCCO service (<https://sirocco.obs-mip.fr/>), coordinated by the Research Infrastructure ILICO (CNRS-IFREMER), for providing the SYMPHONIE code.

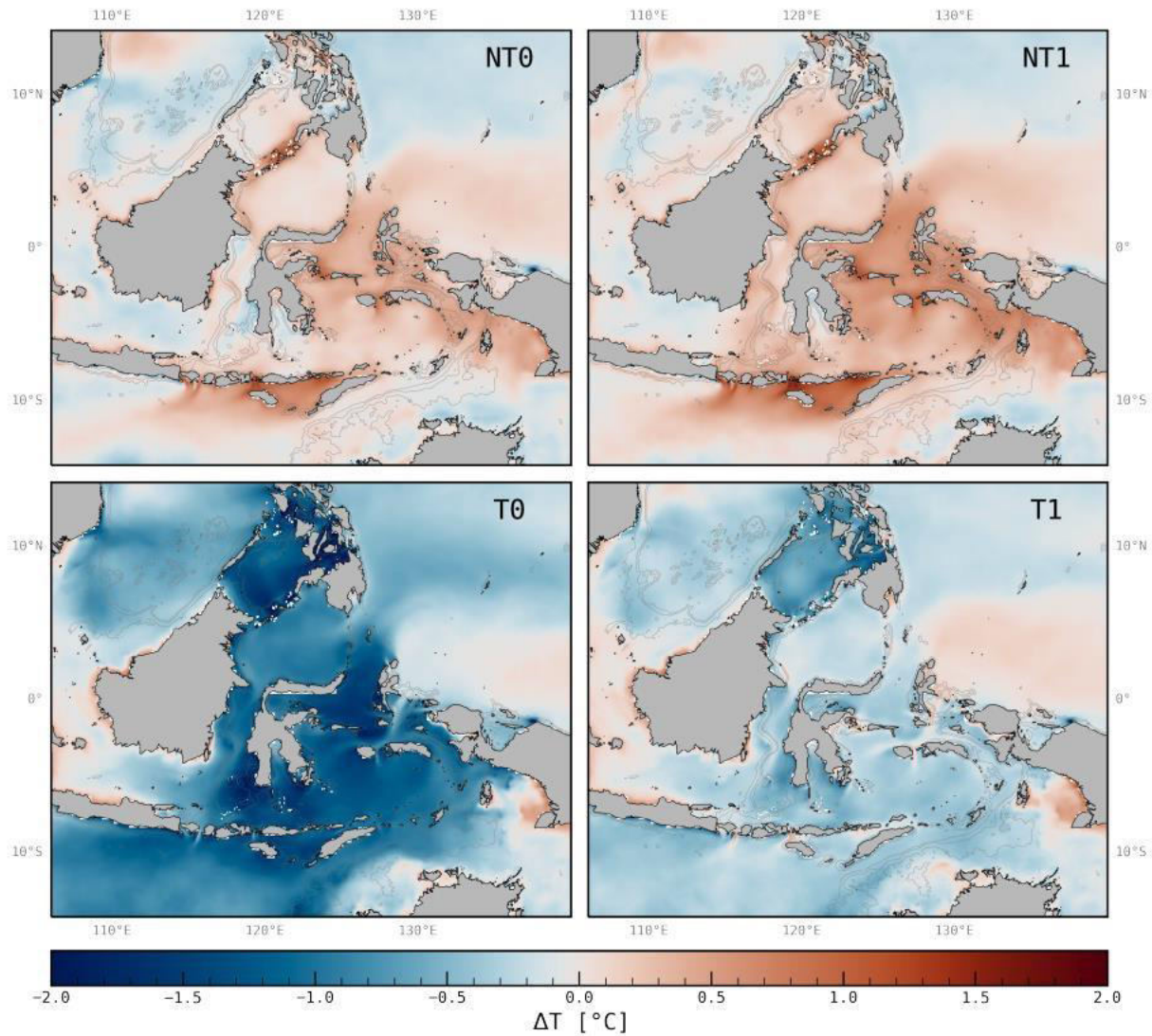


Fig 1. Mean surface temperature bias in the Indonesian Straits region over the period 2017/2018 in different SYMPHONIE simulations performed in the SEA area compared to the OSTIA reanalysis: T0 with explicit tide in the model, without correction of the advection scheme; NT0 without tide, without correction; T1: with tide, with correction; NT1: without tide, with correction. Garinet et al. (2024)

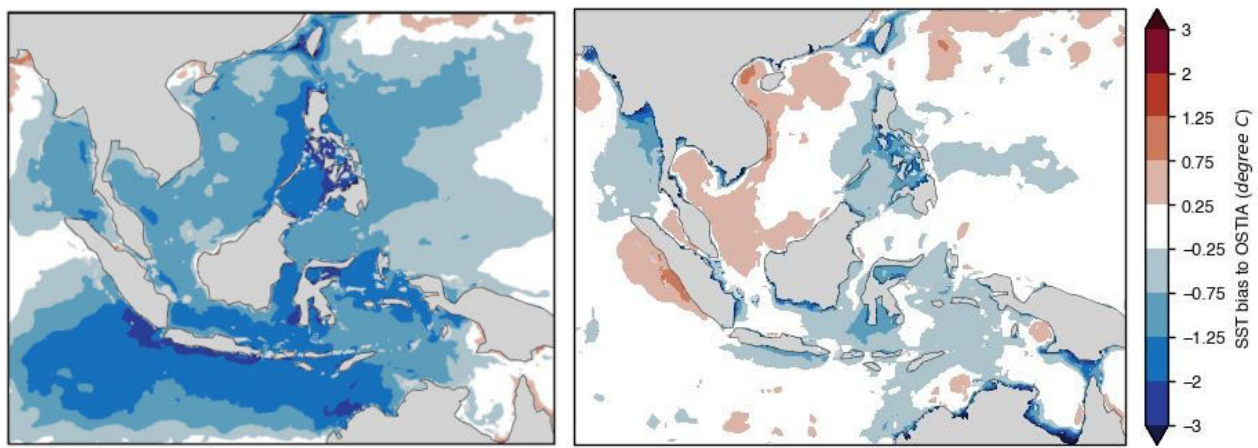


Fig 2. Surface temperature bias over the year 2018 compared to the OSTIA reanalysis in the first coupled simulation performed (left) and in the coupled simulation based on the optimal configuration (right). Desmet (2024). Note the cold bias in very shallow coastal areas.

References

- [1] Desmet, Q.: Exploring the keys to advance air–sea coupled regional modeling for deeper insights into Southeast Asian climate, PhD thesis, Université de Toulouse, 2024.
- [2] Desmet, Q., & Ngo-Duc, T. (2021). A novel method for ranking CMIP6 global climate models over the southeast Asian region. *International Journal of Climatology*, 1– 21. <https://doi.org/10.1002/joc.7234>
- [3] Ngo-Duc, T., Nguyen-Duy, T., Desmet, Q. et al. Performance ranking of multiple CORDEX-SEA sensitivity experiments: towards an optimum choice of physical schemes for RegCM over Southeast Asia. *Clim Dyn* (2024). <https://doi.org/10.1007/s00382-024-07353-5>
- [4] Garinet, A., Herrmann, M., Marsaleix, P., and Pénicaud, J.: Spurious numerical mixing under strong tidal forcing: a case study in the South East Asian Seas using the Symphonie model (v3.1.2), GMD, <https://doi.org/10.5194/egusphere-2024-613>, 2024.
- [5] Giorgi, F. and Coauthors. (2012) RegCM4: model description and preliminary tests over multiple CORDEX domains. *Climate*
- [6] Herrmann, M., Nguyen-Duy, T., Ngo-Duc, T., and Tangang, F. (2022): Climate change impact on sea surface winds in Southeast Asia, *Int. J. Climatol.*, 42, 3571–3595, <https://doi.org/10.1002/JOC.7433>
- [7] Marsaleix, P., Auclair, F., Floor, J. W., Herrmann, M. J., Estournel, C., Pairaud, I., and Ulses, C.: Energy conservation issues in sigma-coordinate free-surface ocean models, *Ocean Model.*, 20, 6189, <https://doi.org/10.1016/j.ocemod.2007.07.005>, 2008.
- [8] Tangang, F., J.X. Chung, F. Cruz, Supari, S.T. Ngai, E. Salimun, F. Cruz, G. Narisma, T. NgoDuc, J. Santisirisomboon, L. Juneng, A. Spaheluwakan, M.F. Akhir, M.S.F. Mohd, 2021: Progress in Climate Change Downscaling Simulations in Southeast Asia. Springer book chapter in "Climate Resilience and Environmental Sustainability Approaches – Global Lessons and local Challenges" (edited by A. Kaushik, C.P. Kausick, and S.D. Attri), Springer, 12–36.
- [9] Trinh, N. B., Herrmann, M., Ulses, C., Marsaleix, P., Duhaut, T., To Duy, T., Estournel, C., and Shearman, R. K. (2024). New insights into the South China Sea throughflow and water budget seasonal cycle: evaluation and analysis of a high-resolution configuration of the ocean model SYMPHONIE version 2.4, *Geosci. Model Dev.*, 17, 1831–1867, <https://doi.org/10.5194/gmd-171831-2024>.

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Abstract

Cultivation of soils is a driver of climate change, and at the same time agricultural soils suffer from climate change in most regions worldwide. Increasing the organic carbon stocks in soils is not only an opportunity to mitigate climate change, but also to increase the resilience of agricultural soils to climatic extremes. In this presentation, I will highlight state-of-the art aspects of humus formation and, based on that, discuss general options to increase organic carbon stocks in agricultural soils. Detailed examples will emphasize the role of biodiversity (example cover crops) and an agricultural system approach (example agroforestry) for organic carbon management in agricultural soils. Finally, these findings on agricultural soils will be related soil carbon feedback to climate change in soils in general."

UNLOCKING COLONIAL-ERA WEATHER DATA FROM INDOCHINA: A KEY TO UNDERSTANDING CLIMATE CHANGE IN SOUTHEAST ASIA

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Abstract

The aim of this paper is to present a new database containing all the meteorological observations made in Indochina since the end of the 19th century that we have managed to assemble as part of the GEMMES Vietnam 2 research program on the resilience of Vietnamese society to climate change and energetical transition. These observations cover the colonial period *stricto sensu* from 1859 to 1954, and go even further back to 1973 (for the weather stations in southern Vietnam). Having scored numerous archives to acquire these data, we will draw up a comprehensive inventory of the corpus thus constituted, and discuss the quality of the meteorological observations it contains.

This database addresses a significant gap of Vietnam historical data assimilated in global reanalysis datasets, which have led to inaccurate representations of Vietnam's weather and climate conditions during this period, particularly extreme events. By providing a robust foundation for historical climatological investigations, our database enhances the credibility of assessments on weather and climate conditions in Vietnam and Southeast Asia. This work has the potential to improve our understanding of climate change impacts in the region and inform more effective adaptation strategies.

Keywords: *Climate data rescue, Climate history, Vietnam climatology*

Acknowledgement:

This research is funded by the French Agency for Development (AFD), within the framework of GEMMES VIETNAM 2 program

MANGROVE FLORA IN THE COASTAL MUNICIPALITIES OF SULTAN KUDARAT PROVINCE, PHILIPPINES

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Abstract

Mangroves play vital role for ecological balance. It provides human the fresh air to breath and protects from threat of typhoons and tsunami. Mangrove also serves as the breeding ground of various species of fish and other aquatic organisms. This study aimed to provide a systematic and scientific recording of the mangrove species in the Southern part of the Philippines. Using a descriptive research design, the prevailing mangrove flora in the coastal municipalities of Sultan Kudarat Province, Philippines was identified and documented. It was conducted in three sampling sites in the municipalities of Kalamansig, Lebak and Palimbang, Sultan Kudarat. Results of the study revealed that there were thirty – one (31) species of mangroves identified; of which twenty-four (24) species were present in Kalamansig, thirty (30) species in Lebak and twenty (20) species in Palimbang belonging to fifteen (15) genera and fourteen (14) families.

Keywords: mangrove, coastal areas, environment, Southern Philippines, sustainable development

Acknowledgement:

This study was funded by the Department of Science and Technology, Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) under the Forest and Environment Research Division (FERD) in cooperation with the Department of Environment and Natural Resources (DENR), Local Government Units through its Municipal Environment and Natural Resources Office (MENRO) of Kalamansig, Lebak and Palimbang, Sultan Kudarat. The authors also acknowledged Mr Arnold Astrolabio for his guidance during the reconnaissance survey and collection of mangrove samples.

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Abstract

Sea cucumbers, such as *Holothuria atra*, play an important role in marine ecosystems. This species is a deposit feeder which inhabits shallow coastal environments. They capture pathogenic bacteria from the sediment due to their feeding process. Thus, the skin and gut microbiota of this species are of interest due to their potential impact on health and ecological interactions. Antibiotic-resistant microbiota of marine organisms may risk human health and aquatic life. This study aimed to determine the antibiotic resistance of bacteria isolated from *H. atra*. Eight bacterial isolates were obtained from the skin, and six were isolated from the gut. The antibiotic susceptibility of the isolated bacteria was assessed using the broth microdilution method against five commercially available antibiotics: erythromycin, clindamycin, ampicillin, amoxicillin, and tetracycline. The results of this study revealed the occurrence of antibiotic-resistant bacteria in both the skin and gut of *H. atra*, with two isolates from the gut showing resistance to all five antibiotics used. Moreover, two isolates from the skin of the sea cucumber were resistant to four of the five antibiotics examined. This suggests that antibiotic resistance is an emerging concern in marine environments and underscores the need for further research on the ecological and health implications of these findings.

Keywords: Antibiotic resistance, *Holothuria atra*, sea cucumber

Acknowledgement:

Department of Science and Mathematics-Accelerated Science and Technology Human Resource Development Program for funding this research.

WATER QUALITY AND ALGAL BIODIVERSITY IN HÒA BÌNH RESERVOIR: EUTROPHICATION MANAGEMENT

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Abstract

The Hòa Bình Reservoir, Vietnam's largest artificial freshwater lake, is vital for hydropower generation, water regulation, domestic supply, and aquaculture. However, increasing nutrient pollution, primarily from agricultural runoff, wastewater discharge, and aquaculture activities, threatens the water quality and leads to potential eutrophication. This study aims to assess the current status of water quality and phytoplankton diversity in the reservoir, identify areas at risk of eutrophication, and propose preventive measures to mitigate nutrient pollution.

Water samples were collected from 34 points across the reservoir, including near the dam and upstream near the Đà River inflow. Key water quality parameters such as pH, water clarity (Secchi disk, SD), total suspended solids (TSS), dissolved oxygen (DO), biochemical oxygen demand (BOD₅), chemical oxygen demand (COD), and nutrients (nitrate, nitrite, phosphate) were measured. Phytoplankton diversity was assessed using species identification and biodiversity indices, including the Shannon-Weiner and Margalef indices. The results indicated that some areas, particularly near the dam, tourist hotspots, and near inflow, showed signs of nutrient enrichment and increased eutrophication risk. pH ranged from 7.3 to 8.3, favorable for algal growth. TSS concentrations varied from 3 to 74 mg/L, with higher levels near agricultural runoff areas. DO levels ranged from 5.8 to 6.3 mg/L, but elevated BOD₅ (up to 13.5 mg/L) and COD (up to 18.9 mg/L) suggested organic pollution that could deplete oxygen in the future. Nitrate concentrations ranged from 0.027 to 0.880 mg/L and phosphate from 0.012 to 0.035 mg/L, contributing to eutrophication risk. Phytoplankton diversity showed moderate richness, with Shannon-Weiner values ranging from 1.5 to 3.2 and Margalef values from 1.1 to 2.3. Notably, picophytoplankton, particularly from the RedNano algae group, dominated in most samples, especially in areas with higher nutrient levels. These small algae thrive in nutrient-rich conditions, serving as early indicators of eutrophication and posing a risk of disrupting the ecological balance. Cage aquaculture, a significant industry in the reservoir, contributed notably to localized nutrient pollution. Waste from fish farms, especially in areas with limited water flow, resulted in nutrient hotspots, increasing the risk of eutrophication near aquaculture zones. The extent of nutrient dispersion depended on water circulation around the farms. Despite these localized risks, several areas showed moderate nutrient levels and lower eutrophication risks. However, these areas remain vulnerable to future nutrient inputs. Preventive measures such as improving wastewater treatment, controlling agricultural runoff, and regulating aquaculture practices are necessary to prevent further eutrophication.

In conclusion, the study revealed that some regions of the Hòa Bình Reservoir, particularly near aquaculture zones, are at higher risk of eutrophication, while others show lower risk levels. However, without proactive management, the entire reservoir could face ecological challenges in the future.

Nutrient management, enhanced monitoring, and better aquaculture practices are crucial to preserving the reservoir's environmental health and ensuring sustainable water use.

Keywords: *Water quality, Algal biodiversity, Eutrophication, Sustainable aquaculture, Hòa Bình Reservoir*

Acknowledgement:

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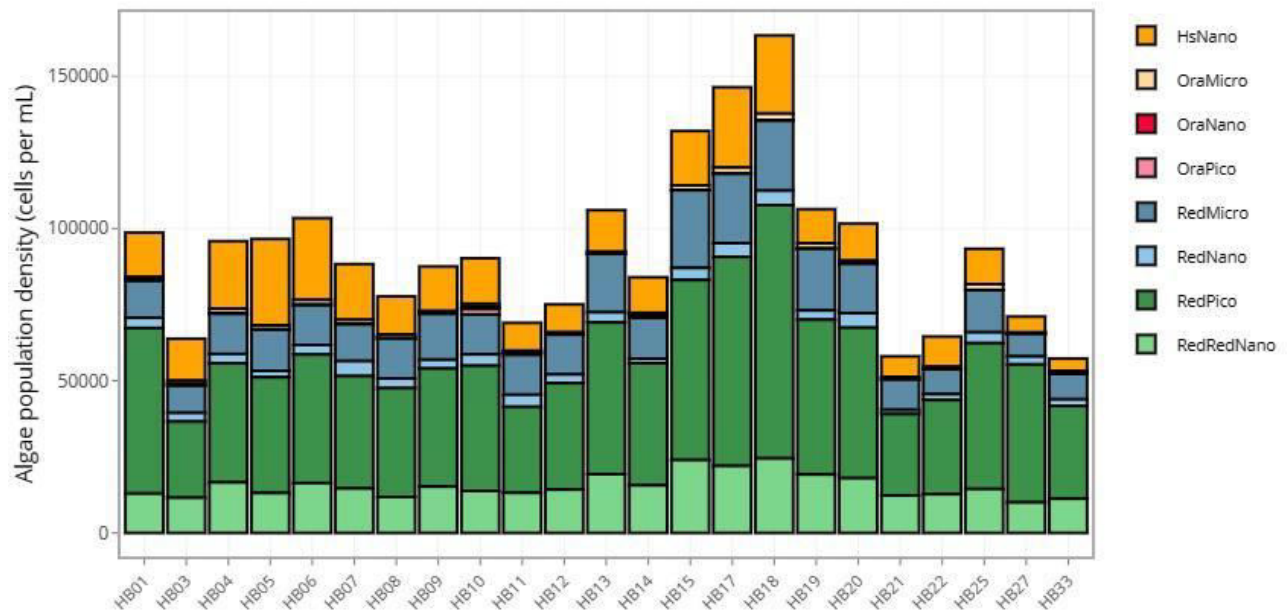


Fig.1. *Algae biodiversity in Hoa Binh Lake (sampling in July, 2023)*

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Abstract

Marine biodiversity is unusually high in the archipelagos of south-east Asia. Indonesia, Papua New Guinea and the Philippines cover more than 90% of the Coral Triangle's surface area, and the Philippines is the center for species diversity of marine fishes. The present study contributes to the growing knowledge of marine fish biodiversity in the Philippines by reporting fish species for the first time and providing information about their biogeographic distributions and range extensions. Local fish markets in Davao City, Panabo City and Tagum City along the coast of the Davao Gulf, in Southern Mindanao, Philippines were regularly visited between May 2017 and June 2020. Fresh fishes were purchased, and meristic counts and morphometric measurements were determined. Subsequently, specimens were preserved and added to the collection of the research museum of the Davao del Norte State College. Thirty-one individuals of seven Perciform and one Tetraodontiform fish species were reported from the Davao Gulf constituting new records for the Philippines namely: *Bodianus leucostictus* (9 individuals); *Bodianus masudai* (3); *Parascolopsis melanophrys* (2); *Pristigenys meyeri* (2); *Odontanthias chrysostictus* (6); *Odontanthias randalli* (5); *Liopropoma latifasciatum* (3); and *Thamnaconus multilineatus* (1). Large range extensions were found for *P. melanophrys*, *O. chrysostictus*, *O. randalli* and *T. multilineatus*. The individuals of *P. melanophrys* are the third and fourth ever-reported individuals of this extremely rare dwarf monocle bream. A new maximum SL of 126 mm was reported for *O. chrysostictus*. Additionally, we recently observed individuals of five rare fish species, the *Brachistegus satoi*, *Bodianus rubrisos*, *Bodianus izuensis*, *Odontanthias borbonius* and *Prestigenys nipponia*. The *Brachistegus satoi* is endemic to the Philippines. The current observations extend our knowledge of marine fishes in the Philippines and the unusually high marine biodiversity in this region. As all recorded species are considered inhabitants of mesophotic coral ecosystems, these observations also confirm that fishing pressure has extended in these deeper habitats.

Keywords: mesophotic, rare, marine biodiversity, Davao Gulf

Acknowledgement:

We are grateful to the funding support of the Davao del Norte State College through the Marine Biodiversity Museum Project.

SYSTEMATICS AND DIVERSITY FRESHWATER CRABS OF GENUS ISOLAPOTAMON BOTT, 1968 (BRACHYURA, POTAMIDAE) OF MINDANAO ISLAND, PHILIPPINES

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Abstract

The freshwater crab genus *Isolapotamon* Bott, 1968 is represented in the Philippines by five endemic species that are poorly known from a limited number of specimens collected from a handful of localities in the island of Mindanao. In the present study, an increase in the number of specimens collected from new localities across the island provides a clearer perspective of their taxonomy and distribution. Crabs were collected from 32 additional localities in Mindanao. Morphological, molecular, and biogeographical characters served as underlying evidence to elucidate the systematics and biogeography of these species. The morphology of the collected specimens was examined in detail and compared to the available type material deposited in natural history museums in the Philippines, Japan, and Singapore, as well as comprehensive collection of published illustrations and descriptions. Partial sequences of the COI gene (313 bp) were obtained from 190 specimens and used to construct haplotype networks and determine pairwise distances. As freshwater crabs are stenotopic and known to show high local endemism, point localities were superimposed on a map of the major river basins to better understand the distribution of *Isolapotamon* spp. and help resolve identification issues. The results of this study bring greater clarity to the geographic distribution of the five species of *Isolapotamon* in Mindanao, and make use of additional taxonomic characters to better delineate taxa. In addition, one new species has been discovered and is in the process of being described. This study serves as a bigger step in understanding the alpha taxonomy and systematics of freshwater crabs in the Philippines. Furthermore, extensive sampling in the unexplored freshwater systems in Mindanao is expected to increase the discovery of new taxa, as well as provide useful data for the conservation of these endemic crabs.

Keywords: endemic species, freshwater system, Mindanao Island, river basin

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Abstract

The ERA5 reanalysis dataset, while widely used, often lacks the resolution needed for fine-scale applications. In this study, we dynamically downscaled ERA5 precipitation using the WRF model to produce 2-km resolution precipitation data for Ho Chi Minh City. The model outputs were corrected using quantile mapping, with rain gauge data used for calibration and validation. Data from 2000 to 2009 served as the training set, while data from 2010 to 2016 was used for validation. The results indicate that on a monthly scale, though WRF shows better performances in some stations, overall, ERA5 outperforms the other datasets considered. However, on a daily scale, category assessments show that WRF significantly enhances accuracy, especially by better modeling dry events. Seasonal probability density function analysis reveals that ERA5 strongly overestimates light rain events, while WRF reduces these overestimations. For moderate and heavy rain events (>20mm/day), ERA5 underestimates the number of occurrences, whereas WRF performs better. Lastly, in assessing extreme climate indices, ERA5 and ERA5-LAND overestimate wet days (leading to higher Consecutive Wet Days values) while underestimating heavy rain events (resulting in lower Rx1day and Rx5day values). This combination leads to an underestimation of the Simple Daily Intensity Index. Compared to ERA5, WRF shows improved performance by reducing the number of wet days and increasing Rx1day. Nonetheless, some biases remain, indicating a need for further refinement in future studies.

Keywords: ERA5 downscaling, WRF, Ho Chi Minh city, precipitation

Acknowledgement:

This work was supported by the Wellcome Trust [grant number 226052/Z/22/Z]. This work is a contribution to the DART project (<https://www.dartdengue.org>).

EVALUATION THE HIGH-RESOLUTION DYNAMICAL CLIMATE MODEL SIMULATIONS FOR VIETNAM WITH CMIP6-GCM DRIVEN DATA AND PROPOSING REASONABLE BIAS-CORRECTION METHODS FOR NATIONAL CLIMATE CHANGES PROJECTION 2025

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¹IMHEN, Vietnam

Abstract

This study evaluates the high-resolution dynamical climate model (RCM) simulations for Vietnam, with the objective of developing climate change and sea-level rise scenarios for the country by 2025. The high-resolution RCMs simulations with GCM-CMIP6 data driven with Shared Socioeconomic Pathways (SSPs) over Southeast Asia, including Vietnam. These models were derived from the CORDEX-SEA community (including RegCM-CNRM-ESM2-1 E1, RegCM-CNRM-ESM2-1 E16, RegCM-MPI-ESM1-2HR, and RegCM-NorESM2-MM) and the Met Office (including HadREM3-GA7-EC-Earth3-Veg, HadREM3-GA7-NorESM2-MM, and HadREM3-GA7-UKESM1-0-LL). A spatial bias-correction methodology was applied to future temperature and precipitation projections, which were subsequently compared to gridded observational data of Vietnam (Ngo Duc Thanh et al, 2024). Results indicates the QM-Gamma, CDFt, and R2D2 bias- correction the consistent outcomes for temperature; however, for precipitation, QM-Gamma is particularly effective in Northern Vietnam, while CDFt performs well in the Central Highlands. In contrast, R2D2 shows not much significant improvement relative to uncorrected data. The further analysis should be carried out for 7 sub-climatic regions and for detailed rainy/dry season as well as multivariate bias-correction methods to improve the model accuracy.

WHY THE EL NIÑO–EAST ASIAN SUMMER MONSOON RELATIONSHIP STRONGEST DURING THE COMBINATION OF THE POSITIVE PHASE OF PDO AND NEGATIVE PHASE OF THE VICTORIA MODE?

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Abstract

The El Niño–Southern Oscillation (ENSO) is a key predictor of the East Asian summer monsoon (EASM). However, the ENSO–EASM relationship is unstable, making EASM predictions challenging. Various dominant climate modes, such as the Pacific Decadal Oscillation (PDO) and Victoria Mode (VM)—the primary and secondary modes of North Pacific sea surface temperature (SST) variability—may contribute to this instability. This study investigates how the relationship between winter ENSO and the following EASM changes depending on the phases of the PDO and VM, considering whether ENSO was in the El Niño or La Niña phase. Both reanalysis and coupled general circulation model ensemble simulations indicate that a positive PDO and negative VM together (*pPDO_nVM*) leads to the strongest negative ENSO–EASM relationship.

During *pPDO_nVM*, a significant El Niño fingerprint persists through the following summer, characterized by anomalous western North Pacific (WNP) anticyclonic circulation (WNPAC). To the southeast and east of the WNPAC, the SST is cooled by the cold SSTA intrusion and the anomalous northeasterlies, thereby increase evaporation and entrainment cooling. This in situ cooling reduces deep convection on the southeastern side of the WNPAC. In turn, the reduced convective heating triggers westward–propagating atmospheric Rossby waves that reinforce the WNPAC in their westward decaying journey. Additionally, easterly wind anomalies associated with the WNPAC over the equatorial western Pacific extend into northern Indian Ocean, decelerating the prevailing monsoonal westerlies, increasing downward solar radiation and reducing evaporation cooling, leading to warming north Indian Ocean. In turn, warm SSTA and enhanced precipitation in northern Indian Ocean excite an atmospheric equatorial Kelvin wave to support the WNPAC via low-level Ekman divergence. This coupling provides positive thermodynamic feedback between the WPAC and underlying SST dipole anomaly in the Indo-Pacific warm pool, which maintains it to the El Niño decaying summer (Fig. 1).

Keywords: *El Niño, East Asian summer monsoon, PDO, the Victoria mode, atmosphere–ocean interaction.*

Acknowledgement:

This study is supported by the Vietnam National Foundation for Science and Technology Development (NAFOSTED) under Grant 105.06-2021.14.

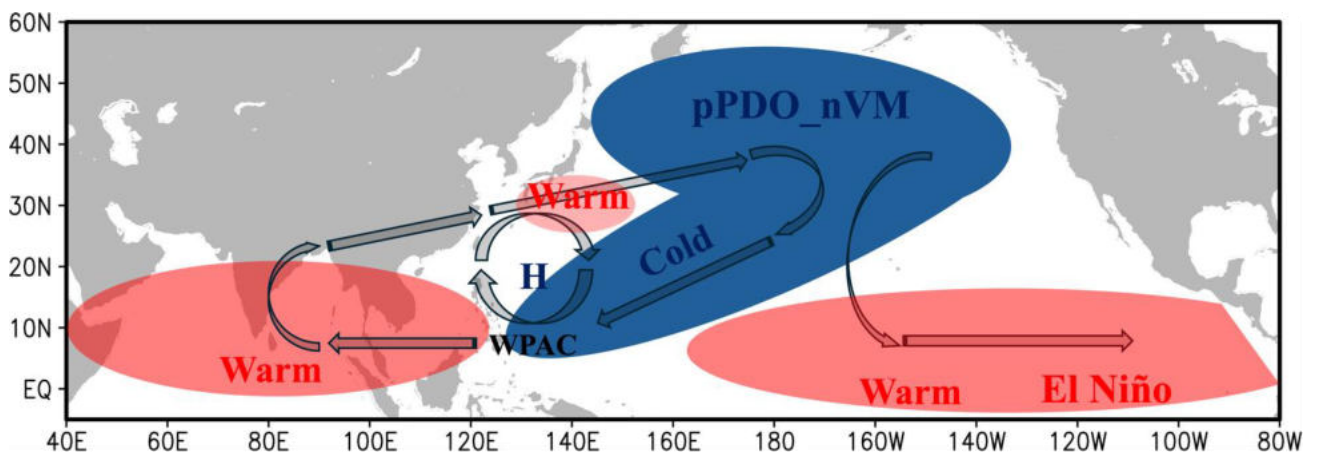


Fig 1. Schematic diagram illustrating underlying mechanisms of the strongest negative impacts of winter El Niño on the following EASM during the pPDO_nVM phase. The diagram shows the anomalous winds and SSTA patterns associated with pPDO_nVM, maintaining the WPAC in the summer JJA(0) through the inter-basin atmosphere–ocean interaction across the Indo-Pacific warm pool. This, in turn, strengthens the negative correlation between EASM and preceding winter El Niño during the pPDO_nVM phase. The arrows represent the anomalous winds. The red (blue) color denotes the warm (cold) SSTA.

CHANGES IN TEMPERATURE EXTREMES IN VIETNAM AT PROGRESSIVE GLOBAL WARMING LEVELS FROM 1.5°C TO 4°C

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Abstract

This study highlights concerning projections for temperature extremes across Vietnam under various global warming levels (GWLs) using high-resolution CMIP6 climate models. Even under the ambitious 1.5°C GWL scenario, Vietnam faces significant increases in the intensity, frequency, and duration of heat extremes, with the situation worsening as temperatures rise. Key findings include the potential for hottest days to increase by up to 3.35°C and warmest nights by up to 3.38°C above the 1995-2014 baseline at 4°C GWL, substantially exceeding the projected 2.24°C mean warming. The frequency of warm days may increase by up to 360% and warm nights by up to 500% nationally at 4°C GWL, notable regional differences. In northern Vietnam, summer could last 40-80 days longer each year, while southern areas may experience heatwaves for over 200 days. Models suggest that global temperatures will surpass the 1.5°C mark by the late 2020s, with the 2°C level exceeded between 2039-2048 across scenarios. These findings underscore the urgent need for targeted adaptation and mitigation strategies in Vietnam, highlighting that even small increases in global temperature can lead to disproportionately large impacts on local climate extremes and emphasizing the critical importance of meeting the Paris Agreement targets.

Keywords: *Global warming level, temperature extreme, CMIP6-VN, Paris Agreement, Vietnam*

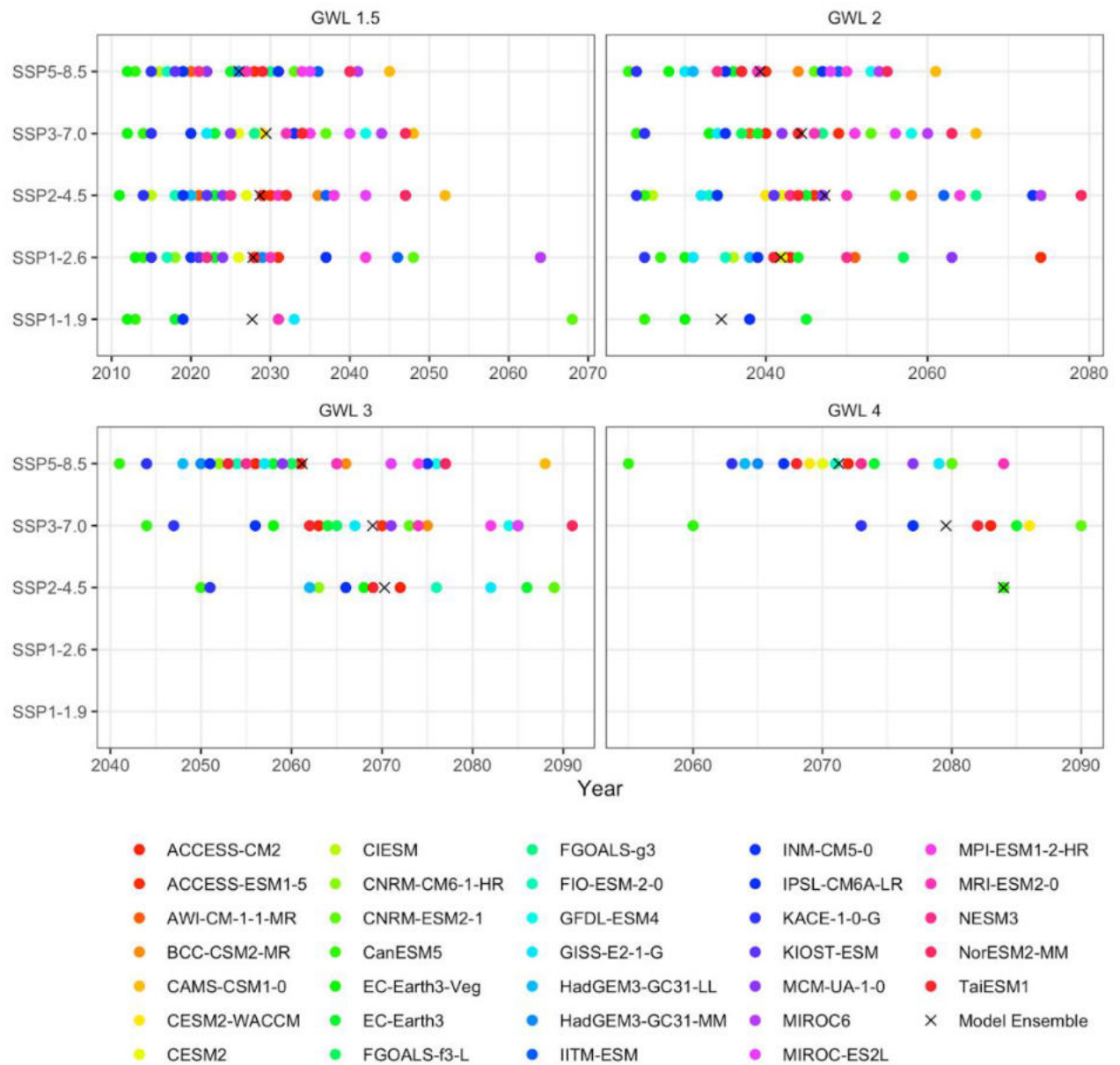


Fig 1. Projected years when GMST crosses 1.5°C, 2°C, 3°C, and 4°C thresholds by 33 CMIP6 models under scenarios SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5. Solid black diamonds represent the MME crossing times for each threshold.



Fig 2. Spatial patterns of projected changes in 21-year mean TXx, TXn, TNx and TNn over Vietnam under different GWLs by MSMME. Left panels show absolute projected temperature at each GWL, and right panels show their corresponding anomalies relative to the 1995–2014 baseline period. Dotted areas highlight regions where the SNR exceeds 1, indicating higher model agreement.

A COMPARATIVE STUDY ON THE COMBINED EFFECTS OF COVID-19 AND METEOROLOGICAL FACTORS ON PM_{2.5} REDUCTION IN HO CHI MINH CITY, VIETNAM: ANALYSIS OF 2016–2019 VERSUS 2020–2021

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Abstract

The COVID-19 restrictions implemented during 2020–2021 may have contributed to a decrease in fine particulate matter (PM_{2.5}) concentrations in Ho Chi Minh City (HCMC), one of Vietnam's most air-polluted cities. This study aimed to compare PM_{2.5} levels during the COVID-19 period (2020–2021) with short-term trends observed from 2016 to 2019, considering meteorological conditions. Five fixed locations were monitored using low-cost particulate matter sensors (Purple Air sensors) across urban districts of HCMC from December 2019 to March 2021. Additionally, hourly PM_{2.5} data from the U.S. Consulate General HCMC and meteorological variables (wind speed, wind direction, air temperature, and relative humidity) from Tan Son Nhat International Airport (2016–2021) were analyzed. PM_{2.5} levels during the COVID-19 period were 18% lower than the 2016–2019 average, though nearly half of the days still exceeded the World Health Organization's standard of 15 µg/m³. Besides the impact of COVID-19 restrictions, meteorological factors such as the rainy season and west-south-west monsoon winds also contributed to the PM_{2.5} reduction. Wind speed and air temperature were significant contributors in Bayesian multiple linear regression models. In conclusion, the substantial reduction in PM_{2.5} during the COVID-19 pandemic offered valuable insights into air quality in HCMC, providing a benchmark for future studies.

Keywords: Air pollution, Coronavirus, Weather conditions, Low-cost sensors, Bayesian.

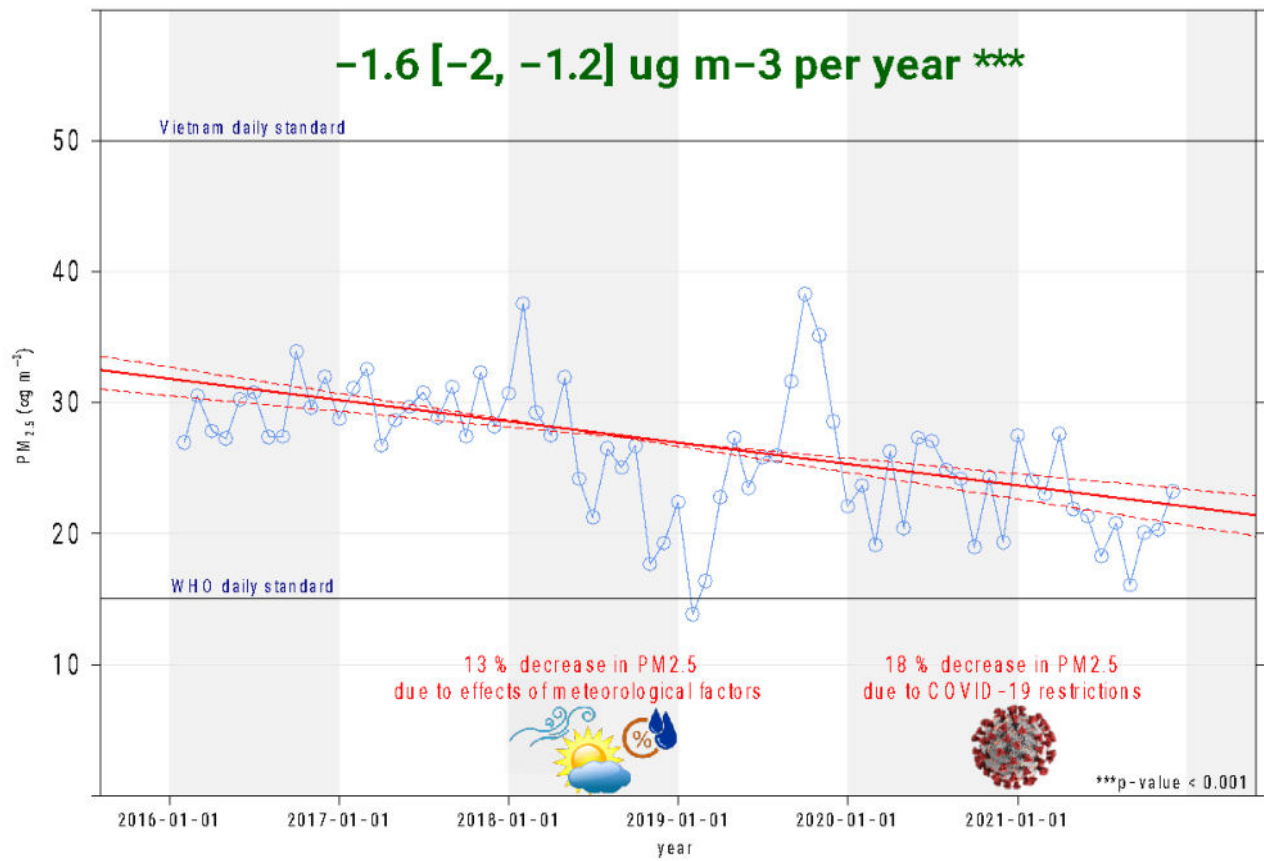


Fig 1. Trends in PM_{2.5} Reduction from 2016 to 2021 in Ho Chi Minh City, Vietnam: The Combined Influence of COVID-19 and Meteorological Factors.

PRELIMINARY STUDY OF LAND SURFACE PHYSICS-BASED DOWNSCALING OF GREATER JAKARTA FOR APRIL 2024

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Abstract

This study investigates the land surface physics-based downscaling for the Greater Jakarta region, focusing on April 2024, utilizing the High-Resolution Land Data Assimilation System (HRLDAS). The research employs HRLDAS to analyze land surface parameters at three distinct spatial resolutions: 2 km, 1 km, and 0.5 km. By leveraging these resolutions, the study aims to enhance the precision of land surface characterization in a rapidly urbanizing area. The downscaling approach involves calibrating HRLDAS outputs to capture fine-scale variations in land surface properties and to assess their implications for local climate and environmental management. In this study, a comparison of the model output results with observation data in the region will also be carried out. Key findings reveal significant improvements in the spatial representation of land surface features and variability at higher resolutions, which are critical for effective urban planning and resource management. The results underscore the importance of resolution in capturing detailed land surface dynamics and provide valuable insights for future studies and applications in high-density metropolitan regions.

Keywords: land surface physics-based downscaling, HRLDAS, Greater Jakarta.

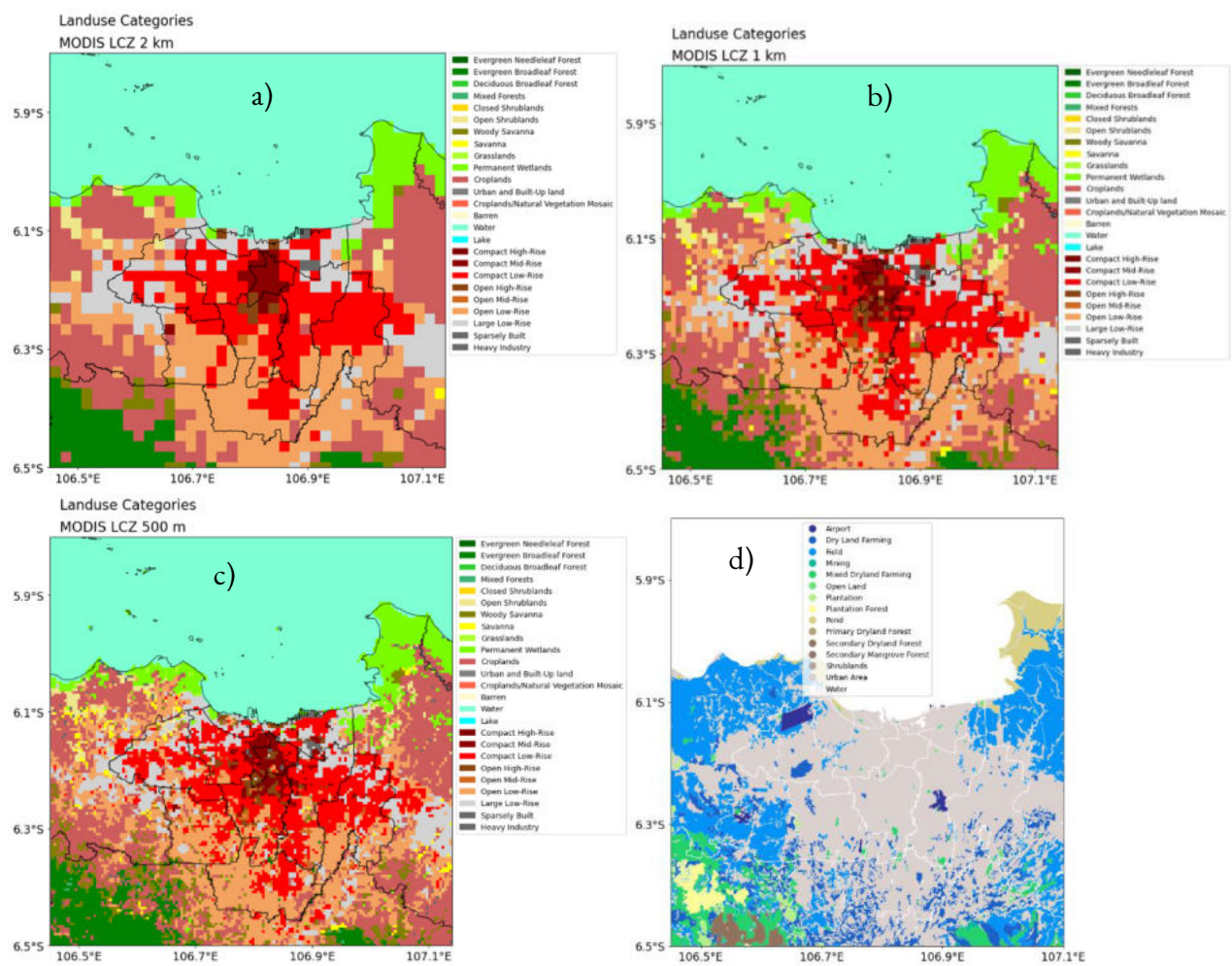


Fig 1. Landuse categories from cglc modis LCZ of (a) 2 km, (b) 1 km and (c) 0.5 km spatial resolution, also (d) Landuse categories from Enviromental Ministry 2010

ENHANCING CLIMATE PROJECTIONS FOR SOUTHEAST ASIAN MEGACITIES USING CITY-SCALE URBAN MODELING: PRELIMINARY RESULTS FROM HANOI, VIETNAM

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Abstract

As part of project entitled “Climatic hazard Assessment to enhance Resilience against climate Extreme of Southeast Asian megacities” (CARE for megacities), this study establishes a city-scale climate modeling system by integrating up-to-date urban information for Hanoi, Vietnam. The study focuses on three key objectives: 1) creating an urban dataset suitable for high-resolution climate modeling of the Hanoi megacity; 2) setting up a modeling system that utilizes the collected data for city-scale simulations; and 3) validating and fine-tuning the modeling system in preparation for long-term climate projections.

Specifically, after evaluating several land-use/land-cover datasets, the hybrid 100-m global land cover dataset, CGLC-MODIS-LCZ, based on the Copernicus Global Land Service Land Cover (CGLC) product, resampled to MODIS IBGP classes and integrated with the global map of Local Climate Zones (LCZ), was found to outperform others for Hanoi. This dataset effectively represents the heterogeneous urban land surface and is suitable for use, either directly or indirectly, in high-resolution downscaling models such as the Weather Research and Forecasting (WRF) model, the Regional Climate Model version 5 (RegCM5), and the High-Resolution Land Data Assimilation System (HRLDAS). Simulation performance, in terms of quality and computational costs, varies depending on the model and its level of detail. However, preliminary results indicate that most simulations can accurately capture the effects of urban land surfaces. While further fine-tuning may be required to enhance the simulation performance, these initial results are promising and may provide valuable insights for other members of the CARE for SEA megacities project.

Keywords: CARE for SEA megacities, land-use/land-cover, Local Climate Zones, urban modeling, city-scale urban modeling.

Acknowledgement:

This work is supported by project entitled “Climatic hazard Assessment to enhance Resilience against climate Extreme of Southeast Asian megacities” (CARE for megacities) with reference code: CRRP2023-08MY-Cruz.

PRELIMINARY STUDY FOR URBAN HEAT ISLAND ANALYSIS IN JAKARTA CITY USING A LAND-SURFACE-PHYSICS-BASED DOWNSCALING METHOD

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Abstract

Rapid urbanization in developing countries across Asia has resulted in the formation of massive urban areas known as megacities, and Jakarta is one such megacity that continues to expand. This study presents a preliminary analysis of the Urban Heat Island (UHI) effect in Jakarta using a Land-Surface-Physics-based downscaling method (LSP-DS). The method integrates simulations of land surface and atmosphere interactions, coupled with urban canopy-process physics, through the offline High-Resolution Land Data Assimilation System (HRLDAS) framework.

The aim of this study is to conduct experiments on surface temperature in Jakarta during April 2024, using Land Use Land Cover (LULC) data derived from a hybrid dataset based on the Copernicus Global Land Service Land Cover (CGLC) product, resampled to Moderate Resolution Imaging Spectroradiometer-International Geosphere Biosphere Program (MODIS IGBP) classes, or CGLC-MODIS. Additionally, the global map of Local Climate Zones (LCZ), which describes the heterogeneous urban land surface, is incorporated through the CGLC-MODIS-LCZ WRF V4.5 (WPS) framework. The spatial resolutions used in the study are 2 km, 1 km, 500 m, and 100 m.

The results show that the temperature distribution after downscaling is higher in urban areas than in rural areas, as illustrated in Figure 1 for CGLC-MODIS-LCZ. In comparison with the MODIS 30s (1 km resolution), the temperature distributions from CGLC-MODIS-LCZ provide better detail of the urban land surface. However, when compared with observed temperature data, the downscaled temperatures are underestimated. The northern, western, and central parts of Jakarta exhibit higher temperatures than the southern and eastern areas. Rural areas such as Bekasi, South Tangerang, and Tangerang City show slightly different temperatures compared to Jakarta City. The UHI phenomenon appears to be expanding into the rural areas surrounding Jakarta.

Keywords: Urban Heat Island, LSP-DS, HRLDAS, Jakarta

Acknowledgement:

This research is part of CARE for SEA megacities and SEACLID/CORDEX SEA project.

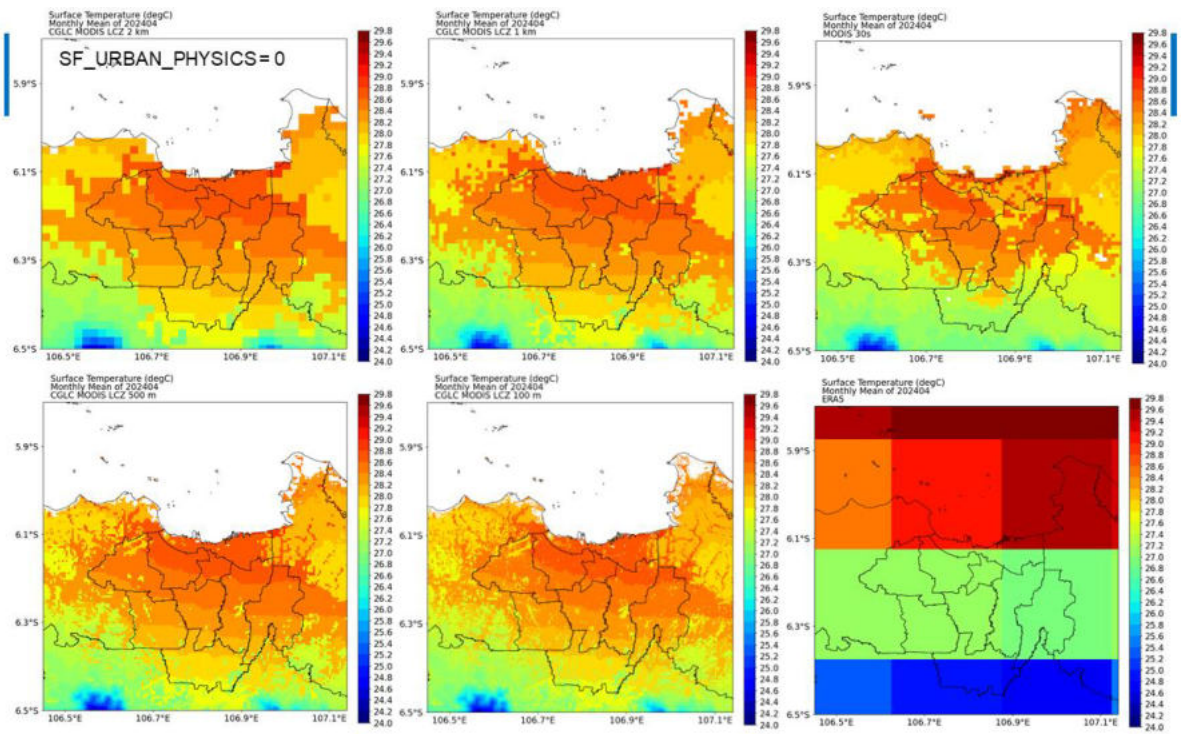


Fig 1. Experiment of temperature simulation (°C) in April 2024

**PERFORMANCE EVALUATION OF LAND SURFACE PHYSICS BASED DOWNSCALING (LSP-DS)
WITH HIGH-RESOLUTION LAND DATA ASSIMILATION SYSTEM (HRLDAS) DURING APRIL 2024
OVER METRO MANILA, PHILIPPINES**

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Abstract

This study evaluates the skill of the Land Surface Physics based Downscaling approach using High-Resolution Land Data Assimilation System (HRLDAS) forced with ERA5 reanalysis data in simulating 2m air temperature (T2), skin temperature (TS), and heat index (HI) over Metro Manila at different spatial resolution of 2 km, 1 km, 500 m, and 100 m for April 2024. The HRLDAS uses the offline Noah-Multi Parameterization (Noah-MP) land-surface model (LSM) coupled with single-layer urban canopy-process physics (SLUCM) to conduct high-resolution, long-term urban-specific simulations with less computational resources. Results showed that spatial distribution and diurnal profile of T2, TS and HI of the different spatial resolution runs have little to no difference with each other. The HRLDAS T2, TS and HI reasonably captures the diurnal cycle when compared to in-situ observations. However, large cold biases in mean T2 and consequently, HI, are noted on the eastern part of Metro Manila. Overall, HRLDAS shows an improved performance over ERA5 in simulating T2, TS and HI in Metro Manila. Optimizing the land surface physics schemes as well as fine-resolution input data for land and soil conditions may further improve the HRLDAS performance.

Keywords: HRLDAS, Metro Manila, temperature, heat index

Acknowledgement:

This work was supported by Asia-Pacific Network for Global Change Research (APN) support for the CARE for SEA megacities project (CRRP2023-08MY-Cruz) and “High-Definition Clean Energy, Climate and Weather Forecasts for the Philippines” project of the Manila Observatory

SIMULATING CITY SCALE SURFACE TEMPERATURE IN GREATER KUALA LUMPUR, MALAYSIA USING HIGH-RESOLUTION LAND DATA ASSIMILATION SYSTEM (HRLDAS)

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Abstract

The threats that climate extreme events could have imposed on highly populated urbanized area has always been the utmost concern of cities operators. This is because these extreme events not only will bring significant losses and damages to the infrastructures, potentially hampering the functions of the cities, they also threaten the well-beings and livelihood of their populations. As climate change is unavoidable and the gradual increase in cities' size and complexity are imminent, it will be crucial that city-scale climate change information is made available to the stakeholders. This is because such a high-resolution information will be valuable to aid the development of the cities and assist in disasters adaption-mitigation plannings. Thus, as part of the Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities (CARE for SEA megacities) project and CORDEX Southeast Asia community's effort in filling up the gap, this study assesses the capability of High-Resolution Land Data Assimilation System (HRLDAS) model in simulating city-scale climate surface temperature in the greater Kuala Lumpur region of Malaysia. Hourly ERA5 data with spatial resolution of 25 km × 25 km from 2000 till 2024 were used to drive HRLDAS, using land use and land cover information obtained from CGLC-MODIS-LCZ dataset. Three simulations with spatial resolution 2 km × 2 km, 1 km × 1 km and 500 m × 500 m were produced. Preliminary assessments reveal that HRLDAS is indeed capable of reproducing the fine details of surface temperature climatology in the greater Kuala Lumpur region, and expectedly, the 500 m × 500 m simulation is able to provide much finer details than the other two simulations. However, some strange artifacts were observed in the simulations results. These artifacts at present are inferred to be due to the usage of the much coarser resolution ERA5 forcing data. Further investigations, testing and tunings of HRLDAS are needed and will be carried out as the current way forward for this study.

Keywords: HRLDAS, CARE for SEA megacities, CORDEX-SEA, Kuala Lumpur, Temperature.

Acknowledgement:

This work is supported by the Asia–Pacific Network for Global Change Research (APN) support for the CARE for SEA megacities project (CRRP2023-08MY-Cruz).

A STUDY ON DISTRIBUTION AND TRENDS OF EXTREME COLD DAY IN VIETNAM FOR THE PERIOD OF 2011 - 2021

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Abstract

This study of the spatial and temporal distribution of extreme cold day and its changing trend in Vietnam in 2011 - 2021 period shows that the extreme cold phenomenon occurs in the Northern, North Central and mountainous areas of the Mid Central region and Central Highlands. In which, extreme cold day occurs mainly in the winter (December, January and February), with the greatest concentration in January. The number of extreme cold days in mountainous areas is significantly higher than in plains and coastal areas. The changing trend of the number of extreme cold days over time shows a decreasing trend for most observation stations, except for Dong Van and some stations in the coastal area of the Central region.

Keywords: Extreme cold, trends, disaster.

Acknowledgement:

This study was sponsored by the Ministry of Natural Resources and Environment (code: TNMT.2022.06.11).

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Abstract

As one of the climate extremes, heatwaves have gained global attention because of their severe impacts on numerous sectors such as human health, society, economy, and the environment. In the context of climate change, heatwaves are expected to rise globally in many aspects like frequency and intensity. Several studies have investigated heatwaves across Southeast Asia and Vietnam, with most focusing on heatwave characteristics during historical periods. On the other hand, it is essential to project future heatwave characteristics in this region throughout the 21st century under different climate scenarios. The main aim of this proposed study is to apply the latest available regional modeling experiments to analyze projected heatwaves in Southeast Asia and Vietnam for the mid and late 21st century and to understand the changes in future heatwaves compared to a baseline historical period. The data used consist of daily temperature records from the station network in the study area, gridded analysis/reanalysis temperatures, global CMIP6 outputs, and their downscaling products. To achieve this objective, the study will go through three steps, including: 1) Determine the characteristics of heatwaves in the historical period, 2) Examine the uncertainty of climate experiments in representing heatwaves, and 3) Evaluate projected changes in heatwaves for the mid and late 21st century across Vietnam and Southeast Asia. Some preliminary results will be introduced in my poster presentation and I look forward to receiving your valuable comments during the conference.

Keywords: Heatwaves, projection, Southeast Asia, Vietnam

CLIMATOLOGICAL CHARACTERISTICS OF THE NORTHEAST MONSOON RAINFALL OVER THE EASTERN COAST OF THE PHILIPPINES

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Abstract

This study investigates the climatological characteristics of precipitating clouds over the eastern coast of the northeast monsoon (NEM) season. The Northeast Monsoon is the seasonal reversal of winds that brings surges of cold and dry air from the northeast direction, influencing the climate of the Philippines from November to February, and is characterized by significant rainfall over the eastern coast of the country. This study mainly uses precipitation radar data from the Tropical Rainfall Measuring Mission (TRMM) to characterize precipitating clouds, analyze spatial and temporal distribution of rainfall, determine dominant hydrometeors, and relate cloud formation with rainfall events during the northeast monsoon. The study focuses on three regions spanning the eastern coast of the Philippines (Region A: 13°N to 19° N, 121.5° E to 125° E; Region B: 10° N to 13.5° N, 124° E to 127° E; Region C: 6° N to 10° N, 125° E to 129° E) identified to have received the highest mean spatial rainfall during the NEM season for 20 years. For all regions, despite the low frequency of days with heavy rainfall and the higher frequency of high outgoing longwave radiation values (indicative of shallower clouds), heavy rainfall events, defined as those exceeding the 90th percentile, were found to contribute the most to the total seasonal rainfall. By relating the rainfall events to the dominant hydrometeors present in northeast monsoon clouds, the study aims to provide insight into the interplay between cloud microphysics and large-scale atmospheric dynamics, contributing a deeper understanding of monsoonal rainfall patterns in the region. Furthermore, the study explores the influence of topography on rainfall enhancement. This study enhances the limited knowledge on NEM-driven hydrological processes in the Philippines, offering potential implications for weather forecasting and climate adaptation strategies, and even understanding rainfall patterns for agricultural applications.

Keywords: *northeast monsoon, cloud microphysics, atmospheric dynamics*

COMPARISON OF DIFFERENT METHODS IN DETECTING AND TRACKING OF TROPICAL DEPRESSIONS IN THE PHILIPPINES SEA USING NCEP-GFS FORECAST MODEL

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Abstract

Tropical Depressions (TDs) that form in the Philippine Sea produce torrential rains over the Philippine archipelago each year which bring about widespread flooding and landslides that result in casualties, agricultural loss, and damage to infrastructure. Notably, meteorological agencies across the Western North Pacific Basin have threshold discrepancies for categorizing TDs which has resulted in disagreements in forecast model outputs and best tracks. This study compares existing tracking algorithms in the $0.25^\circ \times 0.25^\circ$ NCEP-GFS Forecast Model (3-hourly up to 120h) such as Pressure reduced to MSL, Relative Vorticity 850 hPa, and Stream Function 850 hPa in their effectiveness in detecting and tracking select TDs in the Philippine Sea. Stream Function 850 hPa has been selected as it removes the rotational noise associated with Relative Vorticity 850 hPa. Tracking algorithm thresholds are taken from related literature due to the small sample size of the set of TDs. The model outputs are then compared to Joint Typhoon Warning Center (JTWC) 6-hourly Best Track using Along Track Error (ATE) and Cross Track Error (CTE) for Positional Error, and Intensity Bias Error. The initial results for Pressure reduced to MSL show up to 40% increased direct position error (DPE) over land, inherent positive bias for translational speed, positive intensity bias of up to 2 hPa. Keywords: tropical depression, detection, tracking, tropical cyclone, algorithm Acknowledgement: I would like to acknowledge the support from the Regional Climate Systems Laboratory, Manila Observatory, for supporting my research.

MSLP - TD Bolaven/Agaton

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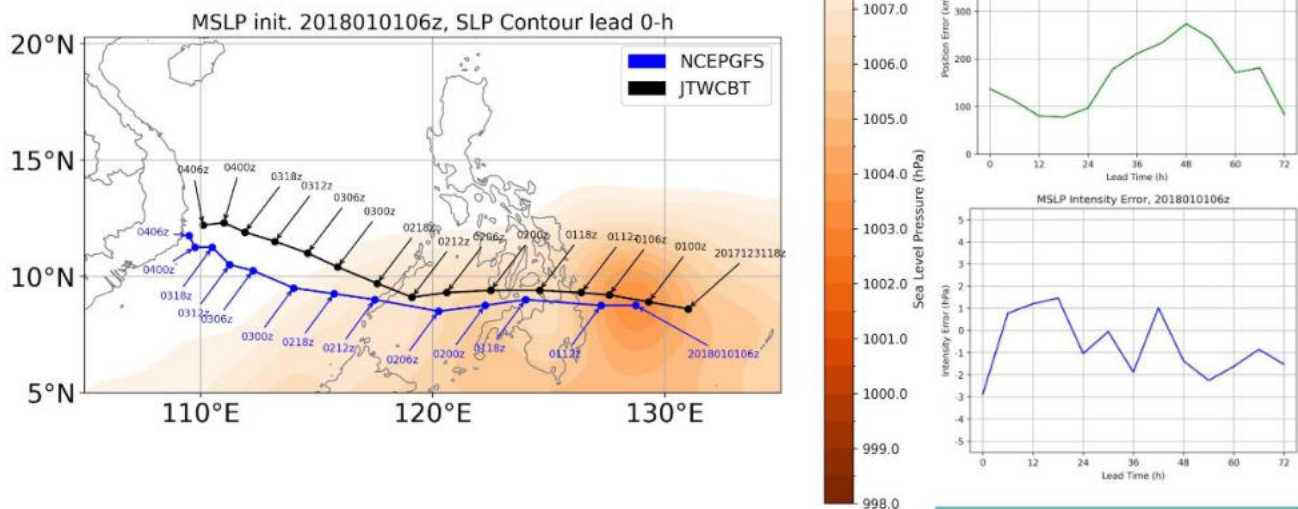
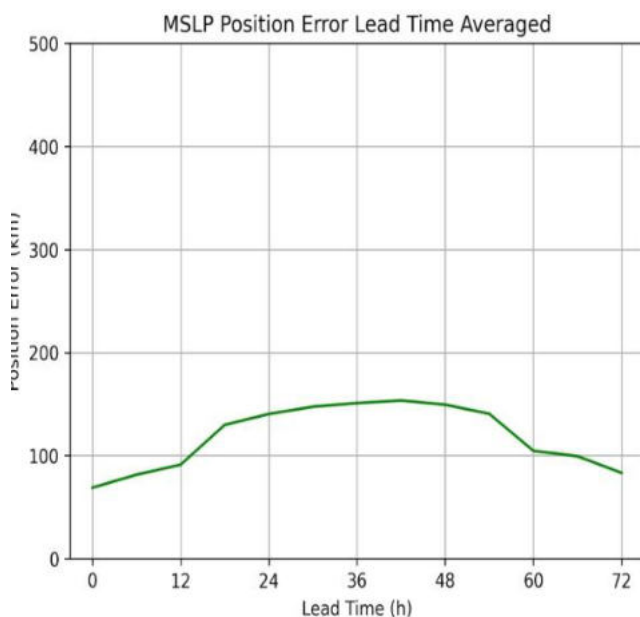


Fig 1. Sample Output for PRMSL – TD Bolaven/Agaton (2018)

MSLP - TD Bolaven - Mean Position Error over Lead Time

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- The hill-shaped Position Error graph with lead time is a result of the increased error likely caused by movement over land

Fig 2. Sample Mean Position Error over Lead Time for TD Bolaven/Agaton (2018)

UNVEILING THE INTERPLAY OF GREENSPACE AND ANTHROPOGENIC COMPONENTS IN AIR QUALITY REGULATION

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Abstract

Air pollution remains a critical global issue, hindering the achievement of sustainable development goals, particularly in urban regions. In the built environment, the complex interaction between human activities and greenspace significantly shapes outdoor air quality. This study explores these interactions across both wet (May to October) and dry (November to April) seasons to inform urban planning strategies. Using landscape metrics, greenspace configurations were analyzed within various buffer zones surrounding 73 in-situ air quality monitoring stations across Taiwan. Greenspace (GS) and anthropogenic component (AC) were derived from landscape and human-related variables, respectively. Air quality data were categorized into outdoor air dimensions (OADs), including air temperature (TEMP), wind speed (WS), relative humidity (RH), particle pollutants (PP), gaseous pollutants (GP), and OZONE. Partial Least Squares - Structural Equation Modeling was applied to explore the intricate relationships among these eight dimensions for each buffer and season. The findings reveal that AC has a stronger impact on OADs than GS, with GS showing a more significant role in reducing PP compared to GP, while AC intensifies GP across seasons. GS and AC demonstrate opposing effects on TEMP, RH, and GP. Specifically, GS influences PP, but has minimal impact on OZONE and WS, while AC shows a notable effect on OZONE and WS but not on PP. AC also indirectly affects RH, PP, GP during both seasons and TEMP during the wet season via its interaction with GS. Moreover, seven landscape metrics: total edge, mean patch area, effective mesh size, largest patch area, percentage of landscape, overall core area, and patch cohesion index were identified for GS, offering potential insights for urban green space planning to enhance ecosystem services.

Keywords: Outdoor air, anthropogenic component, greenspace, landscape metric, Partial Least Squares - Structural Equation Modeling (PLS-SEM).

Acknowledgement:

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METABARCODING OF FISH SPECIES USING ENVIRONMENTAL DNA (EDNA) IN MANGROVE NURSERY GROUNDS: A TOOL FOR CONSERVATION AND FISH STOCK ASSESSMENT

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Abstract

Mangrove forests are vital ecosystems that offer crucial services, including acting as nursery grounds for various marine species. Unfortunately, these ecosystems face significant threats from overfishing, habitat destruction, pollution, and climate change. This study employs environmental DNA (eDNA) metabarcoding as a non-invasive method to identify fish species within mangrove nursery grounds in Mindanao, Philippines. eDNA metabarcoding enables species detection by analyzing genetic material in environmental samples, providing a cost-effective and highly sensitive approach for fish species identification. Seawater samples were collected from selected mangrove nurseries, and the extracted eDNA was analyzed using high-throughput next-generation sequencing (NGS) techniques. The sampling sites included South Cotabato, Surigao del Norte, Misamis Oriental, and Tawi-Tawi. A total of 29 species from 20 families were identified. Significant species include *Zenarchopterus dunckeri* (Zenarchopteridae), a rare fish in the aquarium trade; *Hippocampus comes* (Syngnathidae), the tiger-tail seahorse, listed as vulnerable by the IUCN; *Sardinops melanostictus* (Clupeidae), a species of high commercial value; *Siganus corallinus* (Siganidae), valued in both the food and aquarium industries; and *Gymnothorax flavimarginatus* (Muraenidae), which plays a key role in the food chain as a natural predator of the invasive lionfish. Tawi-Tawi Island emerged as the most biodiverse site, with species from 11 different families recorded. These results emphasize the vital role of mangrove nurseries in supporting diverse fish populations and demonstrate the effectiveness of eDNA metabarcoding in compiling a comprehensive species inventory. These findings are crucial for guiding conservation efforts and ensuring the sustainable management of these vital ecosystems.

Keywords: *eDNA, mangrove, metabarcoding, NGS*

DIATOM MORPHOLOGY IN LAKE BULUAN: IMPLICATIONS FOR WATER QUALITY, AQUACULTURE, AND POTENTIALS FOR SUSTAINABLE FUTURE

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Abstract

Lake Buluan, a vital freshwater resource in Sultan Kudarat, Philippines, is central to local aquaculture and environmental health. This study focuses on the morphological identification of diatoms in Lake Buluan and explores their implications for water quality assessment and sustainable aquaculture practices. Diatoms, with their sensitivity to environmental changes, provide robust means into the ecological status of aquatic environments. Initial identification revealed the presence of several diatom genera, including Sellaphora, Thalassiosira, Frustulia, Synedra, Cocconeis, Neidium, Navicula, and Fragilaria. Among these, the genera Frustulia was the most abundant. The dominance of Frustulia suggests specific ecological conditions in the lake, potentially indicating an environment with moderate to low nutrient levels. This information is valuable for fish farming, as the presence of certain diatoms can affect the water quality that fish depend on. These findings show that monitoring diatoms can be a useful tool for managing the lake in a way that supports both environmental health and economic activities like aquaculture. Furthermore, the study emphasizes the potential of using diatom-based assessments as a cost-effective and reliable tool for guiding aquaculture management strategies in Lake Buluan. The result suggests that diatom morphology can serve as a key indicator for environmental monitoring, providing essential data for policy briefs about sustainable fish farming and water management. Future plans will include the analysis of environmental DNA (eDNA) from water samples that would allow for the detection of diatom species based on genetic material found in the water, offering a more precise and comprehensive understanding of the diatom community.

Keywords: Diatoms, Frustulia, Bioindicator, Water quality, Aquaculture, Sustainable management

SPECIES DIVERSITY OF MANGROVE ASSOCIATED CRABS (CRUSTACEA:BRACHYURA) OF DAVAO GULF, MINDANAO ISLAND, PHILIPPINES

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Abstract

Brachyuran crabs are among the dominant species groups in the mangrove ecosystem. Provided with their ecological role and economic value, little is still known about the diversity of mangrove crabs, particularly in the mangrove forest of Davao del Norte, and data for their conservation status needs to be updated. The current study reported the diversity, species composition, and conservation status of brachyuran crab species from the selected mangrove areas of Davao del Norte. 69 plots of 20m by 20m were established, and crabs were manually collected by hand in every plot. Collected specimens were photographed, labeled, and preserved in 75% ethanol. This study collected 1,310 individuals of mangrove crabs and identified 18 species belonging to 17 genera of seven families under infraorder Brachyura. Most of the identified species are of the family Sesarmidae, the prominent mangrove crab species. The species diversity index value ($H' = 1.139$) indicates that the diversity of mangrove crabs in the area is moderately high, with a total density of 0.0949 individuals/m². All of the identified mangrove crab species were not listed in the IUCN Red list status and thus marked as not evaluated (NE). It is noteworthy that economically important crabs, *Scylla serrata* and *Thalamita crenata*, both are commonly known as “alimango” and other locally consumed crabs such as *Baptozius vinosus*, *Epixanthus dendatus*, and *Varuna litterata*, are found in the replanted mangrove forest of Davao del Norte. The mangrove forest serves as a habitat to a diverse brachyuran fauna. The present study serves as the first biodiversity assessment of the brachyuran fauna within the mangrove forest of Davao del Norte. This research provides important input for local conservation management and conservation assessment. It is recommended to consider other mangrove forests of the Davao Gulf to have a broader scope for biodiversity assessment.

Keywords: Brachyuran crabs, Davao Gulf, IUCN, mangrove forest

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THE ROLE OF HYDROPOWER DAMS IN NORTHERN VIETNAM DURING THE GREAT FLOOD OF 2024

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Abstract

Dams have benefited Vietnam's economic development in recent decades, owing to their ability to ensure a more predictable water supply and the generation of electricity using flowing water. Since the 2000s, the number of dams in Vietnam has increased significantly, with approximately 462 hydroelectric dams operating in 2024, according to the database of the Ministry of Industry and Trade. One of the critical issues that the community is often concerned about is whether the dams mitigate or increase natural hazards, especially in unusual situations such as droughts and floods. This concern is at the center of debate about the recent increase in both flood and drought frequency, duration, and intensity.

The recent historic Yagi (September 2024) storm that hit Northern Vietnam gained widespread public attention and raised questions about the role of dams. Heavy rainfall during and after the historic Super Typhoon Yagi led to inundation in many low-lying mountainous areas and caused water levels to rise dramatically across rivers throughout the North. A domino effect occurred as numerous rivers overflowed their banks, resulting in severe flooding in many provinces, including Vietnam's capital Hanoi, causing painful losses of both life and property. People compare this flood to the one in 1971 when the entire North was submerged "similarly." This comparison, however, is not straightforward, as the landscape across the region has changed substantially over the past 60 years due to urban development, deforestation, and notably the construction of multi-purpose hydropower reservoirs/dams

- considered the most influential factor on river flow and often designed for "flood control." Thus, a research/practical question arises: What role did these hydroelectric dams play in the Great Flood of 2024?

To our knowledge, in-depth analyses have yet to be published using standard hydrological techniques on the hydrological developments on dammed rivers during the recent Typhoon Yagi. Here we aim to provide a rapid, objective account of how these reservoir systems operate and function, as well as their impact on downstream flow, through measured data including rainfall, reservoir operation data, natural flow simulation scenarios, and especially the regulation of reservoir/dam operations during flood season. Despite the limitations of a rapid assessment, this study contributes to providing scientific, data-based evidence on the impacts, both positive and negative, that dams are creating in Vietnam.

Keywords: dam operation, streamflow, storm surge.

MORPHOMETRIC CHARACTERISTICS OF SEA HARE (DOLABELLA AURICULARIA) COLLECTED IN PUJADA BAY, DAVAO ORIENTAL

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Abstract

The Philippines' geographical location, as well as its diverse maritime activities, are important to the country's identity and critical to securing its maritime interests. The waterways around the islands are a major medium for inter-island and worldwide transportation and commerce, a source of food and livelihood for Filipinos, and home to a diverse range of marine species and habitats, many of which are unique to the Philippines. According to marine ecologists, the Philippines is situated at the physical center of the Coral Triangle, a region known as the global center of marine biodiversity. This enormous marine area has some of the best mangroves, seagrass beds, reef fish populations, and coral reefs in the world in its coastal waters. The aquatic environment is home to a variety of aquatic life forms that provide sustenance for humans and a way of life of the community. *Dolabella auricularia* is an herbivorous marine biota primarily found in the waters of the Indo-Pacific that live on the shallow seafloor. This marine species, often known as the wedge sea hare, is a member of the gastropod family. Having two sets of sensory head tentacles, called rhinophores, with distinct shapes and functions are distinctive morphological traits of sea hares. In the present study, the morphometric characterization of sea hares was carried out. Contrarily, *Dolabella auricularia* also has potential and use in the biomedical and business sectors as a source of pharmaceutical industry raw materials and more research has been constantly expounding. Samples were collected from September to December 2023 and 18 individuals were obtained. In order for it to become an oceanic fauna that can be employed in other fields, these marine biotas required more research which discusses the biological characteristics of sea hare in Pujada Bay, Philippines.

Keywords: *Sea hare, biomedical, morphometry, characteristics, Pujada Bay*

SPECIES COMPOSITION, DIVERSITY, AND DISTRIBUTION OF INTERTIDAL MARINE MACROALGAE IN SACOL ISLAND, ZAMBOANGA CITY, PHILIPPINES

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Abstract

The Philippines is considered to have one of the most diverse aquatic ecosystems with rich marine resources. One of the resources that has an important role in marine coastal environment is macroalgae. It acts as primary producers, habitats for marine life and bioindicators of water quality. Sacol Island, an area located in Zamboanga City, Philippines, is characterized by its sandy-rocky substrate with large intertidal zones and seaweed resources that have yet to be thoroughly explored and investigated in terms of their complete composition. This study focused on the assessment of species composition, diversity, and distribution of macroalgae on the island. A line transect-quadrat method was employed with triplicates laid perpendicular to the shoreline. Shannon Weiner's Diversity Index and Bray-Curtis Index were used to determine the species composition. A total of seventy-nine (79) macroalgae species were identified, representing three divisions, 15 orders and 25 families, and 37 genera. A significant proportion of the species composition were from green (39%) and red algae (39%), followed by the brown algae (22%). The most abundant species recorded is *Gracilaria salicornia*. Landang Gua has the highest diversity index among the 3 sampling areas, measuring 3.65. Based on distribution, the Bray-Curtis Index revealed dissimilarity among three sites with index values up to 76.7%. The results of this research offer valuable insights that may inform the development of effective policies and strategies for conservation and management.

Keywords: macroalgae, species composition, diversity, distribution, Sacol Island

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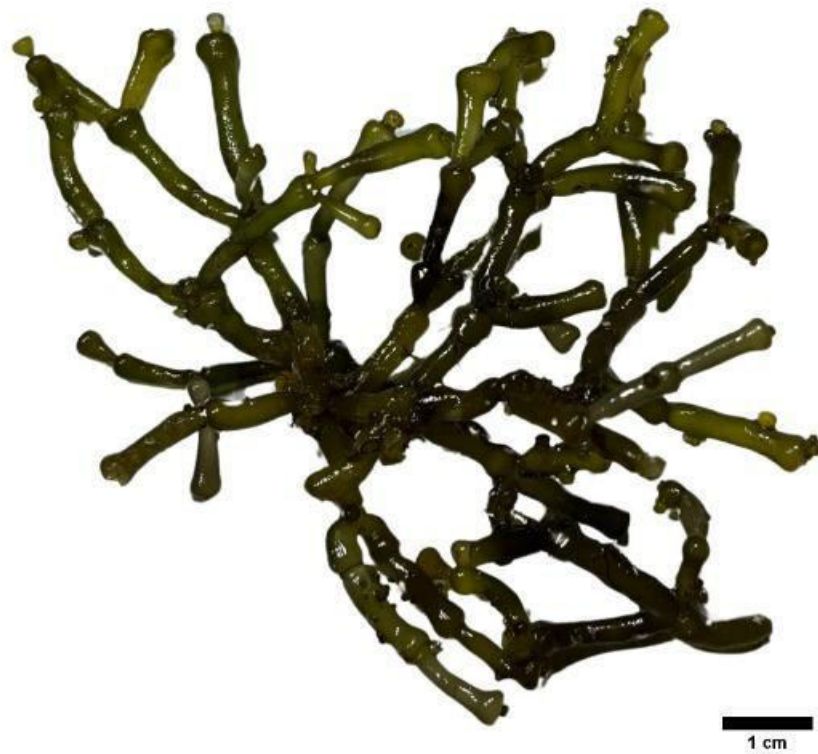


Fig 1. Gracilaria salicornia

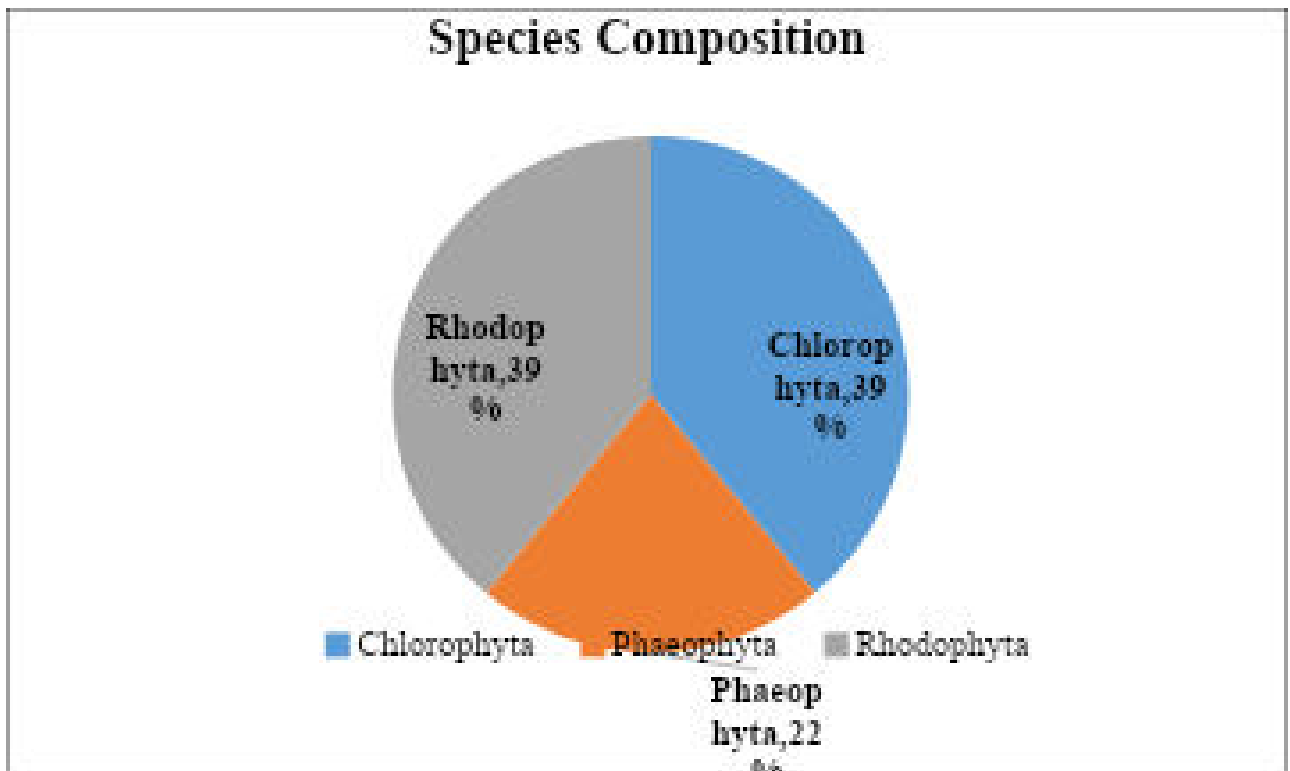


Fig 2. The species composition of macroalgae in three (3) sampling areas in Sacol Island.

DIATOM SPECIES ASSESSMENT IN TWO MARINE SANCTUARIES IN LANA DEL NORTE, PHILIPPINES USING HIGH-THROUGHPUT SEQUENCING OF THE 18S RRNA V4 REGION

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Abstract

Zooplanktons such as diatoms are known to adapt to various ecological niches and contribute to 20% of global primary production. Moreover, they are essential for assessing changes in aquatic environments due to their sensitivity to fluctuations in water quality. Their sensitivity makes them valuable indicators for monitoring the ecological status of various aquatic ecosystems. This research aimed to analyze and understand the diatom species in two marine sanctuaries in Iligan City. The analysis was carried out using metabarcoding of the V4 region of the 18S rRNA gene, which was amplified and sequenced on the Illumina MiSeq platform. Three amplicon libraries were created to represent the diatom composition of the study sites. Data processing was conducted with the Parallel-Meta-Suite software. After rigorous quality control and processing, a total of 16,337 amplicon sequence variants (ASVs) were identified, encompassing 80 families and 121 genera. The most abundant ASVs were identified as species belonging to genera *Chaetoceros*, *Melosira*, *Thalassiosira*, *Minidiscus*, *Pseudo-nitzschia*, *Meuniera*, *Navicula*, and *Amphora*. The assessment of diatom alpha diversity evaluated using the Shannon, Simpson, and Chao1 indices, revealed higher species diversity at Site 1 -D1 (Dalipuga, Iligan City), with values of 1.67, 0.62, and 25, respectively. At Site 1 (D1), the most abundant genus was *Thalassiosira*, while at Sites 2 (K1) and 3 (K2) (Kauswagan, Lanao del Norte), the dominant genera were *Chaetoceros* and *Melosira*, respectively. The presence of these genera raises concerns, as *Thalassiosira* and *Chaetoceros* are associated with harmful algal blooms, while *Melosira* thrives in polluted environments, serving as indicators of water quality. This variation in species composition underscores the ecological differences between the sites and highlights the importance of site-specific assessments in understanding diatom diversity. This study provides baseline information for diatom assessments in marine sanctuaries through environmental DNA (eDNA) metabarcoding and next-generation sequencing (NGS).

Keywords: (diatom, amplicon, eDNA, Next Generation Sequencing)

Acknowledgement:

Department of Science and Technology (DOST), Philippines

RANKING RELEVANT BIOPHYSICAL FACTORS FOR SUSTAINABLE ECOLOGICAL MANGROVE REHABILITATION IN AQUACULTURE PONDS IN MACAJALAR BAY, MISAMIS ORIENTAL, PHILIPPINES

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Abstract

Mangroves are vital coastal ecosystems providing various ecosystem services to sustain human welfare and the environment. This study aims to rank relevant biophysical factors for sustainable ecological mangrove rehabilitation in aquaculture ponds in Macajalar Bay, Misamis Oriental, Philippines. The Analytic Hierarchy Process (AHP) method was used to determine biophysical parameters and elements that strongly influence the rehabilitation of fishponds on a scale of 1-9. The model was tested for the following nine biophysical parameters: presence of mangroves, seed type, hydrology, water depth, frequency of inundation, salinity, soil type, temperature, and stressors. Multi-criteria decision-making through the AHP and Chi-Square tests was used to determine weights and relevance for ranking priority biophysical factors to establish successful ecological mangrove rehabilitation. Results show that the relative weights of all nine parameters show significant results after checking the consistency ratio (CR). All parameters were shown to contribute to a successful EMR of fishponds. Five factors, namely, seed type, temperature, hydrology, frequency of inundation, and salinity have the highest overall relative weights among parameters. All the nine parameters show relatively significant results, except for seed type.

It shows eight out of nine parameters are independent, which means it can be rejected while seed type is dependent, which means the model cannot be rejected. Independent parameters in a model are important because they provide clear, actionable insights that can help guide decision-making and strategic development. By concentrating on each parameter's distinct contributions, organizations can improve their performance, allocate resources more wisely, and devise targeted interventions that promote success. However, continued validation and research are required to effectively utilize these findings and assure their applicability across multiple contexts.

The results can be used as a baseline on the key and right biophysical factors to focus on and prioritize for successful mangrove rehabilitation of fishponds. The application of the AHP method makes it easier for decision-makers and mangrove conservationists.

Keywords: *biophysical factors, analytic hierarchy process, chi-square, EMR, Macajalar Bay*

ELECTROSTATIC INTERACTION OF BASALT POWDER WITH CIPROFLOXACIN ANTIBIOTIC: AN ENVIRONMENTAL IMPLICATION

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Abstract

Widespread distribution of antibiotics has been recognized as one of the arising environmental issues. More seriously, agricultural lands can be contaminated by antibiotics through usage of antibiotic-tainted water for irrigation. Amendment of soils with basalt rock (powder) is expected to serve as reactive sites for immobilizing antibiotics, hence tackling the impacts of antibiotics. Unfortunately, the performance and possible negative effects of basalt application have not been fully understood. The electrostatic interaction between basalt powder and antibiotics has also not been thoroughly addressed. This research aims to explore a potential electrostatic and colloidal interactions of micro-sized basalt powder with ciprofloxacin (CPX) by evaluating zeta potential (ζ), hydrodynamic size (d_h) and transmittance (T%) over a pH range from 3 to 9 and ionic strength from 0.006 to 0.6 N by using dynamic light scattering techniques and a test tube-based method. Basalt powder was found to carry negative charges, but its charges varied greatly depending upon pH and ionic strength. In acidic and neutral pH conditions, electrostatic interaction of basalt powder with CPX (a cationic antibiotic) induced an increase in zeta potential and favored the aggregation of basalt powder, thereby simultaneously favoring the removal of CPX from aqueous solution. This implies that basalt material is potential to immobilize (cationic) antibiotics. This finding opens a new avenue for natural materials that could address the antibiotic problem that the world is currently striving to solve.

Keywords: Basalt powder; antibiotic; surface charge; colloidal properties; ciprofloxacin

ENHANCED DENITRIFICATION PROCESS IN SPONGE-MEMBRANE BIOREACTOR COUPLED WITH IRON SCRAPS FOR MUNICIPAL WASTEWATER TREATMENT: PERFORMANCE AND MICROBIAL COMMUNITY SHIFTS

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Abstract

Simultaneous nitrification and denitrification represent promising biological removal methods that efficiently address nitrogen in a single-reactor and save energy. The sponge membrane bioreactors with and without iron scrap supplementation (SMBR and SIMBR, respectively) were acclimated under aerobic conditions. The main objective of this research was to enhance the efficiency of nitrogen removal by incorporating iron scraps into the sponge membrane bioreactor (SMBR) utilized for the treatment of synthetic wastewater. The influences of adding iron scraps on different parameters such as chemical oxygen demand (COD), ammonium ($\text{NH}_4^+\text{-N}$), nitrite ($\text{NO}_2^-\text{-N}$), nitrate ($\text{NO}_3^-\text{-N}$), total nitrogen (TN) removal efficiency, mass liquid suspended solids (MLSS), and the microbial community in the reactor were examined. The results indicate that the addition of iron improves COD, nitrate, and total nitrogen removal efficiency from $93.90 \pm 2.89\%$ to $96.13 \pm 2.49\%$, $41.79 \pm 11.26\%$ to $59.59 \pm 19.62\%$, and $33.84 \pm 6.73\%$ to $36.05 \pm 7.3\%$, respectively. However, the ammonia removal efficiency decreased from $87.16 \pm 10.33\%$ to $60.33 \pm 8.94\%$. Besides, the addition of iron led to a change in the microbial community, especially Cyanobacteria and Proteobacteria, which are responsible for nitrogen removal.

Keywords: Membrane bioreactor, denitrification, iron scrap, Cyanobacteria

PERSPECTIVES ON MICROBIAL COMMUNITY IN MEMBRANE BIOREACTOR WITH FOCUS ON PERFORMANCE AND BIOFOULING: A SYSTEMATIC REVIEW

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Abstract

Microbial community play a crucial role in biological wastewater treatment process. However, there is a lack of knowledge for comprehensive understanding the role of microbial community structure, function and dynamics in membrane bioreactors. This review is to provide the current available knowlegde on microbial structure, function and dynamics in membrane bioreactor with emphasis on treatment peformance and biofouling. We systematically searched Scopus and Web of Science (from 2000 to 2023) with relative keywords to identify publications in peer-reviewed journals. Additionally, recent developed sequencing techniques are summarized to update the methods for microbial community analysis in the field of biological wastewater treatment. The data and information focus on applicability of membrane bioreactor for different types of wastewater, bioreactor configurations, operational parameters and their incorporation with the microbial community structure and dynamics. Furthermore, microbial compositions and functional microbes are also discussed based on different forms of biomass, including bulk sludge, cake layer and biofilm to reveal the mechanism of performance and biofouling. Overall, the understanding on microbial structure and dynamics has shed lights on stability and performance enhancement of biological wastewater treatment systems.

Keywords: Microbial structure and dynamics; Systematic review; Sequencing techniques; Performance; Biofouling.

EVALUATION OF NITROGEN TREATMENT EFFICIENCY IN MBR MODEL SUPPLEMENTED WITH BIOCHAR SUBSTRATE MADE FROM RICE HUSKS

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Abstract

Despite the advantages of high-quality excellent and low ecological footprint, membrane fouling and limits of nitrogen removal capacity remain the primary hurdle that restricts the applicability of Membrane Bioreactor (MBR) for domestic wastewater. Recently, biochar has been added to bioreactors to enhance nitrogen removal and mitigate fouling. In this study, rice-husk biochar was added in a lab-scale MBR acting as a performance enhancer to investigate its potential in nitrogen removal. Hydraulic retention times (HRTs) was surveyed at 6 and 8h, while biochar doses were ranged at 0, 1, 5, 10, 15 g/L to select the optimal conditions for operating MBR. Subsequently, MBR was operated with and without rice-husk biochar to investigate the improvement of pollutants removal. The results showed that a HRT of 6 h and a biochar dosage of 5 g/L were the optimal conditions regarding the COD and TN removal efficiencies. Compared with conventional MBR (without biochar), the removal efficiencies of COD, $\text{NH}_4^+\text{-N}$, $\text{NO}_3^-\text{-N}$, TN in MBR combined rice-husk biochar were increased by 7%, 10%, 26% and 17%, respectively. The findings derived from this study provide useful perspectives on the widespread application of biochar based-MBR treating domestic wastewater.

Keywords: *Rice husk biochar; Biochar based-MBR; Domestic wastewater; Nitrogen removal enhancement.*

DETERMINATION OF BLACK CARBON EMISSION FACTORS FROM COAL-FIRED POWER PLANTS AND EVALUATION OF EMISSION DISPERSION AROUND PLANTS IN NORTHERN VIETNAM

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Abstract

Emission factor (EF) is an important input for calculating emissions. Currently, data on national-specific emission factors of coal-fired power plants (CFPPs) in Vietnam is limited, especially for black carbon (BC), a short-lived climate pollutant that significantly impacts global warming and public health. This study addressed this gap by determining EF of BC (EFBC) emitted from CFPPs in Northern Vietnam and assessing the effect of BC emissions from the operation of CFPPs to the ambient air.

BC emission and activity data at 4 CFPPs, include 02 utilized Pulverized Coal (PC) boiler technology, and 02 used Circulating Fluidized Bed (CFB) technology were obtained. At each plant, 21 PM_{2.5} samples were taken from stack using Method 5 and Method 201A and applied for BC analysis by a multi-wavelength absorption BC instrument (ANSTO). Then, EFBC of PC and CFB boilers were applied in the AERMOD model to simulate BC concentration distribution around 12 CFPPs in the Northern key economic zone.

EFBC for PC and CFB boilers are 311.24 ± 191.87 and 527.53 ± 445.30 mg/ton of coal consumed, or 16.21 ± 8.14 and 28.25 ± 24.48 mg/MJ, respectively. For both PC and CFB, new CFPPs show significantly lower EFBC than the old ones indicating plant age which also mean technology level have a major influence on emissions. Additionally, coal quality was identified as a factor influencing BC emissions, with CFB boilers had higher emissions compared to PC boilers. The simulation results indicated that the highest average BC concentrations were observed from June to August, particularly in areas with a high density of factories, highlighting the necessity for comprehensive air quality management in regions hosting CFPPs.

Keywords: emission factor, black carbon, AERMOD model.

Acknowledgement:

This work have been supported the data by Vietnam Institute of Hydrology and Meteorology Science and Climate Change (IMHEN).

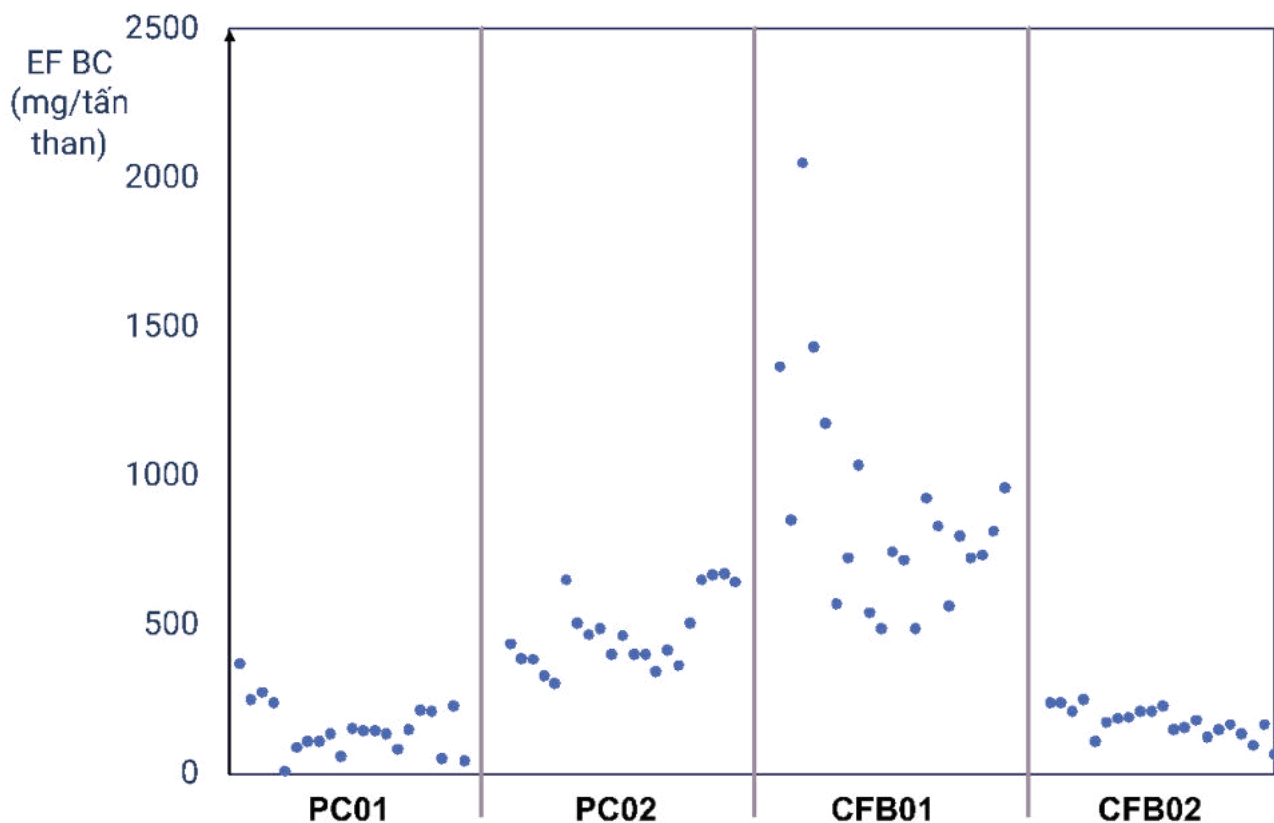


Fig 1. EF_{BC} (mg/coal consumed) of CFPPs

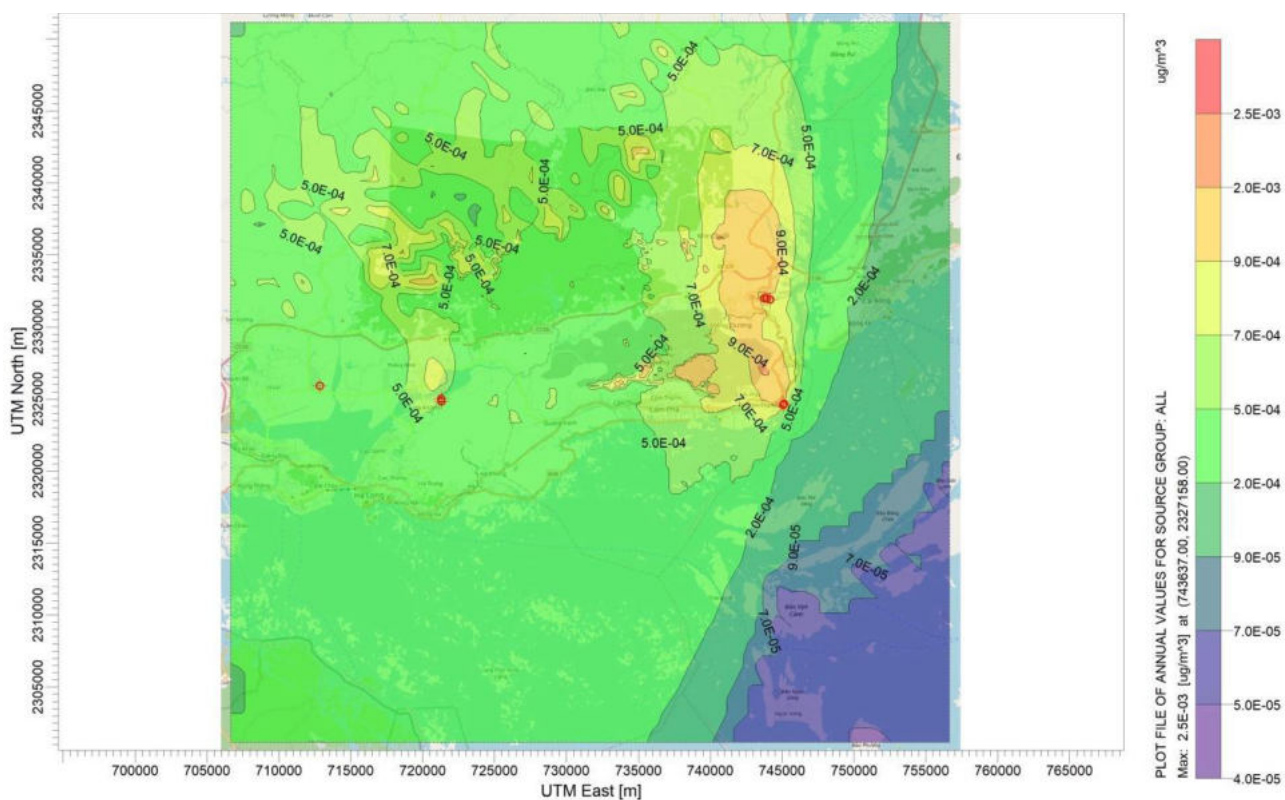


Fig 2. Average BC concentration in 2022 of one domain. Red points are CFPPs

ENHANCED PIG FARMING WASTEWATER TREATMENT IN A DOWN-FLOW HANGING FILTER REACTOR CONTAINING COCONUT FIBER MEDIA

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Abstract

Pig farming wastewater poses a severe threat to aquatic organisms and human health due to direct discharge without proper treatment. In this study, in terms of treatment performance, a down-flow hanging filter incorporating coconut fiber media (DHF₁) was compared to a conventional down-flow hanging filter (DHF₀) for treating pig farming wastewater. The results indicated that the DHF₁ achieved removal efficiencies greater than the DHF₀, which was simultaneously operated at HRT of 8 h for comparison. The average removal efficiencies of chemical oxygen demand (COD), biochemical oxygen demand (BOD), total nitrogen (TN), and total phosphorus (TP) were $77 \pm 10\%$, $79 \pm 7\%$, $56 \pm 8\%$, and $64 \pm 7\%$ with DHF₁, and $54 \pm 7\%$, $40 \pm 13\%$, $35 \pm 8\%$ and $36 \pm 9\%$ with DHF₀, respectively. These enhancements were attributed to the presence of coconut fiber media incorporating a down-flow hanging filter, which enhanced both adsorption and biodegradation for pollutant removal. Overall results suggest that a coconut fiber media incorporating down-flow hanging filter appears to be a viable option for real pig farming wastewater treatment. In addition, the findings derived from this study provide meaningful perspectives for environment protection and reuse of biomass wastes.

Keywords: Down-flow hanging filter (DHF); Pig farming wastewater; Adsorption; Biodegradation.

HOUSEHOLD COMMITMENT TO WASTE CLASSIFICATION: LESSON LEARNT FROM TUY HOA CITY, VIETNAM

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Abstract

Solid waste management is an important component of the circular economy, and waste classification is the first step toward improving the waste management system and increasing circularity. Household waste classification is an important step toward better waste management. Commitment is a motivator for commencing waste sorting behavior at the household level. This paper employs structural equation modeling to examine the factors that influence household commitment to waste sorting at the source. The analysis is based on 377 responds from Tuy Hoa City, Phu Yen province, Vietnam. The findings show that characteristics linked to health and the impact of household waste classification are positively connected to commitment. In contrast, characteristics that cause challenges have a negative impact on household commitment. The findings, when combined with other qualitative studies on attitudes and actions regarding waste sorting in Vietnam, provide a broader view of the issue. This information may contribute to stakeholders encourage household waste separation in Vietnam.

Keywords: Plastic, waste classification, SEM, commitment, household waste

Acknowledgement:

This study is funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) and Swiss National Science Foundation (SNSF) under grant number IZVSZ2.203313.

PROMOTING GAS-PHASE REMEDIATION VIA SURFACE PLASMONIC EFFECTS ON PEROVSKITE-BASED $\text{ZnSn}(\text{OH})_6$ MICROCUBES

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Abstract

This study addresses the challenge of improving photocatalytic efficiency for nitric oxide (NO) degradation under solar light. To enhance performance, Pd nanoparticles (Pd NPs) were decorated on $\text{ZnSn}(\text{OH})_6$ (ZHS) cube structures, utilizing the surface plasmon resonance (SPR) effect. The key research question focused on how Pd NPs could boost the photocatalytic activity of ZHS. Our findings show that Pd-ZHS achieved nearly 80% NO degradation 1.5 times higher than pure ZHS with a tripled kinetic reaction rate constant. The enhanced electron-hole separation, improved charge transport, and reduced band gap contributed to this significant performance boost. The study highlights the novel role of Pd NPs in improving photocatalytic materials for environmental applications.

Keywords: *Located Surface Plasmon Resonances, Nitric Oxide, Pd Nanoparticles, Photocatalysts, $\text{ZnSn}(\text{OH})_6$*

Acknowledgement:

This study was financially supported by Ton Duc Thang University and HUTECH University, Ho Chi Minh City, Vietnam. The authors acknowledge Ho Chi Minh City University of Technology (HCMUT), VNU-HCM. The authors are grateful for the support from Professor Sheng-Jie You and Professor Ya-Fen Wang from Chung Yuan Christian University, Taiwan (R.O.C), for their assistance with the characterization analysis. The authors would also like to extend special thanks to Professor Van-Viet Pham at the Advanced Materials and Applications Research Group, HUTECH University, for providing

characterization analysis support and facilities for this study. Additionally, the authors acknowledge Ho Chi Minh City University of Science (HCMUS), Ho Chi Minh City, Vietnam, for supporting this study.

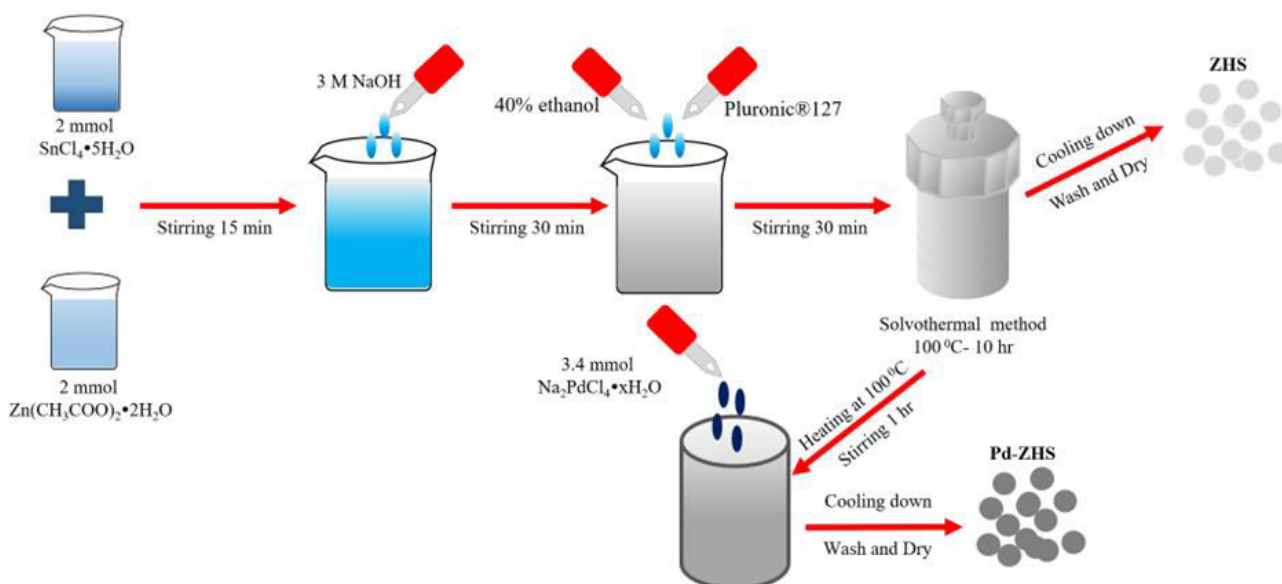


Fig 1. Synthesis process diagram of ZHS and Pd-ZHS materials.

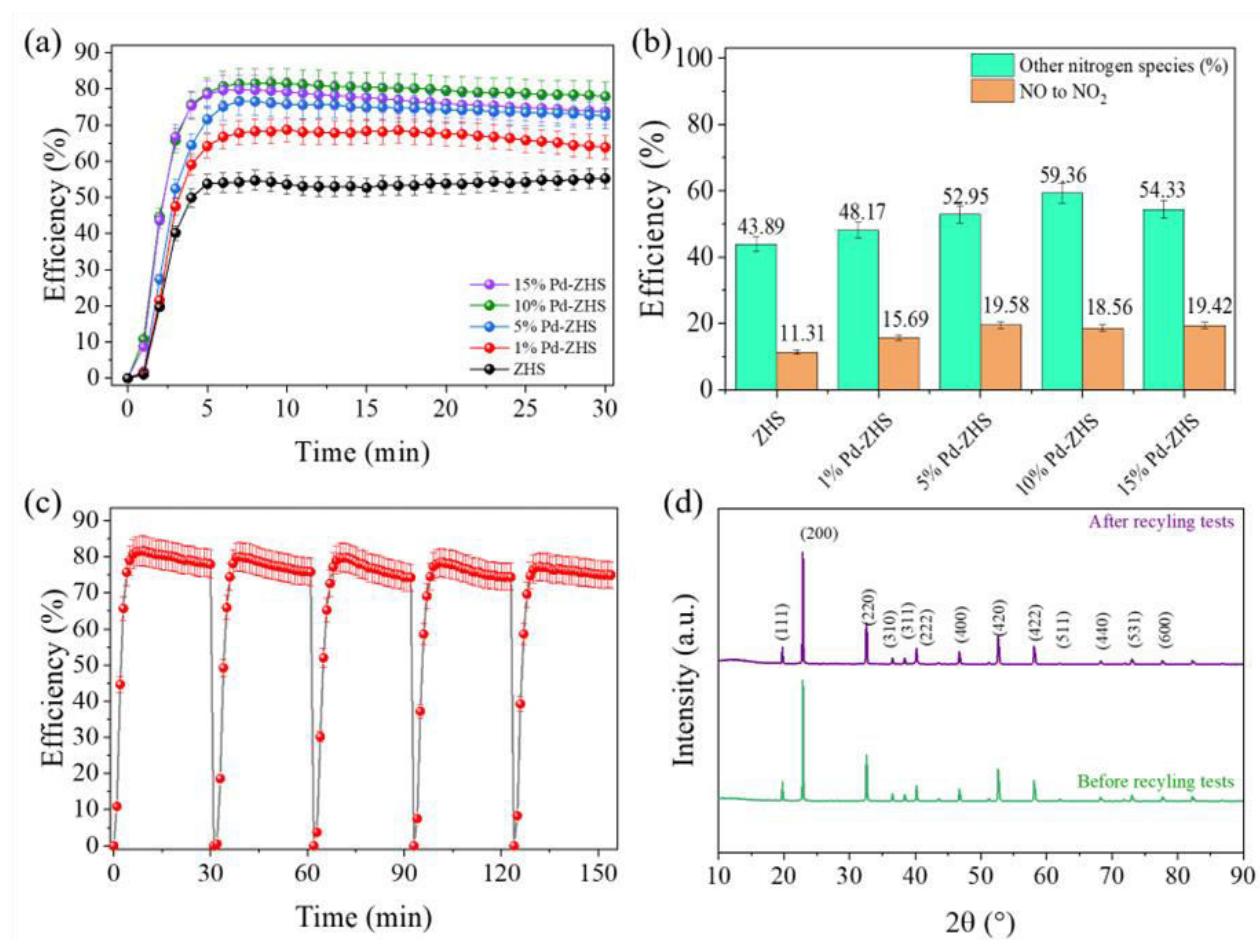


Fig 2. (a) Photocatalytic efficiency for NO removal; (b) Conversion rates of NO and NO₂ for the prepared materials; (c) Recycling performance tests; (d) XRD patterns of 10% Pd-ZHS before and after recycling.

Abstract

Membrane bioreactor (MBR) has emerged as compelling technology for wastewater treatment due to high-quality effluent, high sludge retention, low ecological footprint. Nonetheless, fouling is a major obstacle for the applicability of MBR. To counteract the limitation, incorporating biocarriers into MBR as biofilm carriers has been attracted significantly attention. Notably, the stabilization and performance of biological wastewater treatment technology, including MBR, are closely related to the dynamics and structure of microbial community. This review is to provide an overview of the actual situation, mainly from 2000 onwards, of the microbial community shifts of MBR systems augmented with biocarriers to enhance performance and mitigate biofouling. Initially, it provides a comprehensive overview of materials for biocarriers and the mechanisms of mitigating biofouling and enhancing performance by the addition of biocarriers into the MBR for treating different wastewaters. Subsequently, the underlying mechanisms driving the enhanced performance and reduced biofouling in term of microbial community shifts due to the integration of biocarriers are discussed. Finally, the review presents the challenges on how to optimize microbial community structure and shifts under different stress conditions of MBR systems and elucidated potential directions for future reasearch.

Keywords: Membrane Bioreactor; Biocarrier; Biofouling; Microbial structure and dynamics.

ANALYSIS FLOOD DYNAMICS ALTERATIONS IN THE VIETNAMESE MEKONG DELTA FROM EARTH OBSERVATIONS

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Abstract

Floods in Vietnamese Mekong Delta (VMD) have shown a notable change in recent years. The causes could stem from the impact of upstream dams on the Mekong River, the development of high dike systems in the VMD, and climate change. These factors could have resulted in a significant reduction in floods frequency and flooded areas, disrupting the connection between the floods and their floodplains. This directly affects agriculture and the natural fisheries resources in this area. The objective of this study is to analyze the flood dynamics in the VMD from 2001 to 2018 by using Terra MODIS MOD09A1 remotely sensed imagery data in the Google Earth Engine platform. We preprocessed the raw satellite data to remove low-quality pixels, then created a composite image with important bands, and set visualization parameters to achieve the desired results. We then used the R programming language to detect changes in flood frequency, duration, and extent. The results show that floods began in June and reached peak in September or October, and then gradually receded until December (Fig 1). The areas with the highest flood frequency were the upper and the central areas. Additionally, we found the annual flood duration in the VMD has gradually decreased over the period of 2001-2018, except for the historic flood of 2011 (Fig 2). The results provide a comprehensive assessment of the flood dynamics in the VMD, thereby aid in creating the effective measures to manage and adapt to flood changes in the VMD in the future, contributing to ensuring the livelihoods of residents and stabilize the region's economic development.

Keywords: Flood dynamics, VMD, Google Earth Engine, MODIS

Acknowledgement:

This work was funded by the Asia-Pacific Network for Global Change Research (APN) under project reference number CRRP2023-04MY-Doan Van (Funder ID: <https://doi.org/10.13039/100005536>), the Japan-ASEAN Science, Technology and Innovation Platform (JASTIP) under the JASTIP-Net 2023/24 Collaborative Research, and the Research Unit for Realization of Sustainable Society and by World Bank project, entitled Mekong Delta Land, Climate & Water Data Analytics Services, contract number: 7189013.

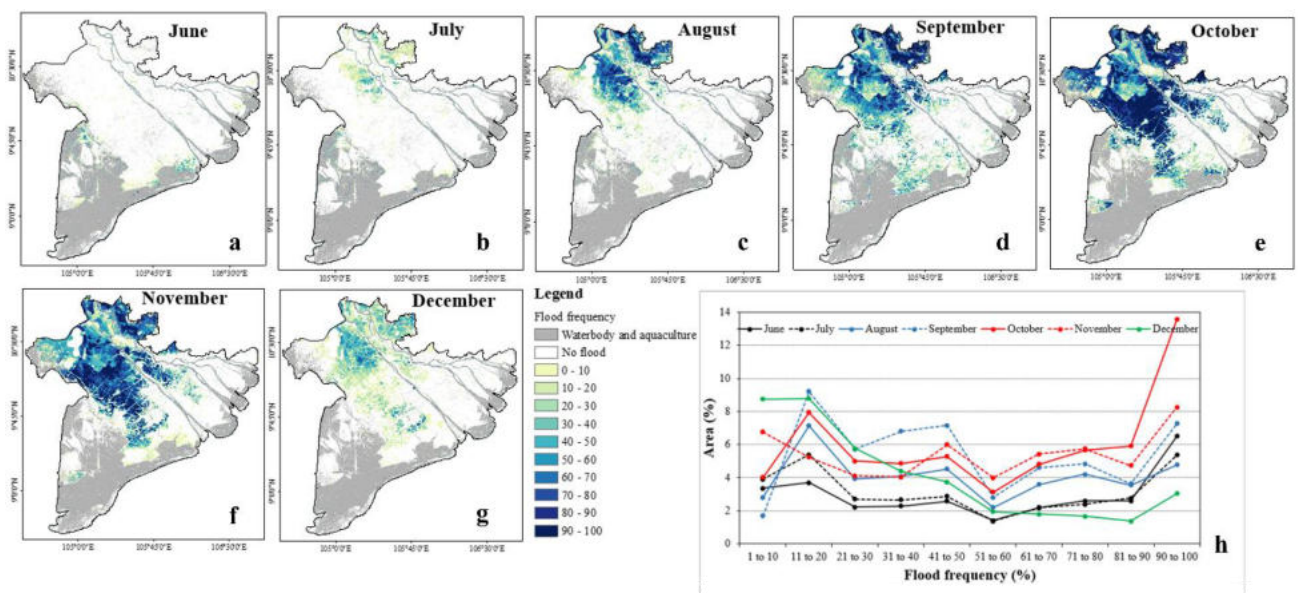


Fig 1. (a-g) Flood frequency analysis from June to December (2001-2018). (h) Flooded area (in percentage) under different flood frequency

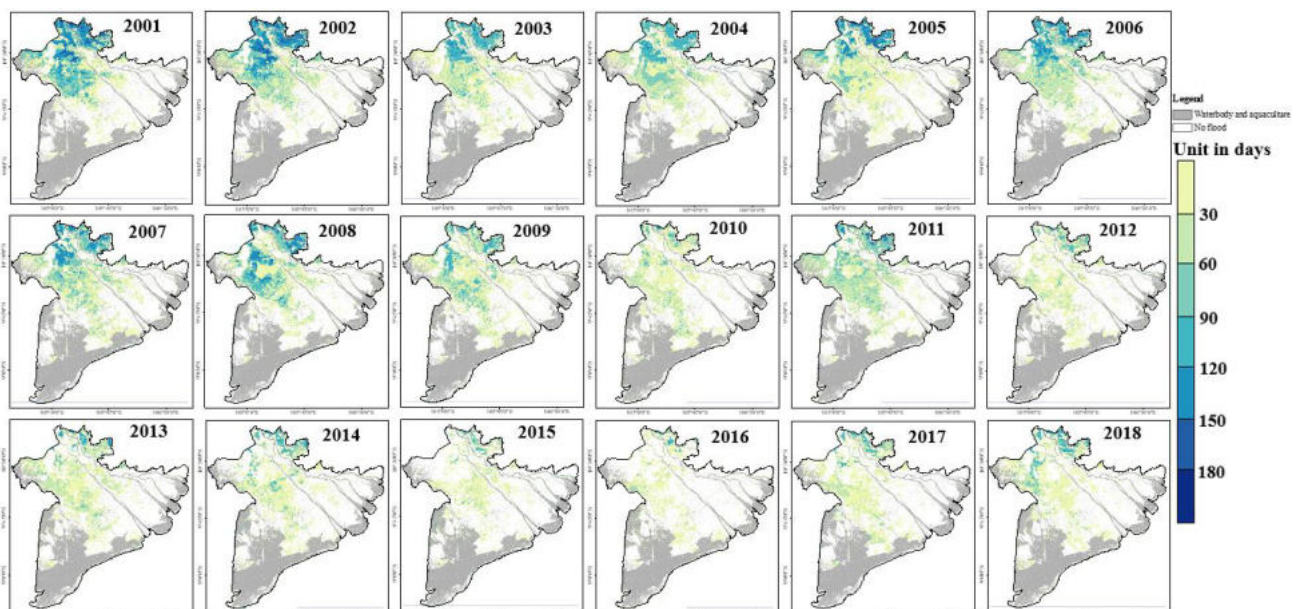


Fig 2. Spatial distribution of flood duration from 2001 to 2018 in Vietnam Mekong Delta

INTEGRATING ENVIRONMENTAL DATA INTO ARTWORKS: CASE STUDIES IN INTERNET OF THINGS AND INTERACTIVE DESIGN

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Abstract

This presentation explores the integration of environmental data into interactive artworks through the use of Internet of Things (IoT) systems, enhancing public engagement with environmental and climate-related issues. Art has long served as an impactful medium to communicate ideas about environmental protection, raise awareness of climate change, and bridge the gap between science and the public. By utilizing real-time environmental data, interactive artworks can create dynamic experiences that foster a deeper, more immersive understanding of ecological challenges. The study examines three case studies that illustrate this approach. *And They Die a Natural Death* by Nguyen Trinh Thi, exhibited at Documenta15 and Artes Mundi, represents wind data from an IoT system through shadow play and flute sounds. *Ri Seīyng (Sound-Less)* by Nguyen Trinh Thi, displayed at the Thailand Biennale 2023, interprets water-movement data with a symphony of xylophones and flute sounds. *Thần Rừng Bri*, currently on view at Phố Bến Đồi Creative Studio, represents open-source weather data using light effects. The presentation discusses the system designs and technical challenges encountered in integrating IoT technology with artistic expression, from the technical point of view of the production team of the artworks. It also reflects on how interactive design, informed by environmental data systems, can enhance the connection between the artwork and the viewer, making scientific and ecological information more accessible and engaging.

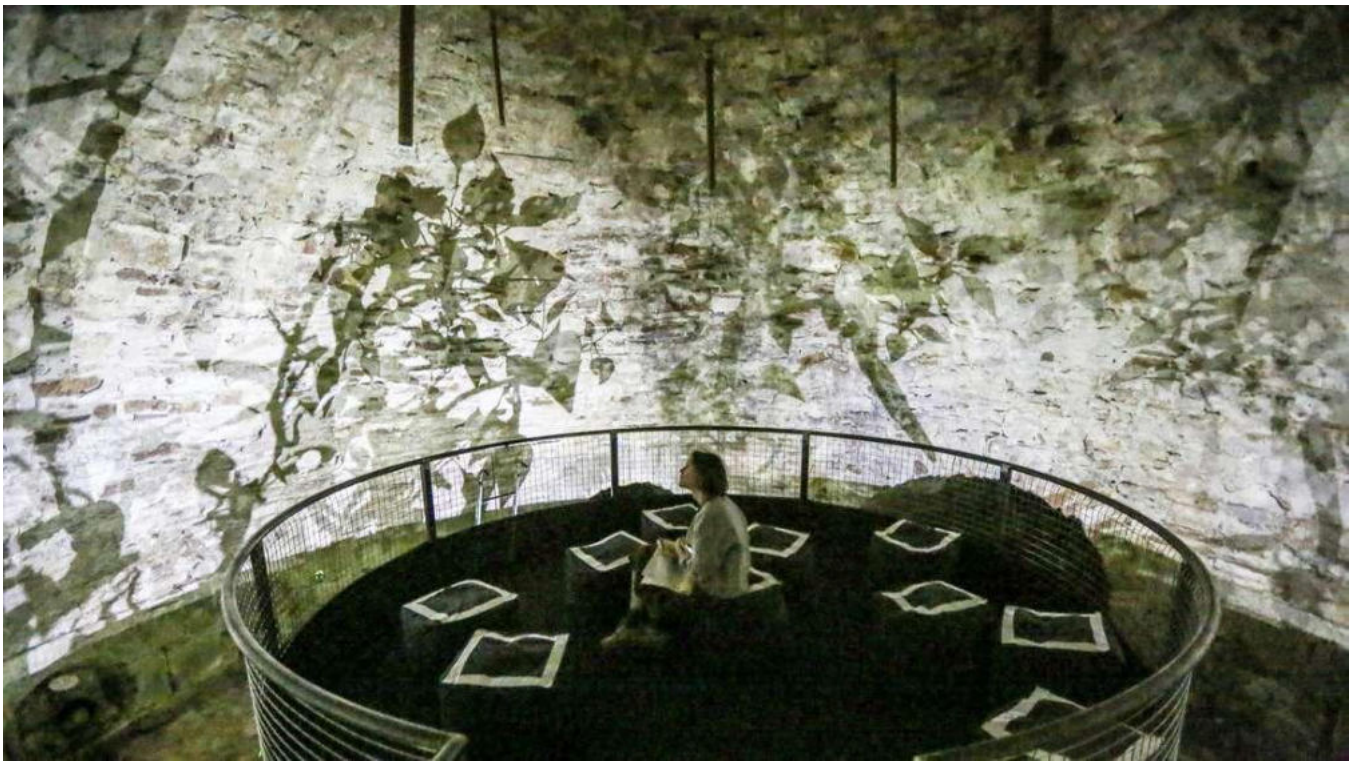


Fig 1. *"And They Die a Natural Death"* by Nguyen Trinh Thi, exhibited at Documenta 15 in Kassel, Germany. Image source: HNA Kultur, Documenta 15: Das Rondell wird durch Installation zum Chiliwald.



Fig 2. *"Ri seiyng (Sound-Less)"* by Nguyen Trinh Thi, exhibited at the Thailand Biennale 2023 in Chiang Rai, Thailand. The image shows a set of automatic xylophones, one in 22, hidden behind wooden statues inside the Golden Pavilion. Image source: Frieze, A Thailand Unified at Its Third National Biennial.



Fig 3. Image of "Thần Rừng Bri," currently exhibited at Phố Bên Đồi Creative Studio, Đà Lạt, Lâm Đồng. Photo courtesy of the technical team from MakerLab.vn Makerspace.

SLUICE GATES OPERATION TO OPTIMIZE SEDIMENT DEPOSITION IN AGRICULTURAL LAND IN AN GIANG

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Abstract

Floodwater, which overflows and carries sediment to fill the paddy fields, regenerates the river ecosystem, helps to flush pests out of the fields, and makes crops more productive, is very important for delta areas including the Vietnamese Mekong Delta (VMD). Climate change causes extreme weather, while human activities like the construction of upstream dams on the Mekong River have significantly reduced the amount of sediment reaching the VMD. A dike system in the VMD has been constructed to protect the inner fields from flooding and to keep the land dry for additional crop cycles. However, this also prevents floods from depositing sediment on agricultural lands and washing away pests. This indicates a severe shortage of sediment replenishment for agricultural land areas.

This study aims to provide a better understanding of the basin processes in an agricultural land area in the VMD, which is heavily affected by the aforementioned issues. We conducted field data collection through surveys in 2023 (river/canal bed elevation, sediment samples, dimensions of sluice gates for irrigation and dikes, and farming practices) and established a mathematical model for the area with farming practices and flood frequencies scenarios.

We found that the flow in agricultural land areas, sediment flows into the infield around September and October. When the sluice gates of the high dike system are not operating, the suspended sand concentration (SSC) is mainly transported from the Vinh Te canal into the Tha La and Tra Su canal areas; Here, additional SSC from the Tri Ton canal is added. Then, through the Tam Ngan and Tri Ton canals, the SSC is transported to the low dike area (canal location - Fig 1). The SSC flow from the Dao and Canthao canals is very small and insignificant.

The opening and closing of sluice gates in the high dike area affect the SSC flow in the low dike area. The type of flood can govern the influence of sluice operation on the change in total SSC in low-dike areas. In addition, further downstream (the main direction of movement of SSC), the impact of closing/opening the sluice on the total SSC is limited.

In the 2-dimensional simulation area, the flow time from the main Vinh Te canal to the infield is about 4 days. Therefore, every year, it is possible to determine the timing and duration of opening sluice gates to capture the SSC peak for the high dike area based on the monitored water level in the Vinh Te Canal. The most efficient scenario is to fully open the entire input sluice gates, all output gates should be closed until the flood peak timing (about 4 days lag compared to that in the Vinh Te canal), 1 day after the flood peak, gates all are opened with an aperture of 50%. In addition, the distribution of sluice gates in every direction of the dike is also a factor that helps optimize sediment deposition in the infield. In this study, the author proposed to build 2 additional sluice gates (scenario 5 – Fig 2) which could provide the most

superior total sediment deposition, with 27,399 m³ (Fig 2). Our results serve as a foundation to develop an operational framework for the basin to support timely and effective decision-making for agricultural production.

Keywords: *Basin processes, Sediment deposition, Agricultural production, Water resources, Vietnam Mekong Delta.*

Acknowledgement:

This research was supported by the project (Grant number 2023IG-01) of the Disaster Prevention Research Institute of Kyoto University and the Asia-Pacific Network for Global Change Research (APN) under project reference number CRRP2023-04MY-Doan Van (Funder ID: <https://doi.org/10.13039/100005536>).

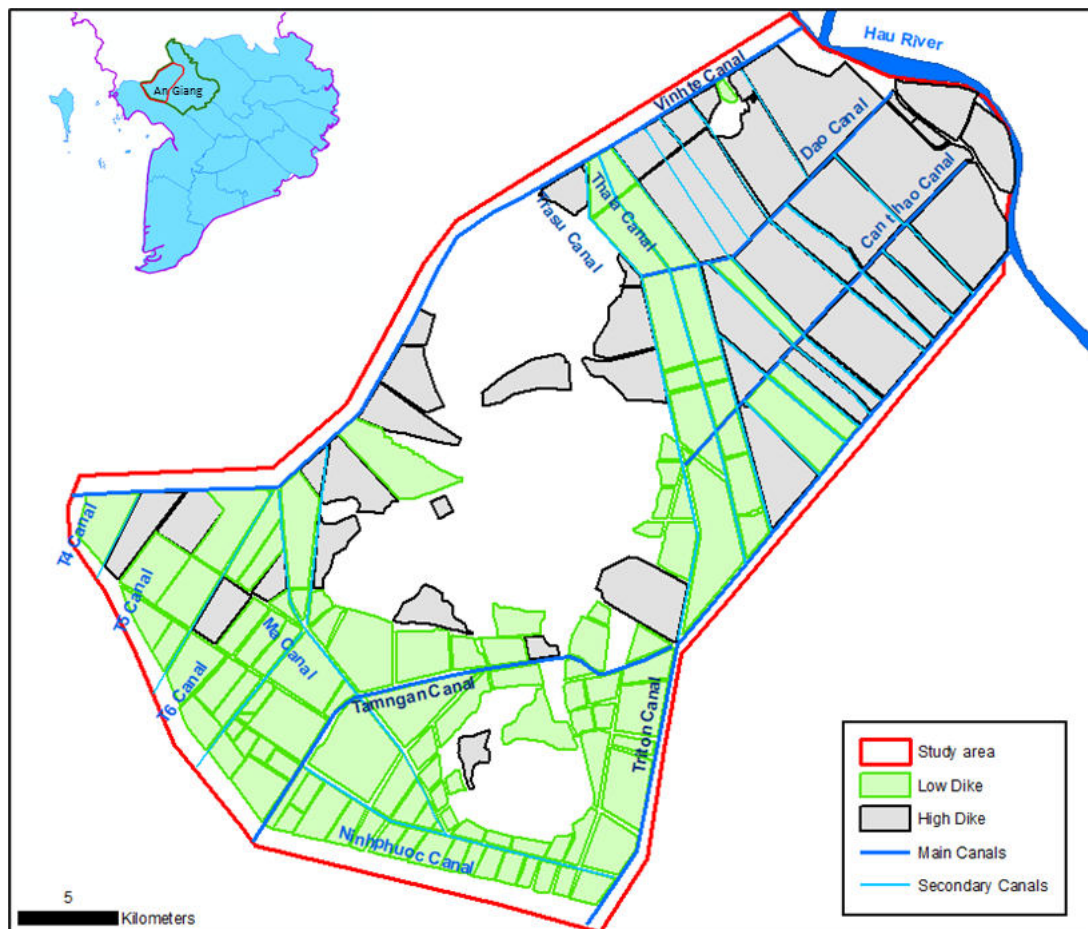
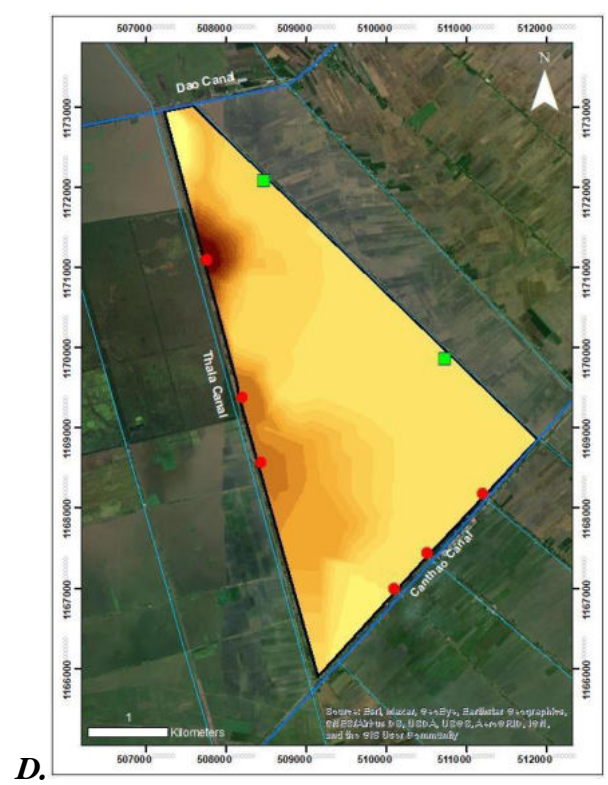
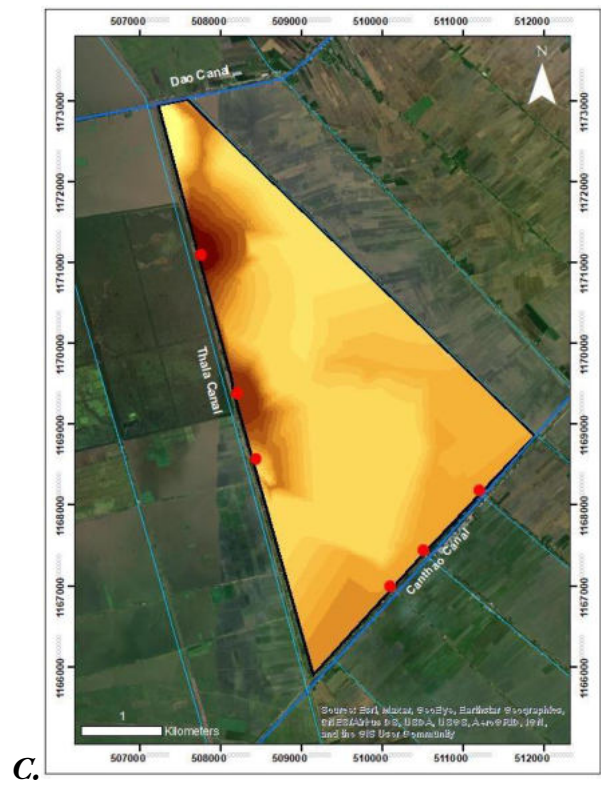
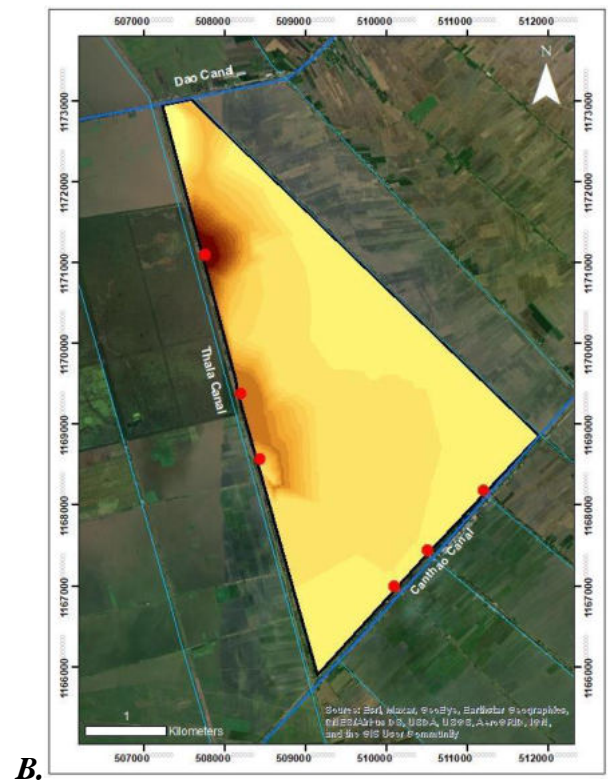
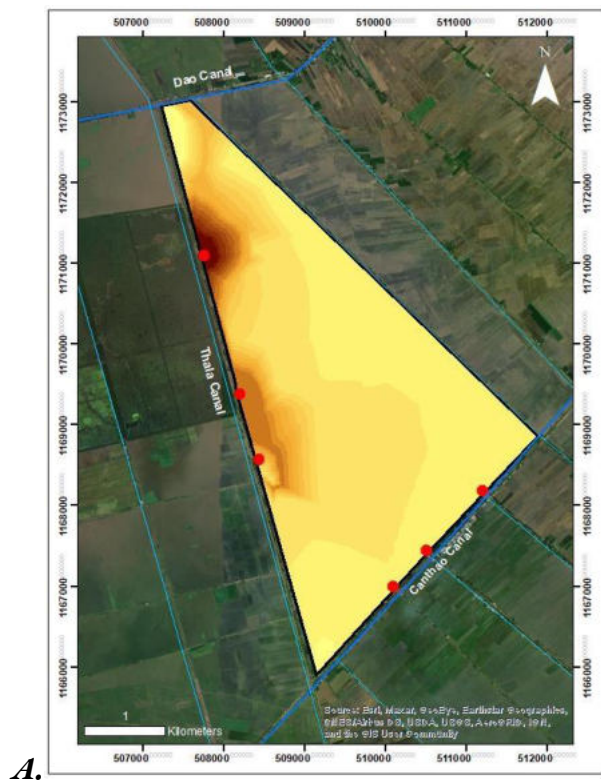


Fig 1. *Canals and dike systems in the study area*



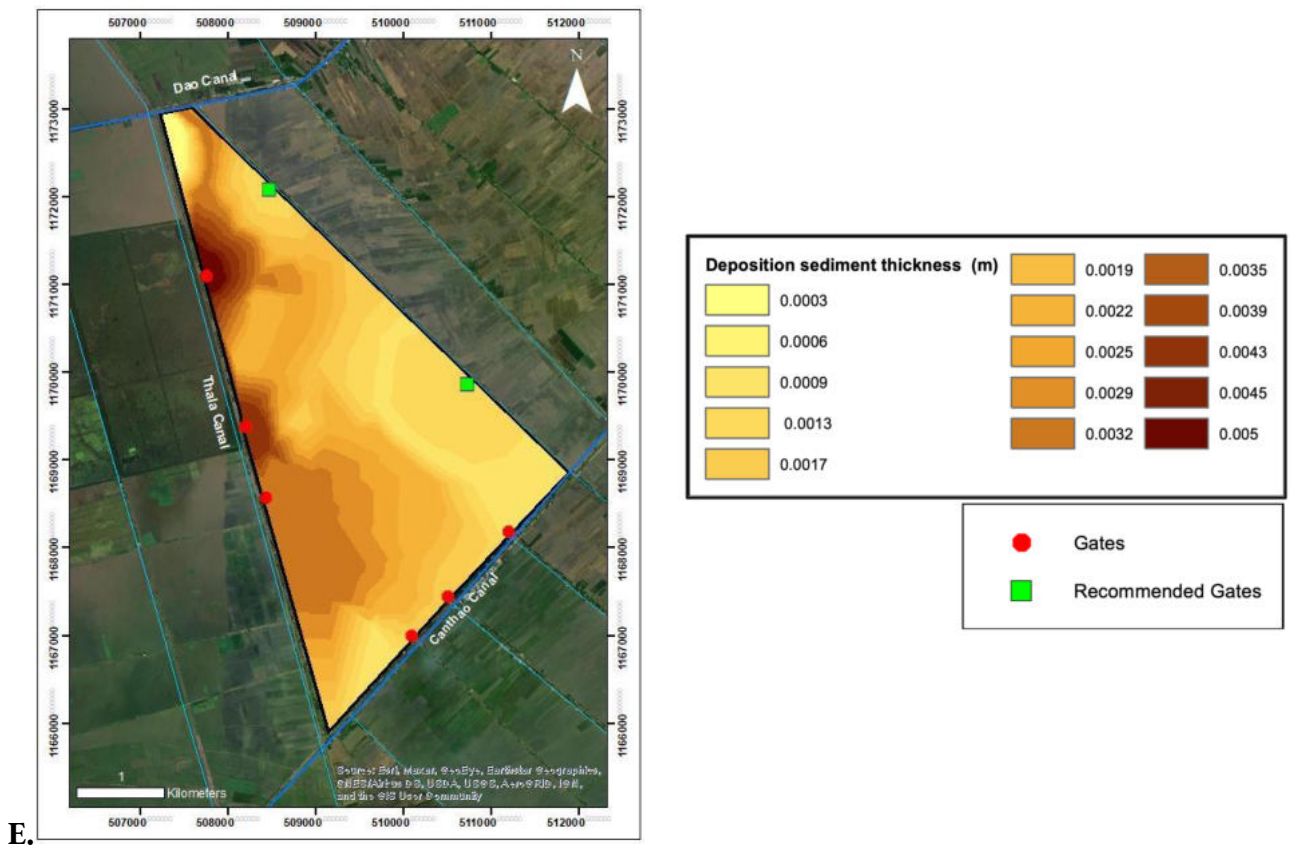


Fig 2. The thickness of sediment deposited (meter) in the high dike area after the sluice gates operating scenarios (Results from 2D model) (A). Scenario 01; (b). Scenario 02; (C). Scenario 03; (D). Scenario 04; (E). Scenario 05.

ASSESSMENT OF DAM IMPACTS ON WATER LEVEL IN THE SAI GON-DONG NAI RIVER BASIN, VIETNAM

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Abstract

Sai Gon-Dong Nai (SGDN) river basin is the largest internal river basin in Vietnam, with the catchment area entirely in the Vietnamese territory. A major programme of dam building is underway in many of the Saigon- Dong Nai river system. This raises the question of whether existing research is sufficient to fully understand the impacts of dams on Sai Gon- Dong Nai river systems. This provides a review of what is known about the impacts of dams on river water level. The review was conducted using the Nha Be, Phu An, Bien Hoa station databases from 1981 to 2021, with papers analysed to look for rainfall, compare water level after dam built, assess the approaches used to help understand dam impacts. Although research on Sai Gon Dong Nai river remains scarce, existing work is sufficient to allow us to draw some very broad dams have resulted in reductions in flow variability, change of water level, and assess impact of sea level to water level.

ENHANCED TREATMENT OF PER-/POLYFLUOROALKYL SUBSTANCES (PFAS) IN WATER USING PERSULFATE-CATALYZED ELECTROCOAGULATION

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Abstract

Per- and polyfluoroalkyl substances (PFAS) are currently of interest due to their persistence, difficulty in decomposition and easy ecological accumulation, especially in the aquatic environment. This study aims to enhance the ability to treat PFAS in water by electrocoagulation persulfate, focus on the appropriate operating conditions and the amount of generated sludge on iron (Fe) and aluminum (Al) electrodes. The results indicate that the concentration and main parameters affecting the electrochemical process (EC) include pH, persulfate concentration (PS), reaction time, current density, electrode material, and NaCl concentration. PFAS removal efficiency of the EC-PS-Fe system was higher than that of the EC-PS-Al system, the highest efficiency recorded was $90.17 \pm 0.95\%$ compared to $86.38 \pm 0.87\%$, respectively. In addition, the energy consumption of the EC-PS process under optimal conditions was 3 kWh/m^3 and the amount of sludge produced was $0.04 \pm 0.00352 \text{ kg/m}^3$. Via these results, it can be seen that the potential for practical application of the electrocoagulation with PS catalyst is extremely promising, however, it is necessary to consider additional external factors affecting the treatment efficiency.

Key words: PFAS, electrocoagulation, persulfate, sludge, operation costs.

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Abstract

Regional Climate Models (RCMs) nested at high resolutions within Global Climate Models (GCMs) and Earth System Models (ESMs) are important to deliver climate change information. Owing to the size of the city-state, such coarse resolution GCMs (with horizontal grid spacing of ~100-150 km) do not offer climate change information at spatial scales required for at city scales, due to which climate downscaling is necessitated. Especially over cities where urbanization is rapid, the effects of climate change can be complicated to understand. To this end this abstract presents high resolution climate modeling performed using the Weather Research and Forecasting model at a resolution of 2 km over greater Singapore. The presentation discusses some of the historical simulations and climate projections using downscale results forced by CMIP6 global climate models. Results show that extreme precipitation indices show biases in simulation results compared to observations, with differences between models and observed data. Spatial distribution of extreme precipitation indices varies across seasons and regions. Future projections of extreme precipitation indices show changes in dry and wet extremes under different emission scenarios and future periods. Models project varying trends in extreme precipitation indices, with some regions experiencing increases and others decreases in extreme rainfall events.

Keywords: UHI, Heat Mitigation, Sensitivity Simulations, Cool Materials, Cool City

EXAMINING THE EFFECTIVENESS OF HEAT MITIGATION STRATEGIES OVER URBAN AREA IN SINGAPORE

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Bhenjamin Jordan Lozada Ona¹, Angelo Benedict Ragonjan¹**

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Abstract

Due to rapid urbanization and infrastructure development, many cities worldwide have been experiencing increased ambient temperatures, due to a phenomenon known as urban heat island (UHI) effect. UHI refers to the increased ambient temperatures in urban areas compared to their surroundings. The common causes of UHI include the excessive absorption of solar radiation by structures such as buildings (walls and roofs) compared to other landscapes such as croplands or forests, the reduced wind speed due to the roughness of the buildings, the anthropogenic heat generated from human activities, and the lack of green landscapes such as parks or lakes. Singapore, a city located in the tropics of Southeast Asia, has also been under the impact of UHI due to excessive infrastructure development and urbanization over the past few decades. It has been estimated that the air temperature in Singapore would be ~1.4°C higher, if Singapore became more densely populated. Given this projected increase in temperature, it is crucial to explore strategies that could mitigate the effects of urban heat. For this reason, this study aims to examine the potential impact of different heat mitigation technologies on the air temperatures in Singapore under various scenarios, using the Weather Research and Forecasting model coupled with a single-layer urban canopy model. To improve the accuracy of the simulation, the urban land cover extracted from the Sentinel-2 10m Land Use/Land Cover (LULC) dataset was used to replace the default urban LC provided by the MODIS dataset in WRF (Figure 1). Here, we conducted a total of six simulations, including 1 baseline simulation and 5 sensitivity simulations. All simulations were conducted for May 2019, which is considered as the hottest month of the year. In the baseline simulation, the default urban parameters were used to evaluate the performance of the model. The sensitivity simulations, consider the implementation of various heat mitigation strategies, including Super-cool material (SCMs), Cool materials (CMs), Green roofs (GRs), Increased vegetation fraction (VEG), and Cool city (CC), to examine the effectiveness of each scenario in reducing air temperatures. Additionally, this study also examined the effectiveness of the heat mitigation strategies under 1.5 and 2°C increase in air temperature. The findings of this study will be useful for policymakers and urban planners by answering the following questions:

- Is urbanization the main cause of warming in Singapore?
- What is the potential of different heat mitigation strategies for reducing the air temperature in Singapore?
- How do the mitigation strategies impact the thermal environment of Singapore?

Keywords: UHI, Heat Mitigation, Sensitivity Simulations, Cool Materials, Cool City

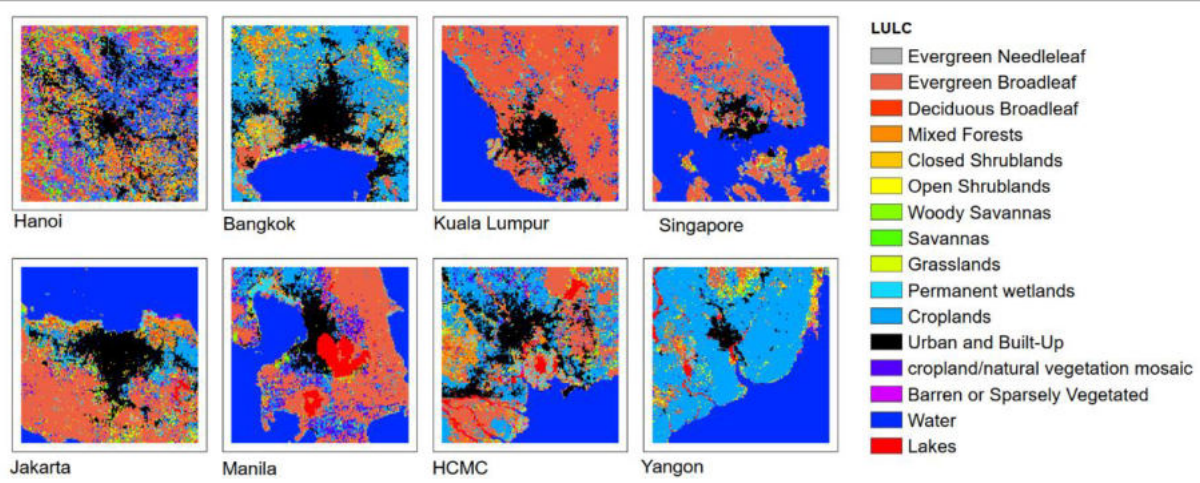


Fig 1. Updated urban LC for major cities in Southeast Asia. For other LC types, the default 20-class MODIS data was used.

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Abstract

Increasing extreme heat events have affected urban areas such as Metro Manila, with rising temperatures and health-related risks. Metro Manila's complex topography and high disaster risk require unique modeling approaches. Further investigation is needed into urban land use impacts during extreme heat events. This paper aims to assess the ability of numerical prediction weather models to simulate Metro Manila's extreme heat events and determine the potential impact of urbanization during these events. Five extreme heat events are selected from weather station data (Fig. 1a) and are simulated using a modified version of WRF with the Urban Canopy Model. To represent urban Metro Manila in the model, a 2-D anthropogenic heat (AH) flux (Fig. 1b) and an updated land cover are added as input. Then, the simulations are validated with respect to observation through model sensitivity tests. To determine the effect of urbanization, experiments representing vegetation (i.e. NOURBAN) (Fig. 1c) are compared to simulations with urban grids (i.e. URBAN) (Fig. 1d). The URBAN simulations represent diurnal temperature well, especially at night, while NOURBAN simulations underestimated temperature. The ACM2 planetary boundary layer scheme and RRTMG radiation scheme also performed best in sensitivity tests. In addition, the AH effect contributed only about 10% of the urban heat island intensity (UHII) for a test case. Nighttime conditions show that the urban heat island effect is more substantial in parts of Metro Manila over the expansion areas, while the AH effect is only shown in the central Manila area. The UHII at night is highest at 22:00 local time (~2.17°C). These findings may help policymakers in adaptation and mitigation scenarios, especially in identifying heat risk hotspots for urban thermal comfort and vegetation planning.

Keywords: Urban heat island, extreme heat event, planetary boundary layer, WRF model, Metro Manila

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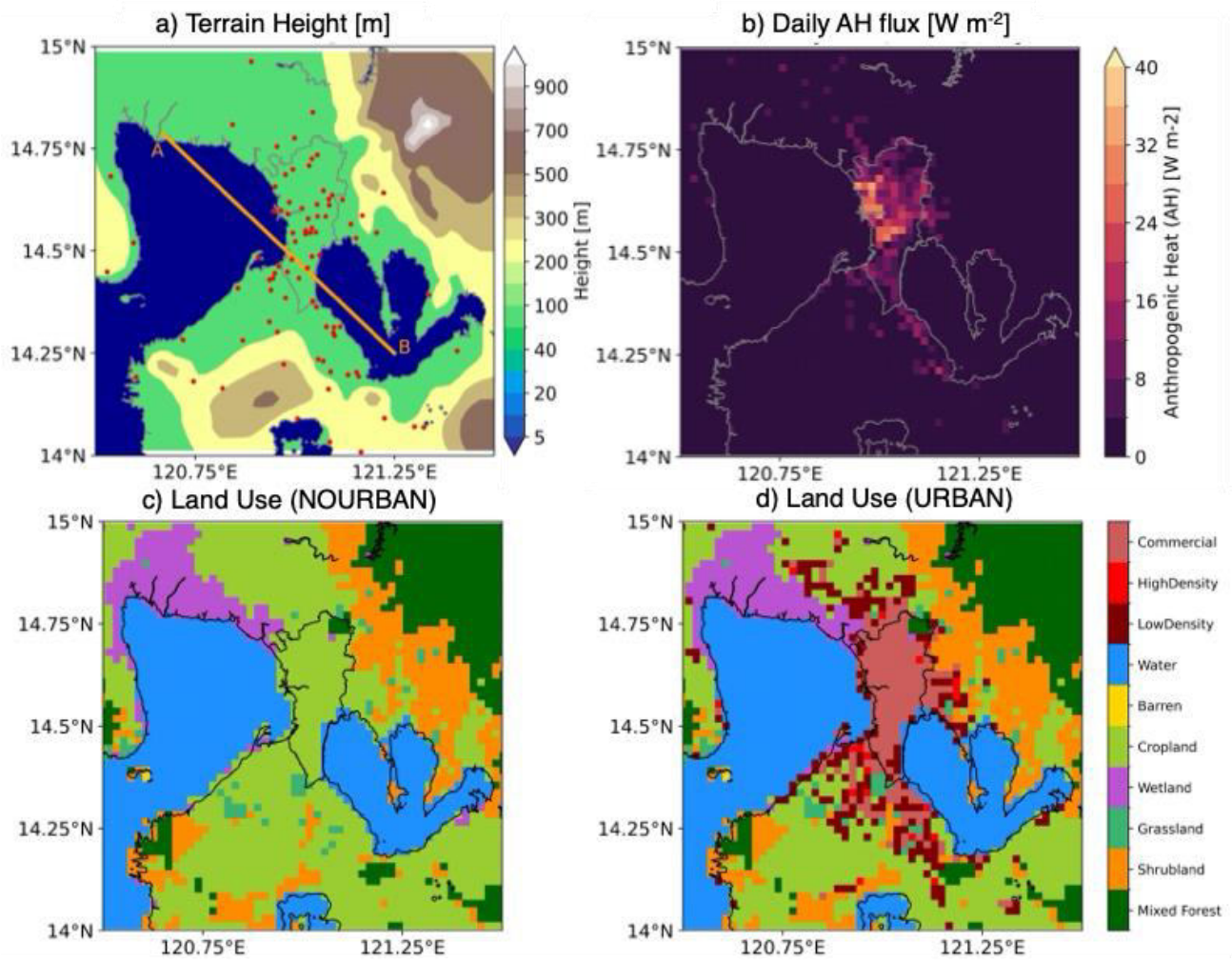


Fig 1. a) Terrain height [m] of the study area, b) daily AH flux [$W m^{-2}$], c) modified land use with no urban grids, and d) land use representing 2015 in Metro Manila. Adapted from Magnaye and Kusaka (2024), *Sustainable Cities and Society*, 110, 105584.

EXPLORING POTENTIAL MITIGATION OF URBAN RESILIENCE BY REDUCING URBAN HEAT ISLAND PHENOMENON & CALCULATING NORMALIZED DIFFERENCE VEGETATION INDEX (NDVI) IN JAKARTA

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Abstract

Jakarta as one of the cities with the highest population density in the world $\pm 16,000$ people/km², with a population of 10.67 million people or 3.76% of the national population (BPS, 2022) continues to face various challenges related to urban areas, one of which is related to climate change and disaster resilience. Jakarta continues to face temperature increases of up to 1.3°C in the 60-year period from 1960-2020 (University of Reading, 2023). The dynamics of surface temperature in Jakarta are directly proportional to the development of building density, but inversely proportional to vegetation density. Although surface temperature in Jakarta undergoes a transformation every year, it tends to experience a superior increase with the largest area in the high to very high category. In addition, the dynamics of surface temperature are also observed to continue to increase along with the allocation of residential land use, industry, public services, and services which reach $\pm 94\%$. In contrast, the allocation of space use in public Green Open Space (RTH) is only 5.21% of Jakarta's total land area.

The main contributors of the largest carbon in Jakarta are from the transportation sector 53%, power plants 25%, and the manufacturing industry by 8% (environment agency, 2022). Responding to this challenge, Jakarta is the only city in Indonesia that has made a joint commitment in terms of environmental sustainability through the DKI Jakarta Governor Regulation Number 90 of 2021 with an ambitious target of reducing emissions to zero (Net Zero Emission) by 2050. Some strategic steps to mitigate in supporting low carbon development include the integration of green and blue open spaces, the development of renewable energy sources, and the transition to the use of environmentally friendly public transportation.

Intensification in the framework of green-blue integration continues to be improved, one of which is based on supporting data (evidence based). Exploration of primary data to support low carbon urban development can be encouraged using Urban Heat Island (UHI) data to Normalized Difference Vegetation Index (NDVI). Utilization of UHI and NDVI data can be used to identify potential locations for green-blue integration that can have implications for reducing surface temperatures and reducing disaster risk. In line with (R Sanusi and M Jalil, 2021) Blue-green infrastructure shows greater microclimate benefits compared to open space with a reduction in air temperature of up to 1.6°C. Furthermore, the availability of primary data such as land cover area based on satellite imagery is also important to be elaborated for potential green open space (RTH) location approaches and RTH service coverage. As the human-settlement.eu raster satellite image data can identify the number and density of population spatially, the actual availability of this data needs to be improved.

In the context of positioning towards global city indicators, collaborative multi-stakeholder data integration is one of the important components in the planning process, especially in achieving DKI Jakarta's long-term goal in 2045 which is: Jakarta is an Advanced, Equitable, Competitive and Sustainable Global City. Based on those deliberations, the chosen study is “Exploring Potential Mitigation of Urban Resilience by Reducing Urban Heat Island Phenomenon & Calculating Normalized Difference Vegetation Index (NDVI) in Jakarta”.

Keywords: mitigation, urban heat island, NDVI, Jakarta.

STUDY ON THE TREATMENT OF EXHAUST GASES CONTAINING AROMATIC VOCs (BENZENE AND TOLUENE) USING Cu (CO)-MNO_x CATALYSTS

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Abstract

Air pollution, caused mainly by human activities, is a significant environmental challenge. Increasing population and continuous economic growth have led to the release of more chemical pollutants into the atmosphere. Volatile organic compounds (VOCs) are a group of pollutants that are of concern worldwide. They are common organic chemical pollutants that evaporate quickly at an average temperature [1] and can also exacerbate air pollution. Some substances are human toxins and carcinogens, such as benzene, toluene, ethylene, and xylene (BTEX) [2]. BTEX is also used in various industries as an additive or precursor for synthesizing chemical substances. For instance, benzene, a BTEX compound, produces plastics, nylon, pesticides, and paints. Toluene is used as a solvent in manufacturing paints, coatings, rubber, oils, and plastics. Ethylbenzene can be used to produce paints, plastics, and pesticides and is also added to aviation fuel. Xylene is a solvent in the paint, rubber, and leather industries [3][4].

Among VOCs, BTEX is a concern because it can harm human health and the environment if its concentration exceeds certain levels. Some VOCs, such as benzene, are considered potential substances that can cause cancer. They can cause severe damage to the liver, kidneys, brain, nervous system, antibody system, and cancer risk [1]. Additionally, some VOCs can contribute to environmental phenomena by producing secondary pollutants such as peroxyacetyl nitrate (PAN), the main components of photochemical smog. Therefore, controlling and converting VOCs into less harmful substances is crucial to addressing these issues and improving global air quality.

Numerous techniques have been researched and implemented to eliminate VOCs. Catalytic oxidation is an advanced environmental engineering technique that effectively oxidizes and breaks down harmful organic compounds, precisely aromatic VOCs, to prevent the release of pollutants into the environment. This method can completely oxidize VOCs at lower temperatures (250 - 500 °C) [11] than thermal oxidation method (>1000 °C), necessitating additional fuel and temperature-resistant materials [11] and prevent the formation of secondary pollutants. In addition, another technique, the adsorption process, can also treat VOCs at room temperature by capturing them in capillaries to prevent their release into the environment. Once the adsorption process reaches saturation, the adsorbent must be desorbed and treated using oxidation. As a result, the thesis proposes combining catalytic oxidation and adsorption

methods to eliminate aromatic VOCs, such as benzene and toluene, from the exhaust gas mixture produced during the waste tyre pyrolysis process.

Research on catalytic oxidation has predominantly focused on noble and non-noble metal-based catalysts. Noble metal-based catalysts such as Pt, Pd, and Au are commonly used for oxidizing aromatic VOCs due to their superior activity to non-noble metal-based catalysts. However, they can be easily poisoned by acid gas and are expensive. On the other hand, non-noble metal catalysts containing manganese, cobalt, nickel, and copper have proven highly efficient in VOC treatment due to their catalytic activity in the VOC oxidation process. Additionally, these catalysts are less susceptible to poisoning by environmental agents such as sulfur and chlorine than noble metals. This has motivated researchers to find more efficient catalysts that exhibit high catalytic activity at low temperatures and apply them to remove VOCs from the exhaust gases of industrial plants.

Our research showed that CuMnO_x powder (with a molar Cu/Mn ratio of 0.515) has a high catalytic activity in the benzene and toluene oxidation process at 250°C. The 23% CuMnO_x12/cordierite catalyst was prepared using the impregnation method with citric acid to apply this catalyst in an environmental treatment system. Moreover, this catalyst could convert toluene and benzene completely at 350 °C. Furthermore, the effectiveness of the CuMnO_x12 catalyst in the presence and absence of sulfur-containing compounds was studied. It was observed that the introduction of SO₂ resulted in a 20% decrease in benzene conversion, while H₂S led to a 30% reduction. These findings have significant implications for applying catalytic systems to treat exhaust gases containing aromatic VOCs in the presence of sulfur-containing compounds. The catalytic activity of the CuMnO_x12/AC catalyst was evaluated in the adsorption-oxidation process of toluene and benzene. The catalyst demonstrates a high adsorption capacity for both toluene and benzene, comparable to the original AC. The 7% CuMnO_x12/AC catalyst achieves a 46.57% benzene conversion, with 13.47% of adsorbed benzene being converted into CO₂ at 150 °C. On the other hand, the 25% CuMnO_x12/AC catalyst shows a 65.79% benzene conversion, with 89.4% of adsorbed benzene being converted into CO₂ at 150°C and reaching 94.41% benzene conversion, with completely adsorbed benzene being converted into CO₂ at 250 °C. These findings have significant implications for the use of adsorption-oxidation techniques in the elimination of aromatic VOCs.

In addition, the CoMnO_x 91 catalyst with a Co/Mn ratio of 9 synthesized using the sol-gel method resulted in the highest catalytic activity. Its primary crystalline phase is Co_{2.9}Mn_{0.1}O₄, and the sub-crystalline phase is Co₃O₄. The 15% CoMnO_x91/cordierite catalyst exhibited higher catalytic activity than the 23% CuMnO_x12/cordierite catalyst.

The exhausted gas containing aromatic VOCs (benzene, toluene,...) from a waste tyre pyrolysis pilot was treated using the investigated catalysts with the combination of the oxidation unit using the 15% CoMnO_x91/cordierite catalyst to oxidize aromatic VOCs into CO₂ and H₂O and the adsorption unit using the 7% CuMnO_x12/AC catalyst to remove remaining aromatic VOCs, CO₂, H₂O, and SO₂ before being released into the environment. The results showed that benzene conversion reached more than 99%, whereas toluene conversion got more than 97%. As a result, the exhaust gas treatment system from the waste tyre pyrolysis can be used to remove aromatic VOCs such as benzene and toluene, not only in the waste tyre pyrolysis process but also in similar processes.

Key words: Manganese -based catalyst, the oxidation – adsorption process

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ACTIVATED COMMERCIAL BENTONITE BY POTASSIUM HYDROXIDE TO ENHANCE THE ADSORPTION CAPACITY OF METHYLENE BLUE

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Abstract

This study investigated the efficiency of activated commercial bentonite (ACB) for the removal of methylene blue (MB) dye from aqueous solution. This composite material was simply chemically synthesized by using potassium hydroxide for activating commercial bentonite. It was characterized by FTIR, and SEM. The results showed that a relatively high adsorption capacity of MB on the ACB (9.33 mg/g) and an MB removal efficiency achieved over 90%. This research also measures the influence of certain operating parameters, including pH and temperature on MB removal efficiency. The results showed that MB removal capacity will increased when the aqueous solution is neutral or slight basis solution and increasing temperature. This study also indicated that the kinetic and thermodynamic study of MB adsorption follows the pseudo-second- order and Langmuir model. The results obtained show that the modified commercial bentonite is an interesting solution for the removal of dyes in water by adsorption.

Keywords: *Methylene Blue, Adsorption, Bentonite, Wastewater Treatment.*

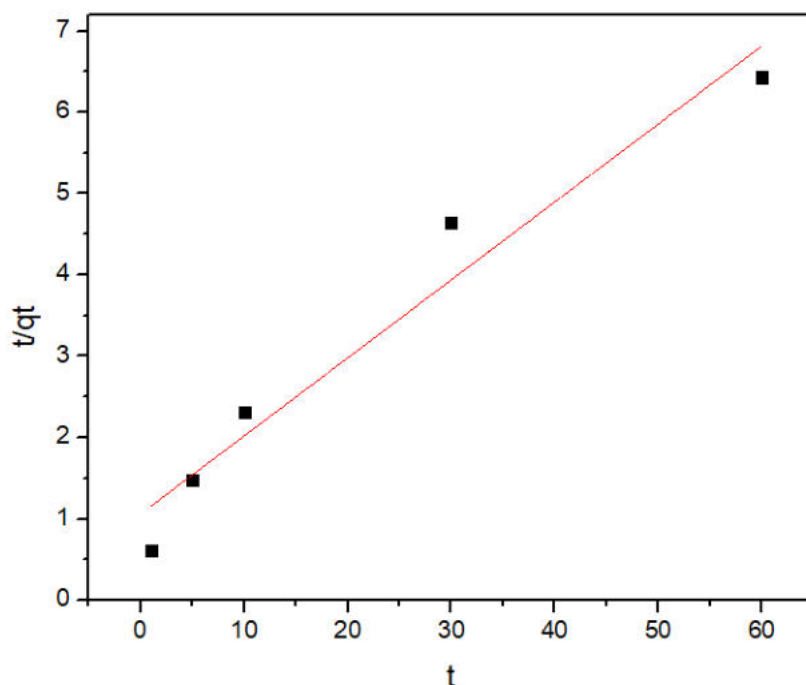


Fig 1. Pseudo-second order adsorption of MB onto MCB. ($[MCB] = 0.2 \text{ g/L}$, $pH = 7$, $V = 100 \text{ mL}$, $t = 60 \text{ min}$).

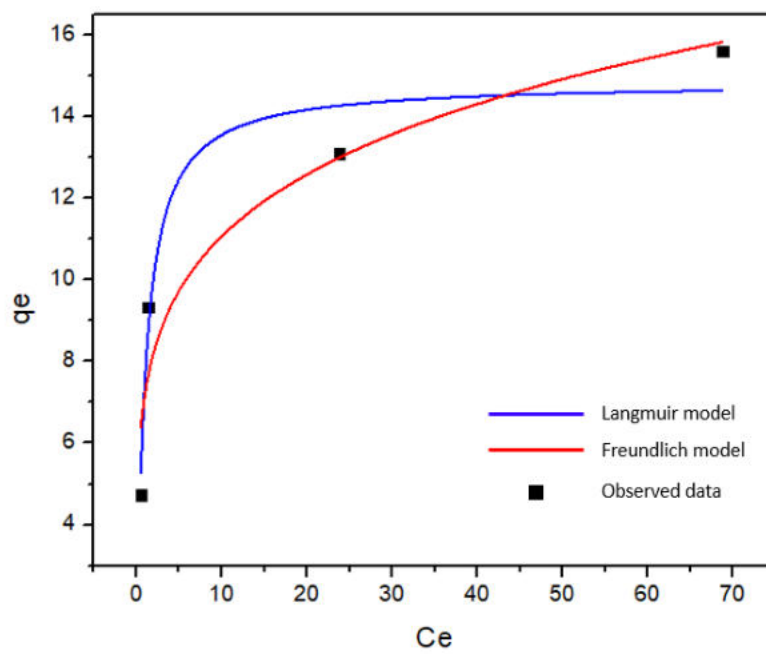


Fig 2. Adsorption isotherm of MB onto MCB ($[MCB] = 0.2$ g/L, $pH = 7$, $V = 100$ mL, $t = 60$ min).

THE EMERGING DANGER: EXTENDED-SPECTRUM BETA-LACTAMASE (ESBL)-PRODUCING BACTERIA ON MICROPLASTICS IN VIETNAMESE WATERS

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Abstract

This study aims to evaluate the antibiotic resistance of bacteria on microplastic surfaces in the Red River Delta and the influence of water quality on microplastics and antibiotic resistance at 17 locations throughout four examined provinces.

By using culturing and molecular biology identification methods, 207 bacterial strains were isolated and characterized from microplastics, predominantly comprising the genus *Aeromonas* (99.2% of the total) and a minor fraction of *Escherichia coli* (0.83%). β -Lactamase encoding genes, such as *bla*_{TEM}, *bla*_{SHV}, and *bla*_{CTXM-X}, were detected by PCR and agarose gel electrophoresis methods. The findings indicated that 23 individuals (~11%) possessed antibiotic resistance genes, predominantly *bla*_{TEM} (13/23; 56.5%), *bla*_{SHV} (9/23; 39.1%), and *bla*_{CTXM-9} (1/23; 4.3%). This indicates that microplastics gathered from regions significantly affected by human activities, such as urban areas, aquaculture farms, and industrial zones, exhibited a higher prevalence of antibiotic resistance genes. Pearson correlation analysis revealed strong positive or negative effects of specific environmental parameters (e.g., TOC, salinity, pH) on the abundance of microorganisms associated with microplastics. Our findings are expected to provide valuable insights for informing environmental management practices and public health strategies in combatting the challenges of AMR in the Red River Delta.

Keywords: *microplastics, antibiotic resistant gene/ bacteria, β -Lactamase, Red river delta, environmental health risks*

Acknowledgement:

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METAL-ORGANIC FRAMEWORKS MATERIALS FOR EFFICIENT PHOTOCATALYTIC DEGRADATION OF ORGANIC DYE CONTAMINANTS IN WASTEWATER

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Abstract

Water soluble unfixed dyes are the major pollutants in textile dyeing industry wastewater. Zeolitic imidazolate frameworks, ZIF-8 and ZIF-67 with a pore-structural network has many potential applications in photocatalysis degradation of organic dye contaminants in wastewater due to their intrinsic properties such as high porosity and large surface area. ZIF-8 and ZIF-67 is prepared under a one-step hydrothermal reaction from zinc and cobalt salt in methanol, respectively. The as-synthesized nanoparticles have a nearly monodisperse structure with a large size of ~600 nm. Using ZIF-8 and ZIF-67 micropores photocatalysts, a fast activation and electron transfer was achieved due to the high conductivity, resulting in a higher removal efficiency of methyl orange (MO) and methylene blue (MB) (over 90% at 60 min). The basic reaction mechanism involved the excitation of electrons from HOMO (oxygen orbitals in ligands) to LUMO (Zn(II)/Co(II) in core nodes) induced by visible light irradiation, followed by the electron transport to generate radical •OH. ZIF-8 and ZIF-67 visible-light photocatalysis would be a potential treatment process for solar abatement of organic contaminants.

Keywords: Metal organic framework, ZIF-8, ZIF-67, photocatalysis.

Acknowledgement:

We expresses our gratitude to all the valuable support from Duy Tan University, who is going to celebrate its 30th anniversary of establishment (Nov. 11, 1994 - Nov. 11, 2024) towards "Integral, Sustainable and Stable Development".

APPLYING THE WASTE FLOW DIAGRAM TO ESTIMATE PLASTIC LEAKAGE FROM TUY HOA'S SOLID WASTE MANAGEMENT SYSTEM INTO THE AQUATIC ENVIRONMENT, VIETNAM

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Abstract

Tuy Hoa is a coastal city in Vietnam with an increasing population and economy. Vietnam's fast-growing, tourism-oriented cities are especially vulnerable to capacity problems in solid waste management. Despite the ongoing and expanding problem of insufficient solid waste management and the associated plastic pollution, there is little information on the mechanisms of plastic leakage into the environment. The Waste Flow Diagram was implemented in this study to better understand the sources and fates of plastics that leaked from the solid waste system in Tuy Hoa city in 2022. The study's purpose is to gain a better understanding of these underexplored sources and their fates. The study shows leakage scenarios into the aquatic environment, ranging from 0.8 to 2.7 kg/cap/year, with the collection system being the primary source. Targeted improvements at this stage of the service could reduce leaks and the overall environmental effect of improperly handled plastic garbage. The study's findings emphasize the need of having current, trustworthy data to better inform stakeholders and service planning, allowing for more efficient action against plastic pollution. It is critical to understand waste leakage in order to make appropriate choices and prioritize areas for development.

Keywords: Plastic, Leakage, Solid waste management, Waste flow diagram, Tuy Hoa city

Acknowledgement:

This research is funded by the Vietnam National Foundation for Science and Technology Development (NAFOSTED) and the Swiss National Science Foundation (SNSF) under grant number IZVSZ2.203313.

UNVEILING VIETNAM'S TRADE DYNAMICS: THE PERSPECTIVE OF VIRTUAL WATER ON AGRICULTURAL PRODUCTS TRADE WITH PARTNERS FOR SUSTAINABLE WATER RESOURCE MANAGEMENT

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Abstract

Vietnam is a big exporter of agricultural products such as rice, coffee, cashews, and seafood, contributing to the global food supply chain. By exporting these water-intensive goods, Vietnam engages in global virtual water trade. This study aims to estimate the virtual water trade between Vietnam and major partners (The United States, China and the CPTPP) associated with agricultural products. The findings reveal that Vietnam has been experiencing a virtual water deficit with its trading partners, although this trend has shown signs of improvement since joining the CPTPP agreement. Over the 2010-2021 period, total imports amounted to 90 billion m³, while virtual water exports reached 149 billion m³. Notably, the US stands as Vietnam's largest virtual water surplus partner with a net import volume of 22.37 billion m³, whereas China is the largest virtual water deficit partner with a net import volume of approximately -87.05 billion m³. Exports of Vietnam's green water to China are staggeringly high, at 24 times the volume sent to the US. On the contrary, a deficit in grey water, primarily with China, constitutes 67.2% of total grey water exports. The trade heavily involves specific products such as “Semi-milled or wholly milled rice, whether or not polished or glazed” (29.83% of virtual water exports) and “Palm oil and its fractions, whether or not refined (excl. chemically modified and crude)” (17.37% of virtual water imports). Based on net imports and water regeneration potential, the trade partner assessment is divided into four types: Bilateral interests (USA, Australia, Malaysia, Canada, New Zealand, Chile); Unilateral beneficiary country (Bruner, Peru); Supported country (Singapore, China, Japan); Double pressure country (Mexico). Adjustments in trade are particularly necessary for China, Singapore, and Mexico to help maintain Vietnam's role in the global food supply chain while reducing water scarcity and promoting sustainable use of water resources.

Keywords: virtual water trade, water footprint, agricultural products, water management, Vietnam and trade partners.

Acknowledgement:

We extend our gratitude to Hanoi University of Science and Technology for their support in conducting this research. Also, thank Tan Trao University for funding this study.

DEVELOPMENT OF BOOSTING ALGORITHMS IN MACHINE LEARNING FOR THE ASSESSMENT AND CONTROL OF INDUSTRIAL WASTEWATER EFFLUENT ECOTOXICITY

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Abstract

Trace heavy metals have a tendency to persist in the effluent of industrial wastewater treatment facilities, leading to toxic effects on downstream water bodies. Traditional assessment method relied on animal testing, but ethical concerns have rendered them unacceptable. An alternative solution is to evaluate wastewater toxicity using trophic-level aquatic organisms as bioassays. However, these bioassay methods involve costly and time-consuming chemical and biological analytical experiments. In this study, an artificial intelligence-powered water quality assessment (AiWA) approach is proposed for predicting industrial effluent ecotoxicity to further enhance the quick and cost-effective ecotoxicity assessment process. Initially, 99 samples were collected from industrial wastewater treatment plants representing 21 different industries in the Republic of Korea. Fourteen parameters were measured, encompassing both physicochemical and ecotoxicological aspects. Boosting algorithms, especially extreme gradient boosting (XGBoost) and adaptive boosting (AdaBoost), were employed for model development. XGBoost outperformed AdaBoost in terms of model performance. Feature selection analysis revealed that conductivity, copper, lead, selenium, pH, and zinc concentrations were the most suitable inputs for training the boosting model. The innovated XGBoost-based AiWA model demonstrated significantly higher performance (i.e., up to 80%) compared to conventional models with an R² value of exceeding 0.94 and root mean square error of 3.5 toxicity unit for predicting the integrated toxicity unit (ITU). Additionally, pH and conductivity emerged as crucial indicators for reflecting ecotoxicity levels. Specially, this case study indicated that non-toxic/directly dischargeable levels (TU ≤ 1) were achieved when the pH ranged from 6.8 to 8.4 and the conductivity remained below 1,651 µS/cm. These findings are expected to facilitate rapid and cost-effective detection of heavy metal ecotoxicity in industrial wastewater effluents, aiding decision-making in wastewater management.

Keywords: Artificial intelligence, Boosting algorithms, Heavy metals, Ecotoxicity prediction and classification, Industrial wastewater management.

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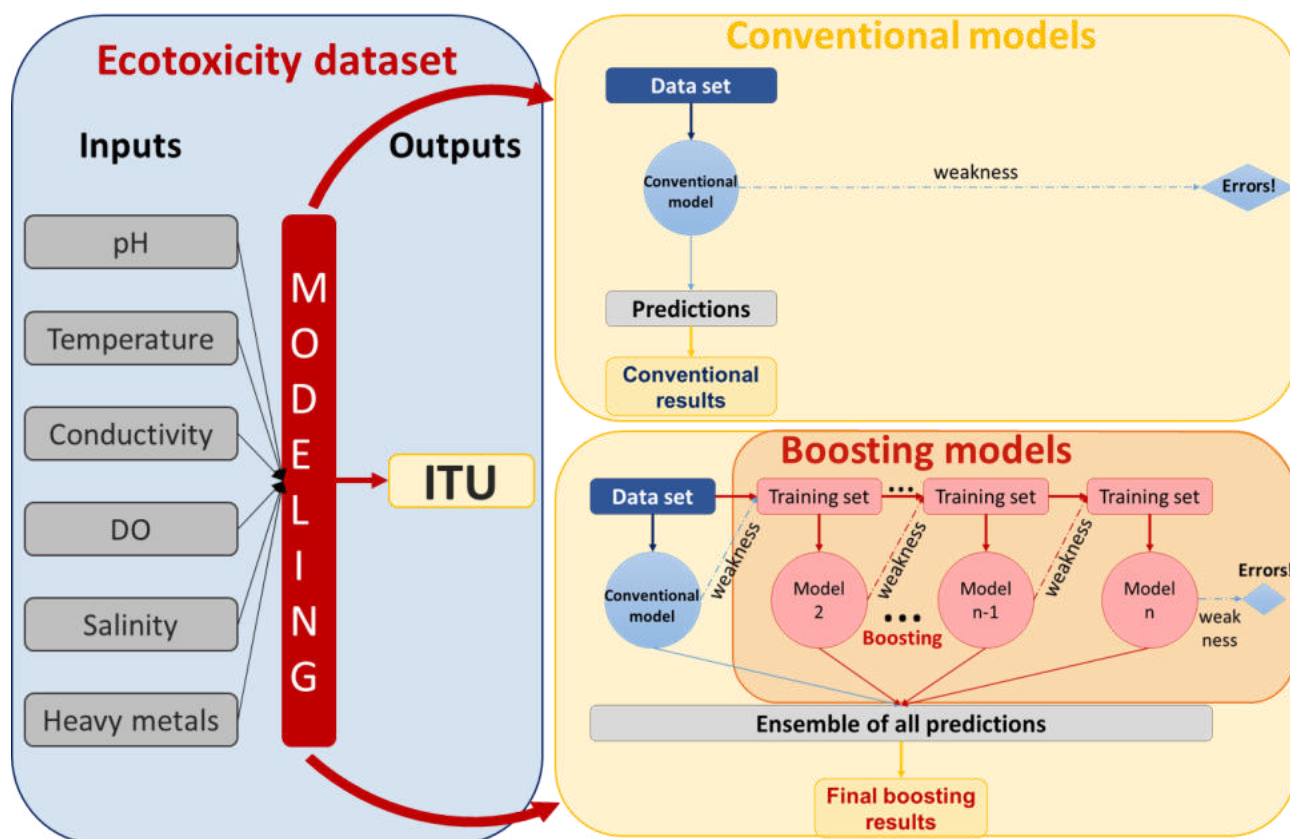


Fig 1. Overview on the structure of the AiWA boosting models compared to conventional models.

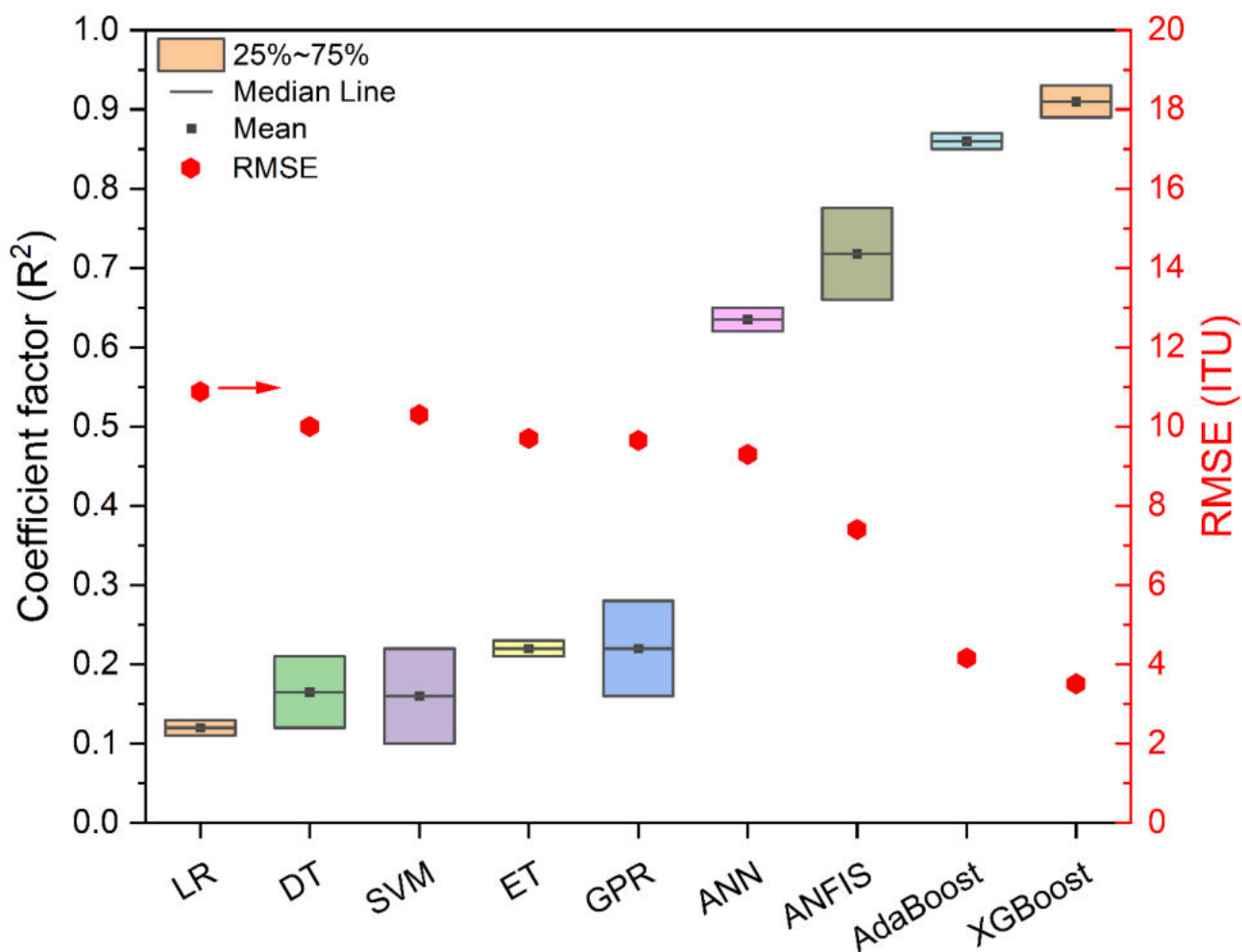


Fig 2. The performance of conventional and boosting algorithms in the prediction of ITU. Machine learning algorithms: Linear regression (LR), Decision Tree (DT), Support Vector Machines (SVM), Ensembles of Trees (ET), Gaussian Process Regression (GPR), Artificial neural networks (ANN), and Adaptive neuro-fuzzy inference system (ANFIS), Adaptive Boosting (AdaBoost) and Extreme Gradient Boosting (XGboost).

RECONSTRUCTION OF DROUGHT EVENTS FROM AD 1347 BASED ON *FOKIENIA HODGINSII* AT TAY GIANG FOREST, QUANG NAM PROVINCE, VIETNAM

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Abstract

Annual temperatures are reconstructed from maximum ring-width data of the *Fokienia hodginsii* (Pơ Mu) come from the Tay Giang Forest in Central Vietnam's (Quang Nam province). This species is growing on terrain between 1000 and 1,500 m above mean sea level. This reconstruction (AD 1347-2021) is the longest densitometrically based annual temperature record from Central of Vietnam. During the period 1575-1978, compared to the 10-year moving average temperature of the reconstructed temperature series, high average annual temperatures were observed during the following periods: 1586-1588; 1610; 1622; 1626-1631; 1661- 1662; 1726- 1730; 1784-1793; 1817-1823; 1846-1847; 1851- 1854; 1904-1926. The cycle of high temperatures ranges from 1-22 years, with an increasing amplitude ranging from 7-8% compared to the average annual temperature. This record of yearly warm reinforces evidence of significant warming at several high altitude in the late twentieth century. Based on the restored PDSI drought index, this study was identified 39 drought events in the following years: 1579-1585, 1592-1599, 1603-1609, 1614-1631, 1635-1636, 1646-1648, 1654-1658, 1661-1662, 1666-1672, 1678-1679, 1682-1684, 1688-1694, 1700-1704, 1708-1716, 1720-1729, 1740-1747, 1751-1757 and 1760-1761, 1778-1789, 1792-1795, 1804-1806, 1811-1819, 1823-1825, 1828-1829, 1833-1835, 1838-1840, 1844-1847, 1851-1859, 1864-1874, 1878-1879, 1888-1890, 1896-1907, 1911-1922, 1926-1927, 1946-1949, 1958-1961, 1969-1970, 1973-1975, 1979-1980, 1998. The reconstruction also indicates that there are four large-scale droughts recorded throughout Southeast Asia: Strange Parallels Drought (1751-1757; 1760-1761); East Indian Drought (1778-1789) Victorian drought I (1878-1879) and Victorian drought II (1888-1890).

Keywords: tree rings; *Fokienia hodginsii*; temperature reconstruction, drought events.

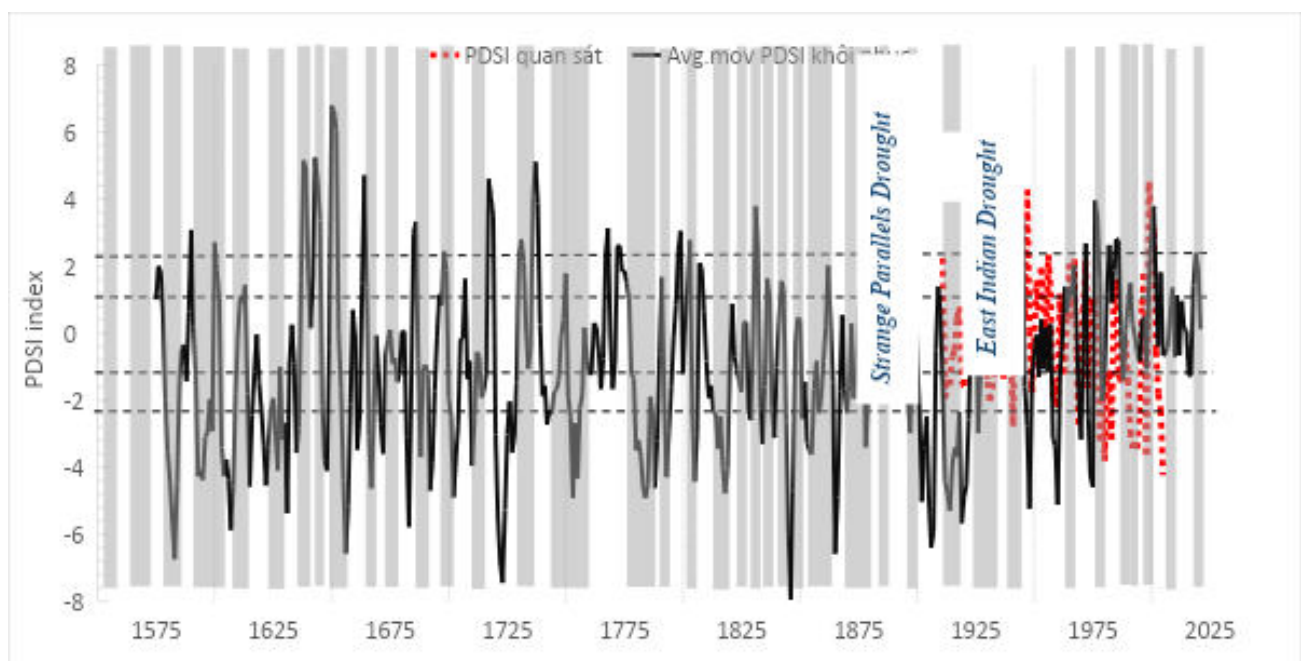


Fig 1. The restored PDSI index is based on the Po-mu tree ring width index for the period 1575-2020. The black line is the 5-year moving average of the restored PDSI index, the red dashed line is the restored PDSI index according to Buckley, 2010, the black dashed lines are the upper and lower asymptote of the PDSI drought index. The gray area squares are drought periods.

COASTAL CIRCULATION ALONG THE MIDDLE-SOUTHERN COASTS OF VIETNAM CHARACTERIZED BY HF RADAR AND MODELLING

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Abstract

Coastal circulations along the middle-southern coasts of Vietnam (VMSC) are characterized by various patterns and phenomena: South-China Sea western boundary currents, a dipole structure characterized by cyclonic and anti-cyclonic gyres offshore Vietnam and a South Vietnam upwelling which usually occurs in summer. For the first time, at coastal regions of Vietnam, a 1km-resolution surface current dataset during one month were obtained from HF radar measurements deployed in Phu Yen coasts, Vietnam. This high-resolution surface current data was used firstly to compare with modelling results and subsequently to optimize wind forcing for improving model surface current simulation. The results have shown globally significant improvements in modeled surface current fields. Analysis wind field showed good agreements at some days in the analysis period compared with satellite wind data. High-resolution measurement data i.e. HF radar surface currents thus are necessary for obtaining better simulation products for complex dynamic coastal areas.

Keywords: *HF radar, coastal circulation, model comparison, Vietnam coasts, surface currents*

Acknowledgement:

This research was funded by the joint Doctoral's Program between the University of the Littoral Opal Coast (ULCO) and University of Science and Technology of Hanoi (USTH), and partially funded by the Vingroup Innovation Foundation (VINIF) under project code VINIF.2023.DA151. It is also supported by the LOTUS international joint laboratory program (lotus.usth.edu.vn). The HFR data were collected from the measurement campaign in Phu Yen, 2019 and provided by the Center for Environmental Fluid Dynamics, University of Science, Vietnam National University (CEFD-HUS/VNU).

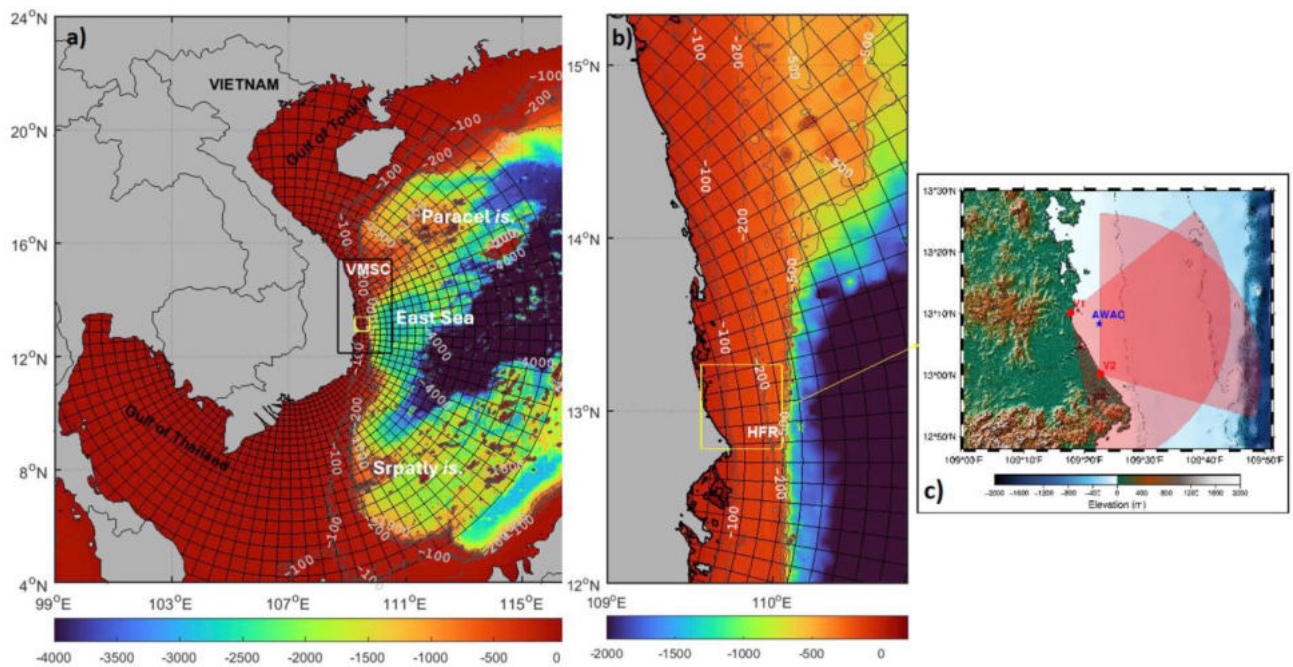


Fig 1. a) Bathymetry map of the EASTSEA domain and b) the VMSC domain (right) (bathymetry data source: GEBCO_2022). VMSC domain is bounded with black box, HFR domain bounded with yellow box. The computation orthogonal curvilinear grid is illustrated by black solid curves (the grid node density was reduced for better demonstrative purpose); c) Spatial coverage by WERA radars installed in April-May 2019 at the Phu Yen coasts, VMSC. Red dots show the two HFR stations V1, V2. Blue star shows location of AWAC. Bathymetry contours are shown by black solid lines.

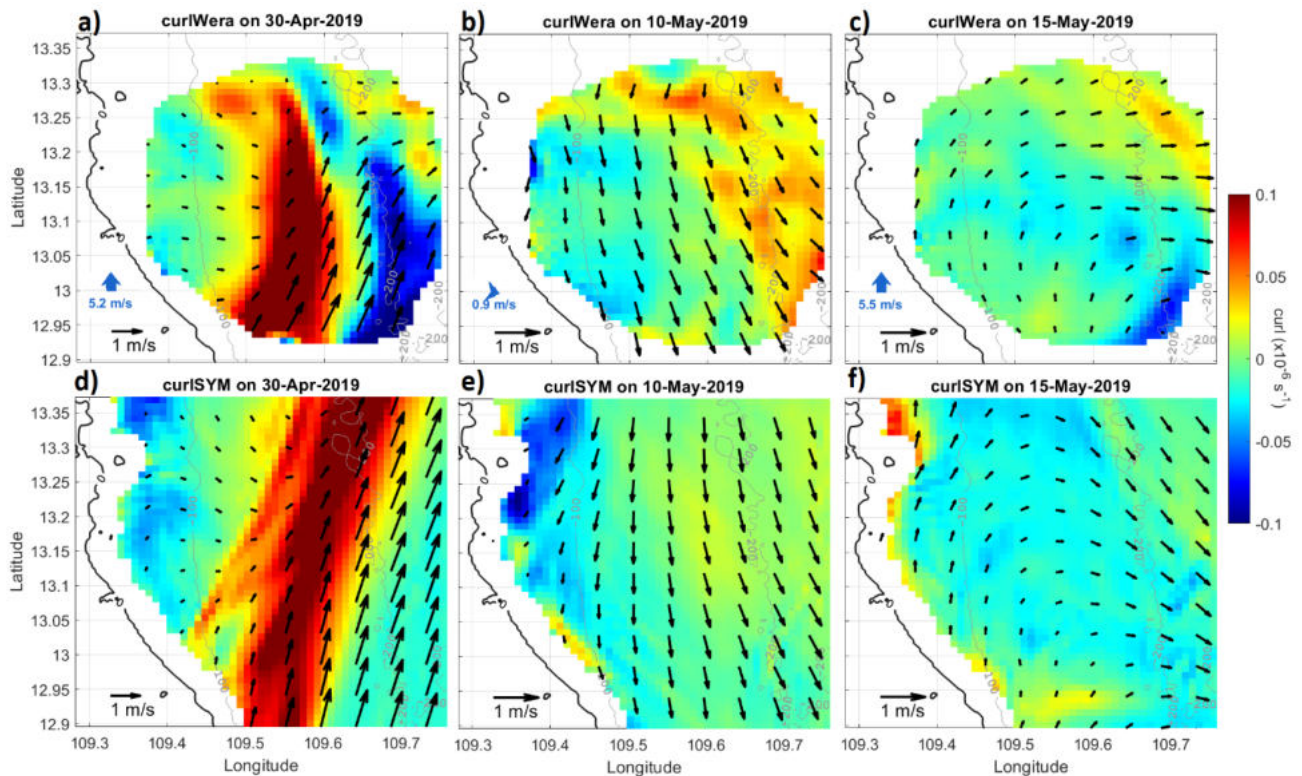


Fig 2. Surface current vectors obtained from HFR (a-c) and SYMPHONIE (EASTSEA run) (d-e) superimposing curl of current velocity field. Blue arrows in the southwest corner denoted averaged wind directions and magnitudes over the HFR domain. Isobaths are given in gray solid lines, coastlines are represented in black solid lines.

ASSESSING HANOI SUBSIDENCE FOR SUSTAINABLE DEVELOPMENT: LONG-TERM MONITORING AND RISK MANAGEMENT THROUGH SATELLITE OBSERVATION

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Abstract

Rapid urbanization and population growth in Hanoi have increased groundwater extraction, raising concerns about land subsidence, a significant geohazard risk. This study is the first to perform a long-term interferometric synthetic aperture radar (InSAR) analysis using multiple SAR sensors, including ALOS, COSMO-SkyMed, and Sentinel-1, to monitor subsidence in Hanoi from 2007 to 2018. The results reveal that while subsidence in central Hanoi has been decreasing, areas in the southern and western outskirts (Ha Dong and Hoai Duc districts) have emerged as hotspots, with subsidence rates reaching up to 50 mm/year. By integrating 22 years of piezometric data, we modeled the subsidence time-series to estimate hydrogeological properties, revealing a mean consolidation coefficient of 0.56 m²/yr - characteristic of aquitards with more than 90% fine-grain material. The model predicts an additional 0.5 to 1.3 meters of subsidence in Ha Dong by the end of the century. These findings emphasize the need for zoning subsidence-susceptible areas as a foundation for groundwater management in Hanoi. Compared to other Southeast Asian cities, Hanoi is relatively less impacted by subsidence due to its geotechnical properties and lower population density. The use of InSAR to monitor subsidence in Hanoi demonstrates the effectiveness of satellite observation as a robust tool for detecting ground deformation, which serves as an early indicator of potential geohazards and provides essential information for risk management and mitigation.

Keywords: subsidence, Hanoi, InSAR, groundwater, geohazard.

Acknowledgement:

The author expresses gratitude for the support provided by the Taiwan International Graduate Program and the Institute of Earth Sciences, Academia Sinica.

EXPERIMENTAL APPLICATION OF THE μ -GA APPROACH TO OPTIMIZE THE CONFIGURATION OF PHYSICAL PARAMETERIZATIONS FOR PREDICTING SUMMER RAINFALL USING REGCM5

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Abstract

The rapid development of science and technology has intensified the use of regional climate models (RCMs) to simulate meteorological conditions at regional and local scales. The latest RCMs can resolve processes down to kilometer or even finer scales, thanks to advancements in physical parameterization (PP) options, enabling broader climate research. However, the growing number of PP options has also increased the complexity and uncertainty of RCM simulations. This study aims to identify the optimal combination of PPs for the Regional Climate Model version 5 (RegCM5), developed by the International Centre for Theoretical Physics (ICTP), to improve the simulation of summer rainfall in Vietnam. A Micro-Genetic Algorithm (μ -GA), based on natural selection principles, is applied to achieve this goal. Previous studies have demonstrated the μ -GA's superior performance in numerical simulations, motivating its integration into the RegCM5 system to find the best PP configuration for the study domain. The identified configuration is used for long-term simulations of summer rainfall during 1995-2004. For comparison, two additional simulations are performed using widely accepted PP configurations for the region. The results show that the new configuration (Tiedtke for convection over land, Kain-Fritsch for convection over ocean, Holtslag for the planetary boundary layer, and SUBEX for microphysics) outperforms the published configurations in simulating rainfall over Vietnam. Additionally, the μ -GA demonstrates an advantage in the rapid convergence of results. This study also contributes to our ongoing research on tuning PP parameters, with promising preliminary results. The findings are expected to make a significant contribution to RCM research in Vietnam and highlight the effectiveness of the μ -GA approach in optimizing simulations across various regions worldwide.

Keywords: RegCM5, micro-GA, physical parameterization, rainfall.

Acknowledgement:

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QUANTIFYING MANGROVE FUNCTIONAL DIVERSITY LEVERAGING REMOTELY SENSED BIOCHEMICAL VARIABLES.

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Abstract

Over the past three decades, the field of quantitative functional diversity (FD) has witnessed significant progress. Encouraged by the Essential Biodiversity Variable (EBV) framework, which emphasized the importance of remote sensing data for biodiversity monitoring, there has been a paradigm shift towards utilizing spatial observations enabled by the unprecedented volume of satellite data. However, the application of FD to muddy mangrove ecosystems remains relatively underexplored compared to terrestrial forests. This is primarily due to the inherent challenges associated with mangrove accessibility and their limited spatial coverage as viewed by Earth Observation constellations. With this perspective in mind, we aimed to map mangrove FD using a multi-trait approach, implemented on the largest mangrove forest located in Ca Mau province, Vietnam. First, we retrieved 19 spectral band ratio vegetation indices and three key biochemical variables (leaf chlorophyll content, leaf mass per area, and equivalent water thickness) from Sentinel-2 imagery. Subsequently, we employed a moving window approach to estimate three independent FD components: richness, divergence, and evenness. This approach captured holistic mangrove characteristics within a three-dimensional (3D) space volume. We employed moving window sizes of 2x2, 4x4, 6x6, and 10x10 pixels with a pixel resolution of 10 meters. Our findings revealed the presence of scale dependencies and the significant influence of correlations between the selected input variables within the FD model. Despite the inherent challenges associated with remote sensing of mangrove ecosystems, our study demonstrates the potential of this approach for retrieving FD metrics. This motivates the way for quantifying large-scale mangrove ecosystem dynamics across spatial and temporal dimensions

Keywords: *remote sensing, functional diversity, mangrove*

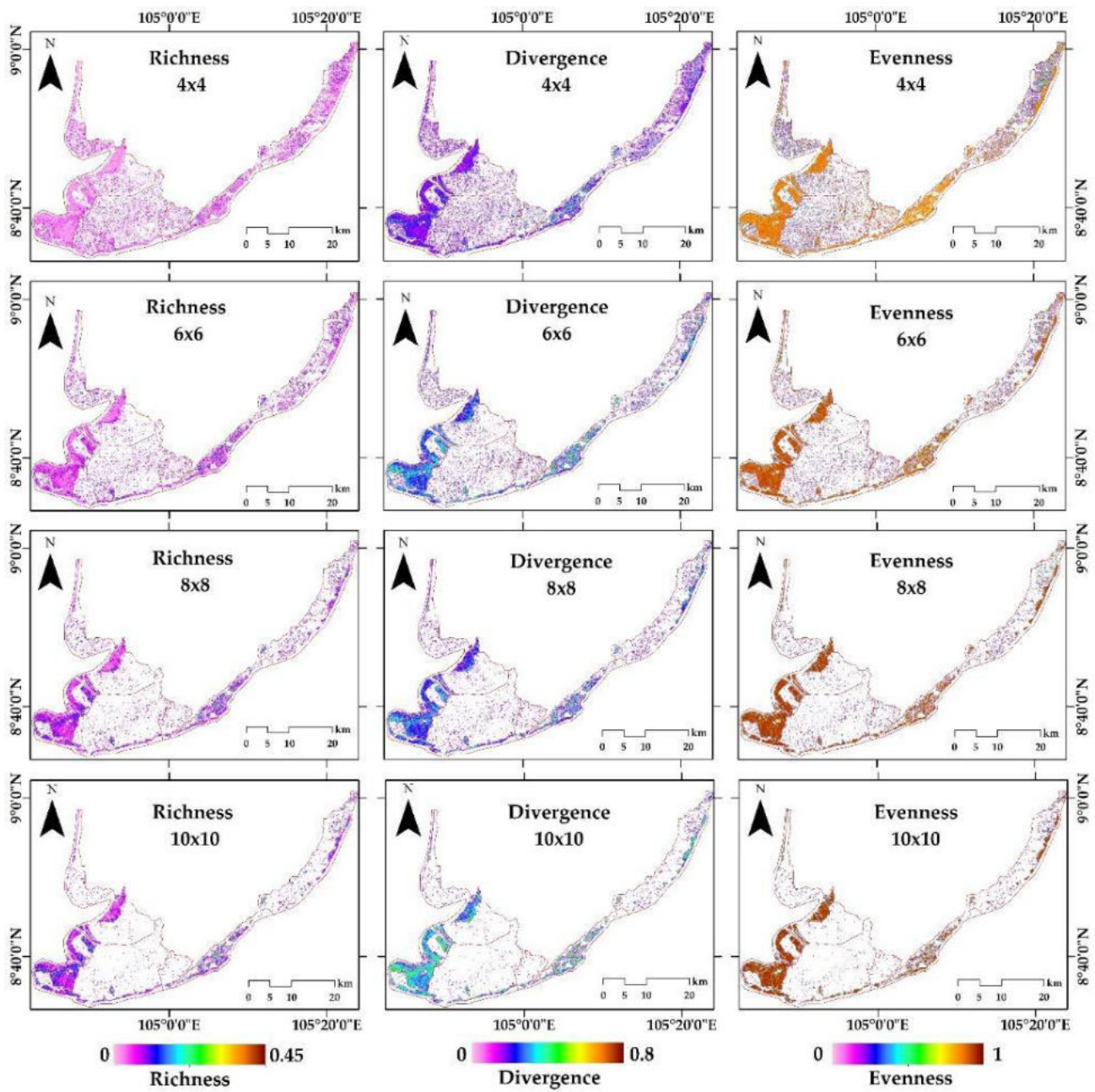


Fig 1. Richness, divergences, and evenness estimated by FD modeling following moving window sizes using three input metrics (leaf chlorophyll content, leaf mass per area, and equivalent water thickness)

PHOSPHORUS ATTENUATION IN LAKE WATER AND SEDIMENT USING GEOTEXTILE FILTRATION AND AIR-INDUCED SEDIMENT RESUSPENSION

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Abstract

Phosphorus, a non-renewable resource and essential macronutrient for living organisms, has been a difficult issue for nations to deal with due to its augmented concentration in surface waters mainly related to increased human activities and climate change scenarios. Phosphorus is discharged in excess into waterbodies and is accumulating in sediments causing recurring eutrophication occurrences. Thus, a cascade of aquatic ecosystem alterations occurs. This is characterized by the proliferation of algal and cyanobacterial communities over other species, potentially accompanied by toxin production, organoleptic issues, and oxygen depletion. These transformations compromise water uses either in recreational and drinking water perspectives, while concurrently imposing economic burdens and potential public health risks. This work is in response to the United Nations' Sustainable Development Agenda for Goal 6 (SDG 6) which emphasizes the clean water and sanitation for all, and more specifically restoration of water-related ecosystems (target 6.6). This target, originally slated for achievement by 2020, underscores the imperative of preserving and rehabilitating aquatic resources for current and future generations.

Procedures (i.e., physical, chemical, and biological) have been created for decreasing the phosphorus sources, the possible limiting nutrient in waterbodies, from the water column and sediment. Following the specialized literature, the remediation methods could be sediment- oriented including dredging and capping with inert elements (i.e., lanthanum modified bentonite) or chemical addition (i.e., coagulants and pure oxygen), water column oriented such as hypolimnetic water aeration oxygenation and biological methods including biomanipulation and macrophyte management. There are also treatment combinations which involve more than two of the previously cited. Some of the disadvantages of dredging, include the generation of a large quantity of phosphorus-contaminated sediment which needs dewatering and proper land disposal. For sediment capping only chemicals and/or inert elements are added to the sediment to create a thin active layer and thus the contaminated sediment remains at the site. Lastly, water column and biological oriented options for alleviating the symptoms caused by eutrophication.

Therefore, there is a growing need for innovative, efficient strategies to mitigate the impacts of P pollution. With this in mind, an emergent treatment method combination is under investigation based on the use of geotextiles as filter media for eutrophic water and sediment. The objective is attenuation of suspended particles and particulate phosphorus, thus increasing the possibility of algae suppression. Presented in Figure 1, this in lake pilot experiment is achieved by using a floating filtration system, a silt curtain (i.e., for containment of a specific area), and geotextiles (woven and non-woven) as the filter

media. Additionally, a laboratory investigation, presented in Figure 2, is evaluating this filter media on reducing the phosphorus concentration in sediments after resuspension. Thus, this paper aims to present information towards the in-lake phosphorus attenuation deployment for a lake system (water column and sediment) using geotextile filtration and air-induced sediment resuspension followed by a bag filtration. A case study related to a Quebec mesotrophic lake (Lake Caron) water filtration and sediment resuspension, located in the Sainte-Anne-des-Lacs municipality in Canada, will be described.

Keywords: *Phosphorus, Eutrophication, Sediment, Resuspension, Geotextile Filtration*

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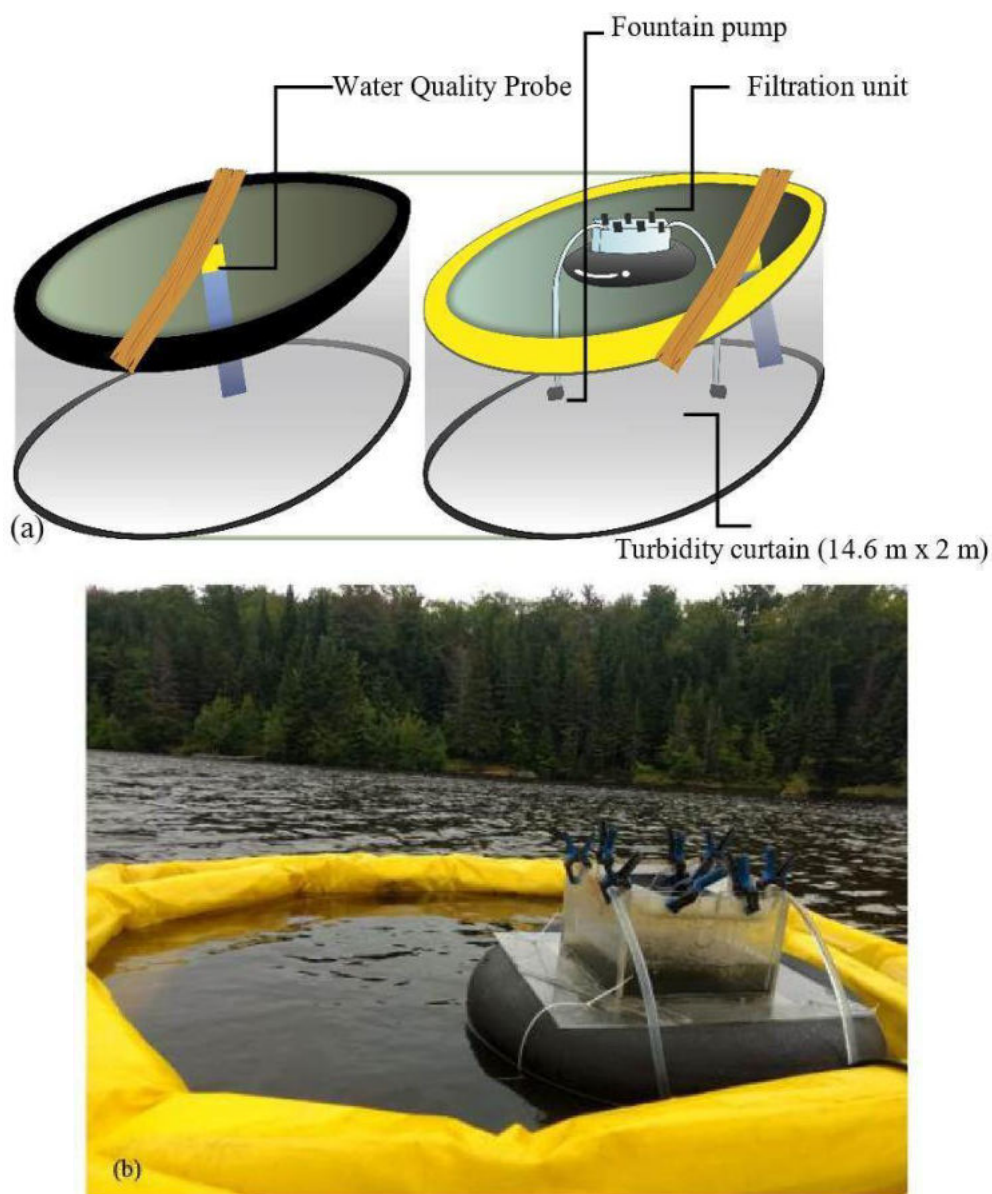


Fig 1. (a) *In-situ filtration setup 3d schematics and (b) in-lake filtration deployment*



Fig 2. Sediment resuspension setup including: (a) sediment before resuspension, and (b) 0.5 min after resuspension and the (c) geotextile bag combination before the filtration process and (d) after the filtration process.

LAGRANGIAN DISPERSION IN THE RED RIVER PLUME REGION FROM DRIFTING BUOY OBSERVATIONS AND MODELING

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Abstract

A large proportion of the terrigenous material, nutrients, sediments and undesirable contaminants are carried to the ocean by rivers. Transition zones where the low density water enters the ocean and the velocity field associated with this flow are known as the river plume. The transport, mixing, and trapping of materials within the plume are influenced by when and where source waters reach the plume front. That is why it is so important to understand plume dynamics and the physical processes that control them. Numerical coastal circulation models have shown significant skill in quantifying the plume behavior in different geographic regions. However, significant gaps still exist in our knowledge of the effect of winds, of frontal mixing on plume evolution. Understanding the circulation patterns near the plume edge and the dominant mixing mechanisms at the plume fronts remains a challenge.

Lagrangian analysis of transport in dispersion processes in the coastal regions of northeastern Vietnam is performed, in order to meet the major challenge of monitoring the fate of particulate materials in this part of the East Vietnam Sea, home to the most famous tourist sites and economic sites. The study area is strongly influenced by the freshwater discharge of the Red River, which creates a large plume, greatly affecting coastal circulation and turbulent dispersion. Sea surveys were organized for the first time in this region in 2022 to better characterize the processes controlling coastal flow variability and turbulent dispersion in the plume region and surrounding waters. Surface drifters, released in the plume, were tracked during short periods of time, from one to a few days (Fig. 1). Estimates of the relative dispersion based on surface drifter measurements have revealed that the dispersion regime is mainly ballistic, induced by turbulent eddies whose size does not exceed a few km. Local wind variability, combined with variations in bathymetry, considerably affects the transport pathways of real drifters and modifies the dispersion regime.

A coastal circulation model was used to better assess dispersion processes over the entire study area. Virtual surface drifters were tracked in the model velocity field during the surveying periods. Comparison of the real and virtual buoy trajectories demonstrated a good agreement that proves the capability of SYMPHONIE model to reconstruct velocity fields and turbulent dispersion in the Red

River plume region. The modeling results revealed that the Lagrangian dispersion is highly anisotropic, an order of magnitude larger along the major axis of spreading, orthogonal to the dominant flow direction (Fig. 2). On scale of several days, the transport of passive tracers is affected by irregularities in current velocity fields associated with zones of current convergence. The location of surface current convergence zones controlling the Red River plume expansion was found to be aligned with the ridge lines of finite-size Lyapunov exponents (FSLE). Moreover, spatial distribution of FSLE ridge lines clearly show that the large Red River plume is composed of individual plumes merged together.

Keywords: *Coastal circulation, Red River plume, Lagrangian dispersion, Current convergence*

Acknowledgement:

This research was supported by the LOTUS international joint laboratory program (lotus.usth.edu.vn) and funded by the French CNES/TOSCA project COCTO-FO.

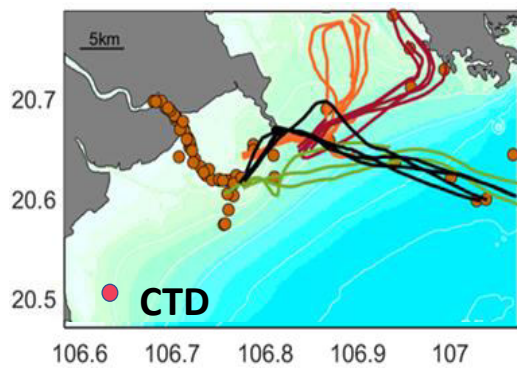


Fig 1. Surface drifter trajectories obtained in June 2024 in the Red River plume region.

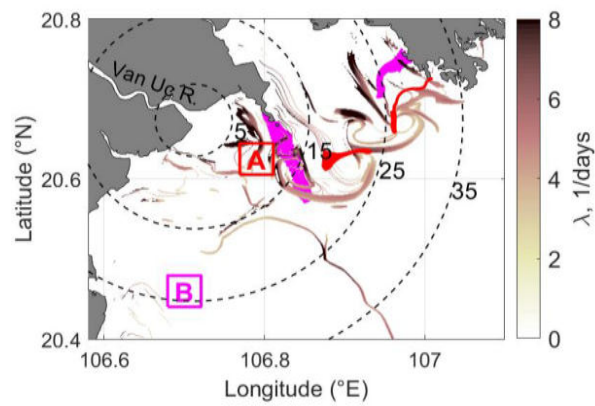


Fig 2. Spatial distribution of tracers, released in location A (red) and B (pink), at time 15h and 24h after release for A and 24h and 38h after release for B. Color shading shows FSLE ridge lines from backward particle tracking simulations. Circular lines give the distance from Van Uc mouth.

PRELIMINARY GEOCHEMICAL RESULTS OF OPHIOLITIC ROCKS IN NORTHERN VIETNAM: IMPLICATIONS FOR THE TECTONIC EVOLUTION OF SOUTHEAST ASIA

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Abstract

In Northern Vietnam, the boundary between the South China Block (SCB) and Indochina Block (IB) is suggested to be determined by a series of mélange belts including mafic and ultramafic rocks along the Song Ma suture zone. The occurrence of mafic-ultramafic rocks is primarily recorded within the SMSZ, including the Nui Nua, Chieng Khuong, and Bo Xinh complexes. Recently, blocks of ultramafic rocks, mafic rocks, cherts, and volcanic and volcanic-clastic materials were found along the northeastern side of the Song Chay fault (SCF). It has been interpreted as an ophiolitic mélange, indicating a suture zone corresponding to the boundary between the SCB and IB. Nonetheless, the data in both geochronology and geochemistry are limited. Newly collected peridotite samples are from the Nui Nua area in Thanh Hoa province, located in the southern section of the SMSZ and the southern region of the Song Chay in Ha Giang province. All samples exhibit significant serpentinization, with an average loss on ignition (LOI) of around 12 wt%. The SM peridotites have elevated MgO concentrations, ranging from 42.6 to 49.9 wt%, and lower FeO levels (7.2-8.9 wt%), resulting in a high Mg# (89-91). In comparison to the Song Ma peridotites, the Song Chay peridotites exhibit a slightly decreased MgO concentration ranging from 31.5-44.0 wt%, elevated FeO levels (7.7-11.2 wt%), and lower Mg# (88-98). The geochemistry of mantle rocks in the Song Ma and Song Chay suture zones might provide important information on mantle source characteristics and tectonic settings, thereby enhancing the understanding of the tectonic evolution of Southeast Asia.

Keywords: Vietnam ophiolite, igneous geochemistry, Southeast Asia tectonics

A TIME-SERIES OF HEAVY METAL GEOCHEMISTRY IN SEDIMENTS OF THE TIEN HAI NATURE RESERVE IN THE BA LAT ESTUARY, VIETNAM

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Abstract

The Ba Lat estuary, regarded as an end-member of the Red River to the East Sea, is an area influenced by natural and anthropogenic factors, receiving the last run-off from sources, such as erosion, industry, agriculture, and wastewater. Over the last 70 years, through various stages of economic development in North Vietnam, significant changes have occurred in the Red River's watershed. This study provides a detail account of these changes by examining heavy metal concentrations in surface sediments, sampled along a channel connecting the northern and southern river mouths, and a sediment core, recovered from the northern mouth of the estuary. The study aims to investigate the spatio-temporal distribution, sources, and potential toxicity of metals within this area. Spatial differences dominate the observed variability in metal concentrations, with higher concentrations in the northern surface sediments, where sediments are more likely trapped due to hydro-dynamic conditions. Temporal variations are reflected in sediment core data, showing relative low levels of geo-accumulation ($I_{geo} \leq 1$) for Co, Cr, Cu, Ni, Zn, and As; slightly higher ($1 \leq I_{geo} \leq 2$) for Pb, but increasing for Hg ($I_{geo} \geq 3$) across nearly all economic stages. Enrichment factors and statistical analyses suggest that Co, Cr, Ni, Mn and Mo primarily originate from natural sources, while Ag, As, Cu, Hg and Zn are predominantly derived from anthropogenic sources. The sediments are considered moderately toxic, with mean values of potential ecological risk index reaching approximately 2, largely due to the significant elevated concentration of Hg compared to standard levels. This unique time-series illustrates how hydro-dynamic processes at the northern mouth and dam reservoirs located in the Red River system influence spatial and temporal distributions of metals in sediments in the northern Ba Lat estuary, driven by both two main sources of nature processes and human activities.

Keywords: *Ba Lat estuary, heavy metal concentration, sediment, spacio-temporal distribution, geochemistry, anthropogenic sources.*

FRictional BEHAVIOR OF ILLITE-BEARING GOUGE DURING EXPERIMENTAL SEISMIC SLIP UNDER FLUID DRAINAGE CONDITION

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Abstract

Large earthquakes can nucleate at several kilometers and propagate to shallow depths through fault zones, commonly composed of clay-bearing gouges surrounded by damage zone. Illite and quartz are common components in shallow crustal fault zones. Therefore, the frictional properties of illite-quartz mixtures are of paramount importance for understanding faulting mechanisms and the relevant seismic hazard assessment. In this study, we conducted rotary-shear rock friction experiments on water-saturated illite/quartz gouges. Illite powders are in ratios of 100%, 75%, 50%, and 25%. All experiments were conducted at a normal stress of 10 MPa, slip rate of 1 m/s, and under fluid drainage conditions (i.e. simulating seismic slip occurred on gouges close to damage zones). The results showed that (1) in gouges with $\leq 75\%$ illite, the friction coefficient (shear stress/normal stress), μ , initially strengthened, then weakened to a steady-state, before restrengthening; (2) in 100% illite gouges, slip strengthening behavior was observed, with μ increasing with slip. After the experiments, we observed that the color changed from white-grey to black and became dry on the slip surface. The X-Ray diffraction and microstructural observations show that thermal decomposition of illite with the presence of vesicles and amorphous material. It supposes that in natural fault zones, the presence of both clay and major minerals may facilitate initial weakening, followed by rapid healing as the permeability of the damage zone increases due to fracturing, potentially leading to a drier slip zone for occurrence of thermochemical reactions (i.g., thermal decomposition) of clay minerals (black gouges observation). Detailed microanalytical studies will be done in the very near future.

Key words: earthquake propagation, mixed illite-quartz gouges, fluid drainage, thermal decomposition.

GROUND MOTION MODEL FOR ESTIMATING THE SITE AMPLIFICATION IN NORTHERN VIETNAM

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Abstract

In this study, a semi-empirical model to estimate local site effects is proposed using on a predominant period classification scheme for application in earthquake ground motion models (GMMs). The proposed model employs the peak amplitude of the average horizontal-to-vertical ratio (H/V) of the spectral response derived from the Northern Vietnam earthquake records at each station. The site effects model is implemented within a GMM estimated using the H/V parameters rather than a common site parameter i.e., the average shear wave velocity in the upper 30 meters depth (VS30). We compare the performance of the proposed site function with other formulations based on VS30 or site predominant period. This approach drives GMM with an estimate of the site effects as compared with alternative methodologies, providing confidence for the use of the H/V parameters as a viable alternative for the estimation of site effects, especially for sites which VS30 measurements are not available. Figure 1 shows the average of the mean H/V (Figure 1a) for all sites per category, along with corresponding standard deviations (Figure 1b) between stations within each category. The results show that the spectral shapes exhibit well-defined peaks located within the range of predominant periods for each category. The location and classification of the recording stations for the events recorded in northern Vietnam (Figure 1c) are used to compute the mean spectra binned by the proposed site classification using the records in the distance range of 150 – 300 km (Figure 1d). Note the contrasting behaviors exhibited by the response spectra in the proposed station categories. For each category, the mean spectra exhibit peaks within ranges of predominant periods for the corresponding category, across all event types. Mean spectra for category S₁, which corresponds to hard rock sites with low-impedance contrasts, typically show lower values for response acceleration than mean spectra for other soil types, which is generally consistent with the site amplification modeled in most GMMs.

Keywords: Horizontal-to-vertical spectral ratio (H/V), H/V amplitude, predominant period, ground motion model, site effects, Northern Vietnam.

Acknowledgment:

We appreciate Dr. Cong-Nghia, Nguyen, and the staff of the Vietnam Academy of Science and Technology and Academia Sinica for collecting the data used in this study.

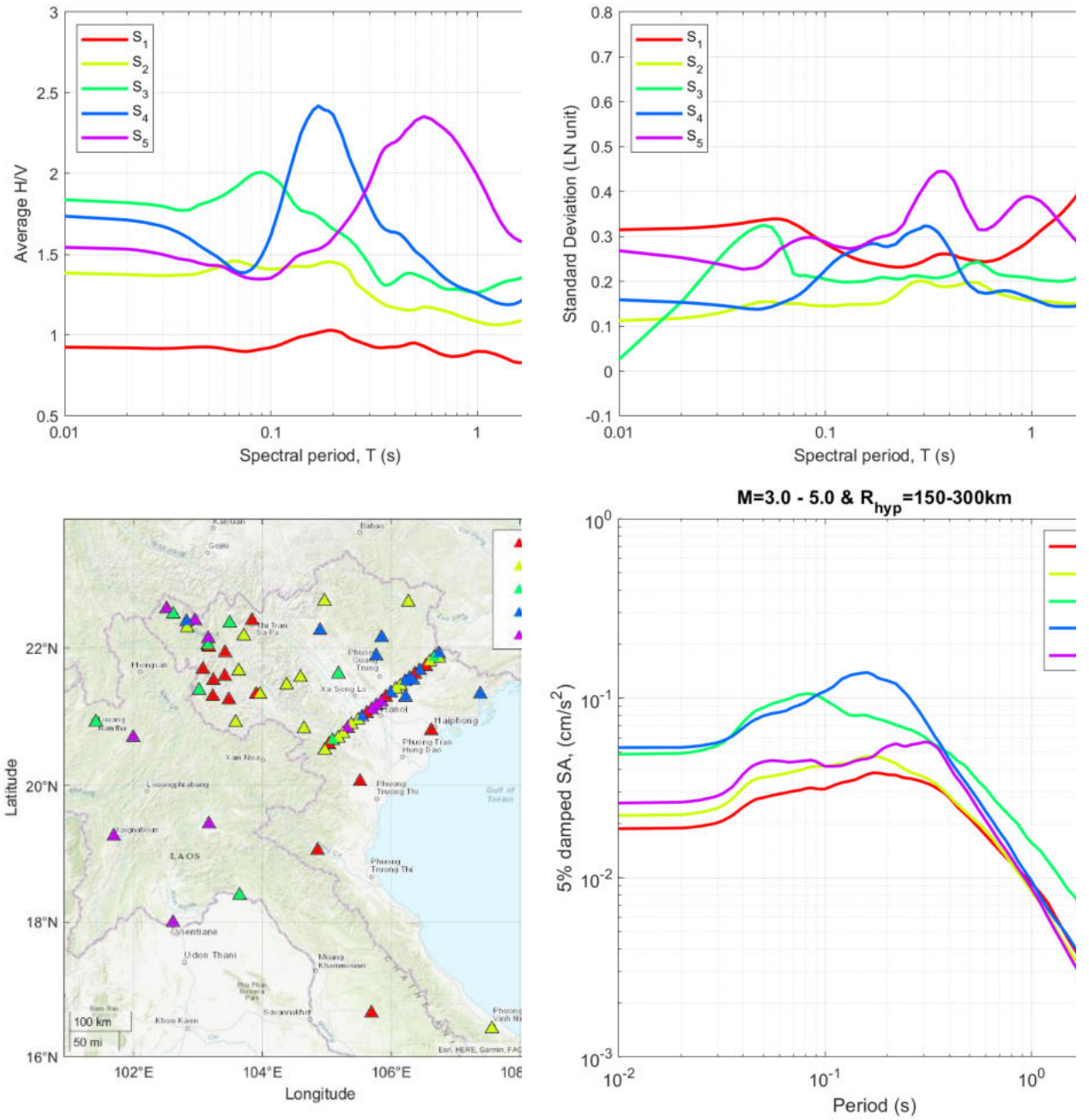


Fig 1. (a) Average of mean H/V of the seismic stations in each category and (b) Corresponding standard deviations for each site category. (c) location and classification of the seismic station in each category. (d) a plot of mean response spectra computed by averaging the recordings between 150 to 300 km for each site category.

ADVANCING SUSTAINABLE PLASTIC WASTE MANAGEMENT: INTEGRATING HYDROTHERMAL CARBONIZATION AND CATALYTIC PYROLYSIS TOWARDS CIRCULARITY

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Abstract

The substantial increase in plastic consumption and waste generation, combined with the urgent need for sustainable energy solutions, has spurred innovative research aimed at converting plastic waste into valuable resources (Che & Heynderickx, 2024). This study focuses on the thermal properties of various types of Korean plastic waste, including polyethylene terephthalate (PET), high-density polyethylene (HDPE), polyvinyl chloride (PVC), low-density polyethylene (LDPE), polypropylene (PP), and polystyrene (PS), and evaluates two different technologies for converting plastic waste. A kinetic analysis using thermogravimetric analysis (TGA) was conducted under both oxidative and inert atmospheres to determine the thermal degradation behavior of these plastics. The results showed that the onset degradation temperatures in inert conditions ranged from 375-430°C for PET and 200-290°C for PVC, while under oxidative conditions, these temperatures shifted to 350-440°C and 250-285°C, respectively. The activation energies also varied significantly among the plastics, from 90 kJ/mol for PVC to 315 kJ/mol for HDPE, highlighting the diverse thermal characteristics and potential energy recovery opportunities of these materials.

First, hydrothermal carbonization (HTC) was explored as a method for converting plastic waste into hydrochar, a carbon-rich solid fuel (Che et al., 2024). For PET and PS plastics, HTC at subcritical conditions (180-250°C, 10-40 bar) produced hydrochars with high energy recovery potential; PET hydrochar achieved an energy densification factor of 1.37 and an energy yield of 89%, compared to lower densification (1.13) and yield (54%) of PS hydrochar. Fourier Transform Infrared Spectroscopy (FTIR) analysis of the hydrochars revealed significant chemical transformations: PET hydrochar exhibited new peaks corresponding to carbonyl (C=O) and alkene (C=C) functional groups, indicating an increase in oxidation products and unsaturated hydrocarbons, while PS hydrochar showed increased hydroxyl (O-H) and carbonyl groups, reflecting enhanced chemical reactivity and potential for energy applications. These changes suggest improved energy properties and thermal stability, making the hydrochars suitable for applications such as solid fuels in industrial furnaces, environmental remediation, and even as precursors for advanced materials.

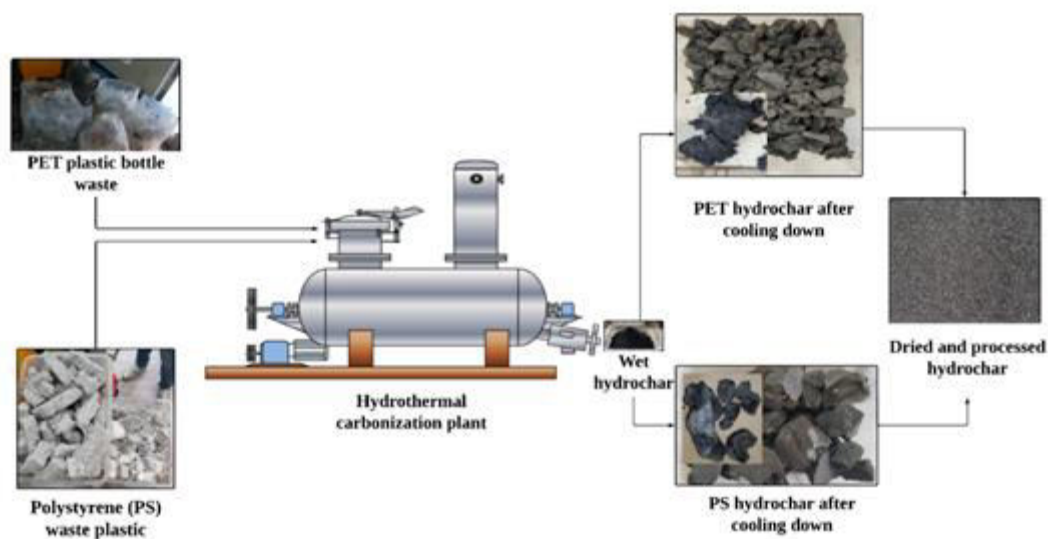


Fig.1. Plastic waste conversion through hydrothermal carbonization (Che et al., 2024)

Secondly, catalytic pyrolysis offers another viable route for plastic waste management. Utilizing a high-surface-area catalyst with a mesoporous structure ($74.4 \text{ m}^2/\text{g}$) and moderate microporosity facilitates efficient deoxygenation and hydrogenation, which enhances the fuel quality. The elemental composition of the catalyst, as determined by ICP-MS analysis, shows high concentrations of silicon, aluminum, and iron, which contribute to the structural stability of the catalyst and provide active sites that support effective conversion processes. Trace elements such as nickel, copper, and precious metals (palladium, rhodium, platinum) further enhance catalytic activity and selectivity, contributing to the high carbon (up to 84.0%) and hydrogen (13.6%) content in the pyrolysis oil, with reduced oxygen levels (as low as 1.10%). Thermal separation further improves fuel quality by concentrating hydrocarbons in the denser fractions, optimizing the suitability of the oil as a fuel.

In conclusion, the combination of HTC and pyrolysis, this study advances sustainable plastic waste management, converting waste into valuable fuels and materials, reducing environmental impact, and enhancing resource efficiency. The multifaceted properties of the catalyst, including its high surface area, tailored pore structure, and strategic elemental composition, are crucial in enhancing the conversion efficiency and fuel quality. The integrated approach aligns with circular economy principles, promoting the circular use of materials and supporting a more sustainable waste management system.

Keywords: Plastic waste conversion, pyrolysis, hydrothermal carbonization, hydrochar, circularity

Acknowledgement

This project is supported by the National Research Foundation (NRF) of Korea (Grant No: 1711173852).

References

- [1] Che, C. A., & Heynderickx, P. M. (2024). Hydrothermal carbonization of plastic waste: A review of its potential in alternative energy applications. *Fuel Communications*, 18, 100103. <https://doi.org/10.1016/j.jfueco.2023.100103>
- [2] Che, C. A., Van Geem, K. M., & Heynderickx, P. M. (2024). Enhancing sustainable waste management: Hydrothermal carbonization of polyethylene terephthalate and polystyrene plastics for energy recovery. *Science of the Total Environment*, 946. <https://doi.org/10.1016/j.scitotenv.2024.174110>

ENHANCING BIOETHANOL PRODUCTION FROM WATER HYACINTH (EICHHORNIA CRASSIPES) BY MICROWAVE HEATING WITH DILUTE ACID PRETREATMENT

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Abstract:

Recently, over exploiting and using fossil fuel has lead to the limitation of this resource and environment problems. Therefore, bioethanol, as a safe, environmentally friendly and renewable resource, has been considered a promising alternative energy source. Furthermore, Lignocellulosic substance from Water hyacinth is attractive material for bioethanol production due to its abundant, cost effective and availability. Pretreatment of lignocellulosic materials by dilute acids with the supporting of microwaves were investigated. Research results have shown that the sugar content in different parts of water hyacinth is different. Therefore, the entire plant of Water hyacinth was used for further experiments, while microwave-assisted pretreatment combined with dilute acid should be carried out at high temperature and for a short period to save energy and operating costs. For the hydrolysis step, the optimal conditions for hydrolysis of the whole plant are a temperature of 140°C, a time of 7 minutes, an acid concentration of 2%, and a feedstock concentration of 50 g/L, resulting in the highest sugar yield of 0.5423 (g/g). For the fermentation step, the optimal conditions for the fermentation process to convert the sugar solution into ethanol using *Saccharomyces cerevisiae* are a yeast solution ratio of 1:20, a pH of 5, and fermentation for 72 hours, yielding the highest ethanol concentration of 9.84g/L, with a fermentation efficiency of 71%.

Keywords: water hyacinth, bioethanol, microwave heating, dilute acid pretreatment

BENTONITE/IRON IMPREGNATED BIOCHAR AEROGEL AS A NOVEL MATRIX FOR CONTROL RELEASE OF PHOSPHORUS AND POTASSIUM

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Abstract

Slow-release fertilizers (SRFs) have attracted increasing attention because they are useful to mitigate environmental impacts from fertilizer overuses. This work aims to create a novel slow release matrix from rice straw aerogel biochar impregnated with bentonite (a high swelling clay) and soluble iron (so-called BFeAB). In-situ loading of phosphorus (P) and potassium (K) was performed simultaneously with the fabrication of BFeAB, the resulting material was tested for its potential slow deliveries of P and K. Four BFeAB types were prepared by varying either the proportions of aerogel biochar, bentonite, FeSO₄ and mixed PK fertilizer (i.e., 10:24:6:60 and 24:10:6:60) or drying temperature (i.e., 100 and 200°C). The obtained BFeABs were characterized using Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM) coupled with energy-dispersive X-Ray spectroscopy (EDS). Batch experiments were conducted in a time span of 7 days for tracking the releases of P and K. The kinetic experiments revealed that P and K contents released from the substrates BFeAB gradually increased in the first 2 days. After the first 2 days, the P and K contents remained almost unchanged or slightly decreased. Our findings illustrate BFeAB as a promising carrier for nutrient loading and delivery, thus its application and further development need to be included into the agenda.

Keywords: Biochar; aerogel; bentonite; phosphorus; potassium

SPATIAL AND SEASONAL VARIATIONS OF TRACE METAL ACCUMULATION ON MICROPLASTICS IN THE RED RIVER DELTA, VIETNAM

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Abstract

Microplastics (MiPs) have emerged as a considerable environmental issue due to their potential hazards to ecosystems and living beings. This study examined the pollution of trace metals on MiPs in diverse aquatic habitats within the Red River Delta region of Vietnam.

The research detected multiple trace metals, such as As, Cd, Pb, Ni, Cr, Zn, Mn, Cu, Co, V, Al, and Fe, in MiPs within both water and sediment samples. The distribution of these metals demonstrated regional and seasonal variability, with differing amounts of accumulation on MiPs. Metals were predominantly localized around river mouths and exhibited increased accumulation during the rainy season, indicating the impact of runoff.

The types, shapes, colours, and concentration of MiPs were determined to affect their adsorption capacity for trace metals. A notable positive association ($p < 0.05$) was detected between the concentrations of hazardous metals (As, Cd, Pb) and the concentrations of MiPs in both water and sediment samples across the seasons and regions.

Microplastics can act as carriers of trace metals, increasing the risks to aquatic organisms and the integrity of aquatic ecosystems. This, in turn, can pose a potential threat to human health. The study underscores the importance of addressing microplastic pollution to mitigate the risks associated with trace metal contamination.

Keywords: Microplastics (MiPs), trace metals, Red River Delta.

Acknowledgement:

This work was funded by the project 'Sources, Sinks and Solutions for Impacts of Plastics on Coastal Communities in Viet Nam' - NE/V006088/1 sponsored by UKRI-GCRF via the programme 'Reducing the Impacts of Plastic Waste in Developing Countries'.

DEVELOPING A SYNERGISTIC APPROACH FOR BIOREMEDIATION OF AGED DIOXIN CONTAMINATED SOILS IN VIETNAM

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Abstract

Vietnam has among the worst dioxin-contaminated sites in the world, which results in serious environmental and human health risks. Hence, dioxin elimination from polluted soils is urgent. Several studies have been conducted on physical, chemical, and biological dioxin remediation technologies. However, dioxin contaminants generally have a very low bioavailability and limit biological techniques. In addition, many soil factors collectively regulate the process of dioxin bioremediation technologies, including soil nutrients, foods (carbon sources), and oxygen, which are the most important parameters that directly affect the activity and numbers of indigenous dioxin-degrading microorganisms in soil. This research focused on the development of a synergistic approach applying dioxin-degrading indigenous microorganisms and a method to enhance the bioavailability of dioxin by using biosurfactant-producing bacteria to maximize the decontamination process of the aged dioxin compound in contaminated soils of Vietnam. Three dioxin-containing soil samples, including Phu Cat (PC), A Luoi (AL), and Bien Hoa (BH) airbases, were collected for the isolation of indigenous bacteria, and Bien Hoa airport soil was used to set up experiments to evaluate the biodegradation remediation of dioxin. As a result, three bacterial communities, and three biosurfactant-producing bacteria (identified as *Pseudomonas aeruginosa*) related to DF degradation have been isolated, with DF degradation capacity varying between 92 and 94% of the initial DF concentration. Sugarcane bagasse is selected as a suitable organic material for the biodegradation of dioxin in soil through an improvement of the soil porosity, nutrients, and carbon source for soil microbes as compared to other materials like cow dung, and sawdust. The experimental results showed that our synergistic bioremediation approach for dioxin-contaminated Bien Hoa airbase soil containing biosurfactant-producing bacteria AL3 and A Luoi bacterial community immobilized in coal slag, nutrient application (NPK, trace elements including zinc, iron, manganese, calcium, and magnesium), H₂O₂ (providing oxygen), organic material (bagasse) as co-substrate, surfactant (Tween 80), and biosurfactant solution effectively removes by 82.2% total dioxin compounds over the control after 90 days of incubation under the laboratory and many dioxin isomers including 2,3,7,8-Tetrachlorodibenzo-p-dioxin, 2,7-dichloro- ; Dibenzo[b,E][1,4]dioxin, 2,7-dichloro- ; 1,3,7,8-Tetrachlorodibenzo-p-dioxin ; Octachlorodibenzo-p-dioxin, 7-dichloro- are dissipated with different extents varying from 58.1% to 100%. Our promising bioremediation approach is considered a green technology and needs to be applied on a larger and wider scale. It should not be limited only to dioxin-contaminated airbase soils but also to other organic chemically polluted soils in agricultural, industrial, and urban areas to improve human health and quality of life.

Keywords: dioxin-containing soil, biodegradation, biosurfactant-producing, *Pseudomonas aeruginosa*

Acknowledgement:

We would like to thank the United States Agency for International Development (USAID) and The National Academy of Sciences (NAS) for funding support to implement the contents of this study.

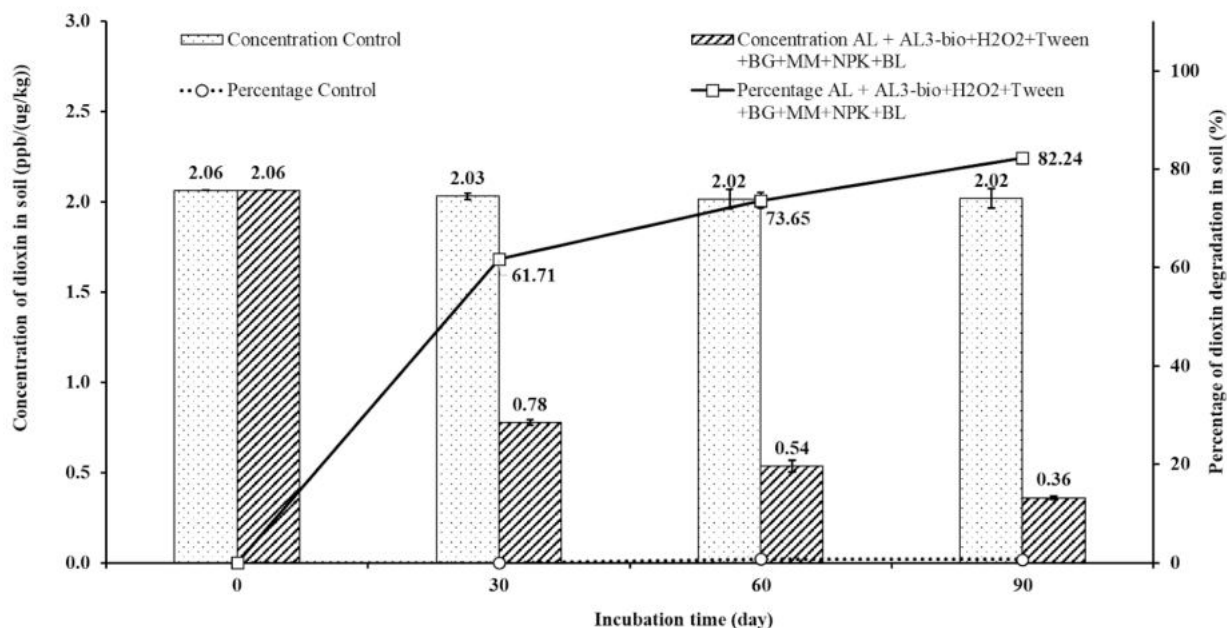


Fig 1. Concentration of dioxin and percentage of dioxin degradation in soil after 90 days of incubation (n=3)

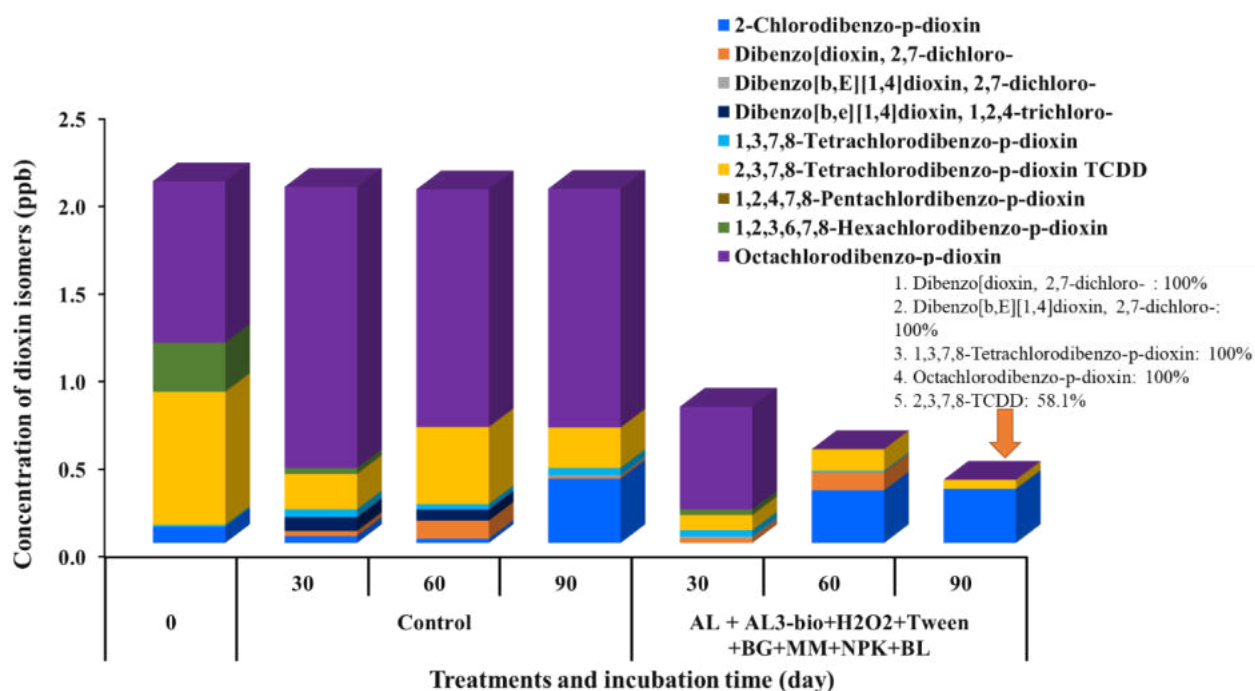


Fig 2. Concentration of dioxin isomers in soil after 90 days of incubation

CHARACTERISTICS OF HEAVY METAL CONTAMINATION IN ROAD DUST FROM A CENTRAL CITY IN VIETNAM: CONTRASTING DISTRIBUTIONS LINKED TO INDUSTRIAL ACTIVITIES

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Abstract

This study investigates the concentration levels and spatial distribution patterns of six toxic heavy metals (HMs) in road dust collected from an industrial park and its surrounding areas in Da Nang City, a key urban and economic center in Central Vietnam. A total of 51 samples were taken from four distinct zones: industrial (IN), industrial outskirts (SUB), outskirts (OUT), and background (BG) areas. Results revealed a noticeable decrease in HM concentrations from the IN area to the BG area, following the order $As < Cd < Pb < Cr < Mn < Zn$. Spatial analysis showed that contamination was highest in industrial zones, confirming a decline in metal concentrations with increasing distance from the industrial center. Pollution indices (Igeo, EF, and PLI) indicated "moderate to high" pollution in the IN area, largely due to industrial activities. Ecological risk assessments identified Cd as the primary contributor to the "very high" risk in the IN zone. Health risk assessments revealed significant non-cancer and cancer risks, particularly for children in the IN and SUB areas, with Cr and As being the main contributors. Source analysis suggested that As, Cd, Pb, and Zn predominantly originated from industrial activities, while Mn and Cr were likely from diverse sources. These findings highlight the need for specific management strategies to address heavy metal pollution from industrial sources and protect both the environment and public health.

Keywords: Da Nang City, heavy metal pollution, road dust, industrial activities, risk assessment.

Acknowledgement:

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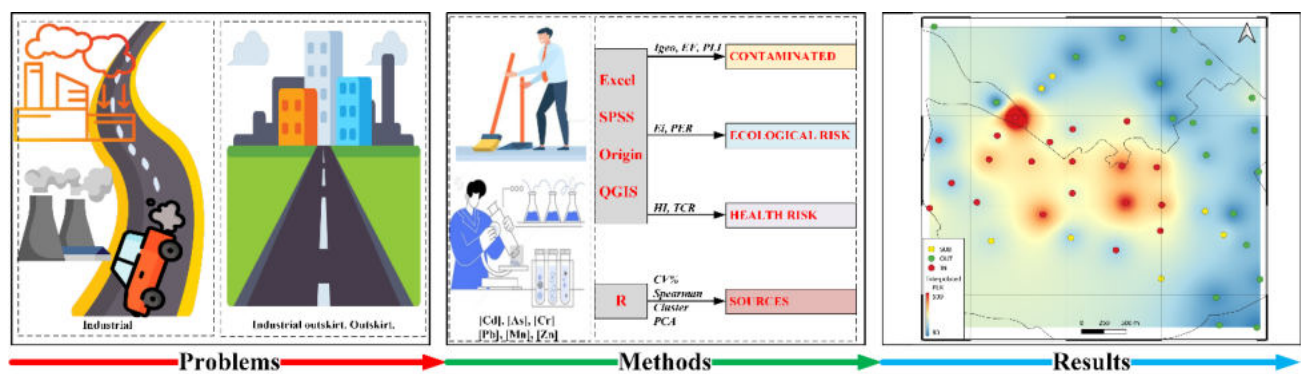


Fig 1. Graphical abstract of the study.

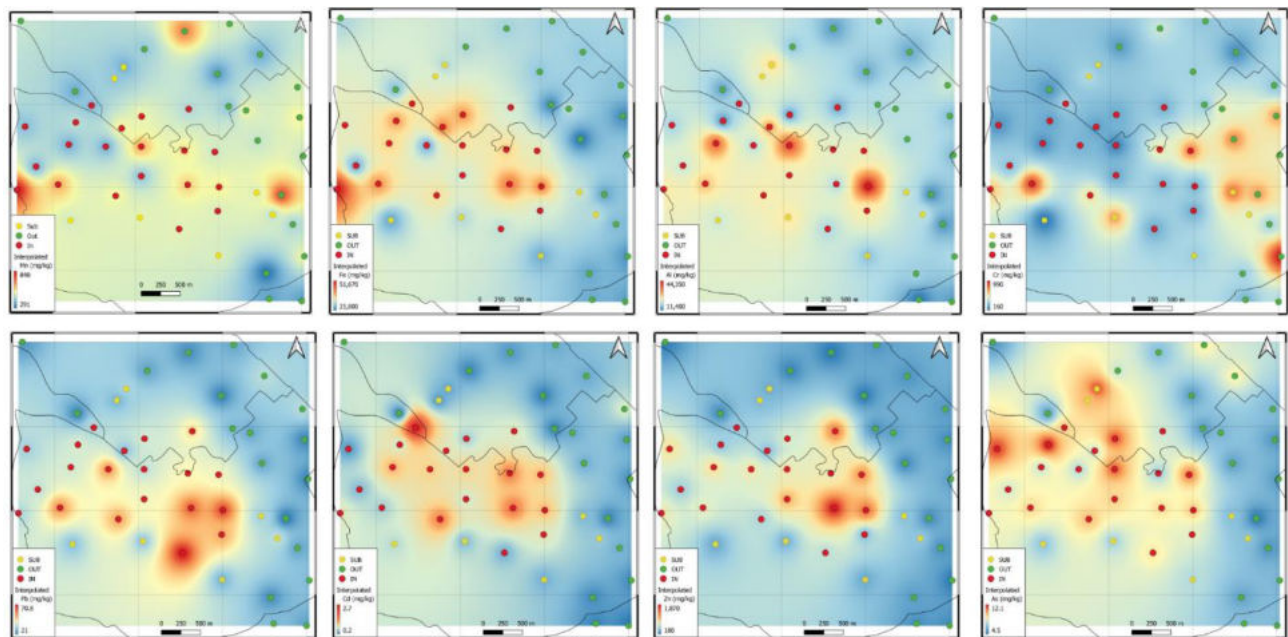


Fig 2. Spatial distribution of six HMs in road dust collected in the studied areas.

SEA-LEVEL RISE STORYLINES TO INFORM COASTAL ADAPTATION PLANNING FOR THE UK, SOUTHEAST ASIA AND BEYOND

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Abstract

Implementing responses to sea-level rise requires accessible, credible and relevant sea-level information to facilitate effective use by coastal adaptation planners and decision-makers. However, consultations with users of sea-level information have revealed the need to better translate sea-level information to meet the physical and cultural diversity of decision-making across the world. This includes communicating sea-level rise across a range of timescales, providing information tailored to risk aversiveness and better linking sea-level rise to impacts analysis to provide useful and usable metrics. We present recent developments in UK sea-level rise projections which build on the methods of UK Climate Projections 2018 (UKCP18). This includes a new framework to generate sea-level rise storylines, which are physically consistent, plausible single trajectories of future sea-level rise. Our approach improves the accessibility and usability of information for decision-makers by providing local, time-continuous information beyond 2100 and information on rates. By focusing on plausibility rather than probability, our storylines approach can address the challenge of “deep uncertainty” associated with ice sheet instability processes. We present sea-level storylines and their spatial variability for the UK, Southeast Asia and beyond, constrained by different emissions scenarios and high-end sea-level rise estimates. Locations are chosen based on population density and geographical spread. We explore how the storylines framework can be tailored to different hazard profiles and decision-making contexts using interdisciplinary approaches.

Keywords: *Sea-level rise; climate science; ice sheets.*

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This work was partly funded by the Met Office Hadley Centre Climate Programme, funded by the Department of Science, Innovation and Technology (UK).

SURVEY OF WATER QUALITY ADAPTATION STRATEGIES UNDER CLIMATE CHANGE IN VIETNAM AND A CASE STUDY ON BRESCIA USE OF REAL-TIME DATA

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Abstract

This study investigated the water quality of water supply systems for domestic and industrial use in Vietnam under the impact of climate change, involving experiment groups of more than 19 plants (May 2022-Feb 2023) to demonstrate the impact of climate change and the technological capabilities of adaptive and efficiently responsive utilities in Vietnam. Key findings showed evidence by water management utilities' perception about climate change with extreme weather impacts on water resources, such as drought and increased rainfall, which reduce supplementary water in the upper reaches of rivers, increasing the levels of organic pollution, ammonia, manganese, and exacerbating algae pollution in natural rivers and lakes.

The number of responses of utilities to adapt in the treatment process includes: the increased levels of organic matter caused by climate change require higher oxidant doses during the peroxidation phase at water supply treatment plants (WSTPs). Additionally, for the coagulation-flocculation stage, elevated turbidity from extreme precipitation events necessitates higher coagulant and flocculant dosing. There are also modifications of hydraulic retention times during granular filtration to accommodate fluctuating influent flow rates and loading resulting from climate change. Adjustments in final disinfection processes are also necessary to address the greater potential for disinfection by-product (DBPs) formation due to increased organic matter. In the distribution system, to mitigate biological regrowth potential and corrosion issues exacerbated by changes in water temperature, stagnation times, and drought conditions, utilities have increasingly chosen to enhance water safety plans, treatment technologies, and monitoring.

In addition, surveys conducted in real-time in Italy provided data on adaptive strategies in response to climate change impacts on water quality and treatment processes. The insights from Italy's water utilities confirmed similar challenges regarding extreme weather, droughts, and increased organic pollution. These real-time data highlight that international perspectives on improving water sector resilience align with Vietnam's risk assessments, improved disinfection processes, and new procedures to enhance the drinking water sector's resilience against climate variability.

The study acknowledges these stressors, stating that "rapid urban growth, industrialization, and pollution" are significant challenges. However, the study focuses on how climate change exacerbates these existing problems, making it a valid research focus. The study's objective was to capture the managerial responses and adaptation strategies of the operators in dealing with climate impacts, which is an important perspective often missing in technical studies focused solely on real-time data.

Operator insights can reveal how plants are adjusting in real-time, what practical challenges they face, and what adaptation measures they implement based on observed climate changes. By incorporating real-time data from Italy alongside operator feedback, the study provides a more comprehensive view of how utilities are addressing the compounded effects of climate change. These perspectives are critical for understanding the dynamics of water management beyond mere technical adjustments, highlighting the human factor in responding to unpredictable climate events and the ongoing need for innovative and responsive management practices in both Vietnam and Italy.

Recommendations emphasize risk assessments, improved disinfection, and new procedures to improve drinking water sector resilience against increasing climate variability as top priorities in Vietnam's water supply system.

Keywords: *climate change, drinking supply water system, real time data, experiments of manager*

Acknowledgement:

I would like to express my sincere gratitude to my advisor, Prof Sabrina Sorlini, for her invaluable guidance and support throughout this research. I also thank Prof Tran Thi Viet Nga, Prof Duong Thi Thu Hang for her insightful feedback and encouragement. This research was supported by the PON program under research contracts DM1061 on innovation topics IV.5 - Doctorates on Green topics. I am grateful to 19 Utilities in Vietnam for their collaboration and assistance.

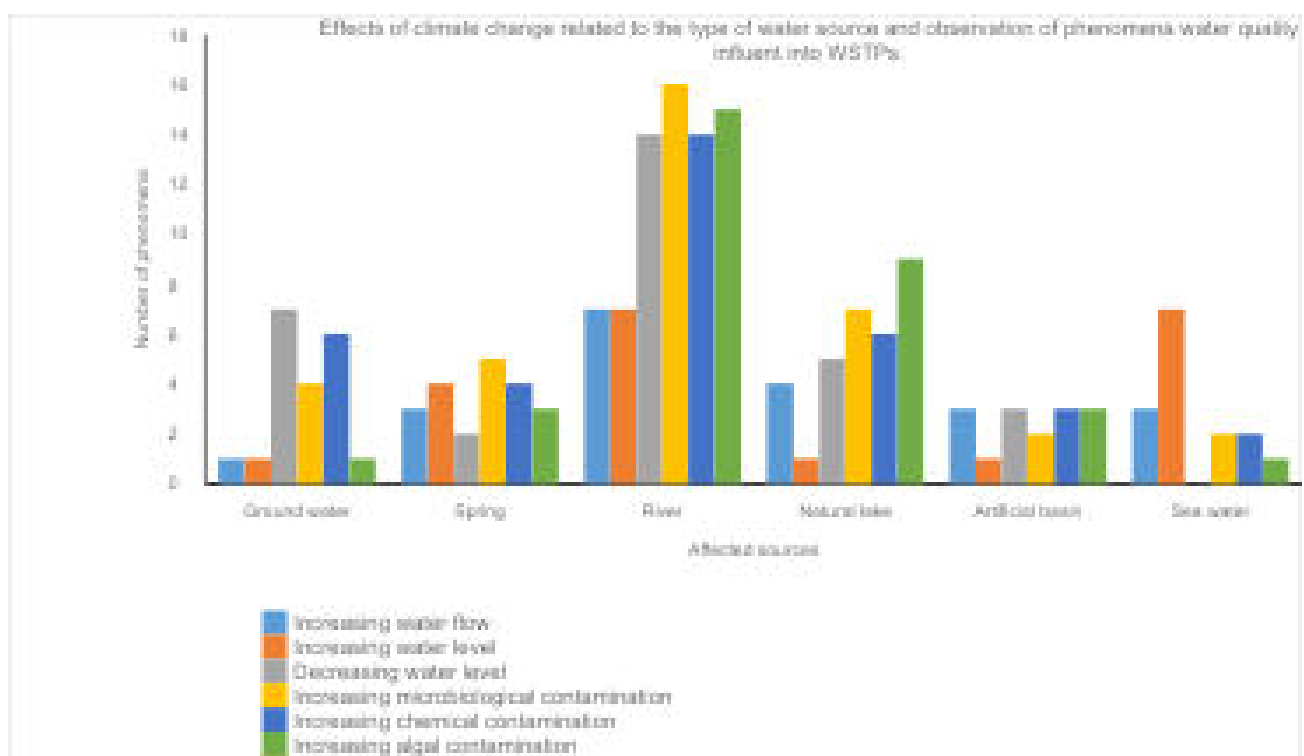


Fig 1. Effects of climate change related to the type of water source and observation of phenomena water quality influent into WSTPs.

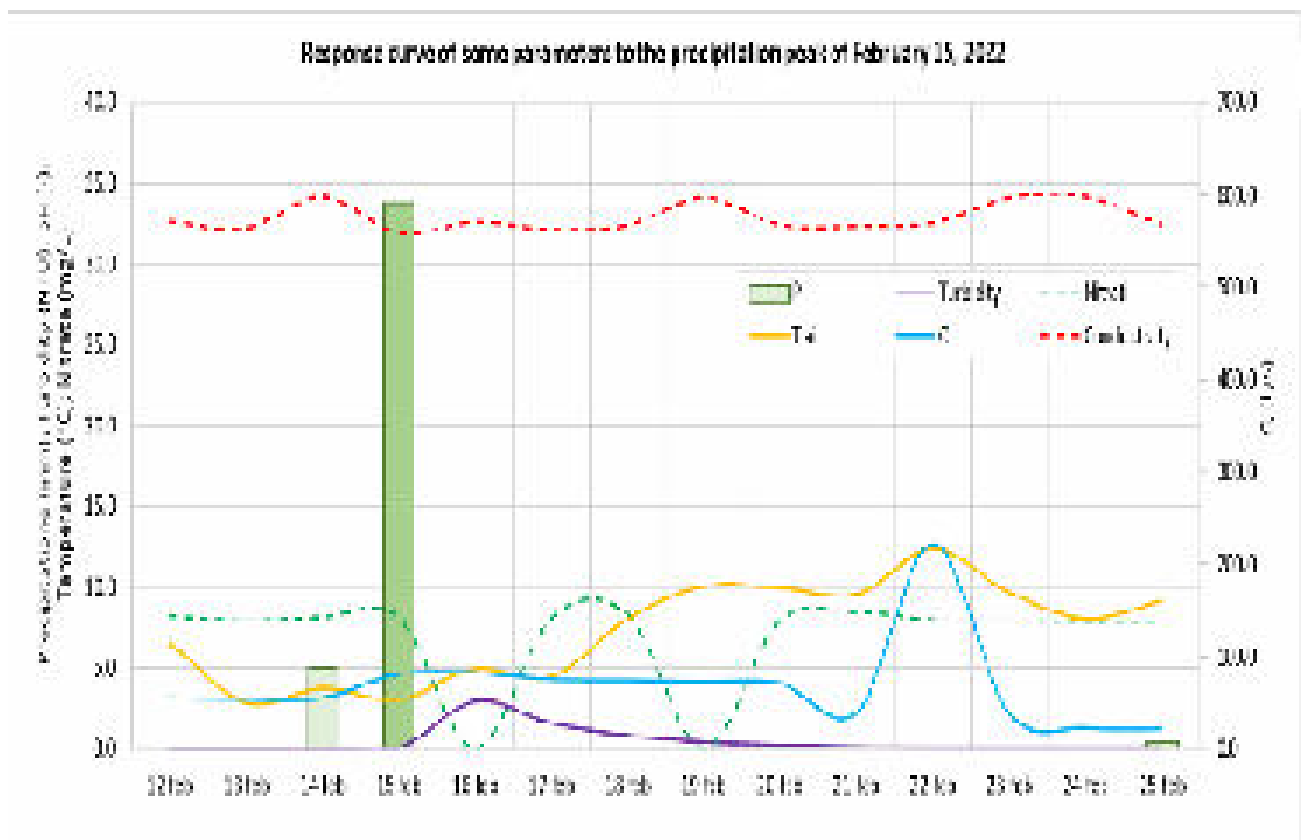


Fig 2. Response curve of some parameters to the precipitation peak of Feb 15, 2022 Brescia, Italy

USING OPTIMIZATION TO INVESTIGATE ADAPTIVE OPERATION OF RESERVOIR UNDER THE CONTEXT OF CLIMATE CRISIS

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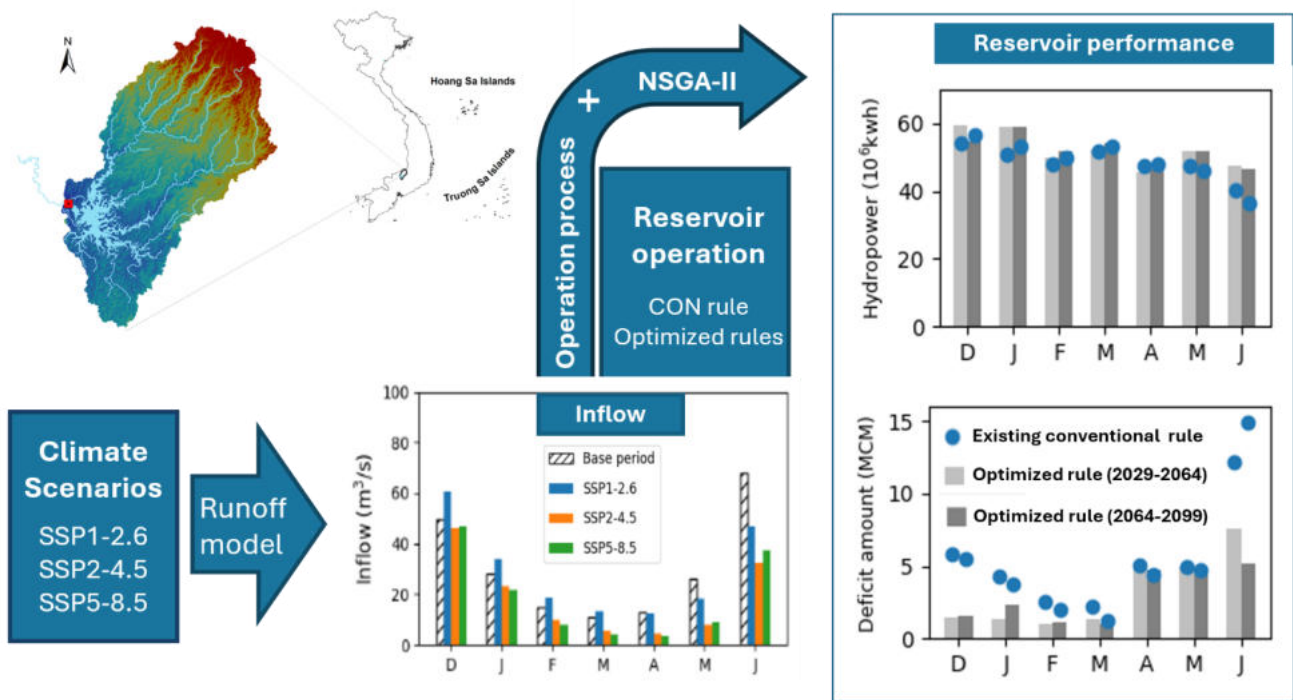
Abstract

This study investigates the climate change impacts on the performance of Thac Mo reservoir in Vietnam during the releasing duration from December to June of the following year. The adaptative optimization operating rules during two periods 2029-2064 and 2064-2099 were analyzed. Precipitation and temperature of three Shared Socioeconomic Pathway (SSP) scenarios (SSP1-2.6, SSP2-4.5, and SSP5-8.5) of the Coupled Model Intercomparison Project Phase 6 (CMIP6) derived from the Global Climate Model (GCM) - Meteorological Research Institute Earth System Model version 2.0 (MRI-ESM2-0) were used for inflow prediction. Due to the decreased inflow, the current operating rule would almost lead to a decrease in hydropower production of two periods of SSP1-2.6, SSP2-4.5 and SSP5-8.5 scenarios of -3.9, 0.7, -7.6, -6.7, -6.3, 7.0% and an increase in water scarcity, with the respective amount of water deficit by 20.4, 6.8, 33.2, 31.3, 30.2, 28.3% compared to the base period (1987-2022). The improved power production of 7.1, 7.1, 7.3, 6.2, 6.9, 6.8% and reduced water shortage of -40.2, -42.7, -37.2, -43.4, -40.8, -39.0% can be achieved by applying the Non-Dominated Sorting Genetic Algorithm II (NSGA-II) optimization technique under different periods and scenarios. This approach is potential to mitigate climate change effects on future reservoir operations.

Keywords: Reservoir operation, climate change, optimization, NSGA-II, power production, water shortage

Acknowledgement:

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COMPARISON OF SYNTHETIC APERTURE RADAR SENTINEL-1 AND ALOS-2 OBSERVATIONS FOR LAKE MONITORING

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Abstract

This work investigates the efficacy of L-band and C-band Synthetic Aperture Radar (SAR) sensors onboard ALOS-2 and Sentinel-1 satellites, as compared to optical sensors onboard Sentinel-2 satellite, for mapping open water of the Tri An reservoir, one of the largest artificial reservoirs in South Vietnam, during the 2016-2023 period. The Google Earth Engine (GEE) was the primary computing platform to pre-process all satellite observations. The Otsu threshold algorithm was employed to generate water/non-water maps derived from the VH- and HH-polarized backscatter coefficient data acquired by Sentinel-1 and ALOS-2 satellites and from the Modified Normalized Difference Water Index (MNDWI) data acquired by Sentinel-2 satellite, respectively. The findings reveal the stability of Tri An reservoir's surface water extent from 2017 to 2022, followed by a significant decline of nearly 70% during the dry season of 2023 to approximately 100 km². This substantial decrease can be explained by the impact of a robust El Niño phase occurring in the region simultaneously. Overall, there is a high consistency between results derived from SAR and optical sensors, but the correlation between Sentinel-1 and Sentinel-2 ($R = 0.9774$) was higher than that between ALOS-2 and Sentinel-2 ($R = 0.9145$). During the drought period, both C-band and L-band SAR sensors overestimate the reservoir's surface water extent due to the similarity in their backscatter coefficient between water and dry flat soil surfaces. This misclassification is more pronounced in ALOS-2 data than Sentinel-1 data, suggesting that the C-band sensor is more suitable than the L-band sensor for mapping the lake's open water areas.

Keywords: Lake monitoring; ALOS-2; Sentinel-1; Sentinel-2; Tri An reservoir.

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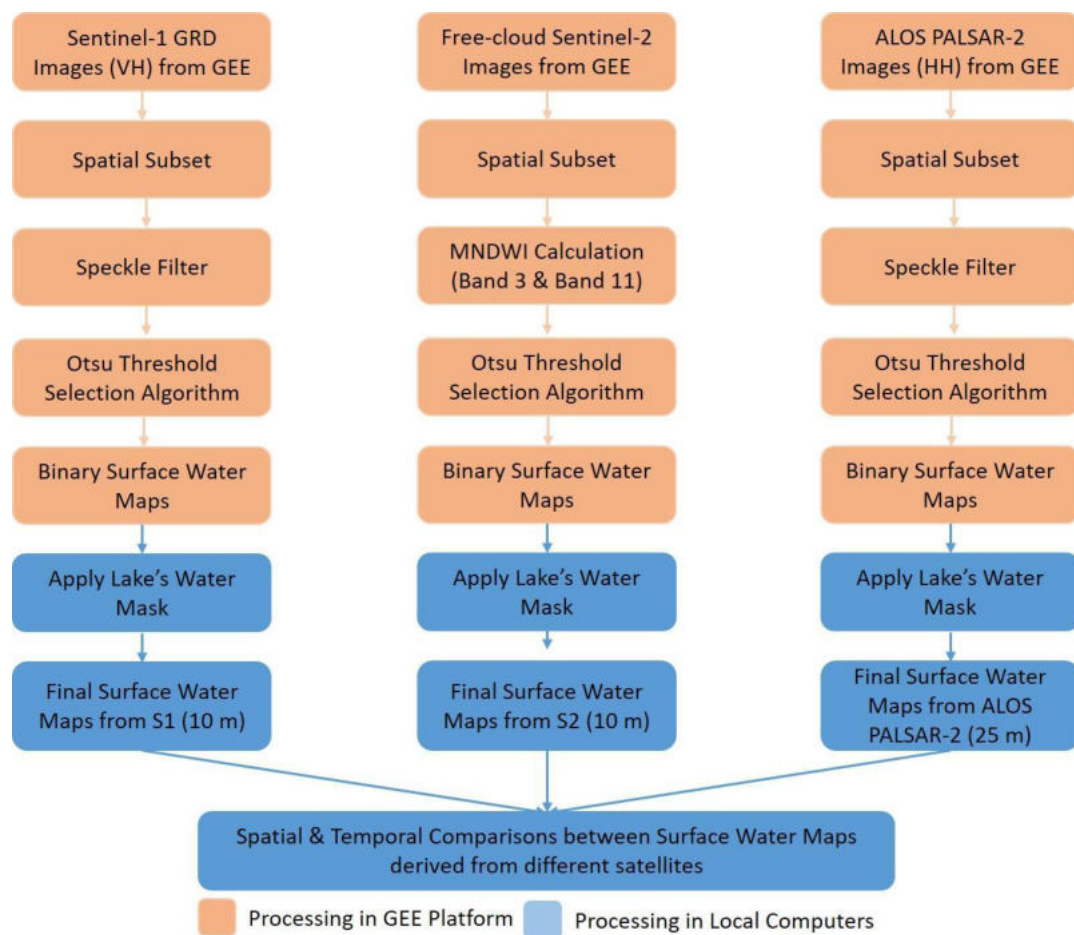


Fig 1. The flowchart utilized in this study.

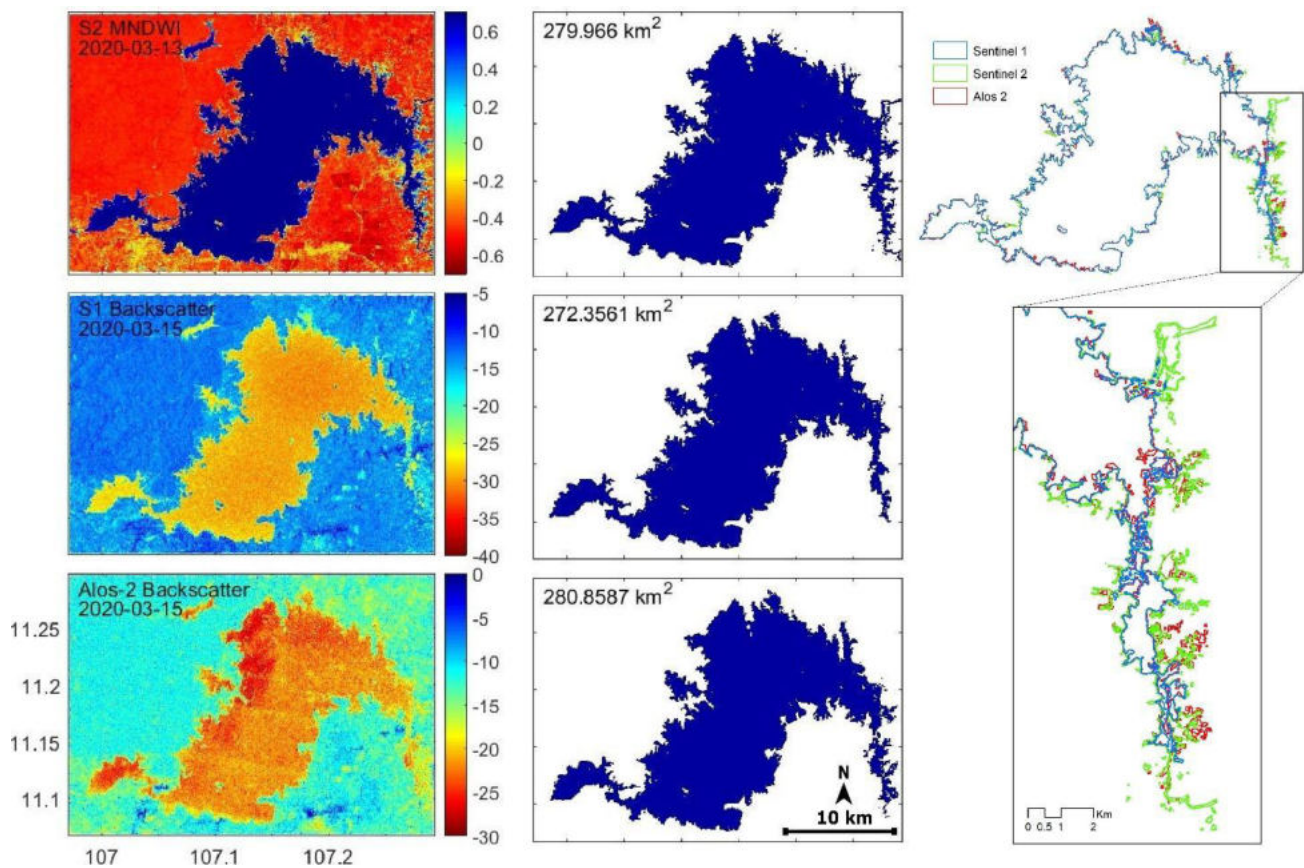


Fig 2. Spatial comparison between surface water maps of Tri An Reservoir, extracted from the three satellite platforms. Sentinel-2 observations were acquired on March 13, 2020, while Sentinel-1 and ALOS-2 observations were acquired on March 15, 2020.

THE HIDDEN DANGERS OF MICROPLASTICS: MICROBIAL COMMUNITIES AND ANTIBIOTIC RESISTANCE

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Abstract

Microplastics pose considerable risks to the ecosystems of the Red River Delta. Due to their coarse surface texture and electrostatic properties, microplastics in water create an optimal environment for accumulating suspended solid particles and charged substances, promoting the development of biofilms that harbour pathogenic and antibiotic-resistant bacteria. Contaminants and germs threaten human health when they traverse the food chain. This research explores the variety of bacteria and antibiotic-resistance genes present in biofilms on microplastics obtained from the Red River Delta in Vietnam. DNA was extracted from microplastic samples collected from Hanoi, Ha Nam, and Nam Dinh using Qiagen's DNeasy PowerSoil Pro Kits. Whole genome metagenomic sequencing was employed to analyze species composition, diversity, and ARGs. Quality-controlled reads were mapped to representative sequences with 98% identity, and Diamond was used for unigene sequence alignment. ARGs were identified using the CARD database with stringent criteria (80% amino acid similarity, E-value of $1e^{-5}$).

Microplastics were shown to harbour archaea, bacteria, viruses, fungi, and animals on their surfaces. The majority of bacteria are classified among the phyla Pseudomonadota, Bacteroidota, and Bacillota. Bacteria from the genera *Pseudomonas* and *Aeromonas* were found, both recognized for their ability to form robust biofilms. Numerous opportunistic bacterial strains may induce illnesses, including sepsis, respiratory infections, and skin infections. Moreover, several species have been linked to gastrointestinal problems in humans as well as diseases in aquatic organisms, as evidenced by various clinical research. Numerous species are recognized for their antibiotic resistance. Furthermore, many antibiotic resistance genes (ARGs) were detected, including those resistant to Multi-Drug Resistance (MDR), Fluoroquinolone, Elafamycin, Beta-lactam, and Tetracycline. Microplastic samples MPW03 and MPW12 exhibited a significant prevalence of these resistance genes. Furthermore, all samples had certain genes, namely YajC, TriC, rsmA, rpsJ, parE, parC, CpxR, oprN, mexF, mexB, and ropB.

Microplastics in aquatic ecosystems can serve as reservoirs for pathogenic bacteria and antibiotic resistance genes. These contaminants pose a significant threat to human health through the food chain. Effective microplastic pollution management is crucial to mitigate these environmental and public health risks.

Keywords: *microplastics, antibiotic resistance genes, pathogenic bacteria, biofilms, Red River Delta.*

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