

Agenda

14 September 2021 (Tuesday)

08:30 – 09:00	Onsite registration		
09:00 – 09:15	Opening Ceremony Chair: Fangli Qiao (Deputy Director General of FIO)		
	Opening remarks by Deputy Director-General of the Department of Boundary and Ocean Affairs, Ministry of Foreign Affairs of the People's Republic of China		
	Opening remarks by Deputy Director General of the Department of International Cooperation, Ministry of Natural Resources of the People's Republic of China		
	Opening remarks by Vice Chancellor of the University of Malaya of Malaysia		
09:15 – 09:30	Group photo		
09:30 – 12:00	Session 1: Climate and marine environment change Co-chairs: San Win, Li Li		
09:30	South China Sea monsoon onset experiment and cooperation perspectives	Weidong Yu	
09:45	Interdecadal differences in the interannual variability of the winter monsoon over the South China Sea	Baochao Liu	
10:00	Validation of atmospheric and oceanic parameters in waters off east coast of Malay Peninsula using data from a MetOcean buoy	Wee Cheah	
10:15	The emission of biogenic halocarbons by the commercially-farmed seaweed, Kappaphycus alvarezii, under varying temperature and irradiance levels	Fiona Seh-Lin Keng	
10:30	Using gastropod shells to biomonitor marine and ocean acidification: an appraisal of the benefits and limitations of this approach	David John Marshall	
10:45 – 11:00	Coffee break		
11:00	Blue ecosystems in two seas threatened by climate change along Myanmar	San Win	
11:15	The "source-to-sink" processes of sediment and paleo- environment change in the western Sunda Shelf since the Holocene	Kaikai Wu	
11:30	Distribution of total ²¹⁰ Pb in the marine sediment of Sunda Shelf seas	Che Abd Rahim K. Mohamed	
11:45	Biogeochemistry of trace metals in the South China Sea	Ruifeng Zhang	
12:00 – 14:00	Lunch break		
14:00 – 15:45	Session 2: Marine biodiversity and ecosystem protection Co-chairs: Po Teen Lim, Haifeng Gu		
14:00	Harmful algal bloom studies in the South China Sea	Pengbin Wang	
14:15	Diversity and distribution of harmful microalgae in the Gulf of Thailand assessed by DNA metabarcoding	Haifeng Gu	
14:30	An update of Harmful Algal Blooms in Malaysian waters	Po Teen Lim	

14:45	Phytoplankton and harmful microalgae community assemblages in Johor Strait	Kieng Soon Hii	
15:00	A preliminary assessment: Exploring the diversity of soft corals in Malaysian waters in search for pharmaceutically potent active metabolites.	Kishneth Palaniveloo	
15:15	Site fidelity and diel activity patterns of green sea turtles Chelonia mydas in their foraging grounds	Lu Sun	
15:30	Smart perception of the marine ecosystem	Xuelei Zhang	
15:45 – 16:00	Coffee break		
16:00 – 17:45	Session 3: Marine disaster mitigation and pollution prevention Co-chairs: Phaik-Eem Lim. Erma Yulihastin		
16:00	Report on operations of the South China Sea Tsunami Advisory Center (SCSTAC)	Jingming Hou	
16:15	Convective cold pool associated with offshore propagation of convection system over the east coast of southern Sumatra, Indonesia	Erma Yulihastin	
16:30	Development of the Southeast Asia Ocean Forecast System	Changshui Xia	
16:45	SFANet for coastal zone change detection	Tianzhu Liu	
17:00	Occurrence and abundance of microplastics in coral reef ecosystem of Peninsular Malaysia	Phaik-Eem Lim	
17:15	Microplastic pollution in the Beibu Gulf of the northern South China Sea	Zuhao Zhu	
17:30	Microplastic research in the South China Sea	Chengjun Sun	
15 September 2021 (Wednesday)			
09:00 – 10:45	Session 4: Future cooperation on marine scientific research Co-chairs: Aan J. Wahyudi, Xuelei Zhang		
09:00	The extension of South China Sea western boundary current on the Sunda Shelf: A brief overview	Mohd Fadzil Akhir	
09:15	China-Cambodia marine cooperation and relevant capacity building	Xin Teng	
09:30	An introduction to a New-Generation Real-time Forecasting System for the SCS Marine Environment (NG-RFSSME)	Yineng Li	
09:45	Construction of in-depth observation system in the South China Sea - Gulf of Thailand	Aijun Pan	
10:00	ASEAN-China potential collaboration on marine science research during the Covid19 global pandemic situation	Aan J. Wahyudi	
10:15	Improve scientific decision-making in ocean governance, realize marine sustainable development	Ying Yu	
10:30	Legal framework for international cooperation in marine scientific research	Nguyen T. Tuong Van	
10:45 – 11:00	Coffee break		
11:00 – 11:30	Discussion on general issues		
11:30 -	Closing Ceremony		
11.40	Thegang Li (Director General of FIO)		

Abstracts

Session 1: Climate and marine environment change

South China Sea monsoon onset experiment and cooperation perspectives

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South China Sea Monsoon is the giant climate system that controls the weather and climate over the South East and East Asian countries. Disaster reduction and sustainable development pose the urgent and high requirements on the better understanding of the SCS monsoon variability. The presentation briefs the 2021 SCS monsoon onset experiment, including the oceanic preconceptions, the northwestern Pacific Subtropical High and the intra-seasonal oscillation. Also it calls for the future cooperation including research, training and applications

Interdecadal differences in the interannual variability of the winter monsoon over the South China Sea

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We investigate interdecadal differences in the interannual variability of the South China Sea (SCS) Winter Monsoon (SCSWM) since 1950. The SCSWM is influenced by both the East Asian Winter Monsoon (EAWM) over the mid–high latitudes and the anomalous anticyclone over the western North Pacific (WNPAC). The EAWM tends to cause a positive linear correlation of wind speeds between the northern SCS (NSCS) and the southern SCS (SSCS). Because the cold surge of the EAWM can make wind speeds over the NSCS and SSCS increase simultaneously. While, the WNPAC tends to weaken this positive correlation (corNS) because anomalies associated with the WNPAC will decrease wind speeds over the NSCS but exert a small or even an opposite influence on wind speeds over the SSCS. The interannual variation of the EAWM before the late 1970s is greater than that after the early 1990s. And the WNPAC was weak and confined to the east of the SCS before the late 1970s but became strong and expanded towards the SCS after the early 1990s. As a result, the positive corNS was significant at the 95% confidence level before the late 1970s but became insignificant after the early 1990s.

Validation of atmospheric and oceanic parameters in waters off east coast of Malay Peninsula using data from a MetOcean buoy

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The performance of atmospheric and ocean parameters such as pressure, wind speed, temperature estimated by model, reanalysis and satellite remote sensing were examined in waters off east coast of Malay Peninsula. Simulated and remotely sensed products were validated using in situ data measured by a MetOcean buoy deployed roughly 100 km offshore from the coast of Kelantan, Malaysia. Correlation and the root-mean-square error between the estimates will be discussed.

The emission of biogenic halocarbons by the commercially-farmed seaweed, Kappaphycus alvarezii, under varying temperature and irradiance levels

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Seaweeds are important coastal sources of the short-lived brominated compounds including CHBr3 and CH2Br2, and account to 70% of the global bromoform production. Data from previous small-scale studies on tropical seaweeds in South-East Asia indicates a contribution of 6–224 Mmol Br yr–1. However, variabilities and uncertainties in the current global estimates of oceanic halogen load, derived from top-down and bottom-up modelling, could arise from poor temporal and spatial data coverage, and are commonly attributed to a lack of data for oceanic inputs and under-representation of coastal and extreme emissions. In light of the on-going expansion of seaweed industry and to understand how changes in environment could affect the halocarbon emission by farmed seaweed species, we investigated the effect of temperature and the combined effect of varying levels of irradiance and temperature on the halocarbon emission by Kappaphycus alvarezii, a commercially farmed seaweed in the tropics.

Using gastropod shells to biomonitor marine and ocean acidification: an appraisal of the benefits and limitations of this approach

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The global oceans are expected to become increasingly acidified in the future, necessitating monitoring of marine environmental change. Currently, all monitoring approaches use fixed position bouys and data-logging stations to record the ambient marine water chemistry. These approaches are limited in terms of spatial distribution and the marine ecosystems in which they can be deployed. This paper summarizes a complimentary biomonitoring system based on carbonate dissolution patterns of gastropod shells that enables widepread sampling within benthic or pelagic habitats, including in wave-washed intertidal zones that preclude the deployment of data-loggers. The paper refers specifically to data collected from intertidal gastropod populations that are exposed to stochastic, allochthonous and localized acidified water discharges into the coastal marine systems of Brunei. It reveals how shell erosion can

easily be ranked and how rank measures relate to the exposure of individual snails to aragonite-undersaturated seawater. The discussion appraises the limitations, specifically the attributes of a good biomonitor species, and distiguishes dissolution patterns from the effects of weathering and shell bioerosion. Overall this paper shows the great potential of this easyto-use, cost-effective biomonitor system, which may benefit of citizen scientist involvement, to ultimately improve understanding of the extent of current and future marine acidification.

Blue ecosystems in two seas threatened by climate change along Myanmar

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Myanmar is well-known positively for its richness in natural resources, diverse topography including 2400-2851 km long coastline and national races but adversely for its vulnerability to the climate change impacts. Mangrove, a home of blue carbon, providing both coastal community, fauna, and flora with its ecosystem service is degrading due to natural disaster due to climate change and anthropogenic actions. The study was conducted to understand the vulnerability of blue ecosystem to climate change. Mangrove ecosystem components were surveyed by applying a modified cluster transect (MCT) survey. Climate data utilized NOAA and CHIRPS time series satellite data. The average precipitation was 3395.73 ± 371.21 mm, with an increasing of 17.26 mm/yr. The average surface air temperature was rising at the rate of 0.031 °C/yr. The average water salinity ranged from 0.53 ± 0.25 to 28.82 ± 0.55 PSU. The mean sea level increases at the rate of 3.917 mm/yr. Thirty numbers mangrove tree species were documented. Among them, fifteen species were documented as the highest salt tolerant species as observed in both low and high salinity areas. Declination of blue ecosystem quality, services, vulnerability the ecosystem and marine water to the climate change. Key words: Climate Change, Sea Level Rise, Mangrove Ecosystem, Coastal Community, Vulnerability

The "Source-to-Sink" processes of sediment and paleo-environment change in the western Sunda Shelf since the Holocene

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The Sunda Shelf located in the southern South China Sea (SCS), is the largest and widest shelf in low latitude region. Huge amount of sediment supply, low gradient, sea level change, and climate change interplay in the Sunda shelf since the Holocene, making this area a natural laboratory to study "Source-to-Sink" processes of sediment and paleo-environment change. To understand the role of grain size to rare earth elements (REE) in tropical mountainous river sediments and establish suitable provenance proxies, sediments from rivers in Peninsular Malaysia were determined for REE composition in six size fractions, we found that the 4-8 μ m fraction is sensitive to REE variation among the six size fractions investigated. Furthermore, the relationship between upper continental crust-normalized δ Eu and (Gd/Yb) could be used as an effective indicator for identifying river-sourced sediments around the southern SCS. Sedimentary, mineralogical and geochemical analysis of the sediments from the western Sunda shelf revealed that the sediments types are mainly sandy silt and silty sand.

Based on REE compositions and parameters, the western Sunda Shelf can be divided into three geochemical provinces, and provenances among them are Kelantan River and Mekong River, Pahang River, and coastal erosion, respectively. According to sediment composition, together with the provenance and hydrodynamic characteristics, the erosion, transport, and deposition of sediments in the western Sunda Shlef are inferred to be mainly controlled by the northeast monsoon current, coastal current, and wave energy. High-resolution records of grain size, major and trace elements, and Sr-Nd isotopes of Core K17 from the western Sunda Shelf were investigated to evaluate the response of weathering and terrigenous input to climatic changes and human activities over the past 7400 years. Sr-Nd isotopic results indicate that the Kelantan river is the main source of sediment in the study core since the mid-Holocene. From 7400 to 1600 cal yr BP, weathering and erosion are primarily controlled by climate change, while since 1600 cal vr BP, human activities have gradually overwhelmed natural climatic controls on weathering and erosion processes in the western Sunda Shelf due to decoupling between weathering/erosion and climate change and increasing agriculture and mining activities. Our studies highlight two points that: (1) fluvial sediments from Malay peninsula are important material sources in the western Sunda shelf; (2) human activities have overwhelming impact on weathering and erosion processes in southern SCS since the past 1600 years.

Distribution of total ²¹⁰Pb in the marine sediment of Sunda Shelf seas

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Distribution of total ²¹⁰Pb radionuclide in surface sediments and through vertical distribution of the water column for the main waters on the Sunda Shelf, off Peninsular Malavsia was determined during a scientific marine expedition. Radiochemical separation techniques were applied to measure ²¹⁰Pb radioactivity in the samples. The average ²¹⁰Pb radioactivity level recorded from the Malacca Strait (MS) is significantly higher than the southern South China Sea (sSCS); this is attributed to the supply of input from the Andaman Sea in its northern areas, and massive terrestrial processes from bordering land masses. The results reveal that the decreasing trend of total ²¹⁰Pb in Peninsular Malaysia's marine sediment starts with the north maritime zone of Malacca Strait (64.28 ± 5.97 Bq/kg) > south maritime zone of Malacca Strait (50.88 \pm 6.15 Bg/kg) > east maritime zone of sSCS (41.01 \pm 3.07 Bg/kg) > south maritime zone of sSCS (40.78 ± 3.16 Bq/kg). The Kelantan and Pahang Deltas have been identified as two of the main anthropogenic sources of input for total ²¹⁰Pb in the sSCS. Vertical distribution of total ²¹⁰Pb in the water column shows that its transportation and occurrence in the sediment of sSCS is mainly influenced by atmospheric sources such as from airborne ²¹⁰Pb or from its parent, gaseous ²²²Rn. In the Malacca Strait, however, the distribution of total ²¹⁰Pb might be influenced mainly by in situ processes of the strait's seafloor and sources origin of sediment.

Biogeochemistry of trace metals in the South China Sea

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Biogeochemistry of trace metals is one of the key topics in marine sciences, which is because their distinctive roles in tracing and indicating geochemical and environmental processes, fertilizing or poisoning the marine biotas. For example, Al and Mn are usually applied as tracers to reveal the lithogenic sources or redox processes; Fe and Zn are essential elements to marine phytoplankton that regulate primary production in some ocean region; Cd and Cu act as either stimulating or toxic element to marine lives depending on their concentration levels; Pb is harmful element for health that cause environmental issues. Stable isotopes offer an additional dimension to study the biogeochemistry and a tool to constrain the processes that participate the cyclings of trace metals. South China Sea is one of the largest marginal seas on earth, and the biogeochemistry in this oligotrophic ocean is regulated extensively by various processes at different temporal and spatial scales, such as, riverine discharge, anthropogenic activities, monsoon, mesoscale eddies, exchanges with western Pacific. Here, I will present a review of the biogeochemistry study of trace metals from Pearl River Estuary to the northern South China Sea from my lab in the past 7 years, as well as a perspective on the application of trace metal to study the biogeochemistry in the South China Sea.

Session 2: Marine biodiversity and ecosystem protection

Harmful algal bloom studies in the South China Sea

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In the past decades Harmful Algal Blooms (HABs) have expand globally and drawn great attention in coastal areas worldwide, because of their multiple effects on marine ecosystems as well as public health. Under the background of climate and ocean change, tropical harmful algal bloom species are expanding to the temperate zone. The South China Sea surrounding countries are facing many same ecological problems. Harmful algal bloom has become a hot issue as it potential threat to the ecosystem, human health and marine aquatic economy. Due to the climate change and human activities, harmful algal blooms expand globally. Constructing the biogeographical distribution patterns of HABs species in South China Sea, it will improve the ability to prevent the marine tropical harmful algal bloom species expedition in the future. We will also explore the toxicity of the target species, laying the foundation for the natural products development and application, and HABs toxicity monitoring.

Diversity and distribution of harmful microalgae in the Gulf of Thailand assessed by DNA metabarcoding

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Information on the diversity and distribution of harmful microalgae in the Gulf of Thailand is very limited and mainly based on microscopic observations. Here, we collected 44 water samples from the Gulf of Thailand and its adjacent water (Perhentian Island, Malaysia) for comparison in 2018. DNA metabarcoding was performed targeting the partial large subunit ribosomal RNA gene (LSU rDNA D1-D3) and the internal transcribed spacers (ITS1 and ITS2). A total of 50 dinoflagellate genera (made up of 72 species) were identified based on the LSU rDNA dataset, while the results of ITS1 and ITS2 datasets revealed 33 and 32 dinoflagellate genera comprising 69 and 64 species, respectively. Five potentially toxic Pseudo-nitzschia (Bacillariophyceae) species were detected, with four as newly recorded species in the water (Pseudo-nitzschia americana/brasilliana, Pseudo-nitzschia simulans/delicatissima, P. galaxiae and P. multistriata). The highest relative abundances of P. galaxiae and P. multistriata were found in Trat Bay and Chumphon (accounting for 0.20% and 0.06% of total ASVs abundance, respectively). Three paralytic shellfish toxin producing dinoflagellate species were detected: Alexandrium tamiyavanichii, Alexandrium fragae, and Gymnodinium catenatum. The highest abundance of A. tamiyavanichii was found in the surface sample of Chumphon (CHO7 station), accounting for 1.95% of total ASVs abundance. Two azaspiracid producing dinoflagellate species, Azadinium poporum ribotype B, Azadinium spinosum ribotype A, and a pinnatoxin producing dinoflagellate species Vulcanodinium rugosum, with two ribotypes B and C, were revealed from the datasets although with very low abundances. Six fish killing dinoflagellate species, including Margalefidinium polykrikoides group IV, Margalefidinium fulvescens, Karenia mikimotoi, Karenia selliformis ribotype B, Karlodinium australe, and Karlodinium digitatum were detected and all representing new records in this area. The findings of numerous harmful microalgal species in the Gulf of Thailand highlight the potential risk of human intoxication and fish killing events.

An update of Harmful Algal Blooms in Malaysian waters

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Harmful algal blooms (HABs) have been increasingly reported in the Malaysian waters, not only in the frequency and severity of events, but also with the association of previously unknown species. In this presentation, a review of HAB events for the past three decades is summarized. Paralytic Shellfish poisoning (PSP) remains the most important seafood safety problem in the country, with new discovery of the toxin producers at new localities (Alexandrium species and Gymnodinium catenatum). Prolonged blooms of HAB species have severely impact seafood supply and the related fisheries industry in the affected areas. A total of 28 species of Pseudo-nitzschia species, the potential amnesic shellfish poisoning toxinproducing diatoms, have been documented from 18 sampling sites in Malaysian waters, with the highest number of species recorded in Bintulu. Five species have been confirmed as domoic acid (DA) producers. Another DA producer, Nitzschia navis-varingica, was also found to be common in the waters. Several algal bloom events have been reported to cause great losses in finfishes mariculture of the country. Notably, the blooms of Karlodinium australe were confirmed attributed to hundreds of tonnes losses in aquaculture farms for two consecutive years (2014-2015) along the Johor Straits, affecting both cultured and wild marine organisms. Several ciguatera fish poisoning (CFP) incidents were confirmed over the last five years. Other bloom-forming species, Margalefedinium polykrikoides, Noctiluca scintillans, Ceratium furca, Prorocentrum minumum, and Chatonella species were observed throughout the waters. Blooms of Alexandrium minutum and its characteristics were also characterized. HAB issues are transboundary and regional, strengthening research networking and collaborative effort through regional program is crucial to minimize its impacts on seafood safety and security.

Phytoplankton and harmful microalgae community assemblages in Johor Strait

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Anthropogenic activities in the Johor strait have led to water quality deterioration and driven the shifts of phytoplankton communities from high-species diversity to monospecific that often form harmful algal blooms (HABs). In this study, the community assemblage of phytoplankton community and HAB species in the Johor Strait was investigated based on metabarcoding data collected between May 2018 and September 2019, covering 19 stations across the Eastern (EJS) and Western Johor strait (WJS). Plankton samples were monthly collected using a 15 µm mesh size plankton net from each station, followed by genomic DNA isolation. Amplicon-based sequencing on the 18S ribosomal DNA V9 region was performed using an illumine Miseq platform. Operation taxonomic units (OTUs) were assigned to taxa using the BLASTn against the NCBI database, with an E-value cut-off of \geq 97 % similarity. This study has revealed 377 protist taxa, with 26 taxa recognized as HAB species, consisted of 12 taxa were new records in the straits. The most common HAB species assemblage, with frequency occurrence > 70%, consisted of Heterosigma akashiwo, Fibrocapsa japonica, Pseudo-nitzschia pungens, Dinophysis spp., Gymnodinium catenatum, Alexandrium leei, and A. tamiyavanichii. Several predominant diatoms such as Skeletonema, Eucampia, Rhizosolenia and Thalassiosira were relatively high, caused hypoxic to an anoxic dead zone at the innermost strait, with the dissolved oxygen levels ranging from 0.19- 1.7 mg/L. Our result also discovered that the phytoplankton and HAB species community was rarely exhibited homogenous between the WJS and EJS waters. This study provided a comprehensive understanding of the phytoplankton and HAB assemblages dynamics in the Johor Strait.

A preliminary assessment: Exploring the diversity of soft corals in Malaysian waters in search for pharmaceutically potent active metabolites

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Soft corals are non-reef building animals with polyps known for their stinging cells as a defense mechanism. Also known as Octocorals from their eight tentacled polyp, the soft corals are sessile marine invertebrates vulnerable to predatory attack, forcing them to synthesize a wide range of secondary metabolites for their survival among the various other functions. Soft corals are rich in alkaloids, diterpenes and sesquiterpenes, prostaglandins, cembrene derivatives, terpenoid, steroid and steroid glycoside that exhibit potential bioactivities such as cytotoxic, anti-inflammation and antibacterial. Malaysian water is rich in soft corals; however, its species diversity is poorly documented and misidentified due to lack of expertise, eventually creating a gap in natural product research. Therefore, we gathered a team of researchers to assess the diversity of soft corals in Malaysian waters. We overall intention is to map soft coral species distribution based on available secondary data, which will be merged with field data observation. We report preliminary data from two samplings, each from the Straits of Malacca and the South China Sea. Soft corals from collected were subjected to molecular identification based on msh1 gene amplification. Successfully identified samples will be extracted for isolation of bioactive secondary metabolites.

Site fidelity and diel activity patterns of green sea turtles Chelonia mydas in their foraging grounds

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Green sea turtle utilizes varied habitats over vast distances throughout different lifecycle stages. Understanding behaviors of green sea turtles in their foraging grounds is critical to the conservation of the species, while currently inadequate comparing to that in their nesting areas. In this study, we tagged two adult turtles with satellite Fastloc-GPS tags near potential foraging areas in Brunei Bay and Gulf of Thailand to investigate their behaviors. In total, we collected 64 and 57 days of location and behavioral data from the two turtles. Both turtles showed site fidelity to certain seagrass beds, with 95% home ranges of 15.23 sqkm and 2.48 sqkm. Tracking and diving data revealed significant and stable oscillations in activity levels between daytime and night-time, indicating diel activity patterns in these foraging grounds. The high fidelity and consistency of the turtles' activity in these coastal waters rendered them vulnerable to fishing and boating activity, with a further threat posed by seagrass degradation. Our study revealed fine-scale behaviors of foraging green sea turtles and highlights the need to implement strict regulations covering seagrass beds in these areas.

Smart perception of the marine ecosystem

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The complexity of marine ecosystem requests humans to obtain and analysis of big data in order to gain effective perception. The South China Sea, connecting the Indian and Pacific Oceans, accommodates rich marine mammal species that lie on apex of the trophic levels and signal healthy ocean. There are also diverse coral reefs that support local communities' welfare. Notwithunderstanding, we are short of methods and knowledge on them and this has been limiting relevant science advances and supporting of society development. To overcome the problem, we propose smart perception methods including the WALA perception framework including unmanned sailboat etc. for marine mammals, and a real-time remote monitoring system for coral reef biodiversity and bleaching. The proposal is laid on the foundation of our recent research and cooperation. We expect to develop our partnership on smart perception of the marine ecosystem and contribute to the UN Decade of Marine Science for Sustainable Development.

Session 3: Marine disaster mitigation and pollution prevention

Report on operations of the South China Sea Tsunami Advisory Center (SCSTAC)

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The South China Sea Tsunami Advisory Center (SCSTAC), built by 9 countries: Brunei, Cambodia, China, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam, monitors major earthquake subduction zones in the South China, Sulu and Sulawesi seas and provides 24-hour uninterrupted warning services. The National Marine Environmental Forecasting Center, part of the Ministry of Natural Resources of the People's Republic of China, is responsible for the operational implementation of the warning system. Over the past ten years, through the joint efforts of the countries in the South China Sea, the earthquake and tsunami monitoring and early warning capabilities in the South China Sea have been greatly improved, and the response time for tsunami bulletin has been significantly reduced to 6-12 minutes. The SCSTAC was proposed in 2009. Subsequently, a proposal "An Outlook of Tsunami Warning and Mitigation System of the South China Sea" was submitted by China to the 24th meeting of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) in 2011. This proposal advocated countries around the South China Sea to strengthen regional cooperation and jointly establish a tsunami warning and mitigation system for the South China Sea. After that, the 25th meeting of the ICG/PTWS adopted a resolution agreeing to establish a sub-regional Tsunami Warning and Mitigation System for the South China Sea region within the framework of the ICG/PTWS. The full operation of the South China Sea Tsunami Advisory Center (SCSTAC) was started on November 5, 2019.

Convective cold pool associated with offshore propagation of convection system over the east coast of southern Sumatra, Indonesia

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The cold pool outflow has been previously shown to be generated by decaying Mesoscale Convective Complexes (MCCs) in the Maritime Continent. The cold pool also has a main role in the development processes of oceanic convective systems inducing heavy rainfall. This study investigated a cold pool event (1-2 January 2021) related to a heavy rainfall system over the coastal region of Lampung, southern Sumatra, within a high-resolution model simulation using a regional numerical weather prediction of the Weather Research and Forecasting (WRF) with convection-permitting of 1 km spatial resolution, which was validated by satellite and radar data observations. It is important to note that the intensity, duration, timing, and structure of heavy rainfall simulated were in good agreement with satellite-observed rainfall. The results also showed that a cold pool (CP) plays an important role in inducing Mesoscale Convective Complex (MCC) and was responsible for the development of an offshore propagation of land-based convective systems due to the late afternoon rainfall over inland. This study also suggests that the propagation speed of the CP 8.8 m s-1 occurring over the seaside of the coastal region, so-called CP-coastal, is a plausible mechanism for the speed of the offshore propagating convection, which is dependent on both the background prevailing wind and outflow. These conditions help to maintain the near-surface low temperatures and

inhibit cold pool dissipation, which has implications for the development of consecutive convection.

Development of the Southeast Asia Ocean Forecast System

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The construction of marine environment prediction and disaster early warning system in Southeast Asia is a systematic project integrating marine observation, model development, prediction service, disaster early warning and regional cooperation. It mainly includes five parts: the construction of wave tide current coupled numerical prediction system, the verification of marine observation and prediction model system, the operational operation of prediction system and the release of service products Prediction and early warning of marine environmental disasters and emergencies, disaster assessment, capacity-building, popularization and application.

A wave tide current coupled numerical marine environment prediction and prediction system in Southeast Asia is established in the way of triple nesting of the world, Southeast Asian waters and offshore waters of Southeast Asian countries, with horizontal resolutions of 10km, 4km and 1km respectively. After three years of independent third-party test, the prediction accuracy of the prediction system has reached the international level of ocean prediction system with the same resolution.

The Southeast Asian marine environment prediction system constructed by the project is the first set of operational marine prediction system in Thailand, Malaysia and Cambodia, which has greatly improved the marine environment prediction ability of relevant countries. Relevant prediction products have been released in the host country and the Western Pacific branch of IOC through network and mobile phone. At present, the forecasting system has become the official marine forecasting system of Thailand and is published on the official website of the National Meteorological Administration of Malaysia. After the shipwreck in Phuket, Thailand in July 2018, the project team timely started the disaster response mechanism of the prediction system, quickly provided the scope and direction of search and rescue, and won high praise from the Thai government.

SFANet for coastal zone change detection

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Coastal zone has become an important area for the study of global change. Remote sensing technology has been widely used in coastal zone monitoring due to its numerous advantages. Therefore, in this paper, Chinese GaoFen 1 Wide Field of View (GF1WFV) multitemporal data are used owe to its short revisiting period. Multitemporal change type identification in costal zone is achieved by firstly extracting the slowly changing features through slow feature analysis network (SFANet) and then identifying types of change with some category labels through long short-term memory (LSTM) network. Experimental results have shown the effectiveness of SFANet feature and LSTM. This study can provide technical feasible scheme and theoretical support for the analysis of coastal zone land change.

Occurrence and abundance of microplastics in coral reef ecosystem of Peninsular Malaysia

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Microplastics (MPs) are plastics with size less than 5 mm. They are abundant in the marine environment as a result of degradation from larger plastic debris or discharged from the sewage. Globally, the research interest on impacts of MPs on marine organisms especially coral reef are rising. It is essential to understand the impacts of MPs in coral reef ecosystem because it serves as a backbone for almost twenty-five percent of marine species. In this study, we investigated the distribution and characteristics of MPs present in seawater, zooplankton, fish, and coral in fringing reef located at Cape Rachado, Malaysia. Preliminary results showed MP abundance in seawater ranging from 0.0249 MP/m3 to 0.3076 MP/m3 across the transects selected for study. In coral, 0 - 20 MPs/individual was observed inside the skeleton of coral. The predominant shape of MPs in both seawater and coral samples were fibre shaped. This research cannot provide a clear picture on the MP contamination level in Malaysia since it only represents the baseline level of MP pollution in the coral reef of west coast of Peninsular Malaysia only. Hence, a comprehensive study must be conducted by extending the sampling to the coral reef located at the east coast (South China Sea) to further reveal the actual MP contamination level. The baseline data of MP pollution is very important for proposing the mitigating strategies for the ocean health.

Microplastic pollution in the Beibu Gulf of the northern South China Sea

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Microplastics were studied in the Beibu Gulf, the northern of the South China Sea. The abundances of microplastics in seawater were 0.669 particles/m3, while in sediment were 4.33 particles/kg (dry weight). The abundances of microplastics in coastal area were greater than off coastal area, indicating that the important contribution of human activities, especially higher microplastic abundances were found in the seawater and sediment adjacent to the urban area. The shape, color, size and composition of the microplastics were also determined. In seawater the fragments contributed the most as 92.38%, and 56.0%, 44.0%, 53.23% of white color, 1-2 mm size distribution, polystyrene (PS). In sediment the most abundant of microplastics were fibre (82.93%), Black (66.83%), 0-1 mm size distribution (50.04%) and PY (39.54%). The abundances of microplastics in off cosatal sediment were only slightly lower than the coastal sediment, indicating that microplastic is readily to transport and bury in open area sediment. This study provides present data of microplastics in the Beibu Gulf, supporting further investigation of transportation fate and the behavior of this emerging pollutant from coastal zone to the South China Sea.

Microplastic research in the South China Sea

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Marine plastic pollution is a global, transboundary problem. It poses a growing threat to the marine ecosystem's safety and potentially to human health. The South China Sea (SCS) is recognized as a global hotspot for plastic pollution. A fundamental understanding of the current plastic pollution status is important for countries in the region. As an important part of plastic pollution, microplastic pollution remains an under studied problem. Studies on the input, transfer, accumulation and sink of microplastic in the SCS will help us to fill the information gap and find ways to deal with the problem. A review on the microplastic research done in the SCS will be presented and the importance of using standardized sampling and analytical methods will be emphasized.

Session 4: Future cooperation on marine scientific research

The extension of South China Sea western boundary current on the Sunda Shelf: A brief overview

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The extension of SCS western boundary current started at the southeast of Vietnam's shelf flow southwestward along the shelf which is known as Vietnam Shelf Currents (VSC). The bifurcation of VSC occurs in between the Gulf of Thailand (5 - 8 °N, 103 - 105 °E). The bifurcation is divided into two parts is the first one is directly flows westward and joins up into the anti-cyclonic eddy inside the GoT. while the second part is flowing southward and continues along the East Coast of Peninsular Malaysia (ECPM). The large extension of the data from Hybrid Combination Ocean Model (HYCOM) was used to study the dynamics of the boundary currents along the Sunda Shelf. The value of the Surface Kinetic Energy (SKE) which indicates the boundary currents in Sunda Shelf is about 0.025 - 0.05 m/s. The detailed analysis of this current system has shown important characteristics that might be vital in understanding the dynamics of this shallow water coastal current as part of the larger system of SCS through flow.

China-Cambodia marine cooperation and relevant capacity building

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Since the signing of the Memorandum of Understanding on China-Cambodia cooperation in the marine field, China and Cambodia have conducted a series of cooperation in the areas of Marine Spatial Planning and Ocean Observation Technology. National Ocean Technology Center, MNR, China and DMCC, GDANCP, MoE, Cambodia cooperating in Cambodia Marine Spatial Planning research, China-Cambodia Joint Ocean Observatory, China-Cambodia Marine spatial Planning Joint Laboratory and Cambodia Marine Spatial Planning Information System construction, the next step is to establish China-Cambodia I cooperation platform for coastal zone planning, continue to deepen the marine technology and capacity building cooperation.

An introduction to a New-Generation Real-time Forecasting System for the SCS Marine Environment (NG-RFSSME)

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A New-Generation Real-time Forecasting System for the SCS Marine Environment (NG-RFSSME) is introduced in this talk. The NG-RFSSME was developed based on a two-way coupling frame of ocean and atmosphere, consisting of four forecasting components: atmosphere, ocean, storm surge and ocean waves. A multiple nesting technology is employed for the dynamical downscaling of the air-sea processes from the global scales to regional scales, i.e., the Global-SCS-Pearl River estuary (Great Bay Area), to achieve a refined and rapid forecasting of the marine environment for the key areas (such as the Great Bay Area) in the SCS. A number of innovative technologies, including the "Scale Selective Data Assimilation" (SSDA) technology, the "Multi-Scale Three-Dimensional Variational Assimilation" (MS-3DVAR), the new parameterization schemes of air-sea interface momentum flux, the wind-induced nonbreaking-wave mixing and tide-induced mixing, have been developed and incorporated into NG-RFSSME. An evaluation based on observations shows that the NG-RFSSME significantly improved the forecast skills for atmospheric and oceanic states in the SCS, especially for the typhoon track and ocean temperature and salinity (with an improvement of about 15-50%). The NG-RFSSME and the related data products have been used in many marine or meteorological operational departments of local government and navy, and thus it has played an important role in disaster reduction and prevention, social and economic construction, and so on. Besides, the NG-RFSSME has also been providing marine environment forecast service for the scientific survey cruises in the South China Sea and the eastern Indian Ocean sponsored by the National Natural Science Foundation of China since 2010. As such, it was awarded the first prize of the "Science and Technology in Ocean Engineering" in 2018.

Construction of in-depth observation system in the South China Sea-Gulf of Thailand

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We hope to conduct in-depth cooperation with countries around the Gulf of Thailand to actively explore multi-angle cooperation in global warming, Marine deoxygenation, coastal ecological environment, physical ocean and nearshore dynamic environment, global climate change, and regional coastal response. To explore structural variation in the marine circulation of the "Gulf of Thailand – Southern South China Sea" and its impact on marine ecosystems. To study the impact of the sea air feedback process in the shallow waters of eastern Malaysia on the summer wind outbreak in the South China Sea. To understand characteristics, variants and association of the oceanic environment changes in "Gulf of Thailand – the southern South China Sea" region with ENSO and IOD events.

ASEAN-China potential collaboration on marine science research during the Covid19 global pandemic situation

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The ocean is now facing a triple threat, i.e., become warmer, more acidic, and less oxygen. Moreover, the marine environment will eventually change following the global change. Therefore, marine science research is necessary to enhance our knowledge and to understand deeply of our ocean. However, we also face a Covid19 global pandemic that prevents active collaboration due to limited activities. Therefore, we need to seek a way for concrete cooperation during these periods. Here we present the alternative route for the ASEAN-China collaboration activities, especially regarding the marine research in South China Seas and Sunda Shelf area. Several kinds of desktop studies (meta-analysis/ systematic literature review, or by using hindcast data) are proposed. The researchers across nations in Southeast and East Asia are invited to collaborate for the studies.

Improve scientific decision-making in ocean governance, realize marine sustainable development

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Marine sustainable development is the common goal of scientific research, management, society, and economic development, and the primary task of scientific decision-making in ocean governance. We use quantitative evaluation and analysis methods to systematic assessment of ocean status, support management needs and provide policy support through marine space planning, build laboratory open platform, and serve the development of national blue economy. In the future, we will carry out research through the combination of theoretical research, method exploration, data mining and institutional design, to serve the management of natural resources and the construction of sustainable marine development, and promote global ocean governance.

Legal framework for international cooperation in marine scientific research

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The presentation aims to provide an overview of legal framework for international cooperation in marine scientific research, especially the 1982 United Nations Convention on the Law of the Sea (UNCLOS) as well as relevant national legislations and regulations of Viet Nam. This presentation hopes to inform the Workshop of Viet Nam's perspective, approach, principles, and priorities for international cooperation in marine scientific research; thus exploring possible areas of common interest for future marine scientific cooperation in the South China Sea.