PORSEC

16th Pan Ocean Remote Sensing Conference

2025

22nd ~ 26th Apr. 2025 in Keelung, Taiwan

PORSEC 2025

16th Pan Ocean Remote Sensing Conference

Ocean Remote Sensing for Achieving Sustainable Development
Under Changing Climate

22nd – 26th Apr. 2025 in Keelung, Taiwan

Content

Welcome Notes

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Message from PORSEC president

We are excited to announce that the 16th Pan Ocean Remote Sensing Conference (PORSEC) has been awarded to the National Taiwan Ocean University (NTOU), Taiwan. The PORSEC Association President Dr. Gad Levy, and Acting President, Prof. MingAn Lee are pleased and honored to endorse this partnership and invite you to participate in this esteemed event. The PORSEC Association is committed to broadening global partnership in space science programs and is pleased to collaborate with NTOU to organize this conference. Together, we aim to foster innovation in ocean remote sensing.

With the theme "Achieving Sustainable Development Under Climate Change Through Ocean Observation", the 16th PORSEC conference will take place from April 22nd to April 25th, 2025, in Keelung, Taiwan, with a capacity building training for early career scientists the week prior. This conference will serve as a hub for interdisciplinary dialogue and knowledge exchange. We welcome your academic papers or abstracts on themes such as large and meso-scale oceanography, coastal impacts, emerging technologies, operational remote sensing, climate resilience, and more. This conference offers a unique opportunity to showcase developments, discuss technologies, exchange insights, and foster international collaboration.

Join us in making the 16th PORSEC conference a success in advancing ocean remote sensing research and promoting international cooperation.

We await your valuable contributions and anticipate welcoming you to this prestigious event.

PORSEC Association President, Dr. Gad Levy

PORSEC Acting President, Prof. Ming-An Lee

Welcome letter from NTOU

Dear participant,

It is a great honor for National Taiwan Ocean University (NTOU) to host the upcoming PORSEC 2025 conference, which will provide an exceptional platform for leading researchers in the field of remote sensing from around the world. The conference theme highlights the importance of utilizing remote sensing technology to achieve sustainable development goals in the context of climate change.

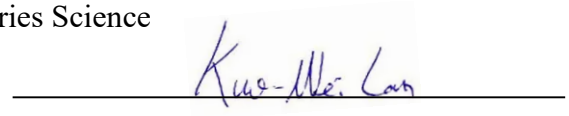
NTOU was established in 1953 which is known for its excellence in ocean-based education and research. With seven colleges and over 9,000 students, including 700 international students, NTOU offers a range of programs that emphasize interdisciplinary learning and cutting-edge research in marine sciences and engineering. The university has been recognized for its teaching and research achievements, including awards from the Ministry of Education and the establishment excellence of research centers. Aligned with national policies, NTOU develops professionals in areas like offshore wind power, smart ships, AI applications, and marine conservation, preparing graduates to address global challenges and contribute to sustainable development.

NTOU committed to advancing the sustainable development through a variety of initiatives. We actively promote sustainability courses and provide facilities designed to empower students, staff, and communities. Key missions aimed at accomplishing the replacement of energy-intensive equipment and the reduction of disposable materials. The sessions at PORSEC will concentrate on AI, education, policy, and applications of remote sensing, and soon, all of which are beneficial for achieving the sustainable development. We eagerly anticipate your participation for the meaningful collaborations and discussions that will emerge from this esteemed gathering. We do hope that we contribute to a more sustainable and resilient future.

The best regards,

Chair professor and president, National Taiwan Ocean University

Chair, Department of Environmental Biology and Fisheries Science



National Taiwan Ocean University

Map & Agenda

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Keelung City Map

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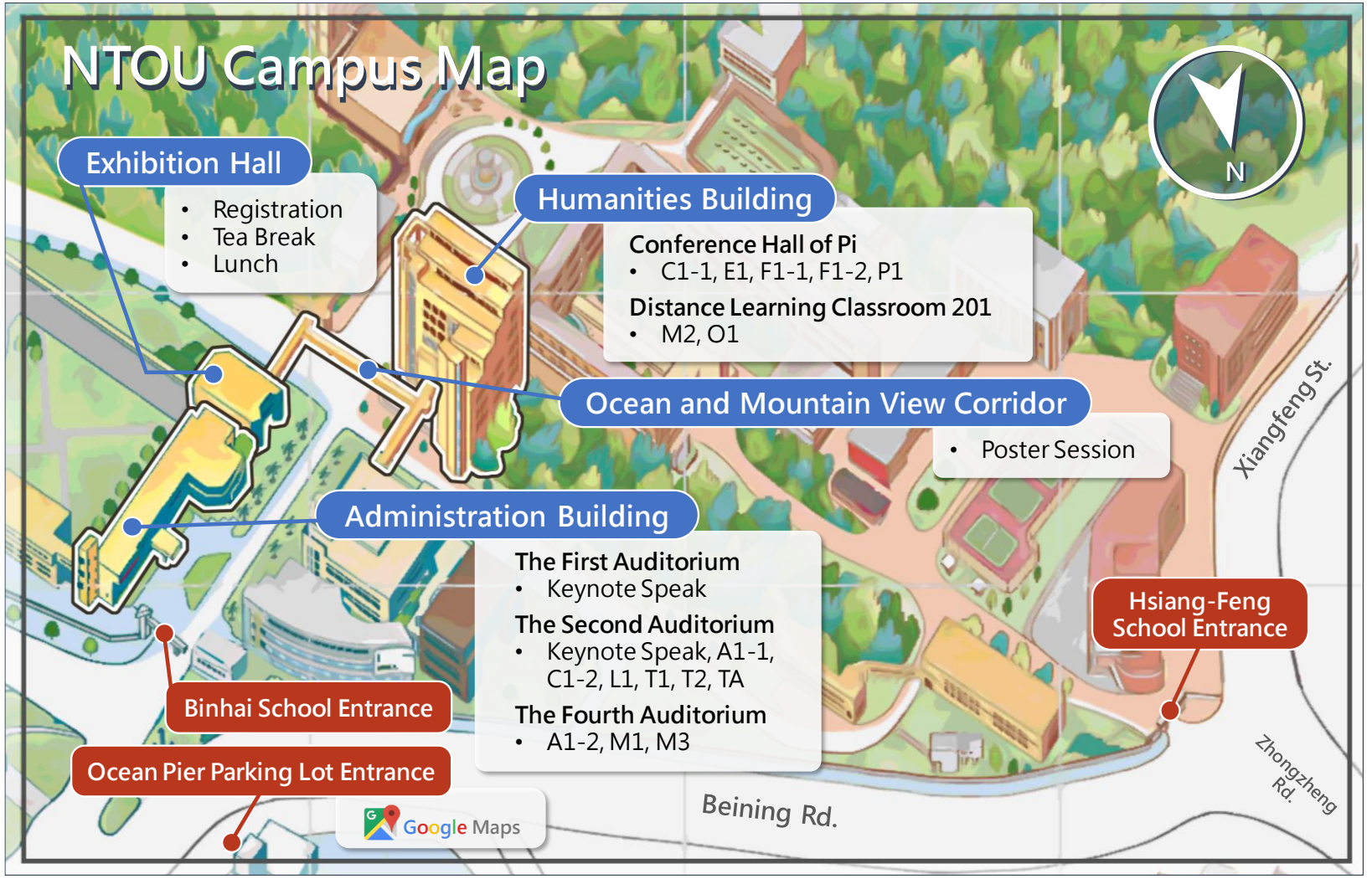
Venue Locations



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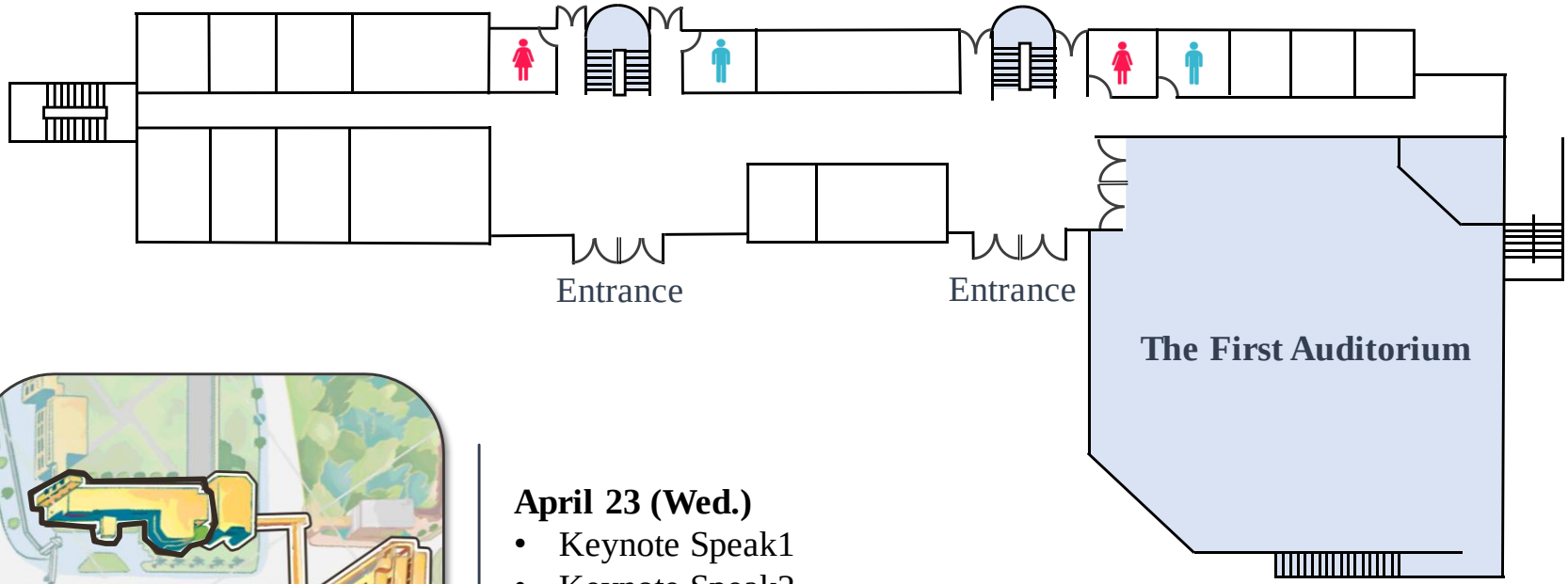
Vanue Map

Administration Building 1F



April 23 (Wed.)

- Keynote Speak1
- Keynote Speak2
- Keynote Speak3

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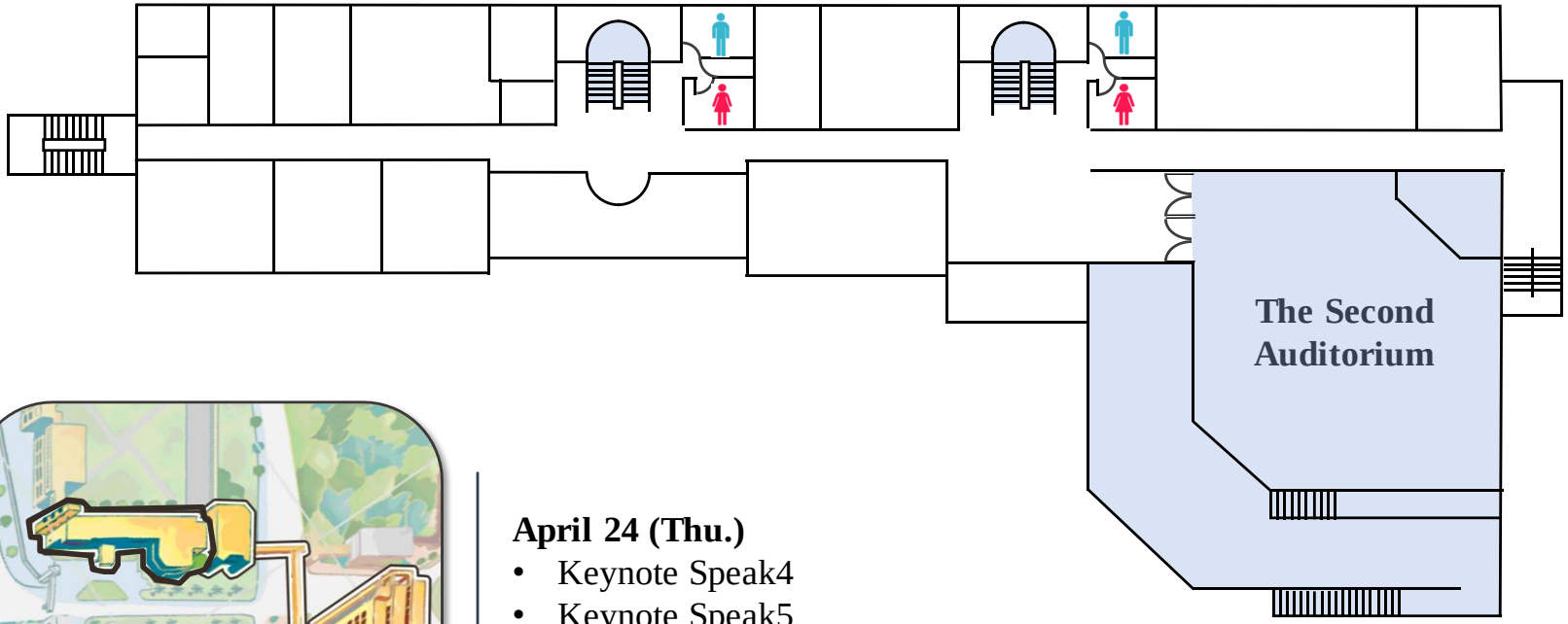
Administration Building 2F



April 24 (Thu.)
- Keynote Speak4
- Keynote Speak5

April 25 (Fri.)
- Keynote Speak6

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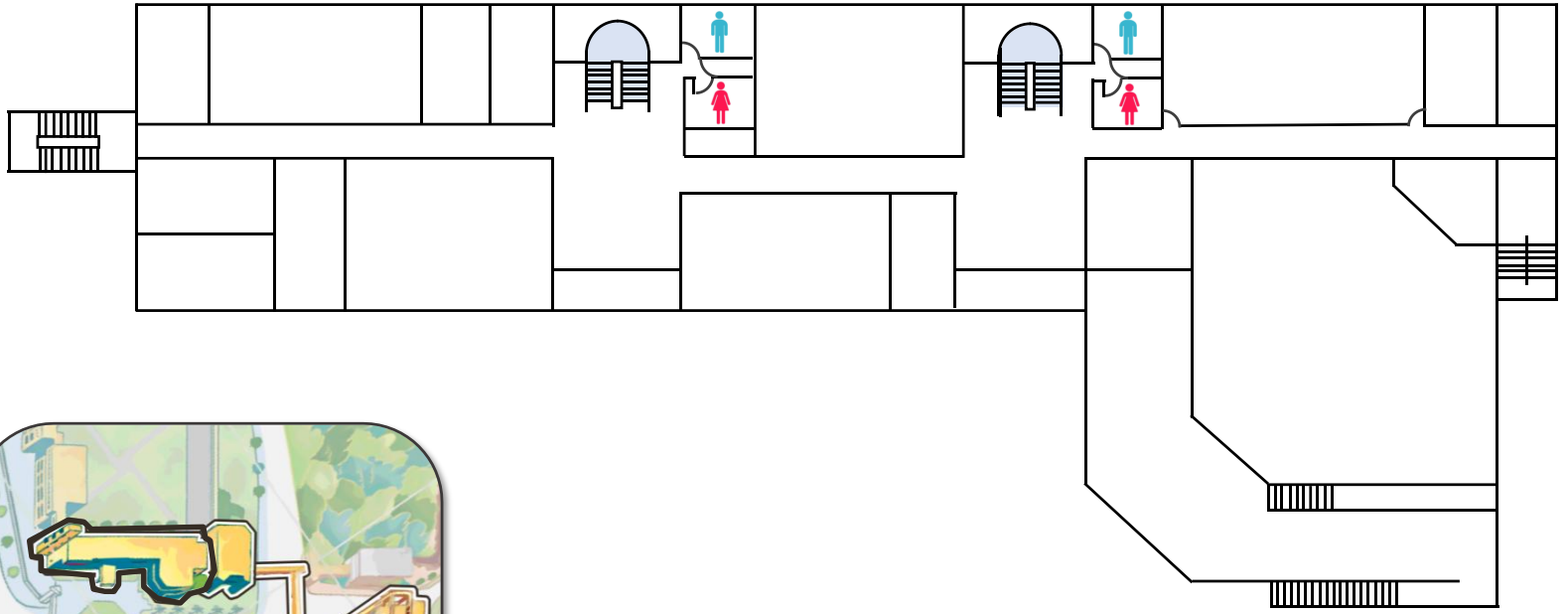
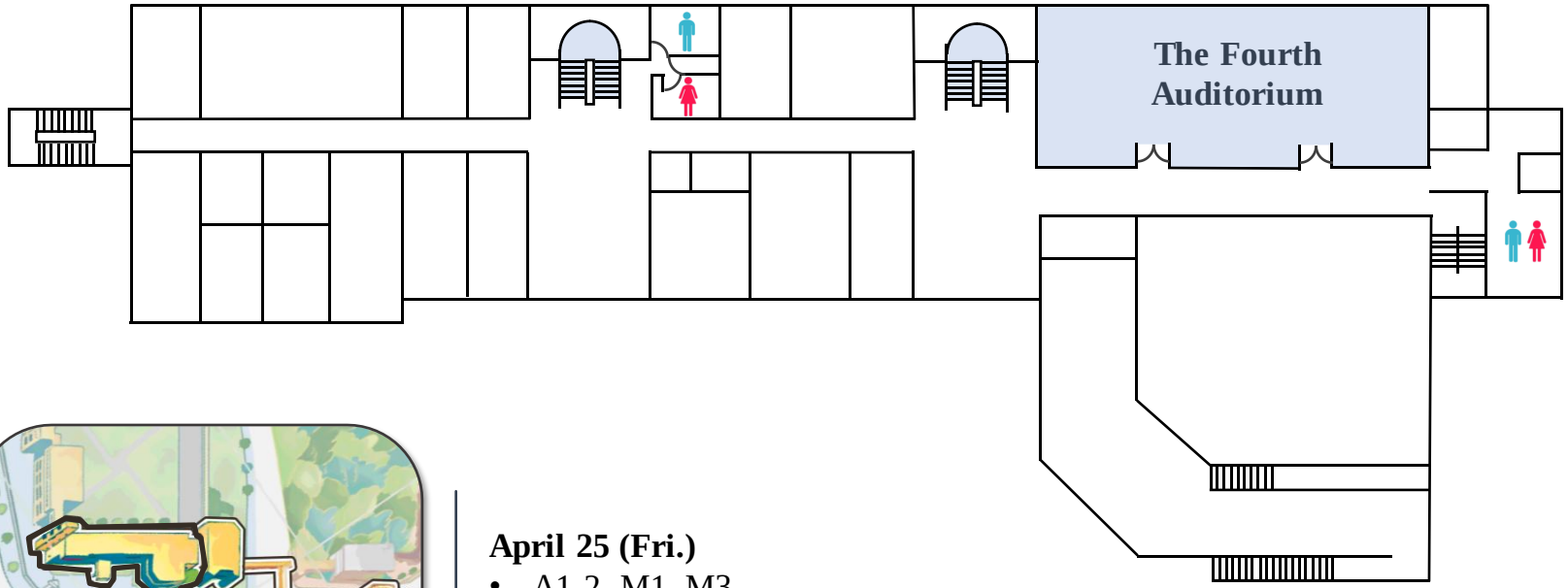
Administration Building 3F



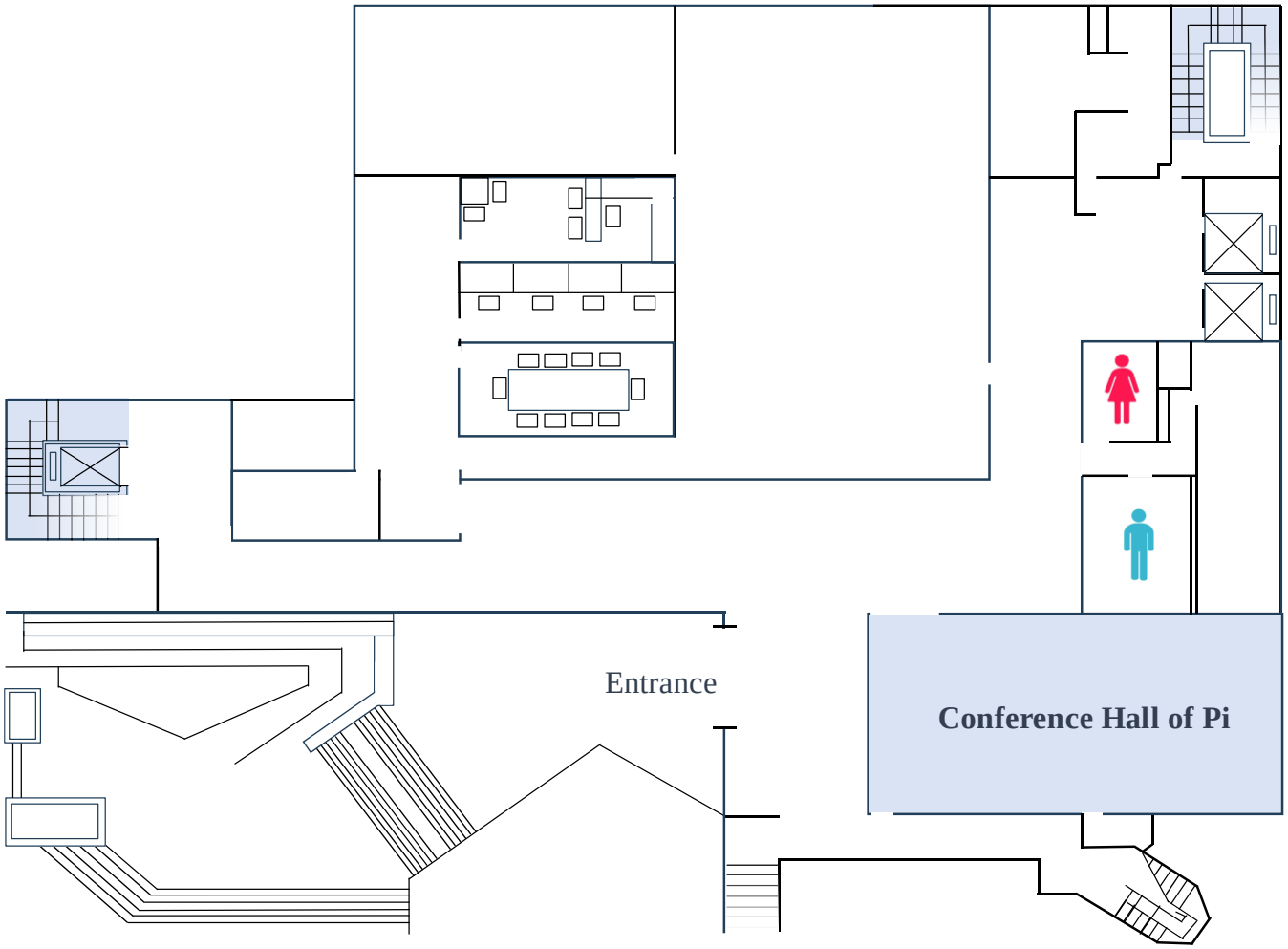
Administration Building 4F



April 25 (Fri.)

- A1-2, M1, M3

Humanities Building 1F



April 23 (Wed.)
- C1-1, E1

April 24 (Thu.)
- F1-1, F1-2, P1

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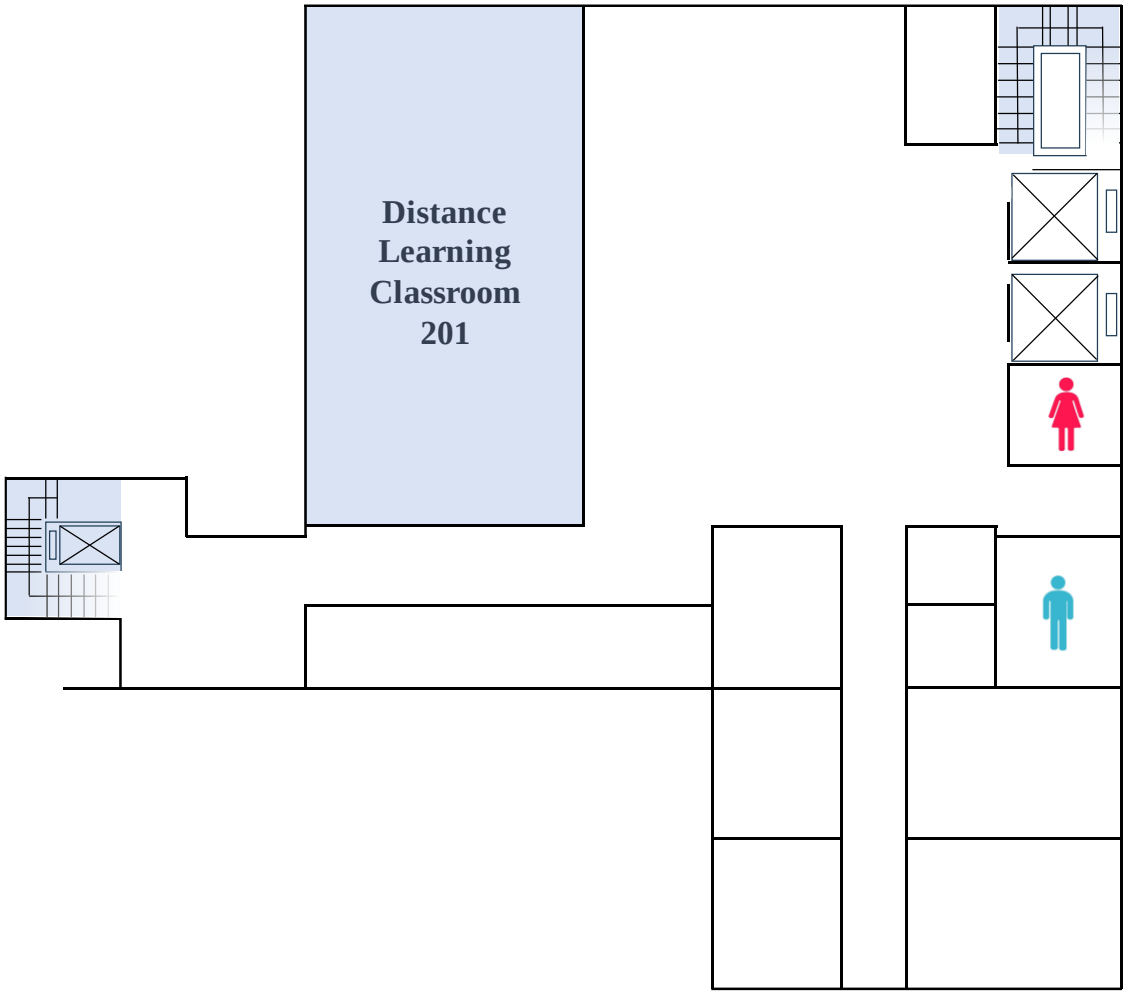
Humanities Building 2F



April 24 (Thu.)
- M2, O1

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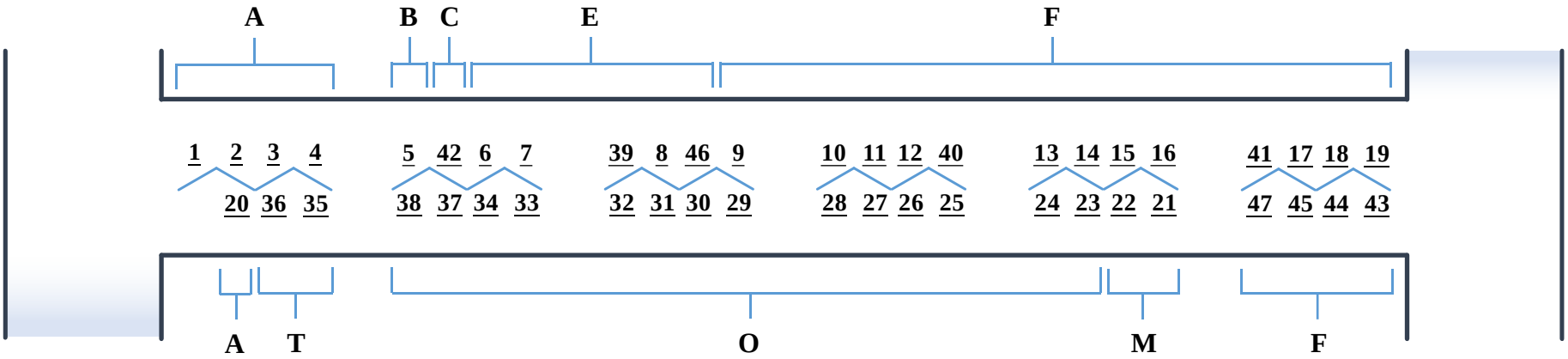
Ocean and Mountain View Corridor



April 24 (Thu.)

- Poster Session
  - Group I (15:20-16:20)
  - Group II (16:20-17:20)

Agenda

Time	Day 1 4/22(Tue)	Day 2 4/23(Wed)		Time	Day 3 4/24(Thu)			Time	Day 4 4/25(Fri)			Day 5 4/26(Sat)
08:00-09:00		Registration		08:00-09:00	Registration			08:00-09:00	Registration			
09:00-09:40		Opening Ceremony		09:00-09:40	Keynote Speak 4 **Prof. Sei-Ichi Saitoh**			09:00-09:40	Keynote Speak 6 **Prof. Young-Je Park**			
09:40-10:20		Keynote Speak 1 **Prof. Naoto Ebuchi**		09:40-10:20	Keynote Speak 5 **Dr. Gad Levy**			09:40-10:00	Tea Break			
10:20-10:40	-	Tea Break		10:20-10:40	Tea Break			10:00-11:00	M1 / M3 / A1-2	C1-2	PORSEC Scientific Member Regular Meeting	
10:40-11:20		Keynote Speak 2 **Dr. Tien-Chuan Kuo*** **Prof. Jong-Shinn Wu**		10:40-12:20	M2	P1 / F1-1	L1 / T1 / T2	11:00-11:40			-	
11:20-12:00		Keynote Speak 3 **Prof. Wing-Huen Ip**						11:40-12:00	PORSEC Plenary Meeting &Close			
12:00-13:20		Lunch		12:20-13:20	Lunch			12:00-13:20	Lunch			Yilan Fishing Village Tour (Additional Fee Required)
13:20-15:00	Registration	C1-1	TA	13:20-15:20	O1	F1-2	Pacific Saury Fishery Resources and Habitat Environmental Change Adaptation Strategies Workshop (Conducted in Mandarin)	13:20-17:50	Fisheries Research and Marine Science Technology Workshop			
15:00-15:20		Tea Break		15:20-15:50	Poster Session	Tea Break						
15:20-17:20		E1	A1-1	15:50-17:50		-	Pacific Saury Fishery Resources and Habitat Environmental Change Adaptation Strategies Workshop (Conducted in Mandarin)					
18:00-20:30	-	Welcome Dinner		18:30-21:00	-			18:30-21:00	Poster & Oral Awarding Ceremony / Farewell party			-

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Committee

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Scientific Organizing Committee

Position	Name	Region
President	Dr. Gad Levy	USA
Acting President	Dr. Ming-An Lee	Taiwan
Vice President/President Elect	Dr. Abderrahim Bentamy	French
Vice President Elect	Dr. Stefano Vignudelli	Italy
Executive Secretary, Membership, Education and Outreach Chair	Dr. Nimit Kumar	India
Treasurer, Chair of Finance	Dr. Cara Wilson	Taiwan
Chair Local for PORSEC 2022	Dr. Nurul Hazrina Idris	Malaysia

Local Organizing Committee

Position	Name	Organization
Member	Porf. Ming-An Lee	National Taiwan Ocean University
Member	Prof. Kuo-Wei Lan	National Taiwan Ocean University
Member	Prof. Hsueh-Jung Lu	National Taiwan Ocean University
Member	Prof. Chen-Te Tseng	Fisheries Research Institute
Member	Prof. Yi Chang	National Sun Yat-sen University
Member	Prof. Chung-Ru Ho	National Taiwan Ocean University
Member	Prof. Jay Chih-Chieh Young	National Taiwan Ocean University
Member	Prof. Chen-Fen Huang	National Taiwan University
Member	Prof. Hwa Chien	National Central University
Member	Prof. Ting-Chun Kuo	National Taiwan Ocean University

Member	Prof. Yu-Chun Lin	National Taiwan Ocean University
16th PORSEC General Call	Dr. Yan-Lun Wu	National Taiwan Ocean University
16th PORSEC Tutorial Leader	Dr. Mubarak Mammel	National Taiwan Ocean University
16th PORSEC Secretary	Ms. Yee Chen	National Taiwan Ocean University

Conference Information

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About The Event

The 16th Pan Ocean Remote Sensing Conference (2025) is set to convene ocean geospatial experts from Taiwan and across the globe to explore various facets of ocean and atmosphere research utilizing geospatial technology. The purpose of this biennial conference is to provide a cooperative forum where scholars, students, and business executives can present their research and inventions, explore the latest developments, and have conversations aimed at advancing the field. It serves as an interdisciplinary forum where participants can present the latest developments, discuss applications, and promote international partnerships. An engaging social program will be proposed during the conference to encourage networking and interaction among participants. The 10th PORSEC Capacity Building Tutorial will take place in conjunction with the PORSEC 2025 conference, before of the conference. The session provides young scientists and students with expert instruction. Theoretical instruction and hands-on training in remote sensing methods for monitoring the ocean-atmosphere system for operations and research will be provided to participants.

Oral Presentation

Each oral presentation will be allocated 20 minutes (15 minutes for the presentation and 5 minutes for Q and A). However, this may be changed according to the number of presentations registered. It will be decided in mid-March 2025.

Poster Presentation

Posters should be prepared and printed with final dimensions under ISO A-0 size (W841mm x H1189mm). Tacks will be provided. All presenters are requested to be at the venue to answer questions during the core time. The details of the poster session will be announced in mid- March 2025. If the number of presentations reaches capacity, the registration may be stopped.

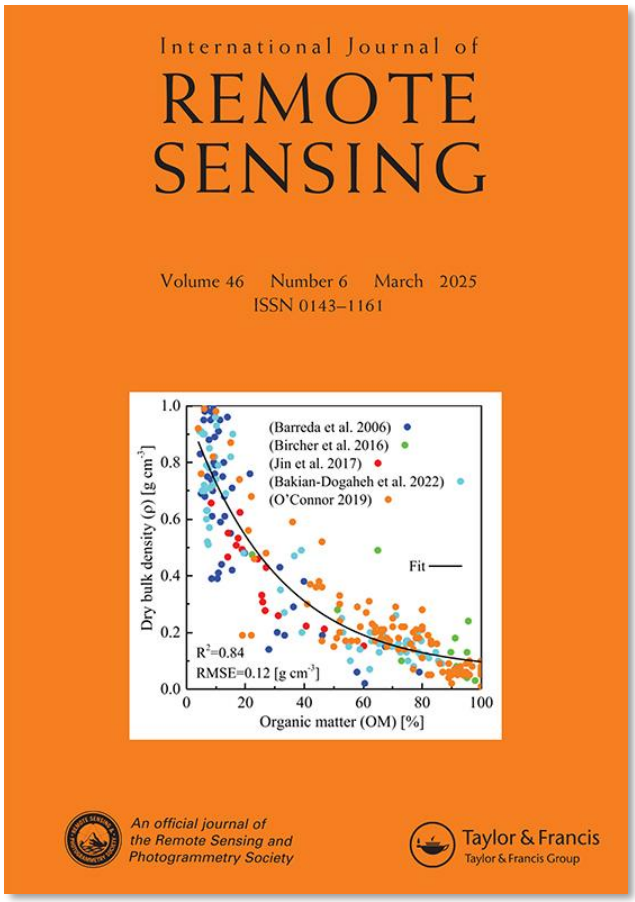
Special Issue

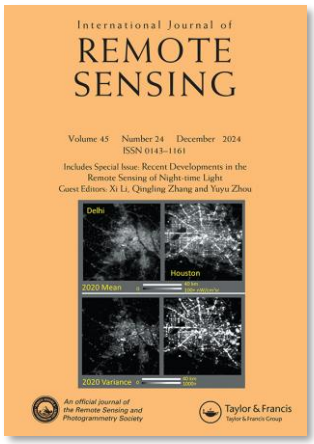
Paper Publication

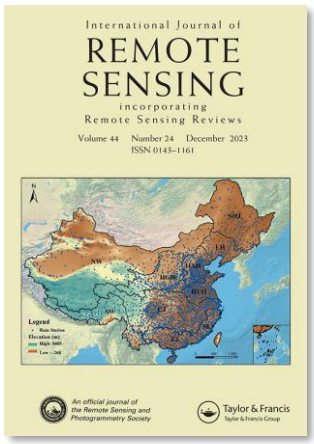
Participants are invited to submit work presented at the symposium for publication in a special issue of the International Journal of Remote Sensing (IJRS). The deadline for Submission of Full Papers is 31 July 2025, and the publication of Special Issue will be October/November 2026.

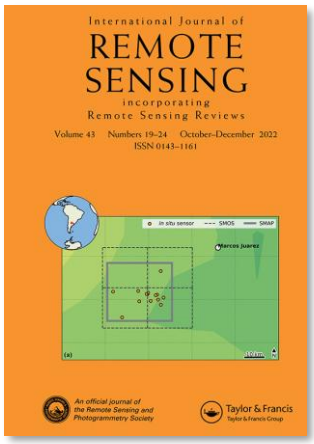
The submission process will follow the standard process for the IJRS. Please refer to the *Instructions for Authors* for guidance.

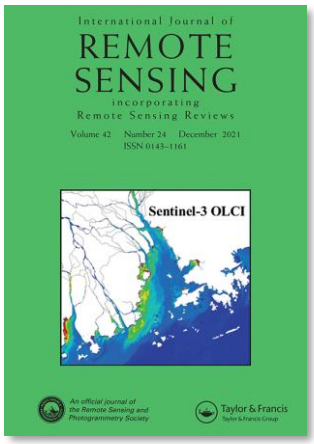
We encourage all authors to submit their manuscripts promptly to meet the outlined deadlines.











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Keynotes

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Naoto Ebuchi

Present Title

-Professor-

Institute of Low Temperature Science, Hokkaido University

Keynote Speak

History and Present Status of JAXA's Spaceborne Microwave Radiometers, AMSR Series, with Oceanic Applications

Keynote Speak 1

Time: April 23, 2025 (Wednesday) 09:40~10:20

Location: The First Auditorium

Introducer: Prof. Tai-Wen Hsu

Honors and Awards

- Outstanding Achievement Award, Advanced Marine Science and Technology Society, June 2022.
- Prize of the Oceanographic Society of Japan (JOS Prize), The Oceanographic Society of Japan, April 2021.
- RSSJ Research Award, The Remote Sensing Society of Japan (RSSJ), June 2019.
- Distinguished Science Award, Pan Ocean Remote Sensing Conference (PORSEC) Association, October 2010.
- ISPRS Commission VIII Best Paper Award, ISPRS Commission VIII Symposium, August 2010.
- IEEE Geoscience and Remote Sensing Society 2003 Symposium Prize Paper Award, IEEE Geoscience and Re-mote Sensing Society, July 2003.
- Prize Paper Award, Advanced Marine Science and Technology Society, May 2001.
- Okada Prize, The Oceanographic Society of Japan, April 1994.

Jong-Shinn Wu

Present Title

-Director General-

Taiwan Space Agency

-President-

Taiwan Space Industry Development Association (TSIDA)

Keynote Speak

Optical and Microwave Remote Sensing Development at Taiwan Space Agency

Keynote Speak 2

Time: April 23, 2025 (Wednesday) 10:40~11:20

Location: The First Auditorium

Introducer: Prof. Ming-An Lee

Honors and Awards

- 1993: Rackham Pre-doctoral Fellowship, The University of Michigan
- 2012: Lam Research Award, Taiwan
- 2015~: ASME Fellow
- 2016: Distinguished Achievements Alumni Award, Dept. Mechanical Eng., National Taiwan University, Taiwan
- 2016~: AIAA Associate Fellow
- 2016~: Member, Hybrid Rocket Technical Committee, AIAA
- 2017: Future Technology Award, 2017 Future Tech Show, MOST (rocket technology)
- 2018: Annual Best Paper Award, Journal of Mechanics (SCI)
- 2018: Outstanding Research Award, Aerospace Discipline, Ministry of Science & Technology (MOST), Taiwan
- 2021~: Member, Emerging Plasma Nanotechnologies (TC 17), Nanotechnology Council, IEEE
- 2021: Future Technology Award, 2021 Future Tech Show, MOST (rocket technology)
- 2023: ISPlasma Special Recognition Award
- 2023~: Fellow, Society of Theoretical and Applied Mechanics of the Republic of China (STAM)

Tien-Chuan Kuo

Present Title

-Deputy Director General-

Taiwan Space Agency

Keynote Speak

Optical and Microwave Remote Sensing Development at Taiwan Space Agency

Keynote Speak 2

Time: April 23, 2025 (Wednesday) 10:40~11:20

Location: The First Auditorium

Introducer: Prof. Ming-An Lee

Honors and Awards

- Division Director, Mechanical Engineering Division of Taiwan Space Agency (2019/03-2021/7)
- Propulsion Department Manager, Taiwan Space Agency (2005/11-2021/04)
- Research Fellow, Taiwan Space Agency (2008~)
- Propulsion Engineer, Taiwan Space Agency (1996~)

Wing-Huen Ip

Present Title

-Chair-

Taiwan Space Union

-Professor-

Graduate Institute of Astronomy, National Central University

Keynote Speak

On the Needs for Space Remote-Sensing Monitoring of the Coastal and Marine Ecosystems

Keynote Speak 3

Time: April 23, 2025 (Wednesday) 11:20~12:00

Location: The First Auditorium

Introducer: Prof. Chung-Ru Ho

Honors and Awards

- National Chair Professor (Taiwan), Academician, Academia Sinica, AGU Fel-low, NASA Exceptional Public Service Medal, AOGS Axford Medal, Honorary Doctoral Degree (MUST); AAS/DPS Kuiper Prize, TWAS Award on Earth, Astronomy and Space Science, CAS/COSPAR JeouJang Jaw Award, Tai-wan Physical Society Special Service Award.

Sei-Ichi Saitoh

Present Title

-Research Professor-

Arctic Research Center, Hokkaido University

Keynote Speak

Space × Aquaculture: A New Approach to Select Optimum Aquaculture Site Using SAR Satellite Data

Keynote Speak 4

Time: April 24, 2025 (Thursday) 09:00~09:40

Location: The Second Auditorium

Introducer: Prof. Chen-Te Tseng

Honors and Awards

- March 26, 2014 Uda Award (Japanese Society of Fisheries Oceanography)
- November 7, 2016 Wooster Award (PICES)
- November 11, 2016 Distinguished Science Award (PORSEC)
- September 5, 2022 Uda Prize (Oceanographic Society of Japan)
- February 14, 2023 Hokkaido Science and Technology Award (Hokkaido Prefecture)
- November 2, 2023 Hakodate-City Culture Award (Hakodate City)

Gad Levy

Present Title

-Senior Research Scientist-

NorthWest Research Associates - Seattle

-President-

Pan Ocean Remote Sensing Conference

Keynote Speak

Bridging the Capacity Across the Globe for Ocean Satellite Remote Sensing Applications: The PORSEC Experience

Keynote Speak 5

Time: April 24, 2025 (Thursday) 09:40~10:20

Location: The Second Auditorium

Introducer: Prof. Ming-An Lee

Honors and Awards

- 2018: Best poster presentation award for “Indian Ocean Double Inter-Tropical Convergence Zones and The Indian Summer Monsoon” (Levy, Geiss, Kumar) at “Remote Sensing of the Ocean: Significant dates and current state” Scientific Session, the Pacific Oceanological Institute, Far Eastern Branch, Russian Academy of Science.
- 2017: Outstanding support to the In-Space Verification of Earth Science Technology (InVEST) program and the NASA Earth Science Technology office.
- 2015: Awarded 1st Laboratory of Tropical Oceanography LTO Overseas Visiting Fellowship, SCSIO, Chinese Academy of Sciences, Guangzhou, China.
- 2015: Awarded “High End Foreign Experts Recruitment Program” by the Administration of Foreign Experts Affairs of Guangdong Province of China
- 2014: Awarded, Visiting Professorship for Senior International Scientists, the Chinese Academy of Sciences.
- 2013: Outstanding support to the In-Space Verification of Earth Science Technology (InVEST) program and the NASA Earth Science Technology office.

Young-Je Park

Present Title

-Chief Research Officer-

TelePIX Co., Ltd.

Keynote Speak

Leveraging Multi-Satellite Data for Monitoring Coastal Ocean Issues

Keynote Speak 6

Time: April 25, 2025 (Friday) 09:00~09:40

Location: The Second Auditorium

Introducer: Prof. Ming-An Lee

Honors and Awards

- Chair of Local Organizing Committee of PORSEC 2018
- Scientific Program Committee of IOCS 2019
- Scientific program Committee cochairs of OSOS-3

Dan-Ling Tang

Present Title

-Professor, PI-

Southern Marine Science and Engineering Guangdong Laboratory (Guangzhou)，China.

-Director-

Guangdong Remote Sensing Center for Marine Ecology and Environment

Keynote Speak

Satellite Remote Sensing: Typhoon Wind Pump Impact on Marine Ecological Environment

Honors and Awards

- 2020, National Innovation Award, China;
- 2019, Vice Chair, The Intergovernmental Group on Earth Observations (GEO);
- 2018, Member of Scientific Advisory Panel, 6 GEO（Global Environment Outlook）;
- 2012-2016, The President, Pan Ocean Remote Sensing Conferences (PORSEC);
- 2018-2020, The President, Pacific Congress on Marine Science and Technology (PACON);
- 2011，The first prize of Guangdong Provincial Science and Technology Award;
- 2010-2014-2018, The Vice Chair of Committee on Space Research, COSPAR;
- 2009, The first prize of Guangdong Provincial Science and Technology Award;
- Councilor, the American Geophysical Union (AGU);
- 2007, PACON International Ocean Service Award;
- 11. 2006, Zayed Award Diploma

Invited Speakers

Xiao-Feng Li

Doctor / Key Laboratory of Ocean Circulation and Waves, Institute of Oceanology Chinese Academy of Sciences

New Advances in Artificial Intelligence Oceanographic Forecasting Research

Session A1-1

Time: April 23, 2025 (Wednesday) 15:20~15:40

Location: The Second Auditorium

Hao-Nan Chen

AI and Remote Sensing, Colorado State University and NOAA Boulder

Using Deep Learning to Improve Geostationary Satellite Remote Sensing of Ocean Precipitation

Session A1-1

Time: April 23, 2025 (Wednesday) 16:40~17:00

Location: The Second Auditorium

Tony Wen-Wei Liao

Senior Research Associate of CIRES at University of Colorado Boulder

Lifelong Learning for Improved Radar Retrievals of Precipitation in Different Precipitation Regimes

Session A1-2

Time: April 25, 2025 (Friday) 11:00~11:20

Location: The Fourth Auditorium

Bambang Semedi

Associate Professor / Head of Division of Research and Community Service, Interdisciplinary Graduate School, Universitas Brawijaya

The Impact of ENSO and IOD Phenomena on the Variability of Oceanographic Parameters in Indonesia

Session C1-1

Time: April 23, 2025 (Wednesday) 13:20~13:40

Location: Conference Hall of Pi

Muhamad Naimullah

University lecturer (Fishing Gear Technology) of Universiti Malaysia Terengganu

Effect of the El Niño Southern Oscillation (ENSO) Event on the Catch and Distribution Pattern of Yellowfin Tuna (Thunnus albacares) in the South Pacific Ocean

Session C1-1

Time: April 23, 2025 (Wednesday) 14:00~14:20

Location: Conference Hall of Pi

Anindya Wirasatriya

Lecturer / Oceanography Department, Faculty of Fisheries and Marine Science, Diponegoro University, Indonesia

The Possible Contribution of Marine Heatwave on the Declining Healthy Coral Cover in Nusa Dua, Bali, Indonesia

Session E1

Time: April 23, 2025 (Wednesday) 15:20~15:40

Location: Conference Hall of Pi

Parichat Wetchayont

Professor / Disaster Management Program, Faculty of Science and Health Technology, Navamindradhiraj University

Extremely Long-Lived and Record-Breaking Marine Heatwave During Rainy 2020 in the Gulf of Thailand

Session E1

Time: April 23, 2025 (Wednesday) 16:00~16:20

Location: Conference Hall of Pi

Hsueh-Jung Lu

Department of Environmental Biology and Fisheries Science, National Taiwan Ocean University

The Impact of Climate Change on Mackerel Fishing Grounds and Fisheries in Northeastern Taiwan

Session F1-1

Time: April 24, 2025 (Thursday) 11:40~12:00

Location: Conference Hall of Pi

Yu-Chun Lin

Department of Marine Environmental Informatics, National Taiwan Ocean University

Estimating of the Habitat of Trichiurus lepturus Northeast Taiwan Obtained from Commercial Data in Winter Seasons

Session F1-2

Time: April 24, 2025 (Thursday) 13:20~13:40

Location: Conference Hall of Pi

Carlos Gabriel

Head of the Panel on Capacity Building, COSPAR

The COSPAR Capacity Building Initiative - what can we do in Oceanography

Session L1

Time: April 24, 2025 (Thursday) 10:40~11:00

Location: The Second Auditorium

Hwa Chien

Professor / Dept. Hydrological and Oceanic Sciences, National Central University

Recent Advances in Taiwanese HF Coastal Radar: Bistatic Developments and Applications

Session M1

Time: April 25, 2025 (Friday) 10:00~10:20

Location: The Fourth Auditorium

Stefano Vignudelli

Senior Researcher / Consiglio Nazionale delle Ricerche, Pisa, Italy

Coastal Lagoon Altimetry to Measure Improved Sea Level from Space at Land-Sea Interface

Session M2

Time: April 24, 2025 (Thursday) 10:40~11:00

Location: Distance Learning Classroom 201

Nurul Hazrina Idris

Manager / Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia

Recent progress on sea level rise over the marginal seas in Southeast Asia

Session M2

Time: April 24, 2025 (Thursday) 11:20~11:40

Location: Distance Learning Classroom 201

Hiroto Abe

Associate Professor / Faculty of Fisheries Sciences, Hokkaido University, Japan

Ocean salinity measurement from space and its application to oceanography

Session O1

Time: April 24, 2025 (Thursday) 13:20~13:40

Location: Distance Learning Classroom 201

Yi-Jay Chang

Associate Professor of Fisheries Science, Institute of Oceanography, National Taiwan University

Application of Tuna and Billfish Joint Species Distribution Models for Exploring the Feasibility of Time-Area Closure for Striped Marlin in the Western and Central North Pacific Ocean

Session P1

Time: April 24, 2025 (Thursday) 10:40~11:00

Location: Conference Hall of Pi

Chang-Ming Dong

International Geophysical Fluid Dynamics Laboratory, Nanjing University of Information Science and Technology

Rotating Tank Experiments for the Study of Geophysical Fluid Dynamics

Session T2

Time: April 24, 2025 (Thursday) 11:40~12:00

Location: The Second Auditorium

Oral & Poster Sessions

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Technical Program

Each oral presenter is allocated a total of 20 minutes, which includes **15 minutes for the presentation** and **5 minutes for the Q&A session**. Additionally, **presenter number marked with an asterisk (*) indicate participation in the oral presentation contest**.

All participants are required to **upload their PowerPoint slides (PPT) before the session begins**. The session hall will open 30 minutes prior to the start of the presentations, providing time for you to upload your materials. Please note that uploading slides during the presentation is strictly prohibited to avoid any delays, so it is essential to arrive early.

(A) Artificial Intelligence and Deep Learning

A1: Artificial Intelligence for Marine Remote Sensing

Session A1-1
Time: April 23, 2025 (Wednesday) 15:20~17:20
Location: The Second Auditorium
Chairs: Prof. Xiao-Feng Li & Dr. Wei-Ting Chao

Time	Presenter	Abstract		
		Title	No.	Pages
15:20~15:40	Invited Speaker-**Xiao-Feng Li**	New Advances in Artificial Intelligence Oceanographic Forecasting Research	A1-17	p.60
15:40~16:00	Ermakov D.M.	Localization of the Center of Tropical Cyclones Based on Infrared Satellite Images Using Machine Learning and Computer Vision	A1-18*	p.61
16:00~16:20	Yakusheva A.N.	Modern Methods of River Plume Segmentation	A1-19*	p.62
16:20~16:40	Po-Yuan Hsiao	Projected ENSO Impacts on Commercial Fish in the Northern South	A1-20	p.63

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		China Sea under Climate Change Simulations		
16:40~17:00	Invited Speaker-**Hao-Nan Chen**	Using Deep Learning to Improve Geostationary Satellite Remote Sensing of Ocean Precipitation	A1-57	p.101
17:00~17:20	Thunchanok Thammasanya	Seagrass Species Classification Using Random Forest and U-Net Models on Multiple Satellite Images	A1-22*	p.65

*Click on the page number to view the abstract.

Session A1-2
Time: April 25, 2025 (Friday) 11:00~11:40
Location: The Fourth Auditorium
Chairs: Prof. Hwa Chien & Prof. You-Ren Wang

Time	**Presenter**	**Abstract**		
		Title	**No.**	**Pages**
11:00~11:20	Invited Speaker-**Tony Wen-Wei Liao**	Lifelong Learning for Improved Radar Retrievals of Precipitation in Different Precipitation Regimes	A1-58	p.102
11:20~11:40	Zalfa Afifah Zahra	A Deep Learning Model for Detecting and Classifying Sea Temperature Rise Using Satellite Imagery	A1-21*	p.64

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(C) Coastal Impacts and Management

C1: Application of Remote Sensing Data in Ocean and Coastal Management

Session C1-1
Time: April 23, 2025 (Wednesday) 13:20~15:00
Location: Conference Hall of Pi
Chairs: Prof. Bambang Semedi & Prof. Muhamad Naimullah

Time	Presenter	Abstract		
		Title	No.	Pages
13:20~13:40	Invited Speaker-**Bambang Semedi**	The Impact of Enso and IOD Phenomena on the Variability of Oceanographic Parameters In Indonesian Waters	C1-01	p.44
13:40~14:00	Marwin s del Rosario	Assessing the Experiences and Perspectives of LGUs and Law Enforcers in the Management and Implementation of MSP in the Philippines	C1-03*	p.46
14:00~14:20	Invited Speaker-**Muhamad Naimullah**	Effect of the El Niño Southern Oscillation (ENSO) Event on the Catch and Distribution Pattern of Yellowfin Tuna (*Thunnus albacares*) in the South Pacific Ocean	C1-05	p.48
14:20~14:40	Husniyah Binti Mahmud	Coastal Inundation Prediction in Kelantan, Malaysia Using Sentinel-2 and ALOS-PALSAR RTC DEM Data	C1-04	p.47
14:40~15:00	Wei-Ting Chao	Typhoon Wave Prediction Using Long Short-Term Memory Networks for Offshore Windfarm on Westerm Coast of Taiwan	C1-02	p.45

*Click on the page number to view the abstract.

Session C1-2

Time: April 25, 2025 (Friday) 10:00~11:40
Location: The Second Auditorium
Chairs: Dr. Norhadija Darwin & Mr. Sandipan Mondal

Time	Presenter	Abstract		
		Title	No.	Pages
10:00~10:20	Norhadija Darwin	Advancing Coastal Geomorphology Analysis Using Lidar and Low-Altitude Remote Sensing: A Case Study of Kelantan, Malaysia.	C1-52	p.96
10:20~10:40	Jen-Han Yang	From Tradition to Innovation: Sustainable Oyster Farming with HDPE Rafts, IoT Tracking, and Remote Sensing	C1-53*	p.97
10:40~11:00	Sandipan Mondal	Is the North-Western Pacific Sea Bream Fishery Primarily Affected by Global Change-Induced Extreme Events: Potentially Single or Multiple Climatic Variabilities	C1-54	p.98
11:00~11:20	Oktif Rafiqka Fiddien	Utilizing Lidar to Analyze Topographic Changes: A Case Study and Its Implications for Coastal Management	C1-55*	p.99
11:20~11:40	Hiroto Abe	Multi-Month Prediction of Summertime Hypoxia Occurrence in the Bottom of Funka Bay, Japan, Using Satellite Remote Sensing	C1-56	p.100

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(E) Extreme Events Under Climate Change

E1: Understanding Extreme Events Responding to Rapid Climate Change

Session E1
Time: April 23, 2025 (Wednesday) 15:20~17:20
Location: Conference Hall of Pi
Chairs: Prof. Anindya Wirasatriya & Prof. Parichat Wetchayont

Time	Presenter	Abstract		
		Title	No.	Pages
15:20~15:40	Invited Speaker-**Anindya Wirasatriya**	The Possible Contribution of Marine Heatwave on the Declining Healthy Coral Cover in Nusa Dua, Bali, Indonesia	E1-06	p.49
15:40~16:00	Wiliam.	Evaluating the Impact of Marine Heatwaves, Cumulative Thermal Stress, and Upwelling on Coral Habitats in the Malacca Strait	E1-07*	p.50
16:00~16:20	Invited Speaker-**Parichat Wetchayont**	Extremely Long-Lived and Record-Breaking Marine Heatwave During Rainy 2020 in the Gulf of Thailand	E1-08	p.51
16:20~16:40	Faqih Musyaffa	Long-Term Sea Surface Temperature Trends and Unprecedented Marine Heatwaves Along the Western Coast of Aceh	E1-09*	p.52
16:40~17:00	Thi-Kieu-Diem Nguyen	Characteristics and Analysis of Marine Heatwaves and Subsurface Warming Under Climate Variability Trends	E1-10*	p.53
17:00~17:20	Naydeline Teresita Smith	Evaluating Climate and Environmental Drivers of Coral Bleaching in the Belize Barrier Reef System	E1-11*	p.54

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(F) Fishery Resources Under Climate Impact

F1: Application of Remote Sensing on Aquaculture and Fisheries under Climate Change

Session F1-1
Time: April 24, 2025 (Thursday) 11:00~12:20
Location: Conference Hall of Pi
Chairs: Prof. Hsueh-Jung Lu & Prof. Yi-Jay Chang

Time	Presenter	Abstract		
		Title	No.	Pages
11:00~11:20	Mubarak Mammel	Assessing the Influence of Sea Surface Temperature Fronts on the Distribution of Large Pelagic Fishes in Taiwanese Waters	F1-34	p.77
11:20~11:40	Chih-Yi Cheng	Evaluating the Impacts of Environmental Variables on Spatial Density Distributions of Pacific Saury by Using Spatio-Temporal Modelling	F1-35*	p.78
11:40~12:00	Invited Speaker-**Hsueh-Jung Lu**	The Impact of Climate Change on Mackerel Fishing Grounds and Fisheries in Northeastern Taiwan	F1-36	p.79
12:00~12:20	Po-Yen Huang	The Spatial Distribution and Overlap Characteristic of *Scomberomorus* and Forage Species in the Waters Around Taiwan	F1-37*	p.80

*Click on the page number to view the abstract.

Session F1-2
Time: April 24, 2025 (Thursday) 13:20~15:20
Location: Conference Hall of Pi
Chairs: Prof. Yu-Chun Lin & Prof. Ting-Chun Kuo

Time	Presenter	Abstract		
		Title	No.	Pages
13:20~13:40	Invited Speaker-**Yu-Chun Lin**	Estimating of the Habitat of *Trichiurus lepturus* Northeast Taiwan Obtained from Commercial Data in Winter Seasons	F1-38	p.81
13:40~14:00	Ching-Tsun Chang	Long-Distance Migration and Mesoscale Eddy Use by a Bumphead Sunfish (*Mola alexandrini*) in the Northwestern Pacific Ocean	F1-39	p.82
14:00~14:20	Kuan-Chun Tseng	Response of Albacore Tuna to Future Climate Scenarios in the North Pacific Ocean	F1-40*	p.83
14:20~14:40	Tung-Yao Hsu	Comparing Fish Yield and Fishing Effort Data for Species Distribution Modeling of Tropical Tunas in the Western and Central Pacific Ocean	F1-41	p.84
14:40~15:00	Irene Chia Ling, Lim	Vulnerability Assessment of Swimming Crab Species in the Southern East China Sea	F1-42*	p.85
15:00~15:20	Hui Xu	The Improvement of the Prediction Accuracy of Yellowfin Tuna Resource Abundance in Longline Fisheries Using VMS Data	F1-43*	p.87

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(L) Capacity Building in Oceanography

L1: Capacity Building in Developing Countries

Session L1
Time: April 24, 2025 (Thursday) 10:40~11:40
Location: The Second Auditorium
Chairs: Prof. Carlos Gabriel & Prof. Chang-Ming Dong

Time	Presenter	Abstract		
		Title	No.	Pages
10:40~11:00	Invited Speaker-**Carlos Gabriel**	The COSPAR Capacity Building Initiative – What Can We Do in Oceanography	L1-44	p.88
11:00~11:20	Tzu-Wei Hung	Advancing Small Satellite Development and Educational Training Through International Collaboration – The INSPIRE Summer Internship Program	L1-45*	p.89
11:20~11:40	Loren C. Chang	Developing Hands-On Space Education and Small Satellite Capacity Building at National Central University Through International Networking and Collaborations	L1-46	p.90

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(M) Emerging Technologies for Ocean and Coastal Applications

M1: Remote Sensing of Marine Hazards in the Coastal Environment

Session M1
Time: April 25, 2025 (Friday) 10:00~10:40
Location: The Fourth Auditorium
Chairs: Prof. Hwa Chien & Prof. You-Ren Wang

Time	Presenter	Abstract		
		Title	No.	Pages
10:00~10:20	Invited Speaker-**Hwa Chien**	Recent Advances in Taiwanese HF Coastal Radar: Bistatic Developments and Applications	M1-49	p.93
10:20~10:40	Shin-Yi Chen	The Physical Coastal Vulnerability Assessment Along the Coast of Terengganu, Malaysia, Using Remotely Sensed Data	M1-50*	p.94

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M2: Satellite Radar Altimetry: Exploitation for Sea Level Studies and Related Applications

Session M2
Time: April 24, 2025 (Thursday) 10:40~12:00
Location: Distance Learning Classroom 201
Chairs: Prof. Stefano Vignudelli & Prof. Nurul Hazrina Idris

Time	Presenter	Abstract		
		Title	No.	Pages

10:40~11:00	Invited Speaker-**Stefano Vignudelli**	Coastal Lagoon Altimetry to Measure Improved Sea Level from Space at the Land-Sea Interface	M2-23	p.66
11:00~11:20	Kaoru Ichikawa	Mean Seasonal Sea Surface Height Variations in and Around Makassar Strait Revealed by Coastal Satellite Altimetry Products	M2-24	p.67
11:20~11:40	Invited Speaker-**Nurul Hazrina Idris**	Recent Progress on Sea Level Rise Over the Marginal Seas in Southeast Asia	M2-25	p.68
11:40~12:00	Suryanarayanacharyulu Phaniharam	Analysis of Extreme Wave Conditions in the Indian Ocean Using Satellite Altimetry in Synergy With Model and Observations	M2-26	p.69

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M3: Advancements in Polar Observation and Remote Sensing

Session M3
Time: April 25, 2025 (Friday) 10:40~11:00
Location: The Fourth Auditorium
Chairs: Prof. Hwa Chien & Prof. You-Ren Wang

Time	Presenter	Abstract		
		Title	No.	Pages
10:40~11:00	You-Ren Wang	Two-Decade Satellite Observations of Arctic CO_2 and CH_4 (2002–2020): Advancing Insights into Permafrost Thaw and Coastal Emissions	M3-51	p.95

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(O) Operational Remote Sensing

O1: Satellite Application on Oceanic Observation and Monitoring

Session O1
Time: April 24, 2025 (Thursday) 13:20~15:20
Location: Distance Learning Classroom 201
Chairs: Prof. Hiroto Abe & Prof. Teruhisa Shimada

Time	Presenter	Abstract		
		Title	No.	Pages
13:20~13:40	Invited Speaker-**Hiroto Abe**	Ocean Salinity Measurement from Space and Its Application to Oceanography	O1-27	p.70
13:40~14:00	Wei-Chuan Chiang	Diving Depth Related Sea Surface Temperature of Five Species of Billfish in the Northwestern Pacific Ocean Inferred from Electronic Tagging	O1-28	p.71
14:00~14:20	Xiao-Bo Yang	Approximate Scheme for Two-Dimensional Sea Surface Current Field Retrieval	O1-29	p.72
14:20~14:40	Takahiro Osawa	Analysis of Oceanic Eddies, Upwelling, and Ekman Transport Processes in the Southern Sea of Java	O1-30	p.73
14:40~15:00	Tom Avikasis Cohen	A Novel Approach in Oil Spill Detection via Satellite Remote Sensing, Data Fusion, and Deep Learning	O1-31*	p.74
15:00~15:20	Misganaw Choto	Initial Trial of Sparse Identification-Based Model for Estimating Phytoplankton Species Using IOPs From GCOM-C in Lake Kasumigaura	O1-32*	p.75

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(P) Remote Sensing Data for Policy Making

P1: Application of Remote Sensing in Marine Policy

Session P1
Time: April 24, 2025 (Thursday) 10:40~11:00
Location: Conference Hall of Pi
Chairs: Prof. Hsueh-Jung Lu & Prof. Yi-Jay Chang

Time	Presenter	Abstract		
		Title	No.	Pages
10:40~11:00	Invited Speaker- **Yi-Jay Chang**	Application of Tuna and Billfish Joint Species Distribution Models for Exploring the Feasibility of Time-Area Closure for Striped Marlin in the Western and Central North Pacific Ocean	P1-33	p.76

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(T) Ocean-Atmosphere Interactions

T1: Tropical Cyclone-Marine Heatwave Interactions: From Coastal Ocean to Deep Ocean

Session T1
Time: April 24, 2025 (Thursday) 12:00~12:20
Location: The Second Auditorium
Chairs: Prof. Carlos Gabriel & Prof. Chang-Ming Dong

Time	Presenter	Abstract		
		Title	No.	Pages
12:00~12:20	Iam-Fei Pun	Marine Heatwave: A Supercharger for Typhoons	T1-48	p.92

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T2: Multi-Scale Oceanic Motions and Interactions Based on Satellite Observations

Session T2
Time: April 24, 2025 (Thursday) 11:40~12:00
Location: The Second Auditorium
Chairs: Prof. Carlos Gabriel & Prof. Chang-Ming Dong

Time	Presenter	Abstract		
		Title	No.	Pages
11:40~12:00	Invited Speaker-**Chang-Ming Dong**	Rotating Tank Experiments for the Study of Geophysical Fluid Dynamics	T2-47	p.91

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(TA) TASA Exclusive Session: Oceanic Observation and Application of FORMOSAT Series

Session TA
Time: April 23, 2025 (Wednesday) 13:20~15:00
Location: The Second Auditorium
Chairs: Prof. Li-Yu Chang & Prof. Wen-Hao Yeh

Time	Presenter	Abstract		
		Title	No.	Pages
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13:40~14:00	Meng-Che Wu	Image Interpretation of Synthetic Aperture Radar and Applications	TA-13*	p.56
14:00~14:20	Yung-Fu Tsai	Next Step for GNSS Remote Sensing Mission in Taiwan	TA-14	p.57
14:20~14:40	Jung-Chien Hung	Detecting and Monitoring Marine Oil Pollution Using Multi-Sensor Satellite Data	TA-15	p.58
14:40~15:00	Hsuan-Cheng Wei	Vessel Target Detection and Information Management Using Data Cube Satellite Imagery	TA-16	p.59

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Poster List

Participants in the poster session must ensure that each poster is presented by at least one of its authors. **The presenter should prepare a short talk (around 3-5 minutes)** to summarize their work clearly and must be available during the session to discuss their posters and answer questions from attendees.

Participants will be divided into two groups: **Group I** will present from **15:20 to 16:20**, and **Group II** will present from **16:20 to 17:20**. Additionally, **presenter number marked with an asterisk (*) indicate participation in the poster contest**. Please ensure that your poster is displayed according to your assigned presenter number.

Posters can be displayed immediately after registration on **April 22nd**, and it is essential that all posters are set up by **3 PM on April 23rd**. Presenters may arrange their posters prior to the opening ceremony or during designated lunch and break times, with tape provided for securing the posters.

Poster Session
Time: April 23, 2025 (Wednesday) 15:20~17:20
Location: Ocean and Mountain View Corridor

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II	Jeong-Eon Moon	Characterization of data obtained from ESOOB (East Sea Ocean Optical Buoy) for validation of ocean color satellite data	PA-02*	p.104
I	Yu-Chao Zhang	Innovative Research on Multi-Modal Deep Learning-based Public Health Surveillance Frameworks Driven by Remote Sensing Data	PA-03*	p.105
II	Hyeong-Tak Lee	Application of Neural Networks for Estimating Absorption Coefficients Using In-Situ Data from Korean Coastal Waters	PA-04	p.106

I	Xiao-Hui Zhu	Using Time-Series Neural Networks to Retrieve CH_4 Concentration in Global Surface Ocean	PA-20	p.124

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(B) Application in Blue Carbon Science

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		Title	No.	Pages
I	Chia-Hsiang Chen	A Bibliometric Analysis of Knowledge Production Trends in Blue Carbon Science, with Applications of Remote Sensing Tools	PB-05	p.107

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(C) Coastal Impacts and Management

Group	Presenter	Abstract		
		Title	No.	Pages
II	Li-Ya Tseng	Research on the Application of Visual Sensory Characteristics of Land Crabs and Portunidae in Ecological Conservation	PC-42*	p.147

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(E) Extreme Events Under Climate Change

Group	Presenter	Abstract		
		Title	No.	Pages
I	Teruhisa Shimada	Climatology of Sea Surface Winds and Cold Surges in the Maritime Continent	PE-06	p.108
II	Jie Feng	Two Types of the East Asian Cold Surge and Their Impacts on El Niño	PE-07	p.109
II	Hui Xu	Impact of Different Spatial Scales on Standardization of Yellowfin Tuna	PE-08*	p.110

		(*Thunnus albacares*) CPUE in Longline Fisheries		
I	Ting-Yu Liang	Abundance Variability of Predators: Asynchronous Fluctuation of Tuna Species in the Atlantic Ocean due to Predation Strategies and Climatic Effects	PE-39*	p.144
I	Po-Yuan Hsiao	Projected ENSO Impacts on Commercial Fish in the Northern South China Sea under Climate Change Simulations	PE-46*	p.151

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(F) Fishery Resources Under Climate Impact

Group	Presenter	Abstract		
		Title	No.	Pages
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I	Chih-Hsien Chang	Analysis of Resource and Environmental Dynamics for Grey Mullets (*Mugil cephalus*) in Taiwan from 2014 to 2023	PF-10	p.112
II	Sandipan Mondal	Impact of Global Climate Change on Apex Pelagic Predators of the World's Oceans: Potential Adaptation or Tropicalization	PF-11	p.113
I	Chia-Wei Hu	Cluster Analysis of Fishing Composition in the Yunchang Rise Area of the Taiwan Strait and Its Relationship with Environmental Factors	PF-12*	p.115
I	Chien-Pang Chin	Climate Change and the Future Distribution and Fishing Seasons of Two Swimming Crabs, *Portunus sanguinolentus* and *Charybdis feriatus*, in the Northwestern Taiwan Waters	PF-13	p.116
II	Ke-Yang Chang	Remote Sensing Data in the Application of Taiwan squid Fisheries	PF-14	p.118

I	Sandipan Mondal	Teleconnection Impacts of Climatic Variability on Tuna and Billfish Fisheries of the South Atlantic and Indian Ocean: A Study Towards Sustainable Fisheries Management	PF-15	p.119
II	Arpita Ghosh	Remote Sensing Analysis of Oceanographic Conditions on Chub Mackerel (*Scomber Japonicus*) Fishery Distribution in Northeastern Taiwan	PF-16*	p.120
II	Shian-Jhong Lin	Thermal Influences on the Vertical Movement Patterns of Dolphinfish (*Coryphaena hippurus*) Off Eastern Taiwan	PF-17	p.121
I	Irene Chia Ling, Lim	Exposure and Climate Change Impacts on Three Swimming Crab Species in Taiwanese Waters	PF-18*	p.122
II	Lim Chang Xin	UAV Innovations for Sustainable Oil Palm Plantation Management: A Systematic Review	PF-19*	p.123
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I	Ipsita Biswas	Climate-Proofing Fisheries: Leveraging Remote Sensing and Ensemble Modelling to Safeguard Spanish Mackerel Habitats in the Taiwan Strait	PF-41*	p.146
I	Pin-Ling Chen	Variations in Migratory Fish Species in Set-Net along the Northeastern Coast of Taiwan under Climate Change	PF-43*	p.148
II	Peng-Yu Sun	Impact of Fishing Pressure on the Ecological Structure and Keystone Species around Western and Central Pacific Ocean	PF-44*	p.149
I	You-De Lin	Impacts of Climate Change on the Abundance and Habitat of Shark in Indian Ocean	PF-45*	p.150
II	Wei-Yu Lee	Using animal trajectory tracking software to compare the effects of different baits on the	PF-47*	p.152

		behavior of *Chionoecetes bairdi*		

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(M) Emerging Technologies for Ocean and Coastal Applications

Group	Presenter	Abstract		
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II	Hai-Yan Li	Melt Pond Observation from SAR Data Using the Segment Anything Model	PM-22	p.126

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(O) Operational Remote Sensing

Group	Presenter	Abstract		
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I	Kwangseok Kim	A Spatial Context-Driven Deep Neural Network for Sea Ice Detection in Liaodong Bay Using GOCI-II	PO-23*	p.127
II	Feng-Mei Yao	Data Reconstruction of Daily MODIS Chlorophyll-a Concentration and the Impact of Typical Typhoon Events on Upper-Ocean Chlorophyll-a in the Northwestern Pacific Region	PO-24	p.128
I	Suk Yoon	Monitoring Seasonal Changes in Fishing Ground Distribution Using DNB Satellite Data in the Korean Sea	PO-25*	p.130
II	Hee-Jeong Han	Optimization Approaches for Deriving Accurate Inherent Optical Properties from Ocean Color Satellite Observations	PO-26	p.131
I	Hua-Bing Xu	Phytoplankton Biomass Variability in the Eastern Hainan Upwelling Region: A 20-Year Analysis (2003-2022)	PO-27	p.132

II	Sheng-Nan Zhou	Variations in Contemporary Benthic Habitat of the Shallow Coral Reef Platform in the Southern South China Sea Under Global Warming: Insights from Ximen Reef in the Nansha Islands	PO-28	p.133
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II	Kuo-Wei Yen	Generalized Additive Modeling of Chlorophyll-a Concentrations in the Taiwan Strait: Insights from Remote Sensing and Fluorescence-Based Quantification	PO-30	p.135
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II	Myeongseop Kim	Long-Term Trends of Phytoplankton Protein Concentration in the East Sea/Japan Sea Based on Ocean Color Remote Sensing	PO-32*	p.137
I	Yu-Chien Cheng	Can Machine Learning Integrate Physical Principles for Accurate Reconstruction of Satellite-Derived Sea Surface Temperature in Cloudy Areas?	PO-33*	p.138
II	Wei-Chih Lin	Measuring Atlantic Meridional Overturning Circulation Using Sea Surface Height Anomaly Data	PO-34*	p.139
I	Pei-Hua Wu	Impact of ENSO on Long-Term Environmental Changes in Taiwan Waters and Its Response Strategies	PO-37*	p.142
II	Xing-Han Wu	Chlorophyll-a (Chl-a) Concentration Retrieval and Its Spatial-Temporal Variation Based on Geostationary Satellite Observations in the Taiwan Strait	PO-38*	p.143

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(T) Ocean-Atmosphere Interactions

Group	Presenter	Abstract		
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I	Yen-Chun Chen	Influence of Environmental Conditions on the Rapid Intensification of Tropical Cyclones in the Northwest Pacific	PT-35*	p.140
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PAPER No. : PORSEC-oral01-C1

THE IMPACT OF ENSO AND IOD PHENOMENA ON THE VARIABILITY OF OCEANOGRAPHIC PARAMETERS IN INDONESIAN WATERS

Bambang Semedi[1,2,3*], Raida Aufa Aleidakanaya[1], Yosephine Anabel Nathania Viera Subroto[1]
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[3] Postgraduate School | Universitas Brawijaya

Corresponding author: bambangsemedi@ub.ac.id

Abstract

The dynamics of Indonesian waters are highly influenced by climate phenomena, including the El-Niño Southern Oscillation (ENSO) in the Pacific Ocean and the Indian Ocean Dipole (IOD) in the Indian Ocean. The Oceanic Nino Index (ONI) was used to determine the ENSO phenomena, while Dipole Mode Index (DMI) to determine the IOD phenomena. These phenomena significantly affect the parameters, such as Sea Surface Temperature (SST), chlorophyll-a, salinity, currents, Sea Surface Heights (SSH), and wind patterns. This study aimed to determine the effects of ENSO and IOD on the variability of oceanographic parameters in Indonesian waters from January 2010 to December 2024. The data used in this study were based on satellite observations and consisted of secondary monthly data. The data were processed and analyzed using descriptive quantitative analysis methods in the form of spatial and temporal time-series graphics. The Generalized Additive Model (GAM) also used to analyze the influence of these climate phenomena on oceanographic parameters. This study found that the ENSO and IOD phenomena has an impact on the variability of oceanographic parameters, such as Sea Surface Temperature (SST), chlorophyll-a, salinity, currents, Sea Surface Heights (SSH), and wind patterns. The impact is seen during special periods, especially when strong El Nino occurred at the same time as IOD (+) and a strong La Nina phenomenon along with IOD (-).

Keywords: Satellite Remote Sensing Data, El Niño Southern Oscillation, Indian Ocean Dipole, Oceanographic Parameters, Indonesian Waters

PAPER No. : PORSEC-oral02-C1

TYPHOON WAVE PREDICTION USING LONG SHORT-TERM MEMORY NETWORKS FOR OFFSHORE WINDFARM ON WESTERN COAST OF TAIWAN

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Abstract

An accurate and efficient typhoon wave prediction model is important for improving the efficiency of offshore windfarm management. In the earlier studies, short-lead-time (i.e., 1 to 3 hours) typhoon wave prediction models were developed for the Taiwan coastal area. These models were constructed by BPNN with local meteorological information. However, Sufficient prediction lead-time is essential for early warning and response to offshore windfarm during typhoon events. Furthermore, past research on typhoon waves along the western coast of Taiwan often presented an underestimated tendency due to the structure of the typhoon being destroyed by the Central Mountain Range. The purpose of this study is to establish a novel long-lead-time typhoon wave prediction model using Long Shor-Term Memory (LSTM) networks while carefully considering typhoon parameters. The basic concept of LSTM is to utilize the memory cell to capture the features or vectors of time-related data, significantly enhancing prediction accuracy. The results of LSTM demonstrate high consistency with in-situ data for 1-hour lead time (i.e., the correlation coefficient is up to 0.95). For longer lead time (e.g., 6hours), the method exhibits a prominent improvement in learning and generalizing capability than shallow learning methods. The correlation coefficients for training and validation reach 0.85 and 0.80, respectively.

Keywords: LSTM, Offshore Windfarm, Typhoon waves, Typhoon parameters, Long-lead-time prediction.

PAPER No. : PORSEC-oral03-C1

ASSESSING THE EXPERIENCES AND PERSPECTIVE OF LGUS AND LAW ENFORCERS IN THE MANAGEMENT AND IMPLEMENTATION OF MSP IN THE PHILIPPINES

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Abstract

The implementation of Marine Spatial Planning (MSP) is of paramount importance for the effective and sustainable governance of marine ecosystem. Particularly within the context of Philippines maritime jurisdiction, this study will examine the Philippine Coast Guard's (PCG's) implementation of MSP. Focusing on its integration with the groundbreaking Legal Framework Senate Bill No. 2450 or the Blue Economy Act of the Philippines, which aims to promote sustainable and inclusive marine development. Through a comprehensive methodology in incorporating secondary data analysis and a reliability-tested survey questionnaire administered to domain experts, this research investigates the PCG's approaches to marine conservation, stakeholder engagement, and technological integration in MSP planning and implementation. The findings reveal significant progress in various areas, including the establishment of marine protected areas (MPA) implementation of advance monitoring systems, and development of inter-agency collaborations. The study highlights the PCGs effort in balancing development with environmental conservation through policy alignment, stakeholder inclusion and technological advancement. Key achievements include in the successful integration of Unmanned Aerial Vehicles (UAVs) and Vessel Monitoring Systems (VMS) for enhanced surveillance, effective partnerships with agencies like Department of Environment and natural Resources (DENR), and the implementation of comprehensive monitoring and evaluation systems. However, challenges persist in areas such as resource allocation, inter-agency coordination, and data integration. This research provides valuable insights into the PCG's role in marine Spatial Planning and offers recommendations for strengthening MSP implementation through improved coordination mechanisms, enhanced technological integration, and more robust stakeholder engagement strategies. These findings will contribute to the broader understanding of MSP implementations in the Philippines and provide a foundation for future policy development.

Keywords: Marine Spatial Planning, Marine Policy, Geospatial Technologies, Blue Economy Act, Stakeholder Engagement

PAPER No. : PORSEC-oral04-C1

COASTAL INUNDATION PREDICTION IN KELANTAN, MALAYSIA USING SENTINEL-2 AND ALOS-PALSAR RTC DEM DATA

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Abstract

The Kelantan area, located on the east coast of Peninsular Malaysia, is extremely prone to flooding due to the impact of heavy rainfall from the northeast monsoon (November to March). With the influence of high tides and hurricanes, the low-lying Kelantan coast is at risk of inundation.

This study aims to develop a virtual sea for flood simulation showing inundated coastal areas under various sea water level rise from 0 m to 32 m with an increment of 0.2 m, using a combination of elevation threshold from ALOS-PALSAR Radiometric Terrain Correction (RTC) product (12.5 m spatial resolution) and spectral information from Sentinel-2 image. To train and validate segmentation models EfficientNet-Unet B0 backbone using the previous flood simulated output as a training dataset for flood depth and segmentation. To evaluate the result, the extent of the flood-prone area by the Department of Drainage and Irrigation is used to validate the result.

Based on the result of the simulated flood depth, based on the increment of sea level rise, shows that the coastline is significantly inundated starting from a 1.2 m flood depth. The training dataset from the simulated 1.2-meter flood depth using EfficientNet-Unet B0 compared to the flood-prone map provided by the Department of Drainage and Irrigation shows similarity where estimately 56.3% of the coastal zone is delineated as the flood extent area. Therefore, a combination of deep learning EfficientNet-Unet B0 method with ALOS-PALSAR RTC DEM and Sentinel-2 can provide flood early prediction when no ground data available.

Keywords: Coastal inundation, Kelantan, EfficientNet-Unet B0 backbone, ALOS-PALSAR RTC, Sentinel-2

PAPER No. : PORSEC-oral05-C1

EFFECT OF THE EL NIÑO SOUTHERN OSCILLATION (ENSO) EVENT ON THE CATCH AND DISTRIBUTION PATTERN OF YELLOWFIN TUNA (*Thunnus albacares*) IN THE SOUTH PACIFIC OCEAN

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Abstract

The yellowfin tuna (*Thunnus albacares*; YFT) is one of the world's most important commercially fished tuna species. However, there is little research on the trend of YFT catches and distribution patterns in the South Pacific Ocean (SPO) with the El Niño Southern Oscillation (ENSO) event. This study aimed to understand the influence of ENSO events on YFT catch trends and distribution shifts in the SPO. The YFT catch data from longline fisheries from 2001 to 2021 were standardized using generalized linear models (GLM) to assess temporal and spatial trends of YFT standardized catch per unit effort (sCPUE). Results reveal that ENSO events alter sea surface temperatures (SST) and salinity (SSS), affecting the sCPUE and distribution of YFT in the SPO. The Normal and El Niño events correlate with higher YFT sCPUE compared to La Niña events in the SPO. Moreover, the El Niño events drive YFT distributions eastward of the SPO. The study provides critical insights into YFT to climatic fluctuations, supporting strategies for sustainable utilization and conservation in the face of changing oceanic conditions in the SPO. Future research should expand the data's temporal and spatial resolution to better understand YFT in the SPO to ENSO events and other climatic variability.

Keywords: climate change, tuna management, remote sensing

PAPER No. : PORSEC-oral06-E1

THE POSSIBLE CONTRIBUTION OF MARINE HEATWAVE ON THE DECLINING HEALTHY CORAL COVER IN NUSA DUA, BALI, INDONESIA

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Abstract

Nusa Dua, Bali is one of the regions filled with diverse coral reef ecosystems that previously had a history of bleaching phenomenon. This study aims to assess the possible contribution of MHW toward the declining rate of healthy coral cover using a historical remote sensing approach combined with field observation. MHW detection was conducted using satellite data of sea surface temperature (SST) from OSTIA to determine climatological mean values and the 90th percentile. Historical benthic mapping of the healthy coral coverage was done using Sentinel 2 imageries with monthly analysis from 2015 to 2022. Additionally, field observation was conducted to obtain the percentage of healthy coral coverage for validation. There have been 38 occurrences of MHW with the most significant and prolonged one happening in 2016, 2020 and 2022. The result indicates that these heatwaves occurred over the west and east monsoon periods, with the most destructive one happening in the west monsoon period. During this period, a declining rate of healthy coral coverage is found with the most destructive occurring in 2016 which accumulates a total loss of healthy coral coverage of 50.9% from the previous year. The east monsoon period acts as the recovery period for the coral reefs since the temperature is much lower. A higher frequency, intensity, and duration of MHW is recorded in 2022 compared to 2023, this is suspected to be related to the lower healthy coral coverage in 2022 compared to 2023.

Keywords: Marine Heatwave, Coral Reef, Nusa Dua, Sentinel 2, remote sensing

PAPER No. : PORSEC-oral07-E1

EVALUATING THE IMPACT OF MARINE HEATWAVES, CUMULATIVE THERMAL STRESS, AND UPWELLING ON CORAL HABITATS IN THE MALACCA STRAIT

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Abstract

The Malacca Strait is a tropical marine corridor crucial to regional climate dynamics and biodiversity. Recent climate trends indicate a significant increase in Sea Surface Temperature, leading to more frequent and intense Marine heatwaves and cumulative Degree Heating Weeks (DHW). These events severely threaten coral reef ecosystems, causing widespread bleaching and altering marine productivity. This study utilizes multi-satellite datasets and MATLAB-based climatological analysis to evaluate the interplay between SST, DHW, bleaching levels, CHL, and upwelling dynamics from 1985 to 2024. From 1985 to 2024, bleaching alert level 1 reached these 14 stations in 1998, 2010, 2016, 2019, 2020, and 2024. Additionally, in 2010 and 2024, two and six stations recorded DHW values in the 12–16 °C/weeks range, corresponding to bleaching alert level 3. The interaction between the Indian Ocean Dipole (IOD) and the El Niño-Southern Oscillation (ENSO) may be a key climate mechanism driving this region's sea surface temperature anomalies. In addition to thermal stress, coastal upwelling is a key oceanographic mechanism that influences nutrient distribution and chlorophyll-a (CHL) concentrations. Upwelling can mitigate thermal stress by bringing cooler, nutrient-rich waters to the surface. However, increasing MHW and DHW events may disrupt upwelling efficiency, leading to a decline in CHL concentrations and potential ecosystem degradation. Analyzing the link between thermal stress and upwelling variability is crucial for assessing coral resilience in the Malacca Strait. This study underscores the need for continuous remote sensing to enhance marine conservation and mitigate climate change impacts.

Keywords: Malacca Strait, Marine Heatwaves, Degree Heating Weeks, Upwelling

PAPER No. : PORSEC-oral08-E1

EXTREMELY LONG-LIVED AND RECORD-BREAKING MARINE HEATWAVE DURING RAINY 2020 IN THE GULF OF THAILAND

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Abstract

Marine heatwaves (MHWs) have been reported often throughout the world, producing severe effects on marine ecosystems. Long-term temperature records are essential for understanding and interpreting warming patterns, as well as the importance of marine heatwaves (MHWs) in coastal ecosystems. We analyse long-term trends in daily sea surface temperature (SST) anomalies and MHWs by using the Operational Sea Surface Temperature and Ice Analysis (OSTIA) product from 1982 to 2021. SST has been persistently and abnormally warm over the last decade, with 2021 being the warmest year in the 40-year record and including record-breaking temperatures for over four months. There were no long-term trends in the number of MHW days or the cumulative intensity of MHWs per year, but break point analysis revealed a considerable and rapid increase in both parameters after 2010. 2020 featured the most MHW days (113) on record, including the two longest and cumulatively intense MHWs, which had various unanticipated effects on coastal ecosystems.

Keywords: Marine heatwave, Gulf of Thailand, Long-live, Global warming, OSTIA, Sea surface Temperature

PAPER No. : PORSEC-oral09-E1

LONG-TERM SEA SURFACE TEMPERATURE TRENDS AND UNPRECEDENTED MARINE HEATWAVES ALONG THE WESTERN COAST OF ACEH

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Abstract

Long-term sea surface temperature (SST) trends and marine heatwaves (MHWs) significantly impact marine ecosystems, fisheries, and coastal resilience. The western coast of Aceh, located in the eastern tropical Indian Ocean, has experienced escalating thermal stress in recent decades. This study examines SST variability and extreme thermal events using 40 years (1985–2024) of Marine Heatwaves-Degree Heating Weeks (MHW-DHW) and SST data from NOAA Coral Reef Watch. Results show a consistent increase in SST over the past four decades, with accelerated warming since the early 2000s. Monthly climatology reveals a distinct seasonal cycle, with SST peaking between April and June (~30.0–30.5°C) and cooling between November and January (~28.0–29.0°C). SST warming is evident in all seasons, with stronger anomalies during the pre-monsoon and peak-monsoon periods. MHW frequency and intensity have increased, with DHW exceeding 4°C-weeks during extreme events recorded in 1998, 2010, 2016, 2019, and 2024. Additionally, three coral habitats (Pulah Weh, Pulah Sabang, and the northwestern coast of Aceh) recorded DHW exceeding 8°C-weeks in 2010, 2016, and 2024, reaching bleaching alert level 2. The coupled climate characteristics of the El Niño-Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) may be key factors driving the accelerated accumulation of sea surface temperature (SST) in this region.

Keywords: Sea surface temperature; Marine heatwaves; El Niño-Southern Oscillation; Indian Ocean Dipole

PAPER No. : PORSEC-oral10-E1

CHARACTERISTICS AND ANALYSIS OF MARINE HEATWAVES AND SUBSURFACE WARMING UNDER CLIMATE VARIABILITY TRENDS

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Abstract

This study investigates marine heatwaves (MHWs) in the East China Sea (ECS: 115–130°E, 25.4–42°N), South China Sea (SCS: 105–120.9°E, 0–25.4°N), and Western Pacific (WP: 120.9–137°E, 0–25.4°N), focusing on key indicators of oceanic response to climate variability. We quantify MHW frequency, duration, and intensity using high-resolution GLORYS12V1 reanalysis datasets (1/12°) from 1993 to 2023 and a threshold-based identification method with a 1993–2012 climatology. Concurrently, subsurface thermal structures, including ocean heat content (OHC) and the mean temperature of the upper 100 meters ($T_{\overline{100}}$), are assessed using analogous techniques, enabling a comprehensive evaluation of their interconnections. MHW, OHC, and $T_{\overline{100}}$ indicators are analyzed in five-year intervals to examine decadal trends and variability. The results reveal distinct spatial and temporal variations across the three regions, strongly influenced by climate-driven variability. Among the examined indicators, MHW frequency, duration, and intensity show the strongest correlation with $T_{\overline{100}}$, followed by a moderate correlation between OHC and $T_{\overline{100}}$, while the correlation between OHC and MHW is weaker. Since 2016, the rapid intensification of MHWs has been evident, with pronounced peaks during strong ENSO (El Niño) events, particularly in 1997–1998 and 2016–2017. The increasing influence of subsurface thermal anomalies underscores their crucial role in modulating extreme marine events. This study comprehensively quantifies the interactions between MHWs and subsurface thermal variability, explicitly highlighting the roles of OHC and $T_{\overline{100}}$. These findings offer new insights into regional climate dynamics, emphasizing the need for continuous monitoring and multi-parameter assessments.

Keywords: Marine heatwaves, Ocean Heat Content, Climate Variability

PAPER No. : PORSEC-oral11-E1

EVALUATING CLIMATE AND ENVIRONMENTAL DRIVERS OF CORAL BLEACHING IN THE BELIZE BARRIER REEF SYSTEM

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Abstract

Coral bleaching significantly threatens reef ecosystems, particularly due to increasing sea surface temperatures (SST) and climate variability. This study evaluates the climate and environmental drivers of coral bleaching in the Belize Barrier Reef System (BBRS), located between 16.0°N and 18.5°N latitude and between 87.5°W and 88.5°W longitude, from 1985 to 2024. By analyzing bleaching alert levels across multiple sites, this research identifies patterns of bleaching severity and potential climate influences that may contribute to coral resilience. Findings indicate that bleaching alert levels reached their highest severity in 2016, 2020, 2023, and 2024, with multiple sites experiencing Alert Level 3 and 4 conditions. In contrast, 2019 and 2022 showed significantly reduced bleaching, with most sites recording only Level 1 or 2 bleaching alerts, and few or no locations reaching Level 3 or 4 alerts. This suggests a potential mitigating effect of climate conditions in those years. Gladden Spit and Silk Cayes, South Water Caye, Caye Bokel of Turneffe Atolls, and Swallow Caye experienced the most bleaching events, with 11 or more occurrences, making them the most vulnerable locations within the BBRS. The Western Hemisphere Warm Pool (WHWP), El Niño-Southern Oscillation (ENSO), and the Tropical Northern Atlantic Index (TNA) are potential climate regulators influencing sea surface temperatures in the Belize Barrier Reef System (BBRS). Other indices, such as the Atlantic Meridional Mode (AMM), North Atlantic Oscillation (NAO), and Atlantic Multidecadal Oscillation (AMO), may also play significant roles, along with local seasonal variations and weather patterns.

Keywords: Belize Barrier Reef System, Coral bleaching, Degree Heating Week

PAPER No. : PORSEC-oral12-TA

OCEAN SURFACE WIND SPEED RETRIEVAL PROCESS OF TRITON

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Abstract

Triton was the second Taiwan-built and also the first Taiwan-built meteorology satellite mission. Triton was launched in October 9th, 2023, for GNSS-Reflectometry (GNSS-R) ocean surface wind speed observation. The mission payload, GNSS-R receiver, is used to receive the Earth surface reflected GNSS signal and process to provide delay-Doppler map (DDM). DDM is a distribution of signal strength in different code phase delay and Doppler frequency and is used to retrieve ocean surface wind speed. In order to retrieve ocean surface wind speed by using DDM, a process system, Taiwan RO/R process system (TROPS), is developed. TROPS originally developed for FORMOSAT-7/COSMIC radio occultation (RO) data process and extended GNSS-R module after Triton launched. There are three parts in TROPS GNSS-R segment: 1. DDM calibration; 2. Supporting data calculation; 3. Ocean surface wind speed retrieving. DDM calibration part is used to remove the influence of hardware. Supporting data calculation part is used to calculate the supporting data, such like the position of specular point and effective scattering area. The ocean surface wind speed retrieving part is used to retrieval ocean surface wind speed by using geophysical model function (GMF). In this study, the detail of three parts will be introduced and the retrieval results will also be validated.

Keywords: Triton, GNSS-R, DDM, TROPS

PAPER No. : PORSEC-oral13-TA

IMAGE INETRPRETATION OF SYNTHETIC APERTURE RADAR AND APPLICATIONS

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Abstract

Synthetic Aperture Radar (SAR) technology is an advanced active remote sensing method capable of acquiring high-resolution images regardless of weather conditions or daylight availability. The presentation explores SAR imaging principles, system architecture, scattering mechanisms, and diverse applications, with an introduction to FORMOSAT-9 (FS9), which aims to develop an independent SAR satellite system for global Earth observation and to provide frequent coverage of Taiwan and other regions, supporting applications such as land deformation analysis, urban planning, and natural hazard assessment, etc.. SAR operates by transmitting electromagnetic waves and analyzing the reflected signals to construct detailed surface images. Unlike passive sensors, SAR is resilient to atmospheric disturbances, making it ideal for environmental monitoring, disaster management, and resource assessment. Key technical aspects include SAR's ability to measure distances based on signal runtime and backscatter properties, influenced by factors such as incidence angle, object orientation, and surface roughness. Various scattering effects, such as specular/surface, double-bounce, and volume scattering, so called scattering mechanisms, impact image interpretation. Based on these mechanisms, the features of the scenes in a single or series of images can be extracted and for the further applications, such as change detection of the landform, classification of land cover/use, monitoring of surface deformations and seismic activities. In the oceanic related applications, monitoring of the coastline and reservoir change will also be introduced. These variety of applications highlights SAR’s role in geospatial intelligence and Earth observation. The findings contribute to the advancement of SAR applications in scientific research, environmental surveillance, and disaster resilience planning.

Keywords: Synthetic Aperture Radar, FORMOSAT-9, remote sensing, scattering mechanisms

PAPER No. : PORSEC-oral14-TA

NEXT STEP FOR GNSS REMOTE SENSING MISSION IN TAIWAN

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Abstract

In past decade, Taiwan has been at the forefront of Global Navigation Satellite System (GNSS) remote sensing, with significant advancements in both GNSS radio occultation (GNSS-RO) and GNSS reflectometry (GNSS-R) techniques. GNSS-RO has been demonstrated its tremendous usage in atmospheric soundings by retrieving the temperature, pressure, and water vaper from the bending angle of GNSS signal while passing through the atmosphere. Taiwan's expertise in GNSS-RO was established with the FORMOSAT-3/COSMIC mission in 2006, followed by the FORMOSAT-7/COSMIC-2 constellation in 2019, both in collaboration with the United States. Furthermore, the reflected GNSS signals can be processed to form delay Doppler maps (DDMs) so that the various geophysical parameters of Earth's surface, such as roughness, ocean wind speed, and soil moisture can be retrieved. Triton program, launched in 2023, represents Taiwan's first GNSS-R mission, utilizing an in-house developed receiver to collect the measurements and retrieve ocean surface wind speed. This mission also highlights Taiwan Space Agency (TASA) growing capabilities in satellite development and data acquisition. Building on these achievements, the next-generation GNSS-RO/R constellation is being conceptualized to enhance severe weather prediction by integrating atmospheric and ocean surface roughness data.

PAPER No. : PORSEC-oral15-TA

DETECTING AND MONITORING MARINE OIL POLLUTION: USING MULTI-SENSOR SATELLITE DATA

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Abstract

Marine oil pollution can cause direct and serious environmental damage, especially for those events happened around coastal areas. When the ocean is polluted by oil slick event, quickly and efficiently responding the disaster information is the top priority. In this case, satellite data can provide both in time and wide area observation data for tracking the movement of the oil slicks. The analyzed oil slicks results can be provided as a most up to date information to the relevant organizations to make decision efficiently. For TASA (Taiwan Space Agency) as space agency in Taiwan, not only provide FORMOSAT series satellite data products for applications but also offer satellite data analysis results directly for decision making. Furthermore, international collaborations among space agencies are also curial once the pollution is spread in ocean areas. Since oil spillage detection is essentially difficult due to its complicated spectral properties, normally an integration of manual and automatic satellite image processing is applied for emergency analysis. In this paper. three case studies are provided for demonstrations. The first case is a freighter stranded near the coast of the north of Taiwan on Mar 3, 2016. The second case is oil tanker explosion in East China Sea on Jan 6, 2018. The third case is oil tanker sunk near the coast of Oriental Mindoro, Philippines on Feb 28, 2023. According to the provided cases, the results show that satellite data can be efficiently applied in the monitoring of marine oil pollution.

Keywords: FORMOSAT series satellite, Marine oil pollution, TASA (Taiwan Space Agency)

PAPER No. : PORSEC-oral16-TA

VESSEL TARGET DETECTION AND INFORMATION MANAGEMENT USING DATA CUBE SATELLITE IMAGERY

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Abstract

In recent years, satellite imagery has been widely applied in national security, environmental monitoring, agriculture, disaster assessment, and scientific research. Multi-temporal data analysis has gained importance, driving global advancements. To meet this demand, the Taiwan Data Cube integrates various multi-temporal satellite images on TWGRID at Academia Sinica, offering robust querying and analysis capabilities. In this study utilizes the Taiwan Data Cube to obtain 4-meter resolution FORMOSAT-5 multispectral imagery for YOLOv8 object detection training. A total of 237 labeled images (512×512) were used for training, 25 for validation, and 25 for testing, all focusing on vessel detection. The trained model achieved an overall Precision of approximately 0.85 in testing. Following detection, local coordinates were converted into a map projection coordinate system and exported as point vector data. Further spatial integration assigned attributes to detected vessels, enabling improved analysis of vessel behavior and supporting decision-making and management.

Keywords: Taiwan Data Cube, FORMOSAT-5, Vessel Target Detection

PAPER No. : PORSEC-oral17-A1

NEW ADVANCES IN ARTIFICIAL INTELLIGENCE OCEANOGRAPHIC FORECASTING RESEARCH

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Abstract

Artificial intelligence, as a core driving force of the new round of technological revolution and industrial transformation, has shown tremendous potential in the field of oceanography. The integration with big data has brought revolutionary changes to traditional oceanographic modeling, making it more reliable and efficient to extract valuable information from massive observational data. This data-driven approach allows for deeper exploration of various marine phenomena and processes. In this lecture, we will explore in detail the application of artificial intelligence technologies in oceanographic forecasting, including the prediction of time series, the conversion from two-dimensional data to one-dimensional point sequences, and predictions using image sequences and visual signals. We will discuss the latest research results of these technologies in predicting small-scale internal waves, medium-scale typhoons, large-scale equatorial instabilities, sea ice, and short-term precipitation. These advances not only provide powerful tools for oceanographic research but also help us understand and predict marine phenomena more comprehensively.

PAPER No. : PORSEC-oral18-A1

LOCALIZATION OF THE CENTER OF TROPICAL CYCLONES BASED ON INFRARED SATELLITE IMAGES USING MACHINE LEARNING AND COMPUTER VISION

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Abstract

Tropical cyclones (TC) are among the most dangerous atmospheric phenomena. Forecasting the movement and evolution of shopping malls is an urgent scientific task.
Automatic localization of the shopping center is difficult. The average statistical error of finding the cyclone center depends on the algorithm used and the sample. The error ranges from 0.237 to 0.49 degrees latitude, which corresponds to the typical eye size of the cyclone. The paper considers the developed algorithms for automatically determining the center of a tropical cyclone from infrared images using machine learning and computer vision methods. A total of 3,593 images were examined. The found coordinates of the shopping center centers were compared with the published data. The reasons for the large differences in the coordinates of the typhoon center are analyzed. The possibilities of improving the methodology based, in particular, on the combined use of IR, radar, and microwave radiometric images, taking into account differences in observation time, are discussed.
Within the framework of the State assignment of the Space Research Institute of the Russian Academy of Sciences, topic “Monitoring”, State registration No. 122042500031-8.

Keywords: tropical cyclone, localization of the center, machine learning

PAPER No. : PORSEC-oral19-A1

MODERN METHODS OF RIVER PLUME SEGMENTATION

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Abstract

The report is devoted to the problem of segmentation of river plumes — areas where the fresh water of rivers mixes with the salty waters of the seas and oceans. These plumes play a key role in ecosystems, significantly affecting the biological productivity and chemical composition of coastal waters. However, their segmentation is a difficult task due to vague boundaries and high variability of characteristics.

The report discusses modern machine learning algorithms, with an emphasis on using various neural network architectures to solve the problem of segmentation of river plumes. The methods of processing satellite data, which are used to train models, are considered. Neural network training strategies are discussed, including data augmentation and the choice of metrics for quality assessment, as well as a comparative analysis of the effectiveness of various models on specific datasets. Practical aspects of the application of segmentation results in environmental monitoring of coastal zones are considered and recommendations are proposed for further improvement of segmentation methods and directions for future research.

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Keywords: river plumes; machine learning; automatic segmentation

PAPER No. : PORSEC-oral20-A1

PROJECTED ENSO IMPACTS ON COMMERCIAL FISH IN THE NORTHERN SOUTH CHINA SEA UNDER CLIMATE CHANGE SIMULATIONS

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Abstract

The El Niño/Southern Oscillation (ENSO) significantly impacts marine ecosystems and fisheries, particularly pelagic species. ENSO events influence environmental factors, leading to variations in fish abundance, yet the mechanisms driving ENSO's impact remain complex and not fully understood. The Northern South China Sea supports a diverse range of fish species, many of which are of commercial and ecological importance. To understand how these species are affected by El Niño and La Niña events under future climate change conditions, we used the Niño 3.4 index to study ENSO-like events. Environmental data from the GFDL ESM2M ensemble model were combined with the Dynamic Bioclimatic Envelope Model (DBEM) to assess fish biomass in response to these events. Correlation tests indicate that some species show increased abundance during La Niña, driven by lower sea surface temperatures and other environmental factors, while others exhibit the opposite trend. Preliminary results suggest that the impacts of different ENSO events may vary, highlighting the complexity of ENSO's influence on fish abundance under changing climate conditions.

Keywords: Taiwan Strait, DBEM, ENSO, Climate change

PAPER No. : PORSEC-oral21-A1

A DEEP LEARNING MODEL FOR DETECTING AND CLASSIFYING SEA TEMPERATURE RISE USING SATELLITE IMAGERY

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Abstract

The rapid increase in sea temperatures due to climate change presents a significant threat to marine ecosystems and coastal communities. Accurate, automated, and real-time detection of sea temperature rise is essential for understanding and mitigating its impacts on marine ecosystems and coastal communities. Identifying and monitoring temperature anomalies, such as thermal fronts and oceanic heat variations, are crucial for assessing the extent of sea surface temperature changes and their long-term effects on the environment.

This study explores the application of advanced deep learning models, specifically U-Net, ResNet-based CNNs, and Spatiotemporal CNNs, to detect and classify ocean features indicative of sea temperature changes. Multispectral and thermal infrared satellite imagery from sensors such as MODIS (Moderate Resolution Imaging Spectroradiometer) and VIIRS (Visible Infrared Imaging Radiometer Suite) is employed to compile a dataset of ocean features under varying sea temperature conditions. Both regression and segmentation models are developed to detect temperature anomalies and predict sea surface temperatures (SST).

The proposed models demonstrated robust performance in detecting and classifying ocean features related to sea temperature changes. The U-Net model achieved an intersection-over-union (IoU) score of 0.88 in segmenting temperature anomalies, demonstrating its effectiveness in spatial localization. The ResNet-based CNNs (ResNet-50 and ResNet-101) performed well in predicting SST, with mean absolute errors (MAE) of 0.35°C and 0.32°C, respectively. Spatiotemporal CNNs, applied to time-series satellite data, successfully captured both spatial and temporal trends of sea temperature rise, yielding a root mean squared error (RMSE) of 0.28°C. These models offer a reliable and scalable approach for real-time.

Keywords: deep learning, ocean feature detection, marine monitoring, environmental informatics

PAPER No. : PORSEC-oral22-A1

SEAGRASS SPECIES CLASSIFICATION USING RANDOM FOREST AND U-NET MODELS ON MULTIPLE SATELLITE IMAGES

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Abstract

Seagrass meadows are significant ecosystems that benefit humans and marine life in several ways. Additionally, seagrass meadows also mitigate climate change due to their ability to serve as carbon sinks. Various seagrass species can store varying amounts of carbon. Monitoring and identifying seagrass meadows are crucial tasks that must be developed. Remote sensing imagery and machine learning are employed to rapidly detect seagrass habitats over broad areas.

This study is the first to map seagrass habitats at the species level with only high spatial resolution using deep learning.

This study compared the results of segmentation using deep learning (U-Net) with pixel-based classification (random forest: RF) for detecting and classifying one non-seagrass class and five seagrass species namely *Cymodocea serulata*, *Halophila ovalis*, *Halophila spinulosa*, *Syringodium isoetifoleum* and *Zostera muelleri* with *Halodule uninervis*. The study sites were at Moreton Bay, Brisbane, Australia and Pak Meng, Trang, Thailand. Transfer learning was also adopted in this study.

With simply the same short prediction, the RF model performed effectively at classifying at the species level. On the other hand, U-Net performed better at detecting seagrass habitats from various image times, places, and resolutions. These two models were capable of mapping seagrass in different environmental settings.

Keywords: Remote sensing, satellite spectral data, seagrass species mapping, machine learning, transfer learning

PAPER No. : PORSEC-oral23-M2

COASTAL LAGOON ALTIMETRY TO MEASURE IMPROVED SEA LEVEL FROM SPACE AT LAND-SEA INTERFACE

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Abstract

Satellite remote sensing has become a powerful tool for scientific studies as it permits global analyses over extended periods. Satellites provide something that ground-truth sensors cannot, i.e., coverage with a single-sensor consistency. Satellite radar altimeters showed capability for globally monitoring open oceans, and only recently a reassessment of years of coastal altimetry data has provided a detailed view of how to get more and better data near the coast. Results show that comparison scenarios with tide gauges vary significantly from one coastal site to the other. The global coastline is spatially highly variable and irregular, having random geometry being formed by various landforms (e.g., sea cliffs, beaches, tidal flats, river deltas, lagoons, estuaries, bays, etc.). Abileah and Vignudelli (2021) introduced a new processing approach (coined Precise Inland Water Altimetry, PISA) which is a waveform and retracker model specifically for flat specular or quasi-specular surfaces greater than 100 m. The new algorithm has been tested in many inland water bodies (rivers and lakes). We will show that lagoon altimetry is more accurate than state-of-the-art coastal altimetry in measuring coastal sea level from space. Coastal lagoons are a typology well defined geographically, possibly protected from wave action and exposed to weaker and less persistent winds, Therefore, patches of calm water that are specular reflectors can be expected. The motivation for the study is that there are 32,000 lagoons and such a wealth of coastal sites could be exploited to extend the coastal altimetry paradigm up to the coastline and further inland.

Keywords: Coastal lagoon, Coastal zone, sea level, Satellite radar altimetry

PAPER No. : PORSEC-oral24-M2

MEAN SEASONAL SEA SURFACE HEIGHT VARIATIONS IN AND AROUND MAKASSAR STRAIT: REVEALED BY COASTAL SATELLITE ALTIMETRY PRODUCTS

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Abstract

Seasonal variations are significant in currents in the Makassar Strait, or 80% of the Indonesian Throughflow (ITF) from the Pacific to the Indian Ocean; they are in phase with both the monsoon and the sea surface height anomaly (SSHA) difference between island tide gauge records in two oceans. In this study, 17 years of along-track Jason altimetry data with the ALES coastal retracker are used without spatial interpolation to investigate independent small-scale seasonal SSHA variations in and around the Makassar Strait. All SSHA variations are in phase between the south Celebes Sea and the north Java Sea through the Makassar Strait, but their amplitude decreases within the strait by the distance from the southern shallow area. The SSHA difference between islands in the two oceans is also in phase; however, it is isolated from the Makassar Strait by adjacent uncorrelated SSHA variations in the north Celebes Sea and the south Java/Flores Seas. Moreover, seasonal SSHA variations at the islands are confined within a few hundred kilometers nearshore the islands. These suggest that the SSHA difference between the islands in two oceans does not generate the seasonal ITF variations in the Makassar Strait, but they are independent phenomena coincidentally generated by monsoon winds. Quantitatively, the bottom friction of the ITF over the shallow Makassar Strait locally balances with the SSHA pressure gradient that are generated by monsoon winds over the significantly variating topography within the strait.

Keywords: Makassar Strait, Indonesian throughflow, coastal altimetry, sea surface height, monsoon

PAPER No. : PORSEC-oral25-M2

RECENT PROGRESS ON SEA LEVEL RISE OVER THE MARGINAL SEAS IN SOUTHEAST ASIA

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Abstract

This paper reports the recent progress of sea-level rise (SLR) over the critical region of Southeast Asia (SEA) that is vulnerable to climate change. While many papers report the SLR on local scales (e.g., Malaysia, Indonesia, Vietnam, etc.), studies on understanding the SEA regional impact of SLR have yet to be reported, which has become the motivation of this paper. A literature review has been adopted to finally formulate the recent progress of SLR in the studied region. Besides global factors, we identified five (5) local factor drivers contributing to the SLR over SEA: 1) El-Nino and La-Nina, 2) seasonal monsoon, 3) wind-driven circulation variability/North Pacific Decadal Oscillation, 4) Indian Ocean dipole, 5) tectonic uplift and subsidence due to earthquake. The satellite altimeters and tide gauges have become major techniques for estimating SLR in the region due to the long-term data availability, except in regions with active seismic (e.g., Indonesia), tide gauge data gaps are crucial. Based on the Jason series altimeters (2002-2018), the SEA relative SLR is reported to be accelerating (2-6 mm/yr), which is critically beyond the global mean SLR (3.6 mm/yr between 2006 to 2015). Celebes Sea (6.05 ± 0.78 mm/yr), Sulu Sea (5.64 ± 0.64 mm/yr) and South China Sea (3.88 ± 0.49 mm/yr) record high SLR exceeding the global value, while Malacca Strait (2.67 ± 0.81 mm/yr) records slightly lower. Several cities (e.g., Surabaya, Jakarta, Benoa, and Semarang Indonesia, and Ko Sichang and Ko Mattaphon Thailand) record extremely high SLR beyond 5 mm/yr.

Keyword sea level rise, satellite altimeter, tide gauge, Southeast Asia

PAPER No. : PORSEC-oral26-M2

ANALYSIS OF EXTREME WAVE CONDITIONS IN THE INDIAN OCEAN USING SATELLITE ALTIMETRY IN SYNERGY WITH MODEL AND OBSERVATIONS

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Abstract

Extreme wave events pose significant challenges to coastal regions along the Indian coast, driven by cyclone-induced waves and remotely generated Southern Ocean swells. This study analyzes extreme wave conditions in the Indian Ocean, focusing on cyclone case studies, Southern Ocean swell propagation, and their coastal impacts. Multiple data sources, including satellite altimetry, wave rider buoy observations, and wave model data, are utilized to characterize the spatial and temporal variability of extreme wave events. Satellite altimetry data from Jason-3 and Sentinel-3 missions provide broad spatial coverage of significant wave height (SWH) during extreme events, validated against localized buoy observations along the Indian coast. Case studies of recent cyclones quantify wave height extremes, wave periods, and coastal manifestations. The study also investigates the propagation of long-period Southern Ocean swells and their role in swell surge events along the Indian coastline. Wave model data offers insights into wave propagation patterns and the timing of extreme wave arrival at the coast. The combined analysis improves understanding of the physical mechanisms driving extreme wave events and provides crucial information for enhancing early warning systems and coastal management strategies. This integrated approach strengthens the monitoring, prediction, and mitigation of extreme wave hazards in the Indian Ocean under changing climate conditions.

Keywords: Extreme wave heights, Swell waves, swell surges, Satellite altimeter, Indian ocean, significant wave height.

PAPER No. : PORSEC-oral27-O1

OCEAN SALNITY MEASUREMENT FROM SPACE AND ITS APPLICATION TO OCEANOGRAPHY

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Abstract

Salinity is an important ocean variable for understanding the global water cycle and thermohaline circulation. Monitoring the salinity at the air-sea interface, where it varies greatly due to physical process such as evaporation, precipitation, sea ice melting, freezing, and river runoff, is of vital importance. It's been more than ten years since satellite-borne microwave radiometers including Aquarius/SAC-D began the global monitoring of sea surface salinity. Although much shorter than sea surface temperature in history of satellite observation, research has progressed in oceanography and further development is expected. For now, however, only a few countries have been able to observe sea surface salinity because of the high technical level required for microwave observation at the frequency sensitive to salinity. In this presentation, I will briefly review the previous studies and introduce Japan's plan to realize salinity observation.

Keywords: salinity, microwave radiometer

PAPER No. : PORSEC-oral28-O1

DIVING DEPTH RELATED SEA SURFACE TEMPERATURE OF FIVE SPECIES OF BILLFISH IN NORTHWESTERN PACIFIC OCEAN INFERRED FROM ELECTRONIC TAGGING

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Abstract

Billfishes are among the largest extant teleost fishes, reaching weights of up to 900 kg, and serve as apex predators in oceanic habitats. They hold significant economic value, being targeted by commercial fisheries and frequently caught as bycatch in global fisheries. Removal of apex predators impact lower trophic levels causing unknown ecological and evolutionary consequences. From December 2008 to June 2024, a total 5 sailfish, 15 black marlin, 15 blue marlin, 5 striped marlin and 5 swordfish were tagged with pop-up satellite archival tags off eastern Taiwan. The tags remained affixed to the animals for durations ranging from 13 to 360 days. For sailfish, black marlin, blue marlin and striped marlin, depth distribution appeared to be constrained by a water temperature difference of ~8°C relative to the warmest surface waters, even when sea surface temperatures (SSTs) ranged from 24°C to 35°C. For swordfish, daytime and nighttime vertical movements were restricted by temperature changes of ≦-20° and ≦-8°C with SST, respectively. Billfishes exhibited a broad depth and temperature range in their habitats, with sailfish, black marlin, blue marlin and striped marlin occupying areas from the surface to the epipelagic zone. In contrast, swordfish was observed diving into the mesopelagic zone during both daytime and nighttime. These findings provide valuable information to support effective fisheries management.

Keywords: Basking behaviour; epipelagic and mesopelagic, vertical movement patterns; temperature threshold

PAPER No. : PORSEC-oral29-O1

APPROXIMATE SCHEME FOR TWO-DIMENSIONAL SEA SURFACE CURRENT FIELD RETRIEVAL

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Abstract

Retrieval of two-dimensional sea surface current under common sea state from spaceborne synthetic aperture radar remains an unsolved problem. So far only the exact retrieval of three-dimensional Ekman current that under strong storm are solved, therefore in this study we proposed a general method for retrieving under common sea state.

OCN product of Sentinel-1 satellite data is used for this research, and HYCOM simulating data is taken for comparison and validation. By using of the linear correspondence relationships between the gradient fields of sea surface speed field and two component fields of sea surface current, an approximate scheme for current retrieval is proposed by constructing intermediate variables that contain the linear correspondence relationships into the integration on the x and y directions.

By comparing the exact Ekman current solution the validation proves this scheme is effective. The factors that affect the accuracy of retrieval include the size of the integration window and the filtering window after integration. The size of filtering window for preprocessing data mainly impact the image quality of the retrieval results. The accuracy of the retrieval method also depends on the quality of the linear correlation relationships. Retrieval cases at different latitudes and on different current speeds situation reveal that numerical simulation has limited accuracy in simulating ocean surface current field.

Keywords: ocean current retrieval, Sentinel-1, remote sensing, HYCOM

PAPER No. : PORSEC-oral30-O1

ANALYSIS OF OCEANIC EDDIES, UPWELLING, AND EKMAN TRANSPORT PROCESSES IN THE SOUTHERN SEA OF JAVA

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Abstract

The Southern Sea of Java, located south of Java Island in Indonesia, exhibits unique oceanographic characteristics that are influenced by oceanic eddies and Ekman transport. These phenomena govern the upwelling and nutrient transfer processes, with nutrient concentrations being higher during the southeast monsoon and lower during the northwest monsoon. This study evaluates the interaction between these dynamics using 13 years (2010–2022) of data from CMEMS and ECMWF. Eight parameters were analyzed: Eddy Kinetic Energy (EKE) and eddy occurrence for oceanic eddies; Ekman Mass Transport (EMT) and Ekman Pumping Velocity (EPV) for Ekman transport; a sea surface temperature-based Upwelling Index (UISST); chlorophyll-a (Chl-a) anomaly as a nutrient indicator; the Ocean Niño Index (ONI) for ENSO intensity; and the Dipole Mode Index (DMI) for IOD activity. This study implements two methods: Empirical Orthogonal Function (EOF) and bicorrelation analyses. These methods are used to identify correlations between variables and determine whether one variable affects the other. The results indicate that anticyclonic eddies are positively correlated with upwelling, Ekman transport, and Chl-a anomalies, whereas cyclonic eddies show negative correlations. Spatial variability was evident, with inshore regions being more influenced by upwelling and Ekman transport than offshore areas. Positive IOD events increase both eddies and upwelling, whereas negative IOD events reduce them. During El Niño events, oceanic eddies increase, while upwelling decreases, and the reverse occurs during La Niña events. These results are primarily attributed to the differing oceanographic profiles of the inshore and offshore regions. ENSO and IOD also impact each variable owing to changes in ocean temperature.

Keywords**:** Oceanographic phenomena, South sea of Java, CMEMS, ERA5

PAPER No. : PORSEC-oral31-O1

A NOVEL APPROACH IN OIL SPILL DETECTION VIA SATELLITE REMOTE SENSING, DATA FUSION AND DEEP LEARNING

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Abstract

This research introduces an innovative approach for the early detection of oil spills in the Mediterranean Sea, employing satellite-based remote sensing technologies. The study was designed to enhance the capacity to identify and respond to oil spills and pollution resulting from extensive maritime traffic along Israel's coastline. A range of sensors, including multispectral and Synthetic Aperture Radar (SAR) at varying frequencies, as well as Ocean and Land Color Instrument (OLCI) and Sea and Land Surface Temperature Radiometer (SLSTR) sensors, were utilized to provide comprehensive seawater data and spectral analyses of pollutants.

Protocols for data integration and calibration were developed, ensuring reliable data processing and high precision in pollution detection. A regional database was established to monitor seawater conditions, serving as a baseline for anomaly detection models. Sensor limitations and environmental variability were addressed, with data fusion techniques enhancing spatial resolution and response times. The study advanced prevention and response capabilities, contributing to increased environmental security and a deeper understanding of pollution dynamics in the Mediterranean. Through the integration of multi-sensor platforms and advanced machine learning techniques, precise anomaly detection and real-time monitoring were achieved. This framework demonstrated the potential of remote sensing systems as effective tools for continuous marine monitoring, offering a robust approach to environmental risk management in the Mediterranean Sea, that can later be implied globally.

Keywords: Remote sensing, Data fusion, Machine learning, Oil spills, Satellites

PAPER No. : PORSEC-oral32-O1

INITIAL TRIAL OF SPARSE IDENTIFICATION-BASED MODEL FOR ESTIMATING PHYTOPLANKTON SPECIES USING IOPS FROM GCOM-C IN LAKE KASUMIGAURA, JAPAN

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Abstract

Phytoplankton species are ecologically vital components of aquatic ecosystems, playing key roles in primary production, nutrient cycling, and food web dynamics. Their spatial distribution is critical for monitoring water quality, assessing ecosystem health, and identifying harmful algal blooms.

This study integrates satellite remote sensing data with a sparse identification model to estimate phytoplankton species distribution in aquatic environments. The Quasi-Analytical Algorithm (QAA) was applied to retrieve phytoplankton absorption coefficients ($a_{ph}(\lambda)$) and particulate backscattering coefficients ($b_{bp}(\lambda)$) from GCOM-C/SGLI satellite data. A sparse identification model was developed using the Least Absolute Shrinkage and Selection Operator (LASSO) for feature selection, with further optimization using Sequential Threshold Least Squares (STLSQ). The best-performing model was determined based on improved error metrics, and a minimum threshold was established considering the highest RMSE and lowest R^2 values, which pose difficulties for accurate remote sensing retrieval. The sparse identification model was developed for nine selected phytoplankton species, and the results demonstrated significant improvements in model performance across multiple species, including *Dictyosphaerium*, *Aulacoseira pusilla-distans*, *Oocystis*, and *Thalassiosirales*. In the Lasso regression model, *Aulacoseira pusilla-distans* exhibited the highest coefficient of determination (R^2 = 0.70), followed by *Dictyosphaerium* (R^2 = 0.66). Upon application of STLSQ optimization with a minimum threshold, *Dictyosphaerium* demonstrated superior predictive accuracy (R^2 = 0.93, RMSE = 28,554 µm³ mL⁻¹, MAE = 18,975 µm³ mL⁻¹), with *Oocystis* and *Thalassiosirales* also performing robustly (R^2 = 0.80). These findings underscore the effectiveness of sparse identification models in accurately estimating phytoplankton species distribution when combined with data acquired from satellites.

Keywords: Inherent optical properties (IOPs), phytoplankton, sparse identification model, GCOM-C/SGLI

PAPER No. : PORSEC-oral33-P1

APPLICATION OF TUNA AND BILLFISH JOINT SPECIES DISTRIBUTION MODELS FOR EXPLORING THE FEASIBILITY OF TIME-AREA CLOSURE FOR STRIPED MARLIN IN THE WESTERN AND CENTRAL NORTH PACIFIC OCEAN

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Abstract

Tunas and billfishes are highly migratory apex predators in marine ecosystems that often share similar habitats, and most of the fishing mortality of billfishes is the result of bycatch in the pelagic tuna longline fisheries. Given the current poor stock status of striped marlin (MLS) in the western and central North Pacific, this study aims to elucidate the spatiotemporal dynamics of tuna and billfish density distributions and examine the possible utility of time-area closures for MLS conservation. A joint species distribution model integrated with remote sensing environmental data was applied to analyze spatial and temporal variations in encounter rates and positive catch rates for six tuna and billfish species within the region (0°N–40°N, 120°E–160°W), utilizing data from the Western and Central Pacific Fisheries Commission's pelagic longline tuna fishery (2005–2020). Results indicated that high encounter rate areas are similar for all species, mainly distributed south of 20°N and near waters of Hawaii, with a gradual east-to-west shift over the years. Spatial variations in positive catch rates differed among six species, but patterns of spatiotemporal variations in the first and fourth seasons allowed species to be grouped into tunas and billfishes. Overall, spatial hotspots for most species showed seasonal changes, with MLS having the highest degree of overlap with other species in the first and fourth seasons. This study compared two MLS density indicators, I^{MLS} (MLS density) and I^{R} (ratio of MLS density to the total density of all six species), for identifying the time-area grids for closure. Results showed that I^{R} consistently outperformed I^{MLS} each season, with the second season being most effective in reducing MLS bycatch while minimizing impacts on other species' catch. This study provides a practical framework for promoting sustainable management of fisheries resources at both fishery and ecosystem scales, which could be widely applicable to other mixed-species fisheries worldwide.

Keywords: bycatch, joint species distribution model, time-area closures, pelagic tuna, longline fisheries

PAPER No. : PORSEC-oral34-F1

ASSESSING THE INFLUENCE OF SEA SURFACE TEMPERATURE FRONTS ON THE DISTRIBUTION OF LARGE PELAGIC FISHES IN TAIWANESE WATERS

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Abstract

This study analyzed satellite-derived Sea Surface Temperature (SST) data to detect SST fronts and examine their influence on the distribution of large pelagic fishes in Taiwanese coastal waters. SST fronts were identified using the Belkin and O'Reilly Algorithm (BOA), focusing on frontal gradient magnitude (GM) and orientation. Additionally, front positions were evaluated through an entropy-based method to enhance accuracy. Large pelagic fishes represent a rapidly growing and economically significant component of Taiwan's coastal fisheries. However, locating these target species in the dynamic marine environment remains a challenge. The primary objective of this study was to identify suitable habitat zones for these species using remote sensing data, with SST frontal features emerging as key environmental indicators. The results highlight that SST frontal regions serve as critical habitat zones for large pelagic species. These findings provide valuable insights for fisheries management and conservation planning, offering a scientific basis for habitat monitoring and sustainable resource utilization.

Keywords: SST fronts; habitat detection; large pelagic fishes; satellite remote sensing; fishing ground detection; marine resource management

PAPER No. : PORSEC-oral35-F1

EVALUATING THE IMPACTS OF ENVIRONMENTAL VARIABLES ON SPATIAL DENSITY DISTRIBUTIONS OF PACIFIC SAURY BY USING SPATIO-TEMPORAL MODELLING

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Abstract

This study investigated the influence of environmental factors on Pacific saury distribution in the Northwestern Pacific Ocean using the spatiotemporal modeling framework sdmTMB. We analyzed the catch-per-unit-effort (CPUE) dataset compiled by North Pacific Fisheries Commission members and examined the variation of CPUE in related to multiple environmental variables through different functional relationships during 2001-2023 by using species distribution models. The quadratic function model provided the best fit, explaining 36.1% of variance. Results suggested that positive associations with net primary production and a dome-shaped response to sea surface salinity, peaking around 33 PSU. Spatial random effects showed distinct seasonal migration patterns, with distributions shifting from eastern offshore waters (160°-170°E) during May-July to coastal waters (40°-45°N) in August-September, followed by a southward coastal migration from October-December. In recent years (2021–2023), Pacific saury density has declined across the region, likely reflecting significant changes driven by environmental variations. This preliminary analysis provided insights how environmental factors and seasonal patterns influence Pacific saury habitats, with potential for model improvement through the exploration of additional environmental variables.

Keywords: Pacific saury, spatio-temporal modelling, environmental factors

PAPER No. : PORSEC-oral36-F1

THE IMPACT OF CLIMATE CHANGE ON MACKEREL FISHING GROUNDS AND FISHERIES IN NORTHEASTERN TAIWAN

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Abstract

Overfishing, habitat destruction, and climate change are the three primary threats to fisheries worldwide. In the context of Taiwan's coastal fisheries, we have witnessed a decline since the late 1970s, with production plummeting by over half. Overfishing and habitat degradation bear significant responsibility for this decline. In recent years, the impact of climate change has further exacerbated the situation, placing fishery resources at greater risk. Among Taiwan's coastal fishing areas, the northeastern grounds stand out as the most critical. Mackerel catches alone account for more than half of Taiwan's total fisheries yield. These mackerel resources play a vital role in both livelihoods and industry, prompting the implementation of extensive management measures. However, climate change has introduced new complexities. Ocean warming and shifts in Kuroshio flow patterns, including continental shelf intrusions, have disrupted traditional fishing seasons. Gradually, negative effects have emerged, impacting overall productivity—especially evident in the decline of chub mackerel populations. Moreover, fishing conditions have worsened, compounding existing challenges faced during normal circumstances. In light of these developments, the sustainability of Taiwan's mackerel fishery, as well as the entire sector, faces a formidable challenge.

Keywords: climate change, blue mackerel, chub mackerel, Taiwanese seine, Kuroshio

PAPER No. : PORSEC-oral37-F1

THE SPATIAL DISTRIBUTION AND OVERLAP CHARACTERISTIC OF *Scomberomorus* AND FORAGE SPECIES IN THE WATERS AROUND TAIWAN

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Abstract

The habitat of marine top predators depends on forage abundance and distribution patterns, which may increase or decrease feeding opportunities, leading to temporal and spatial changes and affecting interspecific species habitat competition and coexistence potential. However, the *Scomberomorus* is an important economic species in Taiwan. With the gradual decline in catches, past study mainly focused on growth, age and population structure, and focus on *Scomberomorus commerson* with highest catch rate. This study purpose will analyze the spatial overlap between *Scomberomorus* and their forage species, and to predict how predator and forage interactions affect *Scomberomorus* populations. This study collected port observers from 2011 to 2022, combined with trawler voyage recorder data (VDR), used the non-metric scaling method (NMDS) to analyze the clustering of catch rates of *Scomberomorus* and forage species, and used spatial overlap analysis to draw spatial overlapping distribution. NMDS clustering and spatial overlap analysis show that：*Scomberomorus commerson*, *Scomberomorus koreanus* and *Scomberomorus guttatus* are similar to the clusters of Hemiramphidae and Scombridae (Distance:53), and are highly overlapping with Hemiramphidae in the waters of central and southwest Taiwan, and highly overlapping with Scombridae is in the waters of western Taiwan and Yilan. Among them, *Scomberomorus commerson* is highly overlapping with Scombridae in the waters near Penghu and Taiwan bank. This result will be provided to Fisheries Agency for resource management.

Keywords: the waters around Taiwan, *Scomberomorus*, Spatial overlap, NMDS, Population dynamics

PAPER No. : PORSEC-oral38-F1

ESTIMATING OF THE HABITAT OF *Trichiurus Lepturus* NORTHEAST TAIWAN OBTAINED FROM COMMERCIAL DATA IN WINTER SEASONS

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Abstract

Understanding the habitat of ocean fishes is difficult due to the limitation in observational methods. Knowledge on the information on the spatial and temporal resources of habitat are important for harvest prediction and management. *Trichiurus Lepturus* is one of the major fishery resources of Taiwan and the main habitats of *Trichiurus Lepturus* are located at southwestern and northeastern Taiwan. In this study, we analyze the fish catch and the catch per unit effort (CPUE) from the commercial data to determine the habitat of *Trichiurus Lepturus* northeastern Taiwan from 2014 to 2018. The gridded maps of monthly climate fish catch indicate that the high fish catch area is shifted from the northern coast of Taiwan in October to the Kuroshio after January with a clear boundary. The monthly averaged fish catch shows that *Trichiurus Lepturus* is high during winter season from October to the following March. The peak month of fish catch over the northern coast of Taiwan (west of the boundary) and over the Kuroshio (east of the boundary) are highest in November and in December, respectively. Comparing with the sea surface temperature and chlorophyll-a obtained from observational and reanalysis data, this migration is found to be restricted by a relative warm sear surface temperature at 22C. The results also shows that the SST northeastern Taiwan is modulated by cold China Coastal Curretn and the location of Kuroshio path.

PAPER No. : PORSEC-oral39-F1

LONG-DISTANCE MIGRATION AND MESOSCALE EDDY USE BY A BUMPHEAD SUNFISH (*Mola alexandrini*) IN THE NORTHWESTERN PACIFIC OCEAN

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Abstract

Satellite tracking of one adult bumphead sunfish, *Mola alexandrini*, revealed long-distance migration patterns in the northwestern Pacific Ocean. In 2019, a bumphead sunfish off eastern Taiwan was tagged with a pop-up satellite archival tag, which remained attached for 178 days at-liberty. The sunfish migrated northwards from the tagging location, covering a straight-line distances of 1,079 km at an average speeds of 6 km per day, travelling to Okinawa Island, Japan in May, and Kyushu, Japan in August and September. Tagged bumphead sunfish showed distinct movement patterns related to oceanographic characteristics. During the daytime, the sunfish descended below the thermocline and ascended to mixed layer depths during nighttime. Instead of using prevailing currents, its northward migration demonstrated extensive use of mesoscale eddies. The sunfish in anticyclonic eddies usually occupied deeper habitats whereas in cyclonic eddies used near-surface habitats. On northwards excursions, the sunfish spent most of its time in regions with high dissolved oxygen concentrations. These findings provide important insights into the movement ecology of bumphead sunfish, highlighting their ability to undertake long-distance migrations while actively utilizing mesoscale eddies across varying spatial and temporal scales.

Keywords: migration patterns, mesoscale eddies, vertical migration, habitat uses

PAPER No. : PORSEC-oral40-F1

RESPONSE OF ALBACORE TUNA TO FUTURE CLIMATE SCENARIOS IN THE NORTH PACIFIC OCEAN

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Abstract

North Pacific albacore (*Thunnus alalunga*) is a highly migratory tuna species widely distributed throughout 0°–50°N in the North Pacific Ocean. Climate-driven changes in the oceanographic condition largely influence the albacore distribution, relative abundance, and availability of albacore to longline fisheries.

In this study, we examined the habitat preference and spatial distribution of North Pacific albacore using spatiotemporal model fitted to the longline fisheries data from the Western and Central Pacific Fisheries Commission (WCPFC) and Inter-American Tropical Tuna Commission (IATTC).

Future projections of albacore distributions (2030, 2060, and 2080) were predicted by using an ensemble modeling approach produced from various atmosphere-ocean general circulation models and anthropogenic emission scenarios to reduce the uncertainty in the projected changes.

The dissolved oxygen concentration at 100 meters (DO100) and sea surface temperature (SST) were found to have the most substantial effects on the potential albacore distribution. This study suggested that the northern boundary of albacore's preferred habitat is expected to shift northward. These findings could lend important implications on the availability of tuna resources to the fisheries and subsequent evaluation of tuna conservation and management under climate change.

Keywords: albacore tuna, spatiotemporal model , climate change

PAPER No. : PORSEC-oral41-F1

COMPARING FISH YIELD AND FISHING EFFORT DATA FOR SPECIES DISTRIBUTION MODELING OF TROPICAL TUNAS IN THE WESTERN AND CENTRAL PACIFIC OCEAN

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Abstract

The large-scale purse seine fisheries targeting tropical tunas in the western and central Pacific Ocean account for about 70% of the world's skipjack tuna catch. Species distribution models for these target species (skipjack, yellowfin, bigeye tuna) have been widely explored. However, the actual fishing activity is not available from global perspective. In this study, we compared two type of fishery data, the single-flag logbook fish yield data versus the globally auto identified system estimated fishing effort data, which were used as species occurrence information for maximum entropy (MaxEnt) models. Fishery data from 2012 to 2019 were matched with satellite-derived environmental factors at three different spatial resolutions (0.01°, 0.1°, and 0.5°) to evaluate the influence of spatial scale on the analysis The results demonstrate that the MaxEnt model based on fish yield data exhibited a prediction accuracy greater than 88%, which was better than that based on the fishing effort data during the fish aggregating devices closure periods. The original and intermediate sample resolutions were appropriate for MaxEnt model, providing high accuracy with lower computational effort. Additionally, parameter contribution in the MaxEnt model based on fishing effort data changed with spatial scale, while the sea surface temperature consistently had the highest priority in the model based on fish yield data. These findings suggest that fish yield data may contribute to more reliable habitat predictions.

Keywords: Purse seine fisheries, maximum entropy model, spatial resolution

PAPER No. : PORSEC-oral42-F1

VULNERABILITY ASSESSMENT OF CRAB COMMUNITIES IN THE SOUTHERN EAST CHINA SEA

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Abstract

Crab communities in the Southern East China Sea face escalating threats from environmental and anthropogenic stressors, yet their vulnerability remains understudied. The crab communities included family from Portunidae, Raninidae, and Calappidae. The swimming crab species (Portunidae) represent a vital ecological and economic resource in the Southern East China Sea. This study conducted a comprehensive vulnerability assessment of swimming crab species in this region, focusing specifically on exposure, sensitivity, and adaptive capacity to environmental stressors. A combination of ecological surveys, environmental data analyses, and expert consultations were used to assess vulnerability. Exposure was evaluated based on environmental factors (such as SST, SBT, SSS, SSH, etc) and fishing pressure. Sensitivity analyses, incorporating biological traits (reproductive rates, habitat specificity, environmental tolerance), revealed species-specific disparities: Adaptive capacity was determined by examining the ability of species to adapt, its mobility, and behavioral flexibility. Expert opinion were collected and data quality were issued accordingly. Results indicated that swimming crab species exhibited moderate to high vulnerability. Specifically, exposure analysis revealed significant threats from sea surface temperatures (SST) and sea surface salinity (SSS), with habitat suitability decline identified as a critical stressor. Sensitivity evaluation highlighted that species such as *Portunus pelagicus*, *Portunus sanguinolentus*, and *Charybdis feriatus* has moderate sensitivity due to broader tolerance to temperature variation, however, these species prefer habitat with sandy bottom. Adaptive capacity analysis suggested moderate resilience for swimming crab species, with certain species demonstrating behavioral flexibility. Among studied species, *Portunus pelagicus, Portunus sanguinolentus Charybdis feriatus, Charybdis natator, Scylla Serrata,* and *Ranina ranina* has higher data quality, as more study were conducted. Data quality limitations were noted for understudied taxa (e.g., Calappidae, Ovalipes punctatus), underscoring knowledge gaps. These findings highlight the urgent need for habitat-centric conservation measures, adaptive fishing regulations, and marine protected areas to safeguard ecologically and economically vital crab communities. Prioritizing multi-species management frameworks will enhance resilience against cumulative stressors in this rapidly changing ecosystem.

Keywords: Vulnerability assessment, exposure, sensitivity, adaptive capacity, crab community swimming crab

PAPER No. : PORSEC-oral43-F1

THE IMPROVEMENT OF THE PREDICTION ACCURACY OF YELLOWFIN TUNA RESOURCE ABUNDANCE IN LONGLINE FISHERIES USING VMS DATA

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Abstract

Accurate catch rate estimation is essential for the reliable assessment of fishery resources. In longline fisheries, spatial scale effects and data source differences lead to inconsistencies in catch rate calculations, affecting the accuracy of resource abundance predictions.

This study utilized logbook data and vessel monitor system (VMS) records from longline vessels in waters near Micronesia to calculate yellowfin tuna catch rates by two methods. Each catch rate was combined with temporal, spatial, and satellite remote sensing data to form two datasets, which were subsequently used as inputs for BiLSTM models to predict yellowfin tuna abundance and evaluate the effect of different catch rate inputs on prediction accuracy.

The results demonstrate that BiLSTM models effectively predict resource abundance, with the VMS-derived catch rate model outperforming the logbook-derived model. SHAP analysis identified key predictors, including chlorophyll-a concentration, dissolved oxygen at 200 m, and temperatures at 200 m and 300 m. Fishing grounds identified from logbook data were widely distributed across northern and southern sea areas, whereas those from VMS data were concentrated in the south. Considering the vertical profiles of temperature and dissolved oxygen, the VMS-identified fishing grounds are likely more reliable.

Based on these findings, when investigating longline fisheries operating across broad geographic range at finer spatial resolution, it is recommended to record catch data for each operation along with its precise location, as done with VMS, to improve the accuracy of resource abundance predictions.

Keywords: Catch rate, logbook, resource abundance, tuna longline, VMS

PAPER No. : PORSEC-oral44-L1

THE COSPAR CAPACITY BUILDING INITIATIVE – WHAT CAN WE DO IN OCEANOGRAPHY

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Abstract

In the current situation, where climate change has long been unquestionable, the ocean represents the most immediate frontline in the fight against its disastrous consequences. Currently, the ocean has absorbed about 90% of the heat generated by rising emissions. As excess heat and energy warm the ocean, the change in temperature leads to unprecedented progressive effects, including melting of the poles, sea level rise, marine heat waves and ocean acidification. These changes are already affecting coastal communities, including some 680 million people living in low-lying coastal areas, and nearly 2 billion people living in half of the world's major coastal metropolises.

In this situation, it is imperative to help those key actors in developing countries who can confront with data and science the enormous challenges. Capacity building in affected countries is of paramount importance. Satellite observations are a fundamental component of understanding how the oceans are evolving. COSPAR's capacity building initiative in developing countries will soon reach a quarter century of activity in all fields of space science. I will show in this presentation the history and scope of this initiative. Earth Observations and Remote Sensing are occupying a large part of it.

It is our intention to strengthen and redouble our efforts in this area, especially in the field of oceanography. In this presentation we will discuss the possibility of organising training courses in oceanography according to the standard COSPAR CB model, based on two-week regional intensive courses in developing countries. We consider that this proposal, which should result from an agreement between COSPAR and PORSEC, could be an improvement on the model adopted so far by PORSEC of MOOCs + few days of tutorials

Keywords: capacity building, oceanography, developing countries, space sciences

PAPER No. : PORSEC-oral45-L1

ADVANCING SMALL SATELLITE DEVELOPMENT AND EDUCATIONAL TRAINING THROUGH INTERNATIONAL COLLABORATION – THE INSPIRE SUMMER INTERNSHIP PROGRAM

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Abstract

The INSPIRE (International Satellite Program in Research and Education) summer internship program took place during the summer of 2024 at the Laboratory for Atmospheric and Space Physics, University of Colorado Boulder. The purpose of this internship program was to perform development work on INSPIRESat and COSPAR small satellites under the aegis of the INSPIRE consortium, while also providing an opportunity for networking and collaboration among the multi-national teams of students involved. Development work on the INSPIRESat and COSPAR missions was performed by students from Taiwan, India, Peru, Germany, Canada, Kuwait, and the USA. Students from Taiwan's National Central University participated in the development and integration of the COSPAR-1 CubeSat, while also delivering one of the scientific payloads to be flown. Working together over a two-month period, the team members from different universities were divided into groups for different subsystems to work on mission concept and system definition, structural and thermal design, electrical power budget estimations, link budget estimations, orbit simulations, payload testing, and harness fabrication. The work concluded with preliminary FlatSat tests. Classes were also offered for different categories of topics, including mechanical, thermal design, flight software, electrical, and space weather. For many of the participating students, this was their first exposure to spacecraft systems engineering and the space environment, leading to fruitful discussions and networking between students with different levels of experience. This was effective in helping the students gain a better understanding of space systems engineering and communication between team members with different backgrounds, facilitating a smooth development process.

Keywords: Capacity building, small satellites, international networking

PAPER No. : PORSEC-oral46-L1

DEVELOPING HANDS ON SPACE EDUCATION AND SMALL SATELLITE CAPACITY BUILDING AT NATIONAL CENTRAL UNIVERSITY THROUGH INTERNATIONAL NETWORKING AND COLLABORATIONS

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Abstract

Building on a long history of space science and space environment research, National Central University (NCU) established Taiwan's first Department of Space Science and Engineering in 2020. Since then, four classes of undergraduates, as well as a growing graduate student group of diverse backgrounds have been working with the faculty of the department to further develop and enhance capacity in small spacecraft development and utilization both for scientific research and hands on education. In addition to hands on cross-disciplinary emphasizing the integrative nature of space science and engineering, we have also sought to drive and participate in new and ongoing research and development projects targeting science and technology development through small satellite and payload missions in collaboration with international partners, government, and private industry. In this presentation, I will provide a brief overview of ongoing projects, including international small satellite science missions as part of the International Satellite Program in Research and Education (INSPIRE) consortium, including COSPAR-1, COSPAR-2, and the annual summer capacity building internship program. This allows students to understand the real-world implications of their science and engineering coursework and network with peers to understand the international nature of the space sector, allowing for a better appreciation of the value of mathematical and scientific theory as tools for analysis, prediction, and design. This is very helpful for producing a new generation workforce for the space sector with a global worldview and relevant hands-on experience and know how.

Keywords: Capacity building, small satellites, international networking

PAPER No. : PORSEC-oral47-T2

ROTATING TANK EXPERIMENTS FOR THE STUDY OF GEOPHYSICAL FLUID DYNAMICS

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Abstract

Rotating tank is an indispensable experimental instrument for the study of geophysical fluid dynamics (GFD). In this talk, the applications of rotating tanks in the GFD are discussed. The largest rotating tank for the study of the GFD has been implemented at Nanjing University of Information Science and Technology (NUIST). In this talk, the detailed information of the largest rotating tank its application perspectives are introduced.

PAPER No. : PORSEC-oral48-T1

MARINE HEATWAVE: A SUPERCHARGER FOR TYPHOONS

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Abstract

Due to the cold water temperatures, the East China Sea (ECS) is usually unfavorable for typhoon development. Recently, in a rare event, Typhoon Bavi (2020) reached major typhoon status and became the strongest typhoon in the ECS in the past decade. Based on in situ observations and model simulations, we discover that this typhoon is fueled by a marine heatwave, which creates a very warm ocean condition with sea surface temperature (SST) exceeding 30°C. Also, because of suppressed typhoon-induced SST cooling caused by the shallow water depth (41m) and strong salinity stratification (river runoff) within the ECS, the SST beneath the typhoon remains relatively high and enhances the total heat flux for the typhoon. More interestingly, due to the fair weather ahead of the typhoon, we find that the rapid development of this marine heatwave is likely, in part, attributed to the typhoon itself. As the risks from typhoons and marine heatwaves are heightening under climate change, this study provides important insights into the interaction between typhoons and marine heatwaves.

PAPER No. : PORSEC-oral49-M1

RECENT ADVANCES IN TAIWANESE HF COASTAL RADAR: BISTATIC DEVELOPMENTS AND APPLICATIONS

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Abstract

In recent years, Taiwan has made continuous efforts to establish an HF radar network comprising 37 stations, employing both CODAR SeaSonde systems and the OceanPhysics® linear phased array system in monostatic mode. This presentation highlights three key topics:

1. Network Advances and IT Integration

We will showcase recent progress in utilizing information technology to streamline data acquisition and system monitoring—from raw level-0 antenna signals to final radar products. These efforts ensure reliable real-time data flow and facilitate proactive maintenance in operational mode.

2. Tsunami Demonstration (April 3, 2024 Case Study)

By examining a tsunami event on April 3, 2024, we will demonstrate how the HF radar network provided critical early detection. This example underscores the system's capacity for tsunami alerts and research.

3. Preliminary Bistatic HF Radar Development

Finally, we will share initial progress on the development of bistatic HF radar technology. This approach addresses Taiwan's complex coastline and frequent electromagnetic interference, leading to improved spatial resolution, reduced coverage gaps, and enhanced detection of sea surface currents and waves.

Through these three focal points, we aim to illustrate the evolving capabilities of Taiwan's HF radar network and its growing significance in coastal monitoring, disaster preparedness, and scientific research.

PAPER No. : PORSEC-oral50-M1

THE PHYSICAL COASTAL VULNERABILITY ASSESSMENT ALONG THE COAST OF TERENGGANU, MALAYSIA, USING REMOTELY SENSED DATA

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Abstract

This paper demonstrates the extraction of physical coastal vulnerability parameters using radar imaging and non-imaging data. Seven key physical parameters extracted are shoreline changes, coastal slopes, geomorphology, sea level rise rate, significant wave height (SWH), tidal range, and rainfall intensity from the available multi-sensors. These sensors the Sentinel-1, ALOS PALSAR, Sentinel-3A and 3B altimeters, and Tropical Rain Measuring Mission (TRMM) rainfall radar. The analysis shows that the accuracies of the satellite-derived parameters are consistent with ground verification using the Global Positioning System (GPS). When compared to the GPS surveys, the root mean square (RMS) error of coastal slopes from ALOS DEM products is 0.70 m, and the extracted shorelines from Sentinel-1 range between 0.39 to 1.32 m. The accuracy of altimetry SWH is 0.38 m when compared to the field observations. Incorporating in-situ tide gauge data and Sentinel-2 optical imagery, the extracted parameters are integrated into the Coastal Vulnerability Index (CVI), which is calculated within a 1 km grid with an emphasis on 21 strategic sites. The vulnerability is ranked between 1 to 5, where 1 indicates very low vulnerability and 5 indicates very high vulnerability. The findings indicate that seven strategic sites fall into Category 4 (high vulnerability), eleven sites are Category 3 (moderate vulnerability), and three sites are Category 2 (low vulnerability). This concludes that the CVI along the Terengganu coasts is moderate to high, thus alarming the proper strategy of coastal management.

Keywords: Coastal Vulnerability Index (CVI), Sentinel-1, radar altimeter, ALOS PALSAR, coastal erosion

PAPER No. : PORSEC-oral51-M3

TWO-DECADE SATELLITE OBSERVATIONS OF ARCTIC CO_2 AND CH_4 (2002–2020): ADVANCING INSIGHTS INTO PERMAFROST THAW AND COASTAL EMISSIONS

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Abstract

The Arctic region experiences warming at a rate four times greater than the global average, which leads to significant ice melting and permafrost thawing while potentially increasing greenhouse gas emissions. From 2002 to 2020, this study examines how carbon dioxide (CO_2) and methane (CH_4) levels have evolved and shows their distribution patterns throughout the Arctic environment.

The study utilized NASA's AIRS and JAXA's GOSAT-2 satellite datasets to perform a monthly analysis of gridded GHG concentrations. We conducted spatial mean extraction and linear trend estimation along with Fourier analysis to identify repeating patterns. The data underwent regionalization which resulted in land and oceanic subsets while focusing on coastal zones vulnerable to permafrost degradation and methane hydrate emissions.

The Arctic CO_2 concentration increased by approximately 10 ppm within ten years following the general trend observed globally. The area close to Jan Mayen Island experienced intermittent increases in anomalies which we believe are caused by volcanic events. The concentration of CH_4 along coastal seas demonstrated consistently faster growth rates compared to inland areas with notable differences in Baffin Bay and Russian coastal regions. Sources of greenhouse gases in the Arctic include gas hydrate dissociation along with organic matter decomposition.

Arctic GHG levels rise due to the merging of regional thawing with atmospheric circulation. Satellite-based remote sensing proves essential in monitoring Arctic variability according to our results, which also indicate the importance of further in situ verification for accuracy. The findings prove essential for improving climate feedback models and providing vital mitigation strategies.

Keywords: Arctic warming, greenhouse gases, remote sensing, permafrost, climate feedback

PAPER No. : PORSEC-oral52-C1

ADVANCING COASTAL GEOMORPHOLOGY ANALYSIS USING LIDAR AND LOW-ALTITUDE REMOTE SENSING: A CASE STUDY OF KELANTAN, MALAYSIA.

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Abstract

Coastal regions, shaped by the dynamic interactions between natural processes and human activities, present significant challenges for environmental monitoring and geomorphological analysis. Traditional mapping and surveying techniques often fall short of meeting the necessary standards for accuracy, resolution, and efficiency in these environments. To address these limitations, light detection and ranging (LiDAR) technology has emerged as an essential tool for obtaining high-resolution topographical data, particularly in smaller coastal areas. Low-altitude airborne LiDAR, specifically, offers a non-invasive method to collect precise, high-density point cloud data, which allows for detailed modelling of coastal terrain. These point clouds play a crucial role in analysing complex geomorphological features, such as dunes, beaches, cliffs, tidal flats, and estuarine systems. The ability to capture data from low altitudes enables the acquisition of accurate elevation measurements and fine-scale surface features, both of which are vital for understanding coastal morphological processes. LiDAR technology also facilitates the creation of Digital Elevation Models (DEMs) and 3D representations of topography across various terrains. This study was conducted along the Kelantan coastal area, located on the eastern coast of Peninsular Malaysia. Low-altitude remote sensing was utilized to obtain high-resolution point cloud data of the region. By employing these advanced techniques, this study provides a comprehensive representation of the coastal landscape, contributing valuable insights to the fields of coastal management and environmental conservation. The findings offer critical data to inform decision-making processes and support sustainable development in coastal regions.

Keywords: LiDAR, low altitude, coastal geomorphology, remote sensing

PAPER No. : PORSEC-oral53-C1

FROM TRADITION TO INNOVATION: SUSTAINABLE OYSTER FARMING WITH HDPE RAFTS, IOT TRACKING, AND REMOTE SENSING

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Abstract

Oyster farming is a widely practiced traditional marine cultivation method along the southwestern coast of Taiwan. However, conventional bamboo raft structures are susceptible to damage and disintegration during extreme weather events, such as typhoons and storms, resulting in scattered debris and significant marine pollution. Therefore, promoting environmentally sustainable oyster farming has become an urgent concern. In this study, oyster farming rafts were constructed using high-density polyethylene (HDPE) and tested at sea to assess their wave resistance. A comparative analysis with longline oyster farming systems was also conducted to evaluate the feasibility of these innovative materials and designs for sustainable aquaculture. To improve management efficiency and accuracy, satellite imagery and geographic information system (GIS) technologies were integrated to delineate the farming area and quantify the number of oyster racks. Additionally, a LoRa-based Internet of Things (IoT) system was utilized for rack marking, positioning, and dynamic tracking. Simultaneously, passive RFID tags were embedded to facilitate real-name-based management. The results indicate that even after withstanding three typhoons, the HDPE rafts maintained their structural integrity and demonstrated effective resistance to wind and waves. Furthermore, the developed monitoring system offered automated real-time monitoring, along with intelligent identification, positioning, and supervision, thereby reducing management costs and risks while promoting marine environmental conservation. This system enhances the management and oversight of marine areas by providing essential scientific evidence for maritime spatial planning. It contributes to the development of a sustainable framework for marine development and utilization, in accordance with blue economy principles and marine functional zoning.

Keywords: Oyster farming, High-Density Polyethylene (HDPE), real-name-based management, IoT communication, geographic information system (GIS)

PAPER No. : PORSEC-oral54-C1

IS THE NORTH-WESTERN PACIFIC SEA BREAM FISHERY PRIMARILY AFFECTED BY GLOBAL CHANGE-INDUCED EXTREME EVENTS: POTENTIALLY SINGLE OR MULTIPLE CLIMATIC VARIABILITIES

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Abstract

The impact of climatic variability on global fisheries is substantial as it modifies oceanographic conditions, potentially influencing fishing yields and the composition of species. Therefore, it is essential to study the effects of climate variabilities in order to comprehend marine ecosystems, forecast disruptions, and develop sustainable management strategies. Hence, this research examines the impact of climatic variability on the Sea Bream Fishery in the North-Western Pacific. The research used generalized additive models (GAM), cross-spectrum, and wavelet analyses to evaluate the relevance and temporal influence of several climatic indices on the catch rates of diverse seabream species. This analysis was based on fisheries data collected between 2014 and 2019. The findings suggest that the Pacific Decadal Oscillation (PDO) has the greatest influence on climatic conditions, significantly impacting all species of seabream. This effect remains persistent and surpasses the impact of other climatic variabilities. The PDO result in both direct and delayed effects on seabream, causing notable variations in capture rates. The results highlight the need of implementing long-term, flexible methods for managing fisheries that are in line with phases of the PDO. These findings provide valuable information for promoting sustainable fishing practices for North-Western Pacific seabream fishery and can develope global policy frameworks worldwide also.

Keywords: Climate variability, cross spectrum, GAM, North-Western Pacific, sea bream fishery, wavelet

PAPER No. : PORSEC-oral55-C1

UTILIZING OF LIDAR TO ANALYZE TOPOGRAPHIC CHANGES: A CASE STUDY AND ITS IMPLICATIONS FOR COASTAL MANAGEMENT

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Abstract

Coastal ecosystems are increasingly vulnerable to both anthropogenic and natural impacts such as erosion, pollution, and habitat degradation, which directly affect Blue Carbon stocks. Effective coastal management requires advanced technologies to accurately monitor and assess these changes. One of the technologies with significant potential is LiDAR. The study that integrates LiDAR to analyze topographic changes on Turtle Island using LiDAR data from 2005 and 2011 show result that LiDAR provides high-resolution and precise topographic data, enabling the detection of subtle changes in coastal landscapes, such as shoreline erosion and habitat loss, which are critical for understanding Blue Carbon sequestration areas. The study also incorporates additional analytical methods such as shadow maps, slope, aspect, contour, and Particle Image Velocimetry (PIV) analysis to investigate the topographic shifts on Turtle Island. Findings indicate that most of the topographic changes occurred along the cliffs of the turtle's shell and head, which are composed of volcanic clastic rocks, demonstrating the vulnerability of the island to erosion and its potential impacts on Blue Carbon habitats. Thus, LiDAR proves to be highly beneficial for monitoring topographic changes in remote coastal islands which is essential for effective Blue Carbon management. In conclusion, LiDAR is a valuable tool for detailed and rapid analysis of coastal changes, enabling better management of Blue Carbon ecosystems and promoting sustainability through informed conservation practices.

Keywords: Coastal Management, LiDAR, Topographic, Turtle Island

PAPER No. : PORSEC-oral56-C1

MULTI-MONTH PREDICTION OF SUMMERTIME HYPOXIA OCCURRENCE IN THE BOTTOM OF FUNKA BAY, JAPAN, USING SATELLITE REMOTE SENISNG

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Abstract

Remote sensing, which can monitor a wide area of the ocean, has now become an indispensable tool for oceanography and fisheries science. To maximize the strengths of remote sensing, which can only measure the sea surface, knowledge of the dynamics and phenomena occurring inside the ocean is necessary. Funka Bay, located in Hokkaido, Japan, is a cone-shaped bay 100 m deep, and hypoxic water masses with extremely low oxygen concentrations occur near the seabed in summer once every few years. Once this occurs, it has a serious impact on marine organisms that require oxygen for breathing, and for us who fish them, it leads to a decrease in catches. Our analysis suggests that the inflow of cold, less salinity, light Oyashio water originated from melting sea ice from the Sea of Okhotsk flowing into the bay six months prior in winter, contributes to the occurrence of hypoxic water masses in summer. In this presentation, we introduce an attempt for multi-month prediction of the hypoxic water occurrence using satellite remote sensing.

Keywords: oxygen, Oyashio, prediction, Funka Bay, remote sensing

PAPER No. : PORSEC-oral57-A1

USING DEEP LEARNING TO IMPROVE GEOSTATIONARY SATELLITE REMOTE SENSING OF OCEAN PRECIPITATION

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Abstract

Precipitation plays a key role in understanding the complex atmospheric processes, air-sea interactions, and their variability and impacts on atmospheric prediction. Accurate precipitation measurements or estimates are also instrumental in driving various scientific and operational applications ranging from long-term weather and water resources studies to real-time monitoring of natural disasters such as severe convective storms. However, obtaining accurate precipitation estimates over oceans at high spatial and temporal resolutions remains a formidable challenge due to the limited coverage and sampling capabilities of existing sensors such as rain gauges, weather radars, and low Earth orbit satellites. In contrast, the latest generation of the geostationary operational environmental satellite, i.e., GOES-R series, has unique advantages in continuously monitoring atmospheric conditions at large scales over land and oceans at a high spatiotemporal resolution, although the conventional parametric approaches for GOES-based precipitation retrievals are insufficient to represent the complex precipitation distribution and variability. This paper presents a deep learning model to improve geostationary satellite remote sensing of ocean precipitation. The ground-based multi-radar multi-sensor (MRMS) rainfall rate estimates and space-borne dual-frequency precipitation radar data are used as labels in training the deep learning model over land and ocean, respectively. The model will then incorporate knowledge from multiple domains and facilitate the adaption of the deep learning model to diverse regions. The experimental results indicate that the combined model can achieve promising performance for accurate precipitation estimation in different precipitation regimes.

PAPER No. : PORSEC-oral58-A1

LIFELONG LEARNING FOR IMPROVED RADAR RETRIEVALS OF PRECIPITATION IN DIFFERENT PRECIPITATION REGIMES

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Abstract

Accurate and timely estimation of surface precipitation is essential for decision-making and coastal security, especially during extreme weather events. Polarimetric weather radar is the primary tool used for quantitative precipitation estimation (QPE). However, significant differences in topographical environments and meteorological characteristics in different precipitation regimes can degrade the generalization capability of a deep learning model trained in a specific region when applied to other regions. In addition, many areas have a lack of rain gauges and/or radar observations that are sufficient to train a machine learning model. This paper presents a Domain-Adaptive Regulation Transfer Model (DARTM) for polarimetric weather radar quantitative precipitation estimation, which incorporates a long-distance regulation module and a short-distance adaptation module. To adaptively adjust the number of shared features in the neighborhood and alleviate the negative knowledge transfer problem, the DARTM model adopts a dynamic adaptive layer and a novel loss function. The feasibility and performance of the DARTM model are demonstrated and quantified using U.S. Weather Surveillance Radar-1988 Doppler (WSR-88D) observations and surface gauge measurements from three different precipitation regimes, including coastal areas. Experimental results suggest that DARTM can not only improve the accuracy of precipitation estimation in data-scarce regions but also enhance the model's generalization capability across diverse geophysical regions.

PAPER No. : PORSEC-poster01-A

DEEP LEARNING-BASED REAL-TIME SURF DETECTION MODEL DURING TYPHOON EVENTS

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Abstract

Surf during typhoon events poses severe threats to coastal infrastructure and public safety. Traditional monitoring approaches, including in-situ sensors and numerical simulations, face inherent limitations in capturing surf impacts - sensors are constrained by point-based measurements, while simulations require intensive computational resources for real-time monitoring. Video-based monitoring offers promising potential for continuous surf observation, yet the development of deep learning models for surf detection remains underexplored, primarily due to the lack of high-quality training datasets from typhoon events. To bridge this gap, we propose a lightweight YOLO (You Only Look Once) based framework for real-time surf detection. A novel dataset of 2,855 labeled images with surf annotations, collected from five typhoon events at the Chongwu Tide Gauge Station, captures diverse scenarios such as daytime, nighttime, and extreme weather conditions. The proposed YOLOv6n model achieved 99.3% mAP50 at 161.8 FPS, outperforming both other YOLO variants and traditional two-stage detectors in accuracy and computational efficiency. Scaling analysis further revealed that YOLO models with 2–5M parameters provide an optimal trade-off between accuracy and computational efficiency. These findings demonstrate the effectiveness of YOLO-based video monitoring systems for real-time surf detection, offering a practical and reliable solution for coastal hazard monitoring under extreme weather conditions.

Keywords: Surf detection; YOLO architectures; coastal monitoring; real-time object detection; typhoon events

PAPER No. : PORSEC-poster02-A

CHARACTERIZATION OF DATA OBTAINED FROM ESOOB (EAST SEA OCEAN OPTICAL BUOY) FOR VALIDATION OF OCEAN COLOR SATELLITE DATA

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Abstract

In-situ data measured by hyperspectral radiometers are widely used as true values to verify satellite data. In field surveys, in-situ data are collected using various marine structures such as ships and buoys. In this study, we obtained a large amount of underwater optical data by mooring an oceanographic observation buoy (East Sea Oceanographic Optical Buoy, ESOOB) equipped with hyperspectral radiometers in a specific area of the East Sea of the Korean Peninsula for a long period of time. In addition, to verify the quality of ESOOB data, we collected data on ocean optical properties and oceanographic environmental characteristics in the seawater around the buoy at specific times through field surveys.

To understand the performance of the ESOOB optical data by depth, we used Profiler-II data collected on the same day. Based on the results of this analysis, we classified the patterns of outliers in ESOOB's time-series optical data by depth. Using the ESOOB optical data and additional data such as Rrs, Kd, and CHL calculated by applying the algorithm to the depth-based optical data, we analyzed whether seasonal variations occur according to the time series of the ESOOB data.

In-situ data for validation of satellite data must be collected from waters that are almost free of seasonal variations in space and time. This is to detect the variability of satellite data caused by the degradation of sensor sensitivity. For this purpose, it is important to check whether seasonal variations occur in the time series of the ESOOB data.

Keywords: Optical Buoy, East Sea, Validation, Optical Properties, Ocean Color

PAPER No. : PORSEC-poster03-A

INNOVATIVE RESEARCH ON MULTI-MODAL DEEP LEARNING-BASED PUBLIC HEALTH SURVEILLANCE FRAMEWORKS DRIVEN BY REMOTE SENSING DATA

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Abstract

Remote sensing technology offers a novel paradigm for disease prediction and health resource optimization in public health. This study proposes an integrated multi-source remote sensing data analysis framework aimed at healthcare management, innovatively combining deep contrastive learning with spatiotemporal graph neural networks to overcome limitations of traditional methods in heterogeneous data processing and dynamic modeling. Taking malaria transmission risk prediction as a case study, the system integrates MODIS land surface temperature data, Sentinel-2 vegetation indices, and OpenStreetMap infrastructure data to construct multidimensional environmental feature tensors. By designing a cross-modal feature alignment module (CMFA), semantic-level fusion between multi-resolution remote sensing data and clinical reports is achieved. Experiments show that compared to the traditional random forest model, our framework achieves a 27% increase in F1-score (from 0.68 to 0.86) in monthly predictions over a 3km grid in Southeast Asia. Additionally, key environmental drivers extracted via gradient inversion algorithms provide interpretable decision-making support for health departments deploying prevention resources. This research validates the transformative potential of AI technologies in applying remote sensing data within smart healthcare, offering scalable technical pathways to address emerging public health challenges under climate change. .

Keywords: Remote sensing, Machine Learning

PAPER No. : PORSEC-poster04-A

APPLICATION OF NEURAL NETWORKS FOR ESTIMATING ABSORPTION COEFFICIENTS USING IN-SITU DATA FROM KOREAN COASTAL WATERS

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Abstract

The accurate estimation of optical absorption coefficients in coastal waters is essential for understanding inherent optical properties. This study applies deep neural networks to predict a_p(443nm), a_d(443nm), and a_{dom}(443nm) using remote sensing reflectance (Rrs) at multiple wavelengths (380, 412, 443, 490, 510, 555, 620, 660, 680, 709, 745, 865nm) as input data. The dataset consists of 99 in-situ measurements collected from Korean coastal waters between 2020 and 2023.

Data augmentation was performed using Gaussian noise addition and random scaling techniques to improve model generalization. The dataset was divided into training and test sets, and separate neural network models were trained for each absorption parameter. The models' performances were evaluated using R^2 (coefficient of determination) and RMSE (Root Mean Square Error).

The models demonstrated high predictive accuracy for a_p(443nm) (R^2=0.9607, RMSE=0.1893) and a_d(443nm) (R^2=0.9867, RMSE=0.0697), indicating that neural networks effectively capture bio-optical relationships. However, the a_{dom}(443nm) model exhibited lower performance (R^2=0.7148, RMSE=0.0187), suggesting potential challenges in modeling dissolved organic matter absorption due to environmental variability.

These findings highlight the potential of deep neural networks in estimating absorption coefficients, contributing to ocean color remote sensing in Korean coastal waters. Future research will focus on refining data augmentation techniques, integrating additional in-situ data, and incorporating regional coastal characteristics to develop location-specific models. These improvements aim to enhance model robustness and applicability for diverse coastal environments.

Keywords: Absorption Coefficients, Remote-sensing reflectance, In-situ Data, Neural network, Korean Coastal Waters

PAPER No. : PORSEC-poster05-B

A BIBLIOMETRIC ANALYSIS OF KNOWLEDGE PRODUCTION CHARACTERISTICS IN BLUE CARBON SCIENCE, WITH APPLICATION OF REMOTE SENSING AS TOOLS

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Abstract

Blue carbon ecosystems such as mangroves, tidal marshes, and seagrass meadows, face numerous threats that undermine their ability to mitigate climate change. Remote sensing presents a promising and cost-effective solution for monitoring these ecosystems on a large scale.

This analysis method employs bibliometric analysis on "blue carbon" and "remote sensing," utilizing bibliometric and visualization techniques based on 165 records from the Web of Science (2015-2024). It includes contributions from 61 countries, 994 authors, and 79 journals.

The results reveal 92 articles were published by authors from a single country, while 73 articles resulted from international collaborations. International collaborations accounted for 44% of the total publications in this field. Among the 994 authors involved, 36 contributed more than three articles, 73 published two articles, and 885 published just one article. This indicates that the authors' collaboration network is diverse and widely distributed. This research spans various disciplines, including the Environmental Sciences and Marine Biology, with key themes such as forest, aboveground biomass, seagrass, vegetation, dynamics, classification, and climate change.

However, research trends in blue carbon with remote sensing application differ across countries. For example, Taiwan, although ranking 32nd globally, has produced three papers, without any international collaborations. A prominent theme in this field is vegetation, leading substantial potential to extend to environmental science and climate change, as well as oceanography and blue carbon. As reviewed in this study, a decade of research development, themes, contributions, and future directions in blue carbon science could provide suggestions for future directions.

Keywords: blue carbon, remote sensing, bibliometric analysis, scientific development trends

PAPER No. : PORSEC-poster06-E

CLIMATOLOGY OF SEA SURFACE WINDS AND COLD SURGES IN THE MARITIME CONTINENT

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Abstract

This study presents a climatology of sea surface winds and cold surges in the Maritime Continent using scatterometer wind measurements and atmospheric reanalysis data. During the East Asian winter monsoon and the Australian winter monsoon, surface winds predominantly blow over the seas along the routes formed by the coastlines of the islands and the chains of the islands. Strong winds are formed along these routes, and the major direction of the variability in winds is well aligned with these routes. Wind speeds associated with the Australian winter monsoon are stronger and more persistent than those associated with the East Asian winter monsoon. The strong winds indicate the routes of cold surges. We consider the Asian-Australian monsoon as a cold air intrusion from the winter hemisphere into the Maritime Continent and define the cold air by applying an isentropic analysis method to atmospheric reanalysis data. During the East Asian winter monsoon, a large amount of cold air covers the western Maritime Continent. Cold air flows from the South China Sea throughout the Java Sea to northern Australia. Cold air flux is high from the Java Sea to the northern Australia. During the Australian winter monsoon, cold air covers the south of the islands due to the topographic blockage. Cold air outflows to the Java Sea, the Indian Ocean, and the Pacific Ocean. This study consistently analyzes the seasonally reversing monsoons to compare the key features of the East Asian winter monsoon and the Australian winter monsoon.

Keywords: sea surface wind, cold surge, monsoon, Maritime Continent, scatterometer

PAPER No. : PORSEC-poster07-E

TWO TYPES OF THE EAST ASIAN COLD SURGE AND THEIR IMPACTS ON EL NIÑO

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Abstract

Case studies have shown that the East Asian cold surge (CS) in winter exerts considerable impact on the development of El Niño by changing the surface wind over the western equatorial Pacific. However, a statistical assessment of the conditions under which the CS is more likely to make such an impact is lacking. Our statistical analysis shows that the CS can be divided into two types with respect to their prevailing area. The western CS type passing through the South China Sea rarely influences the equatorial surface wind owing to blocking and friction effects from high mountains in Borneo, whereas the eastern CS type passing through the Philippine Sea induces strong equatorial surface westerly anomalies. Observations and model experiments show that only the eastern CS type can efficiently trigger El Niño.

Keywords: East Asian cold surge, El Niño

PAPER No. : PORSEC-poster08-E

IMPACT OF DIFFERENT SPATIAL SCALES ON STANDARDIZATION OF YELLOWFIN TUNA (*Thunnus albacares*) CPUE IN LONGLINE FISHERIES

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Abstract

Nominal catch per unit effort (CPUE) is a common relative index of resource abundance, however, it is influenced by fishing efficiency and spatiotemporal factors, requiring standardization. In longline fisheries, difference in spatial scale between fishery data and satellite observations arise due to the extensive operating areas and prolonged fishing periods, making it essential to evaluate the impact of spatial scale on CPUE standardization.

This study utilized catch data from yellowfin tuna caught by the longline vessels in waters near Micronesia from 2019–2022 to compare the impact of different spatial scales (0.25 °×0.25 °, 1 °×1 °, and 2 °×2 °) on the CPUE standardization and to analyse the spatiotemporal distribution patterns of CPUE. Spatiotemporal environmental factors, and operational factors were incorporated across spatial scales using generalized additive models (GAMs).

The results showed that CPUE standardization estimates were significantly affected by spatial scale. The most effective model corresponded to 1 °×1 ° resolution when the longline operation spans approximately 1° in the longitudinal direction. The standardization models effectively mitigated the impact of spatiotemporal, gear-related, and environmental effects to a certain extent. The relatively high abundance indices were in the first and fourth quarters, and the high standardized CPUE was predominantly located between 4 ° N and 0 °.

The results suggest that spatial scale selection for CPUE standardization in tuna fisheries should account for fish behavior, gear characteristics, and operational range. The GAM approach, which accounts spatiotemporal effects, demonstrated good performance in CPUE standardization and can be an effective method when data dimensionality is relatively low.

Keywords: CPUE standardization, GAM, longline fishing, spatial scale, yellowfin tuna

PAPER No. : PORSEC-poster09-F

EXPLORING THE RELATIONSHIP BETWEEN *Scomberomorus* SPECIES AND OCEANOGRAPHIC FACTORS IN THE WATERS OFF TAIWAN

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Abstract

This study collected and analyzed fisheries data on *Scomberomorus* species from the waters surrounding Taiwan. Additionally, remote sensing data, including sea surface temperature (SST), sea surface salinity (SSS), sea surface height (SSH), and chlorophyll-a concentration (CHL), were obtained from online databases. Analysis of the fishing data indicated that the main fishing season for *Scomberomorus commerson* occurs from winter to spring, with the primary fishing grounds located in the northwestern waters of Taiwan and around Penghu. *Scomberomorus niphonius* is primarily caught from autumn to winter, with its distribution concentrated in the nearshore waters off western Taiwan. S*comberomorus guttatus e*xhibits two distinct fishing seasons, one in early spring and another in autumn, with primary fishing grounds similar to those of *S. commerson*. Using a generalized additive model (GAM) for optimal model construction, the results suggest that the catch rates of *S. commerson* and *S. niphonius* are significantly influenced by all oceanographic factors, whereas the catch rate of *S. guttatus* is not significantly correlated with sea surface chlorophyll-a concentration and sea surface salinity. These findings provide valuable insights for fisheries management authorities in developing regulatory policies to ensure sustainable exploitation of these species.

Keywords: *Scomberomorus* species, fishery dynamics, remote sensing data, generalized additive model

PAPER No. : PORSEC-poster10-F

ANALYSIS OF RESOURCE AND ENVIRONMENTAL DYNAMICS FOR GREY MULLETS (*Mugil cephalus*) BETWEEN 2014-2023 IN TAIWAN

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Abstract

Grey mullet (*Mugil cephalus*) is an important economic fish species in Taiwan during the winter season. During the period from the beginning of winter in November to January of the following year, it often follows the China coastal current to the western waters of Taiwan for spawning migration. This study used the grey mullet fishing catches, Voyage Data Recorder (VDR), HYbrid Coordinate Ocean Model (HYCOM) environmental information, mainly sea surface temperature (SST). The GIS module with Python software was used to map the fisheries on a weekly dynamic time series from 2014 to 2023, a total of 9 years. The analysis of resource and environmental dynamics during the grey mullet season showed that weekly changes in SST along the Taiwanese coast during the winter months would influence changes in fishing grounds. In the early part of the fishing season, from the fourth week of November to the third week of December, the optimal fishing grounds were in the isothermal range of SST from 19.5 to 21.5 ℃ at 24-28° N latitude. In the middle and late fishing season, from the third week of December to the fourth week of January of the following year, the optimal fishing grounds were in the isothermal range of SST from 20 to 22 ℃ at 22 - 26° N latitude. In the future, we will continue to analysis the causes of changes in fisheries by using fishing catch, VDR, satellite or model environmental modelling information to provide reference and application for various sectors.

Keywords: grey mullet, sea surface temperature (SST), fishing grounds

PAPER No. : PORSEC-poster11-F

IMPACT OF GLOBAL CLIMATE CHANGE ON APEX PELAGIC PREDATORS OF THE WORLD'S OCEANS: POTENTIAL ADAPTATION OR TROPICALIZATION

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Abstract

Examining the consequences of worldwide climate change on fisheries is essential as it directly impacts the well-being of marine ecosystems, the sustenance of millions of individuals, and the security of global food supplies. Thus, understanding these impacts is crucial for developing adaptive management strategies for sustainable fisheries. This study aimed a comprehensive analysis on the potential responses of apex pelagic predators inhabiting in the Indian and South Atlantic oceans in response to changing climate conditions. The study analyzed sea surface temperature, salinity, and chlorophyll levels to predict species' impact by the end of the 21st century using a generalized additive model in response to normal and extreme conditions. Significant shifts in the mean temperature of catch (MTC) were forecasted for all species inhabiting the Indian and South Atlantic oceans under extreme climatic conditions (potential adaptation), but no changes in MTC were expected under normal conditions. All the species from both oceans exhibited a tendency to shift their distribution latitudinally (southward) in response to extreme conditions, while shifting longitudinally (wither east or westward) under normal conditions (potential tropicalization). In addition, South Atlantic species were predicted to experience higher latitudinal and longitudinal displacements (33-1125 kms, and 11-724 kms) compared to those in the Indian Oceans (33-679 kms, and 45-468 kms), in normal to extreme conditions. Present study suggests that, tropical Indian ocean species like bigeye, skipjack, yellowfin tuna, swordfish and marlins are less susceptible to climate change due to higher SST preferences, while

temperate Indian ocean species like albacore and southern-bluefin tuna are more vulnerable compared to their counterparts in the South Atlantic ocean under changing climatic conditions. The study's results can enhance comprehension of the potential consequences of climate change on marine species, provide guidance for conservation strategies, and assist in the development of adaptive management practices for sustainable fisheries in global oceans.

Keywords: Adaptation, climate change, habitat displacement, Indian Ocean, mean temperature of catch, pelagic predators, south Atlantic Ocean, tropicalization

PAPER No. : PORSEC-poster12-F

CLUSTER ANALYSIS OF FISHING COMPOSITION IN THE YUNCHANG RISE AREA OF THE TAIWAN STRAIT AND ITS RELATIONSHIP WITH ENVIRONMENTAL FACTORS

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Abstract

This study collected bottom trawl catch data from research vessels operating in the waters around the Yun-Chang Rise in Taiwan's western water from 2019 to 2024. By analyzing fish abundance data, cluster analysis was conducted to examine temporal and spatial variations in species composition. Additionally, environmental remote sensing data from the fishing grounds were gathered, including surface temperature, surface salinity, bottom temperature, bottom salinity from the HYCOM model, as well as wave height, current velocity and direction, and wind speed from the ASCAT model. Principal component analysis (PCA) was used to assess the correlations among species, while canonical correlation analysis (CCA) was applied to investigate the relationships between species and environmental factors.

The results indicated a correlation between surface and bottom water temperatures with *Dussumieria elopsoides* and *Equulites leuciscus*, whereas salinity showed a weak correlation with species composition and no significant relationship. The study area has a depth range of approximately 35 to 55 meters, with minimal vertical temperature variation and no distinct thermocline. Preliminary observations suggest a potential relationship between water temperature and certain species. Continuous monitoring and collection of additional environmental parameters will be necessary to further assess the interactions between species and environmental factors in this region.

Keywords: bottom trawl, Yun-Chang Rise

PAPER No. : PORSEC-poster13-F

CLIMATE CHANGE AND THE FUTURE DISTRIBUTION AND FISHING SEASONS OF TWO SWIMMING CRABS, *Portunus sanguinolentus* AND *Charybdis* feriatus, IN THE NORTHWESTERN TAIWAN WATERS

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Abstract

Global Warming Levels (GWLs) serve as an alternative way to assess climate change, providing a clearer understanding of the varying severity and impacts of climate change based on different levels of climate action implemented globally. This project integrates long-term climate change simulation data from the National Science and Technology Center for Disaster Reduction (NCDR) with advanced fisheries resource prediction models developed by the Fisheries Research Institute to assess future marine ecosystem dynamics.

Analyzing the fishing ground environment around Taiwan using the Taiwan Earth System Model (TaiESM), the baseline model (1996–2014) indicates an average sea surface temperature (SST) of 25.18°C. Projections show a consistent rise in SST across all seasons. During the period from 2019 to 2041 (GWL 1.5°C), the average SST is expected to reach 26.02°C, while from 2027 to 2053 (GWL 2.0°C), it is projected to further increase to 26.47°C.

The first annual peak in *Charybdis feriatus* catches occurs in summer (June–July), followed by a second peak in autumn and winter (October–December). According to the GAM model, the preferred sea surface temperature (SST) for the *Charybdis feriatus* ranges from 22.0°C to 30.5°C, with an optimal salinity range of 33.3 to 34.5. Under the GWL 2.0°C scenario, the decline is expected to be greater, ranging from 15.20% to 34.37%. The second peak season (November–December) is expected to benefit from rising SSTs, with the probability of suitable conditions increasing by an average of 34.63% to 39.96% under the GWL 2.0°C scenario.

The GAM model also suggests that *Portunus sanguinolentus* exhibits a preference for lower SSTs, ranging from 15.2°C to 27.2°C, with an optimal salinity range of 31.2 to 34.1. Under both the GWL 1.5°C and 2.0°C warming scenarios, the probability of suitable SST conditions along Taiwan's coastal waters is projected to decline, with monthly averages decreasing by 2.71% to 20.03% and 1.61% to 23.12%, respectively. The most significant declines occur from May to September in both scenarios, whereas the primary fishing season in November experiences only slight decreases of 2.25% and 3.59%, respectively.

Keywords: Global Warming Level, climate change, TaiESM, *Portunus sanguinolentus*, *Charybdis feriatus*

PAPER No. : PORSEC-poster14-F

REMOTE SENSING DATA IN THE APPLICATION OF TAIWAN SQUID FISHERIES

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Abstract

Global warming-induced climate change has intensified changes in the marine environment, causing seasonal fishery resources to shift in both temporal and spatial distribution. This study utilizes Taiwan's nearshore trap fishery data in conjunction with remote sensing data of the marine environment to establish short-, medium-, and long-term resource assessment models, providing fishermen with operational guidance and references for sustainable fishery management. The short-term model helps fishermen increase their catch by 10-15%, while the medium-term model successfully predicted the trends of fishery resources for 6 out of 7 years. Combined with long-term climate prediction data, the model shows a declining trend for the trap fishery by 2040.

Keywords: climate change, squid, remote sensing

PAPER No. : PORSEC-poster15-F

TELECONNECTION IMPACTS OF CLIMATIC VARIABILITY ON TUNA AND BILLFISH FISHERIES OF THE SOUTH ATLANTIC AND INDIAN OCEAN: A STUDY TOWARDS SUSTAINABLE FISHERIES MANAGEMENT

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Abstract

Grey mullet (*Mugil cephalus*) is an important economic fish species in Taiwan during the winter season. During the period from the beginning of winter in November to January of the following year, it often follows the China coastal current to the western waters of Taiwan for spawning migration. This study used the grey mullet fishing catches, Voyage Data Recorder (VDR), HYbrid Coordinate Ocean Model (HYCOM) environmental information, mainly sea surface temperature (SST). The GIS module with Python software was used to map the fisheries on a weekly dynamic time series from 2014 to 2023, a total of 9 years. The analysis of resource and environmental dynamics during the grey mullet season showed that weekly changes in SST along the Taiwanese coast during the winter months would influence changes in fishing grounds. In the early part of the fishing season, from the fourth week of November to the third week of December, the optimal fishing grounds were in the isothermal range of SST from 19.5 to 21.5 ℃ at 24-28° N latitude. In the middle and late fishing season, from the third week of December to the fourth week of January of the following year, the optimal fishing grounds were in the isothermal range of SST from 20 to 22 ℃ at 22 - 26° N latitude. In the future, we will continue to analysis the causes of changes in fisheries by using fishing catch, VDR, satellite or model environmental modelling information to provide reference and application for various sectors.

Keywords: grey mullet, sea surface temperature (SST), fishing grounds

PAPER No. : PORSEC-poster16-F

REMOTE SENSING ANALYSIS OF OCEANOGRAPHIC CONDITIONS ON CHUB MACKEREL (*Scomber Japonicus*) FISHERY DISTRIBUTION IN NORTHEASTERN TAIWAN

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Abstract

Grey mullet (*Mugil cephalus*) is an important economic fish species in Taiwan during the winter season. During the period from the beginning of winter in November to January of the following year, it often follows the China coastal current to the western waters of Taiwan for spawning migration. This study used the grey mullet fishing catches, Voyage Data Recorder (VDR), HYbrid Coordinate Ocean Model (HYCOM) environmental information, mainly sea surface temperature (SST). The GIS module with Python software was used to map the fisheries on a weekly dynamic time series from 2014 to 2023, a total of 9 years. The analysis of resource and environmental dynamics during the grey mullet season showed that weekly changes in SST along the Taiwanese coast during the winter months would influence changes in fishing grounds. In the early part of the fishing season, from the fourth week of November to the third week of December, the optimal fishing grounds were in the isothermal range of SST from 19.5 to 21.5 ℃ at 24-28° N latitude. In the middle and late fishing season, from the third week of December to the fourth week of January of the following year, the optimal fishing grounds were in the isothermal range of SST from 20 to 22 ℃ at 22 - 26° N latitude. In the future, we will continue to analysis the causes of changes in fisheries by using fishing catch, VDR, satellite or model environmental modelling information to provide reference and application for various sectors.

Keywords: grey mullet, sea surface temperature (SST), fishing grounds

PAPER No. : PORSEC-poster17-F

THERMAL INFLUENCES ON THE VERTICAL MOVEMENT PATTERNS OF DOLPHINFISH (*Coryphaena hippurus*) OFF EASTERN TAIWAN

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Abstract

The dolphinfish (*Coryphaena hippurus*) is a highly migratory, top epipelagic predator widely distributed in tropical and subtropical waters worldwide. To refine regional and global stock assessments and ecological evaluations of dolphinfish in fisheries, it is essential to understand their habitat use and preferences. A total of four dolphinfish were tagged with pop-up satellite archival tags (PSATs) in the northwestern Pacific Ocean, around eastern Taiwan from 2022 to 2024. The tagged dolphinfish retained their PSATs for 9 to 43 days. They reached maximum depths of approximately 254.5 m and experienced sea surface temperatures (SST) ranging from 23.8°C to 29.4°C. They also encountered mixed-layer depths (MLD) and mixed-layer temperatures (MLT) ranging from 15.3 to 199.3 m and 23.3°C to 28.5°C, respectively. Their movements appeared to be limited by a 6°C change relative to SST. About 80% of their time moved vertically within the MLD, where temperature variability ranged from -1°C to 1°C relative to MLT. The data indicate that dolphinfish are highly migratory, with vertical movements primarily influenced by SST, MLD, and MLT. These findings underscore the importance of thermal factors in dolphinfish habitat use and have significant implications for refining stock assessments and ecological evaluations in tropical and subtropical fisheries.

PAPER No. : PORSEC-poster18-F

EXPOSURE AND CLIMATE CHANGE IMPACTS ON THREE SWIMMING CRAB SPECIES IN TAIWANESE WATERS

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Abstract

This study quantifies climate-driven environmental exposure for three commercially vital swimming crab species —*Charybdis feriatus* (crucifix crab), *Portunus pelagicus* (blue swimming crab), and *Portunus sanguinolentus* (three-spotted swimming crab)—in Taiwanese waters. Using standardized catch per unit effort (CPUE) data and a Suitability Index (SI) model, the study analyzed the impact of five key environmental variables: sea surface temperature (SST), sea bottom temperature (SBT), sea surface salinity (SSS), sea surface height (SSH), and chlorophyll-a (Chl-a). Seasonal variations in habitat suitability and exposure scores were analyzed to determine the vulnerability of these species to climate-driven environmental changes. The results reveal significant seasonal and species-specific differences in exposure, with *P. pelagicus* exhibiting greater exposed to environmental variability, *C. feriatus* showing, and *P. sanguinolentus* demonstrating moderate exposure. Chl-a emerged as the most influential variables particularly during winter and spring seasons, while SSH influenced swimming crab species especially *C. feriatus* . SST and SSS also played critical roles in shaping habitat suitability. These findings underscore the importance of adaptive fisheries management strategies, including seasonal fishing bans and habitat restoration, to mitigate the impacts of climate change on swimming crab populations. This research assessing species-specific vulnerabilities and offers valuable insights for sustainable fisheries management in the Taiwan Strait.

Keywords: Portunidae, Swimming crab, Exposure, Environmental variables, Taiwan Strait

PAPER No. : PORSEC-poster19-F

UAV INNOVATIONS FOR SUSTAINABLE OIL PALM PLANTATION MANAGEMENT: A SYSTEMATIC REVIEW

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Abstract

Oil palm plantations play a crucial role in global agriculture, but their sustainability is challenged by deforestation, soil degradation, water stress, and pest outbreaks. Unmanned Aerial Vehicles (UAVs) have emerged as transformative tools in precision agriculture, offering efficient solutions for monitoring, yield estimation, disease detection, and environmental conservation. This study systematically reviews UAV applications in oil palm plantation management, focusing on their contributions to sustainability.

A systematic review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Data were collected from Scopus, Web of Science, and Wiley Online Library using predefined search terms. Articles published from 2013 to 2024 were screened based on relevance to UAV-based plantation management, sustainability, and precision agriculture. Eligible studies were critically assessed for quality and categorized based on UAV applications in disease management, crop health monitoring, resource optimization, and environmental impact assessment.

Findings indicate that UAVs significantly enhance oil palm sustainability by improving early disease detection (e.g., Ganoderma monitoring), optimizing fertilizer and pesticide use, and supporting carbon sequestration analysis. Multispectral, hyperspectral, and LiDAR-equipped drones have demonstrated superior efficiency in precision monitoring. However, challenges such as high initial costs, regulatory restrictions, and limited accessibility for smallholders hinder widespread adoption. Future research should focus on integrating artificial intelligence and machine learning with UAV systems to enhance decision-making in plantation management.

UAV innovations present promising solutions for sustainable oil palm management. Further advancements in affordability and technology integration are essential for broader adoption and long-term impact.

Keywords: Unmanned Aerial Vehicles (UAVs), Oil Palm Plantation Management, Precision Agriculture, Remote Sensing Technology, Sustainability in Agriculture

PAPER No. : PORSEC-poster20-A

USING TIME-SERIES NEURAL NETWORKS TO RETRIEVE CH_4 CONCENTRATION IN GLOBAL SURFACE OCEAN

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Abstract

Methane (CH_4) emissions from oceans are a critical yet poorly quantified component of the global carbon cycle, mainly due to the challenges in capturing its spatial and temporal variability. This study aims to overcome these challenges by applying a time-series neural network approach to retrieve ocean surface CH_4 concentrations using satellite remote sensing data. It leverages multi-sensor satellite remote sensing data, including ocean color, sea surface temperature, and wind speed from OCCCI, MODIS, and OISST datasets. The time-series approach integrates oceanic environmental parameters over daily scales to capture the complex interactions between physical, chemical, and biological processes influencing CH_4 production and emissions. By incorporating these temporal dynamics into the model, we aim to improve the accuracy of CH_4 retrievals, particularly in data-sparse regions such as the northern South China Sea.

Initial tests of the model have achieved a promising coefficient of determination (R^2) of 0.87, suggesting strong predictive capability for global CH_4 concentration estimates. However, further work is required to optimize the model, including hyperparameter tuning, cross-validation, and in-situ data calibration. This research contributes to a deeper understanding of the spatial and temporal distribution of oceanic CH_4 emissions, with significant implications for assessing the marine contribution to global methane budgets and predicting its response to climate change.

Keywords: methane, CH4, methane photoproduction, remote sensing, time series neural

PAPER No. : PORSEC-poster21-M

ESTIMATION OF ARCTIC SEA ICE THICKNESS USING HY-2B ALTIMETER DATA

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Abstract

Sea ice thickness is an important component of the Arctic environment, bearing crucial significance in investigations pertaining to global climate and environmental changes. This study employs data from the HaiYang-2B satellite altimeter (HY-2B ALT) for the estimation of Arctic Sea ice thickness from November 2021 to April 2022. The HY-2B penetration coefficient is calculated for the first time to correct the freeboard in areas with sea ice concentration greater than 90%. The estimation accuracy is improved by enhancing the data on sea ice density, seawater density, snow depth, and snow density. The research analyzed the effects of snow depth and penetration coefficient on sea ice thickness results. The results of sea ice type classification were compared with OSI-SAF ice products, and the sea ice thickness estimation results were compared with four satellite ice thickness products (CryoSat-2 and SMOS (CS-SMOS), Centre for Polar Observation and Modelling Data (CPOM), CryoSat-2 (CS-2), and Pan-Arctic Ice-Ocean Modeling and Assimilation System (PIOMAS)) as well as two validation ice thickness data sets (Operation IceBridge (OIB) and ICEBird). The accuracy of sea ice classification exceeds 92%, which is in good agreement with ice type product data. The RMSD of sea ice thickness estimation is 0.56 m for CS-SMOS, 0.68 m for CPOM, 0.47 m for CS-2, 0.69 m for PIOMAS, and 0.79 m for validation data.

PAPER No. : PORSEC-poster22-M

MELT POND OBSERVATION FROM SAR USING SEGMENT ANYTHING MODEL

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Abstract

Melt ponds from snow and sea ice are pervasive features of summer Arctic sea ice, can cover up to 50%–60% of the sea ice surface. Melt ponds have a surface albedo four times smaller than snow-covered sea ice, and absorb solar light four times more efficiently. The increased absorption induced by melt ponds and the intensified warming of the ocean possibly delays the ice growth in the autumn. Spaceborne Synthetic Aperture Radar (SAR) sensors have proven to be ideal for melt pond monitoring because of all-weather operation, and sensitivity to surface roughness, dielectric properties. SAR is more suitable than any visible optical sensor-based methods, because the pervasive cloud coverage during the Arctic summer can be about 80%.

In recent years, the rapid upgrade of deep learning and large models have revolutionized the field of image segmentation. Notably, the Segment Anything Model (SAM) has demonstrated remarkable performance in various domains.

This study proposes a novel hybrid approach combining the SAM with Otsu's thresholding segmentation to detect and quantify melt ponds using Sentinel-1 SAR data. The method was validated using Sentinel-2 optical imagery and melt pond fraction products from the University of Bremen. Results demonstrated alignment with SAR-derived melt pond fractions and optical data (correlation coefficient r = 0.81, RMSE = 0.06) as well as melt pond products from University of Bremen (r = 0.72, RMSE = 0.05). The approach successfully solved the barrier made by the similarity in radar backscatter between melt ponds and open water.

Keywords: melt ponds, sea ice, SAM(Segment Anything Model), SAR(Synthetic Aperture Radar)

PAPER No. : PORSEC-poster23-O

A SPATIAL CONTEXT-DRIVEN DEEP NEURAL NETWORK FOR SEA ICE DETECTION IN LIAODONG BAY USING GOCI-II

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Abstract

Sea ice not only plays a crucial role in marine and atmospheric systems but also directly impacts various economic activities such as fisheries, maritime transportation, and oil exploration. In particular, drifting sea ice poses a significant threat to port infrastructure and vessel operations, as it undergoes rapid changes due to tidal currents and wind. Therefore, continuous monitoring of sea ice is essential. In response to this demand, extensive research has been conducted using various satellite datasets, including synthetic aperture radar (SAR) and ocean color sensors. Recently, artificial intelligence (AI)-based sea ice detection has also gained increasing attention. However, most studies rely on polar-orbiting satellites, which offer global coverage but are limited by their revisit periods, making it challenging to capture short-term variations in sea ice.

In this study, we developed a deep neural network model for sea ice detection in Liaodong Bay using data from the geostationary ocean color satellite GOCI-II (Geostationary Ocean Color Imager-II). To train the model, we generated labeled datasets using Sentinel-2 imagery and converted them to the GOCI-II grid for consistency. Furthermore, instead of relying solely on single-pixel analysis, we implemented a multi-scale spatial approach that incorporates surrounding spatial information to improve detection accuracy. Experimental results demonstrated that analyzing both the reflectance of a target pixel and the reflectance variations in adjacent areas enables more precise differentiation between sea ice and non-sea ice regions.

The GOCI-II-based sea ice detection algorithm proposed in this study is expected to enable near real-time detection of sea ice, allowing for the effective monitoring of short-term sea ice variability and drifting sea ice influenced by tidal currents. This approach has significant implications for understanding the dynamic behavior of sea ice in response to oceanic and atmospheric changes, as well as for ensuring maritime safety and supporting marine ecosystem monitoring.

Keywords: Sea ice detection, GOCI-II, Deep Neural Network, Spatial Context, remote sensing

PAPER No. : PORSEC-poster24-O

DATA RECONSTRUCTION OF DAILY MODIS CHLOROPHYLL-A CONCENTRATION AND IMPACT OF TYPICAL TYPHOON EVENTS ON THE UPPER-OCEAN CHLOROPHYLL-A CONCENTRATION IN THE NORTHWESTERN PACIFIC REGION

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Abstract

Sea surface chlorophyll-a concentration (Chl-a) is a key proxy for phytoplankton biomass. Spatio-temporal continuousChl-a data are important to understand the mechanisms of chlorophyll occurrence and development and track phytoplankton changes. However, the greatest challenge in utilizing daily Chl-a data is massive missing pixels due to orbital position and cloud coverage. This study proposes the application of a spatial filling method using the machine learning-based Extreme Gradient Boosting (BST) to reconstruct missing pixels of daily MODIS Chl-a data from 2007to 2018. The approach is applied to different trophic biogeographical subregions of the Northwestern Pacific whereit has complex phytoplankton dynamics and frequent data missing. Various environmental variables are taken into consideration, including meteorological forcing, geographic and topographic features, and oceanic physical components. The BST-reconstructed Chl-a (BST Chl-a) is validated using in-situ Chl-a measurements, VIIRS and Himawari-8 Chl-a products. The results show that the BST model is highly adaptive in reconstructing Chl-a data, and it performs well in pelagic, offshore and coastal with the best performance in pelagic. BST Chl-a improves coverage without significant quality degradation compared to the original MODIS Chl-a. BST Chl-a agrees better with in-situ datathan that of MODIS. Cross-satellite validation using VIIRS and Himawari-8 Chl-a also shows the high accuracy of BST Chl-a. Using reconstruction data of daily BST Chl-a, explores the effect of typhoons Tembin and Bolaven on CHL and the changes in CHL are driven by the potential factors, including sea surface temperature (SST), mixed layer depth (MLD), and sea surface height anomaly (SSHA). The results indicate that Tembin and Bolaven significantly increase CHL with the maximum increment of ~3.2 $mg \cdot m^{-3}$and a time delay of 4 – 5 days, The distributions of the maximum change areas of CHL, SST, and MLD are found near the intersection of the tracks of Tembin and Bolaven (32°N, 125.2°E). Tembin and Bolaven contribute to increasing CHL by enhancing vertical mixing, delivering nutrients to the sea surface and promoting phytoplankton growth. However, anticyclonic transport of lower CHL seawater and direct damage to phytoplankton cellular structures by typhoons during its passage also induces CHL reduction, especially in the coastal Yellow Sea. During the 15 days before and after typhoons, SST is negatively correlated with CHL (the correlation coefficient of about -0.85), and MLD shows a positive correlation with CHL (the correlation coefficient of ~0.80). SST is known to trigger

the increase of CHL by controlling phytoplankton metabolism to promote its growth. Deepening MLD caused by typhoons allows more nutrients to be transported from the subsurface layer to the euphotic layer for phytoplankton blooms. The region with the largest increase in CHL is consistent with the distribution of pre-existing oceanic anticyclones captured by SSHA. These findings invite us to rethink the daily effects of typhoons on CHL, essential for predicting and managing the ecological consequences of these intense storms in the marine environment.

Keywords: Remote sensing, Data reconstruction Chlorophyll-a ,MODIS, Extreme Gradient Boosting ,Typhoon events, impact

PAPER No. : PORSEC-poster25-O

MONITORING SEASONAL CHANGES IN FISHING GROUND DISTRIBUTION USING DNB SATELLITE DATA IN THE KOREAN SEA

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Abstract

he VIIRS (Visible Infrared Imaging Radiometer Suite) Day/Night Band (DNB) data onboard the Suomi-NPP and NOAA-20 satellites is useful for detecting faint light emissions and monitoring nighttime maritime activities. In this study, we analyzed the spatial and temporal distribution of fishing vessels across the Korean Peninsula using monthly composite nighttime light data from the Suomi-NPP VIIRS satellite and examined seasonal variations.

To improve the accuracy of nighttime light data, we utilized cloud-free data, removing pixels affected by clouds to enhance the precision of nighttime light observations. The results of this study are expected to contribute to advancements in nighttime marine monitoring technology and support fishing ground protection and sustainable fisheries management for fishermen.

Keywords: Monitoring Seasonal Changes in Fishing Ground Distribution, DNB Satellite Data

PAPER No. : PORSEC-poster26-O

OPTIMIZATION APPROACHES FOR DERIVING PRECISE INHERENT OPTICAL PROPERTIES FROM OCEAN COLOR SATELLITE OBSERVATIONS

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Abstract

The processing of Level 2 data for ocean color satellites, like the second Geostationary Ocean Color Imager (GOCI-II), necessitates distinguishing between atmospheric and ocean color signals. This differentiation is accomplished through atmospheric correction and the derivation of inherent optical properties. Atmospheric correction errors can significantly affect the optical properties.

In this study, we propose developing a unified architecture that integrates atmospheric correction and the derivation of oceanic inherent optical properties, enabling simultaneous processing to mitigate atmospheric correction errors grounded in ocean optics and physics. We propose an optimization algorithm that adjusts parameters in both forward and inverse models. Through the optimization process, we utilize gradient descent to fine-tune these parameters. We aim to minimize the difference between the Rayleigh-corrected reflectance derived from total signals (ρ_rc) and the reflectance calculated from the parameters-applied forward model (ρ_rc_model). We successfully derived inherent optical properties using the optimized parameters, such as absorption coefficients (a) and backscattering coefficients (b_b). Also, we can infer concentrations of chlorophyll (CHL), total suspended solids (TSS), and colored dissolved organic matter (CDOM). We are conducting a comparative analysis with GOCI-II Level 2 products, and preliminary findings indicate variations in coastal regions.

The optimization results facilitated a quantitative assessment of the uncertainty in inherent optical properties, identifying the key factors influencing remote sensing reflectance across different marine areas. Future work will focus on analyzing the impact of various elements of the optimization process to refine the parameters further.

Keywords: Geostationary Ocean Color Imager, Atmospheric Correction, Inherent Optical Property, Optimization, gradient descent

PAPER No. : PORSEC-poster27-O

PHYTOPLANKTON BIOMASS VARIABILITY IN THE EASTERN HAINAN UPWELLING REGION: A 20-YEAR ANALYSIS (2003-2022)

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Abstract

Using satellite remote sensing data (2003–2022), this study examines the seasonal and interannual variability of chlorophyll-a (Chl-a) concentrations in the coastal upwelling region off eastern Hainan Island (HEU; 18°–20°N, 110°–112°E) in the northwestern South China Sea (SCS). Bivariate wavelet coherence (BWC) and multiple wavelet coherence (MWC) analyses were used to assess the driving factors of Chl-a variability. During summer, the prevailing southwest monsoon generates substantial wind stress, which drives surface Ekman pumping. Unlike other upwelling regions, phytoplankton biomass in the HEU is significantly higher in autumn and winter than in summer. This seasonal pattern is attributed to nutrient depletion resulting from strong stratification and photoinhibition during the summer months. BWC analysis identified wind speed (WSP) as the dominant factor controlling interannual Chl-a variability. Meanwhile, MWC results showed that the combined effects of WSP and rainfall (RAIN) best explained interannual Chl-a variability. Moreover, rainfall and marine heatwave events significantly influence Chl-a concentrations in the region. Notably, the strong 2015–2016 El Niño event, coupled with heavy rainfall, significantly increased Chl-a concentrations. In contrast, frequent marine heatwaves from 2017 to 2021 coincided with a marked decline in Chl-a concentrations, likely due to reduced nutrient availability and phytoplankton productivity.

Keywords: Upwelling off eastern Hainan Island, Empirical orthogonal function, Wavelet analysis, phytoplankton biomass

PAPER No. : PORSEC-poster28-O

VARIATIONS IN CONTEMPORARY BENTHIC HABITAT OF THE SHALLOW CORAL REEF PLATFORM IN THE SOUTHERN SOUTH CHINA SEA UNDER GLOBAL WARMING: INSIGHTS FROM XIMEN REEF IN THE NANSHA ISLANDS

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Abstract

Global warming poses severe threats to coral reef ecosystems, yet the spatiotemporal dynamics of benthic habitats in shallow reef platforms of the southern South China Sea remain inadequately documented. Ximen Reef, a representative shallow platform in the Nansha Islands, was selected to investigate habitat responses to climate change over two decades.

Using field surveys and multi-temporal high-resolution remote sensing imagery (2000–2023), we mapped benthic habitats through object-based image analysis (OBIA) combined with random forest classification in eCognition. This approach integrated multispectral and depth-independent bands, followed by spatial linear regression to quantify substrate changes with 95% confidence intervals.

The results reveal four dominant habitat shifts: (1) coral rubble accumulation toward the inner reef flat, (2) contraction of living corals, (3) external coral regrowth, and (4) coral-to-algae transitions. While sea level rise created vertical accommodation space promoting outer-reef flat coral growth, extreme events (marine heatwaves, hydrodynamic forces) intensified rubble deposition and algal colonization, restricting reef-flat recovery.

This study advances understanding of climate-driven ecological changes in the southern South China Sea and provides critical insights for adaptive coral reef management under global warming.

Keywords: Coral reef, benthic habitat variation, coral rubble, climate change, Southern South China Sea

PAPER No. : PORSEC-poster29-O

DEVELOPMENT OF THE REALISTIC PARAMETERIZATION MODEL (REP) FOR ENHANCING TYPHOON WIND FIELD ACCURACY AND STORM SURGE FORECASTING

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Abstract

Storm surges pose significant risks to coastal regions, making accurate forecasting essential for disaster response. Traditional typhoon wind field models, such as the Holland model, do not fully account for topographic effects. To address this, the Realistic Parameterization Model (REP) is developed to enhance storm surge predictions by improving parameterized wind fields affected by terrain. Unlike traditional models, REP integrates historical 10-meter wind field and sea-level pressure data, applying a statistical method to adjust wind speed and pressure distribution, better reflecting terrain influences. Since typhoon wind speed greatly exceeds its movement speed, the flow field transitions rapidly to a quasi-steady state, allowing transient effects to be neglected. This study hypothesizes that incorporating historical data and reanalysis datasets will enhance the accuracy of parameterized wind fields influenced by topography, leading to improved storm surge forecasts and computational efficiency. REP is developed through (1) data collection—using 20 years of reanalysis and CWA Best Track Data, (2) wind field adjustment—applying a statistical method with topographic influence factors, (3) storm surge simulation—using COMCOT-SS, and (4) model validation—comparing results with CWA tide gauge data and traditional models. Results show RMSE reductions of 15%–25%, improved water level prediction accuracy, and enhanced computational efficiency. REP improves terrain representation, reduces wind and pressure errors, and supports more reliable disaster prevention strategies.

Keywords**:** Realistic Parameterization Model (REP), storm surge forecasting, topographic effects, reanalysis data

PAPER No. : PORSEC-poster30-O

GENERALIZED ADDITIVE MODELING OF CHLOROPHYLL-A CONCENTRATIONS IN THE TAIWAN STRAIT: INSIGHTS FROM REMOTE SENSING AND FLUORESCENCE-BASED QUANTIFICATION

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Abstract

Chlorophyll-a concentration is essential for understanding marine ecosystem dynamics, serving as a key indicator of primary productivity and nutrient availability. While satellite-based observations provide large-scale chlorophyll-a data, their accuracy in shelf waters remains a challenge.

To address these challenges, the Taiwan Fisheries Research Institute initiated the Taiwan Cooperative Oceanic Fisheries Investigations (TaiCOFI) program in 2003, establishing an 18-year marine environmental database from hydrographic and fisheries resource surveys. Fluorescence-based quantification of chlorophyll-a, which uses fluorescence intensity measurements and standard curve calibration, offers reliable ground-truth data for validating satellite-derived models.

This study developed a chlorophyll-a concentration model using collinearity analysis, generalized additive models, and the Akaike Information Criterion. The model, integrating ten environmental factors, achieved a coefficient of determination (R^2) of 0.42, indicating moderate explanatory power for capturing chlorophyll-a variability. Time-series analysis demonstrated the model's ability to reduce outliers and enhance data reliability.

These findings underscore the potential of combining fluorescence-based quantification with remote sensing for large-scale, real-time monitoring of chlorophyll-a concentrations in the Taiwan Strait. This approach provides critical insights into the impacts of climate change on marine productivity and ecosystem health, as well as valuable contributions to blue carbon research.

Keywords: chlorophyll-a, fluorescence quantification, remote sensing, marine ecosystems, climate change

PAPER No. : PORSEC-poster31-O

NAGATIVE VORTICITY INCREASE IN THE WEST LUZON STRAIT CAUSED BY CYCLONIC MESOSCALE EDDIES EAST OF TAIWAN

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Abstract

In this study, we utilized absolute dynamic topography and satellite altimeter eddy tracking data derived from satellite altimetry to investigate the dynamics of the Luzon Strait. Our findings indicate a significant increase in negative vorticity in the western region of the Luzon Strait, which is attributed to cyclonic mesoscale eddies situated east of Taiwan. This phenomenon is closely related to a reduction in Kuroshio velocity east of Taiwan, coupled with an enhancement of Kuroshio velocity east of Luzon. The Kuroshio east of Taiwan is influenced by westward mesoscale eddies originating from the North Pacific Ocean. Notably, these eddies can intermittently obstruct the primary path of the Kuroshio, leading to an accumulation of the northward current in the waters southeast of Taiwan. Consequently, this upstream segment of the Kuroshio is compelled to flow westward through the Luzon Strait into the South China Sea, thereby augmenting local negative vorticity in the western Luzon Strait. Employing a composite analysis methodology, we observed that during Kuroshio cut-off events occurring east of Taiwan, negative vorticity in the western Luzon Strait increased by 45% during the global warming hiatus period from 1998 to 2013 when compared to other timeframes. This research highlights the intricate interplay between mesoscale eddies and oceanic currents, contributing to our understanding of ocean dynamics in this critical region.

Keywords: satellite altimeter, Kuroshio, mesoscale eddy, South China Sea, vorticity, remote sensing

PAPER No. : PORSEC-poster32-O

LONG-TERM TRENDS OF PHYTOPLANKTON PROTEIN CONCENTRATION IN THE EAST SEA/JAPAN SEA BASED ON OCEAN COLOR REMOTE SENSING

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Abstract

Over the past two decades, substantial changes in environmental conditions and marine ecosystems have been observed in the East Sea/Japan Sea. Phytoplankton protein (PRT), a nitrogen-rich resource for higher trophic levels, serves as a sensitive indicator of environmental fluctuations. This study examines the long-term variability of phytoplankton protein concentration in the southwestern East Sea/Japan Sea from 2012 to 2024. An empirical protein algorithm incorporating chlorophyll-a and particulate organic nitrogen was applied to VIIRS ocean color satellite data, enabling a comprehensive assessment of phytoplankton protein dynamics. Validation against field data confirmed the algorithm's reliability in estimating protein concentrations. Long-term observations revealed distinct seasonal fluctuations, with concentrations peaking in spring and reaching their lowest levels in summer. Spatially, elevated protein levels were primarily concentrated along coastal areas. Time series analysis indicated a gradual decline in the peak protein concentration of the spring bloom, accompanied by a similar decreasing trend in the fall bloom. Under the IPCC's SSP5-8.5 scenario, phytoplankton protein concentrations in the East Sea/Japan Sea are projected to decline by an average of 47% by 2100. These findings suggest that climate change may reduce nitrogen-rich resources for higher trophic levels, potentially disrupting major fishery resources and the broader marine food web. This underscores the need for continuous monitoring and a deeper understanding of these environmental shifts to support effective fisheries management and marine ecosystem conservation.

Keywords: phytoplankton, remote sensing, ocean color, proteins, climate change

PAPER No. : PORSEC-poster33-O

CAN MACHINE LEARNING INTEGRATE PHYSICAL PRINCIPLES FOR ACCURATE RECONSTRUCTION OF SATELLITE-DERIVED SEA SURFACE TEMPERATURE UNDER CLOUDY AREAS?

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Abstract

Sea surface temperature (SST) plays an important role in affecting global climate, weather disasters, and marine resources. Full SST data that covers large areas and spans long periods is essential for various scientific research. Nowadays, meteorological satellites (e.g., the Himawari 8) have been able to provide large-scale, high-resolution continuous observations, but have always been interfered by cloud activities. While a lot of efforts have been made for the SST analysis, limitations associated with existing tools have not been resolved. Thus, based on interdisciplinary knowledge, we propose a physically-informed machine learning approach to elegantly reconstruct daily SSTs under both cloud and cloud-free areas. To capture the advection and diffusion processes, a TS-RBFNN (i.e., Temporal-Spatial Radial Basis Function Neural Network) is developed for SST reconstruction with applications in the Northwestern Pacific Ocean (NPO) and Taiwan's adjacent waters (TAW). Overall, compared to the conventional DINEOF (i.e., Data Interpolation Empirical Orthogonal Function), the TS-RBFNN would better perform SST reconstruction with significant improvement up to 60%.

Keywords: sea surface temperature, satellite observation, physical processes, machine learning

PAPER No. : PORSEC-poster34-O

MEASURING ATLANTIC MERIDIONAL OVERTURNING CIRCULATION USING SEA SURFACE HEIGHT ANOMALY DATA

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Abstract

The Atlantic Meridional Overturning Circulation (AMOC) is an important component of the thermohaline circulation, which is characterized by the northward transport of warm surface water and the southward transport of cold deep water. At 26°N latitude, the AMOC accounts for a quarter of global meridional heat transport and plays a key role in maintaining Europe's mild climate. It also has a significant impact on global climate change. However, current AMOC monitoring methods rely solely on in-situ instrument deployment. With the advancement of satellite altimetry technology, high-quality sea surface height data can now be obtained, and the wide spatial coverage of satellites makes them very suitable for large-scale ocean observations. Previous studies have shown a strong correlation between satellite-measured sea level anomalies (SLA) and AMOC transport. This study combines SLA data with deep-sea observations from the RAPID project to develop a more accurate method for estimating AMOC transport, aiming to improve traditional monitoring methods.

Keywords: AMOC, RAPID, sea surface height, climate change, satellite remote sensing

PAPER No. : PORSEC-poster35-T

INFLUENCE OF ENVIRONMENTAL CONDITIONS ON THE RAPID INTENSIFIED TROPICAL CYCLONES IN THE NORTHWEST PACIFIC

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Abstract

Tropical cyclones are intense ocean-atmosphere phenomena in tropical and subtropical regions, causing severe damage along their paths after landing. Accurate forecasting of their track, intensity, and rainfall is crucial, with rapid intensification (RI) being a key yet complex research topic. Previous studies indicate that RI may be influenced by upper ocean warm water thickness (Z26), vertical wind shear (Vs), and relative humidity (RH), collectively forming the Intensity Change Index (ICI). For example, in Typhoon Soudelor, vertical wind shear had twice the impact of Z26. However, the effects of these factors on the RI typhoons are not well studied systematically. We aim to extend the analysis of these potential RI factors to typhoons in the Northwest Pacific over the past 30 years. By incorporating the Intensity Change Index, we seek to systematically explore the influence and patterns of these environmental factors on typhoons in the region.

PAPER No. : PORSEC-poster36-T

HIGH CHLOROPHYLL RESPONSES OF A CATEGORY 1 TYPHOON NALGAE (2022) IN THE NORTHERN SOUTH CHINA SEA

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Abstract

Tropical Cycle (TC) is a strong atmospheric circulation over the tropical and subtropical ocean. The vigorous TC winds often cause intense interactions between the atmosphere and the ocean, leading to the upwelling of subsurface water, the asymmetric cooling and the chlorophyll blooming in the TC wakes, which are potentially linked to the TC intensity. This study focuses on the mechanism of a high chlorophyll blooming event caused by Category 1 Typhoon Nalgae (2022) in the South China Sea. After Typhoon Nalgae (2022) formed east of Philippines on October 27, 2022, it moved westward across Luzon Island and turned 90° northward into the North South China Sea. Typhoon Nalgae (2022) caused high phytoplankton blooming that reaches 3.86 $mg\ m^{-3}$ in the wake (15°-20°N, 115°-118°E) after Typhoon Nalgae passed 5-days on November 4, 2022. According to the IBTrACs data, the average translation speed of Typhoon Nalgae is 4.54 m/s, which is moderate among the 406 TCs in the South China Sea from 1998 to 2022. After carefully examining the environmental data, we found that the such high blooming caused by a relative weak TC could be attributed to the combination of the shallowing of the Depth Chlorophyll-a Maximum (DCM) layer in the North South China Sea and the circling of TC path.

PAPER No. : PORSEC-poster37-O

IMPACT OF ENSO ON LONG-TERM ENVIRONMENTAL CHANGES IN TAIWAN WATERS AND ITS RESPONSE STRATEGIES

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Abstract

The El Niño-Southern Oscillation (ENSO) is one of the most significant natural climate variability. It has a profound impact on marine environmental parameters. Taiwan is located on the edge of the northwest Pacific Ocean, and the waters east and west of Taiwan show different responses to ENSO events. During El Niño years, the sea surface temperature (SST) in eastern Taiwan increases, while the chlorophyll-a concentration decreases. In contrast, rainfall patterns in west waters vary significantly. In La Niña years, the sea surface temperature in the east waters of Taiwan decreases, while the west waters benefit from enhanced upwelling and an increase in chlorophyll-a concentration. This study analyzes long-term observation data (1981-2023) to explore the environmental changes in the sea areas around Taiwan caused by ENSO and its potential driving mechanisms. Finally, we propose adaptation strategies for fisheries management and climate resilience, providing valuable insights for policymakers to mitigate long-term risks associated with ENSO-driven environmental change.

Keywords: ENSO, sea surface temperature, chlorophyll-a, fisheries management, remote sensing

PAPER No. : PORSEC-poster38-O

CHLOROPHYLL-A (CHL-A) CONCENTRATION RETRIEVAL AND ITS SPATIAL-TEMPORAL VARIATION BASED ON GEOSTATIONARY SATELLITE OBSERVATIONS IN THE TAIWAN STRAIT

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Abstract

The Japanese geostationary satellite Himawari, launched in 2015, provides imagery every 10 minutes, effectively addressing challenges related to cloud cover and temporal resolution limitations. This enhancement has significantly improved capabilities for oceanographic research.

This research project compiled Himawari satellite imagery spanning from July 2015 through June 2024, while simultaneously collecting 203 in-situ chlorophyll-a (Chl-a) measurements from research vessels. Ocean color imagery obtained from satellites was utilized to monitor sea surface Chl-a concentrations, which contribute valuable data to biogeochemical dynamics research.

Validation analysis of the Chl-a data demonstrated strong correlation ($R^2 > 0.9$) and minimal root mean square error (< 0.07) between satellite and in-situ measurements, confirming the reliability of Himawari imagery for further scientific investigation.

Keywords: Chlorophyll-a, Himawari satellite, Taiwan Strait, Geostationary observation, Remote sensing

PAPER No. : PORSEC-poster39-E

ABUNDANCE VARIABILITY OF PREDATORS: ASYNCHRONOUS FLUCTUATION OF TUNA SPECIES IN THE ATLANTIC OCEAN DUE TO PREDATION STRATEGIES AND CLIMATIC EFFECTS

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Abstract

Bigeye tuna (*Thunnus obesus*; BET) and yellowfin tuna (*Thunnus albacares*; YFT) are commercially and ecologically important Atlantic Ocean species. Numerous studies have examined interacting species with clearly synchronous or asynchronous dynamics, but few have investigated interactions among tuna species. This study investigated the effects of climate indices on the standardized catch per unit effort (CPUE) and habitat preferences of BET and YFT in the Atlantic Ocean. The indicators for both tuna species were found to be influenced by the Atlantic Multidecadal Oscillation (AMO) and Tropical North Atlantic index. The AMO had the strongest effect on standardized CPUE for the two species, and habitat suitability also reflected AMO trends. We compared CPUE trends in overlapping suitable habitat areas and estimated variations in primary prey abundance for between BET and YFT to evaluate their species' competition for limited prey and habitat area resources. The standardized CPUE, habitat suitability index (HSI), and primary prey levels (squid and crustaceans) of BET all increased following the change to the positive AMO phase after the 1990s. Although the HSI value for YFT also increased in an area of habitat overlap, the corresponding standardized CPUE decreased. We suggest that this pattern of a decreasing-standardized CPUE for YFT may have been caused by competition for limited prey and habitat area resources in the overlap area.

Keywords: Atlantic Ocean, climate change, ecosystem, population dynamics, tuna

PAPER No. : PORSEC-poster40-F

EFFECTS OF OCEANOGRAPHIC CONDITIONS ON INDO-PACIFIC KING MACKEREL (*Scomberomorus guttatus*) FISHERY DISTRIBUTION IN THE TAIWAN STRAIT USING REMOTE SENSING DATA

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Abstract

Changes in oceanographic conditions can affect species distribution in marine habitats. Global climate change may negatively influence the oceanographic factor–species distribution relationship. Here, we assessed the influence of oceanographic conditions on Indo-Pacific King Mackerel (*Scomberomorus guttatus*) distribution in Taiwan Strait by constructing and using a habitat ensemble model incorporating king mackerel fishery, climatic oscillation, and oceanography data. Our results indicated that the king mackerel catch was mainly influenced by the Pacific Decadal Oscillation (PDO). Moreover, sea-surface height and mixed-layer depth exerted the most and least significant effects on Indo-Pacific King mackerel distribution, respectively. The king mackerel catch rate peaked in the study area with a suitable sea-surface temperature between 23.50°C to 29.75°C, sea-surface chlorophyll between 0.20 mg/m^3 to 0.55 mg/m^3, sea-surface salinity between 33 psu to 35 psu, and sea-surface height between 0.575 m to 0.775 m. Indo-Pacific King mackerel was the most widely distributed in the area between 22°N, 120.7°E and 25.5°N, 121.5°E. Our findings can be used to develop critical adaptation plans for managing Indo-Pacific king mackerel fisheries in the waters of Taiwan Strait. Considering changing climate conditions globally, the incorporation of this knowledge into managerial strategies may aid decision-makers in protecting not only other ocean fisheries but also individual's dependent on them.

PAPER No. : PORSEC-poster41-F

CLIMATE-PROOFING FISHERIES: LEVERAGING REMOTE SENSING AND ENSEMBLE MODELLING TO SAFEGUARD SPANISH MACKEREL HABITATS IN THE TAIWAN STRAIT

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Abstract

The escalating impacts of climate change necessitate innovative approaches to fisheries management to ensure the sustainability of vital marine resources. This study employs an ensemble habitat modeling framework, integrating satellite-derived oceanographic parameters, to predict the seasonal distribution patterns of Spanish mackerel (*Scomberomorus commerson*) in the Taiwan Strait. Key predictors include sea surface temperature (SST), sea surface chlorophyll (SSC), mixed layer depth (MLD), sea surface height (SSH), and salinity (SSS). The analysis reveals notable seasonal habitat shifts, with Spanish mackerel favoring cooler waters in winter (SST: 16–17°C) and high-productivity zones in summer (SSC: 1.2–1.3 mg/m³). The integration of remote sensing data enhances habitat suitability models, enabling dynamic monitoring and adaptive management strategies. By aligning with Sustainable Development Goal 14 (Life Below Water), this research underscores the critical role of advanced technologies in mitigating climate-induced challenges and promoting fisheries resilience.

Keywords: Climate change adaptation, remote sensing, species distribution modeling, Spanish mackerel, fisheries management, sustainable fisheries.

PAPER No. : PORSEC-poster42-C

RESEARCH ON THE APPLICATION OF VISUAL SENSORY CHARACTERISTICS OF LAND CRABS AND PORTUNIDAE IN ECOLOGICAL CONSERVATION

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Abstract

This study used the biology of Trichopodia crabs captured in the Kenting Sand Island Ecological Zone to reduce the mortality of land-killed crabs and increase the passage rate of underground culverts. During the experiment, a total of 312 egg-bearing crabs were sampled from September 2022 to October 2024. Conduct outdoor and indoor LED lighting experiments respectively to test the effects of LED light in different bands on land crabs' tropism. The light source uses homemade LED light-emitting diode lights. The peak wavelengths are blue 458nm, green 526nm, red 630nm, and white 460nm. The indoor experiment is divided into 5 groups. The average speed of the red light group is 0.785cm/s, the blue light group is 0.73cm/s, the green light group is 0.686cm/s, the white light group is 0.682cm/s, and the no-light group is 0.885cm/s. In addition, through images, it was found that blue light has the best positive taxis response. Red light has caused crabs to escape from the experimental site many times and attack the light source. This shows that red light may be a threat, while blue light is relatively stable. inducement. Field experiment results showed that the retrograde rate in the no-light group was 16% and the anterograde rate was 84%; the retrograde rate in the blue light group was 17% and the anterograde rate was 79%; the retrograde rate in the red light group was 0% and the anterograde rate was 100%.

Keywords: Trichopod crab, Fishery Biology

PAPER No. : PORSEC-poster43-F

VARIATIONS IN MIGRATORY FISH SPECIES IN SET-NET ALONG THE NORTHEASTERN COAST OF TAIWAN UNDER CLIMATE CHANGE

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Abstract

In recent years, global environmental and climate change have led to changes in the migration patterns of numerous fish species worldwide. The waters surrounding Taiwan are among the hotspots of ocean warming, with significant increases in coastal water temperatures since the 1980s ; however, long-term observations of fish stocks remain insufficient. Additionally, the eastern waters of Taiwan, influenced by the Kuroshio Current, serve as an important fishing ground. The set-net fishery uses passive stationary gear, allowing for the long-term capture of migratory fish in specific areas, with fishing condition being less affected by human interference. Therefore, set nets have become an ideal resource for studying the structural changes in fishery resources along the northeastern coast of Taiwan under climate change.

This study utilizes daily catch data from the Hsinshefar set-net (1993-2023), combined with satellite remote sensing data - sea surface temperature (SST), to investigate the impacts of climate change on coastal fishing grounds. By observing the changes in key dominant species, the study aims to understand how shifts in fish species affect fishery structure and ecological effects.

The results indicate that driven by the rising trend in sea surface temperature, the fish assemblage structure has changed, leading to the phenomenon of species replacement and an increase in the number of fish species. The catch numbers of cold-water fish species show a declining trend, and the seasonality of many species have also changed.

Keywords: Climate change, Set-net, Catch composition analysis, Sea surface temperature (SST)

PAPER No. : PORSEC-poster44-F

IMPACT OF FISHING PRESSURE ON THE ECOLOGICAL STRUCTURE AND KEYSTONE SPECIES AROUND WESTERN AND CENTRAL PACIFIC OCEAN

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Abstract

The Western and Central Pacific Ocean is one of the important fishing grounds for pelagic species utilizing a variety of fishing methods. Previous studies mostly focused on single-species resource assessment to explore how their catch composition is affected by ocean environmental changes such as El Niño events. This study was conducted using the Ecopath with Ecosim (EwE) model to investigate changes in the ecological structure and keystone species effect by commercial fishing in eight Marine Ecoregions of the Western and Central Pacific. The fishing data is divided into two periods to compare different fishing statuses. Preliminary analysis results indicate that during periods of higher catches, energy flow decreases due to the reduction in biomass. According to the mixed trophic impact results from the model, purse seine has the most significant negative effect on skipjack tuna, while longline exerts the greatest negative impact on species such as blue shark (*prionace glauca*), oceanic whitetip shark (*Carcharhinus longimanus*), and yellowfin tuna (*Thunnus albacares*). As catch increases, the results indicate that the negative impact on large pelagic leads to a positive effect on their prey, such as Pacific chub mackerel (*Scomber japonicus*) and Pacific jack mackerel (*Trachurus symmetricus*). This suggests a top-down control in the ecosystem, driven by increased fishing pressure. Finally, the Ecosim was utilized to predict how the biomass of various species will change over time due to fishing pressure, as well as to incorporate ocean environmental data into a complete model.

Keywords: Western and Central Pacific, fisheries resources, trophic level, ecosystem, ecological model

PAPER No. : PORSEC-poster45-F

IMPACTS OF CLIMATE CHANGE ON THE ABUNDANCE AND HABITAT OF SHARK IN INDIAN OCEAN

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Abstract

The Indian Ocean is a crucial fishing ground for Taiwan's longline fishery, with approximately 40,000 metric tons of sharks caught annually as bycatch. This catch accounts for about 4–5% of the global shark catch, highlighting its significance to Taiwan's fisheries.

This study utilizes longline fishery data from the Indian Ocean Tuna Commission (IOTC) from 2006 to 2023, including catch numbers,weight, fishing effort, and operational latitude and longitude records from various countries. The results indicate that in the Indian Ocean, the annual bycatch rate of *Prionace glauca* (blue shark) has significantly increased since 2006, mainly during operations targeting *Thunnus albacares* (yellowfin tuna), *Thunnus obesus* (bigeye tuna), *Thunnus alalunga* (albacore tuna), and *Thunnus maccoyii* (southern bluefin tuna). Meanwhile, the annual bycatch rates of *Carcharhinus falciformis* (silky shark), blue shark, and *Lamna nasus* (porbeagle shark) have been accurately recorded since 2009. The time-series trend of bycatch species reveals that the catch rates of other species have been gradually declining, except for the continuously increasing CPUE of silky shark.

In the future, this study will try to use the principal component analysis (PCA) to explore the correlation between shark and tuna population trends and investigate the spatiotemporal variations in habitat hotspots between these species.

Keywords: Bycatch, Longline Fishery, Shark CPUE, Indian Ocean, Predator Habitat

PAPER No. : PORSEC-poster46-E

PROJECTED ENSO IMPACTS ON COMMERCIAL FISH IN THE NORTHERN SOUTH CHINA SEA UNDER CLIMATE CHANGE SIMULATIONS

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Abstract

The El Niño/Southern Oscillation (ENSO) significantly impacts marine ecosystems and fisheries, particularly pelagic species. ENSO events influence environmental factors, leading to variations in fish abundance, yet the mechanisms driving ENSO's impact remain complex and not fully understood. The Northern South China Sea supports a diverse range of fish species, many of which are of commercial and ecological importance. To understand how these species are affected by El Niño and La Niña events under future climate change conditions, we used the Niño 3.4 index to study ENSO-like events. Environmental data from the GFDL ESM2M ensemble model were combined with the Dynamic Bioclimatic Envelope Model (DBEM) to assess fish biomass in response to these events. Correlation tests indicate that some species show increased abundance during La Niña, driven by lower sea surface temperatures and other environmental factors, while others exhibit the opposite trend. Preliminary results suggest that the impacts of different ENSO events may vary, highlighting the complexity of ENSO's influence on fish abundance under changing climate conditions.

Keywords: Taiwan Strait, DBEM, ENSO, Climate change

PAPER No. : PORSEC-poster47-F

USING ANIMAL TRAJECTORY TRACKING SOFTWARE TO COMPARE THE EFFECTS OF DIFFERENT BAITS ON THE BEHAVIOR OF *Chionoecetes bairdi*

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Abstract

Understanding the feeding behavior of snow crabs in response to different bait types can improve bait selection strategies in trap fisheries, reduce bycatch, and facilitate the development of artificial baits to lessen dependence on wild baitfish. This study focuses on *Chionoecetes bairdi*, an important target species in Hokkaido, Japan. Four bait types—mackerel, mackerel viscera, squid, and chicken heads—were used. Using the animal tracking software EthoVision XT 13, we analyzed the crabs' feeding behaviors under different bait conditions, examined potential sex-based differences in bait preference, and recorded their spatial distribution patterns.

Preliminary results indicate that mackerel was the most effective bait in attracting crabs, followed by mackerel viscera, chicken heads, and squid. Male crabs demonstrated stronger exploratory and feeding behaviors than females. Future experiments will increase the sample size for each treatment group and perform comprehensive statistical analyses.

Keywords: Animal trajectory tracking software, *Chionoecetes bairdi*, Crab behavior, Image analysis

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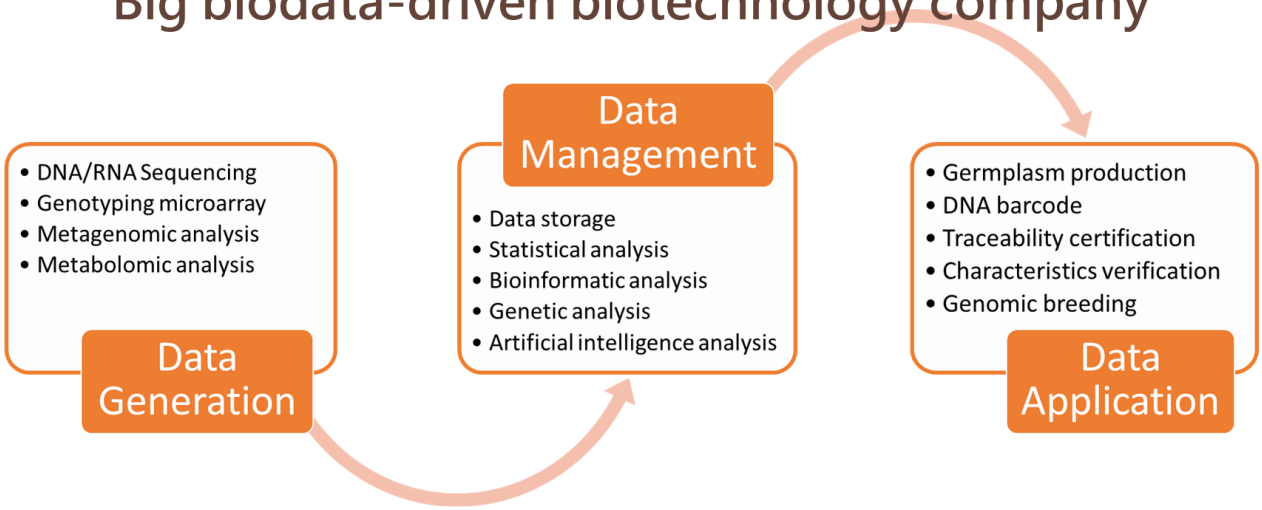

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