their evolution. The REE pattern and spider diagram of the samples of this study show OIB like pattern. The 87Sr/86Sr value range is from 0.70460±23 to 0.70624±15, and 206Pb/204Pb value is from 18.241±16 to 18.599±15, 143Nd/144Nd value is from 0.512646±8 to 0.512826±7, 176Hf/177Hf value is from 0.282830±7 to 0.282967±6, which show that their magma source differs from EMI to EMII. The ocean-island-basalt-like geochemistry and isotopic composition of the WPSP seamounts contrast with those formed by purely deformation-related shallow mantle-derived volcanism, favoring the role of a long-lived mantle anomaly in their origin. Finally, new 40Ar/39Ar age show that these seamouts formed in ~97Ma and ~106Ma, and may have been formed in multiple-stages.

Diversity Fish Sound Types in the Pearl River Estuary, China

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The repetitive species-specific sound enable identifying the presence and behavior of soniferous species by acoustic means. Passive acoustic monitoring has being widely applying to monitor the spatial and temporal occurrence and behavior of calling species. In this study, we analyzed the underwater biological sounds in the Pearl River Estuary, China and uncovered a diversity of 66 types of fish sound. Besides single pulse, sound tend to poses a pulse trains structure with a maximum zero-to-peak sound pressure level over 164 dB. A total of 1408 suspected fish calls, comprising 18942 pulses were qualitatively analyzed by custom made acoustic analysis routine. Pulse was characterized by about 8 ms in duration, with a peak frequency varying between 500 and 2600 Hz and majority of the energy below 4000 Hz. The inter pulse-peak intervals (IPPIs) of majority multi-sections call types were median at 9 or 10 ms. Comparisons of our acoustic data with the signature sound of local fish species thorough literature review suggest call types of 1+1 and 1+N10 might belong to big-snout croaker (Johnius macrorhynus) and 1+N19 might produced by belanger's croaker (J. belangerii). The categorization of the baseline ambient biological sound is an important first step. For the next step, identifying the species producing each sound is needed. Localization and mapping of the spatial and temporal patterns of soniferous fishes will not only helpful for the protection, management and effective utilization of the local fishery resources, but also useful in marine environmental impact assessment. The fine-scale distribution pattern of soniferous fishes can also aiding the conservation of the dolphins. Additionally, prey and predator relationship can be observed when a database of species identified sounds will be completed.

Bycatch of Finless Porpoise in China's North-Eastern Coastal Fisheries

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The narrow-ridged finless porpoise (Neophocaena asiaeorientalis) is predominant in China's northeastern waters, but anthropogenic pressures seem to cause a continuous decline of its population. It is inferred that bycatch in coastal fisheries might be likely the most immediate and serious threat to porpoises, but none makes quantitative investigations on threat ranges and levels. Questionnaire surveys should be conducted among fishermen on their fishing gears and methods, the intensity and frequency of porpoise bycatch in fisheries, as well as their attitudes to trapped and injured porpoises. Facts might promote governments to take measures for mitigating porpoise bycatch in coastal fisheries.

Relationship between the Symplectoteuthis oualaniensis Resource and Environmental Factors in the Central South China Sea in Spring

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Variations of Symplectoteuthis oualaniensis resource was studied in the central South China Sea in spring (March to May) during 2006-2010, using standardized catch per unit effort (CPUE) based on Generalized Linear Models (GLM). The relationship between Symplectoteuthis oualaniensis abundance and environmental factors, including satellite remote sensing sea surface wind (SSW), sea surface temperature (SST) and chlorophyll a concentration (Chl-a) were analyzed. Results showed that Symplectoteuthis oualaniensis resource increased as while as SST raised in the range of 25~28.5 ℃ and Chl-a decreased in the range of 0.1~0.16 mg/m3. The maximum CPUE of Symplectoteuthis oualaniensis appeared when SST varied in the range of 27~28.5℃ and Chl-a changed between 0.1~0.13 mg/m3. The peak value of Chl-a appeared in March, which was one of the breeding months of Symplectoteuthis oualaniensis. The peak value of the Symplectoteuthis oualaniensis resource appeared in May. Response of Symplectoteuthis oualaniensis to Chl-a delayed for about two months. In addition, resource abundance of Symplectoteuthis oualaniensis in spring of 2008 fluctuated in wider range, partly connected with climate change induced by La Nina in 2007-2008. Results of this study were meaningful to understand variations of

Symplectoteuthis oualaniensis, to guide for scientifically fishing, and to develop fishery resources in the central South China Sea.

Analysis and Forecast of Coupling Coordinative Development on the Economy−Resources−Environment in Coastal Cities of Zhejiang Province

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Taking the Economy−Resources−Environment as an open system with complex structures and coupling relationship, the coordinated relationship of the three subsystems is the prerequisite and basis for regional sustainable development. Based on the statistical data of 7 cities in the Zhejiang province, this paper firstly established the evaluation system of the Economy−Resources−Environment toassess the comprehensive development level of the whole coupling system and its subsystems in the coastal cities of Zhejiang provinces, respectively, weighted byentropy method. Secondly, the coupling coordinative degree of all coastal cities in Zhejiang province were calculated in temporal and spatial dimensions based on the coupling coordinative degree model derived from the capacity coupling coefficient model in physics. Finally, the trend of the coupling coordinative degree in coastal cities of Zhejiang province were predicted by R/S analysis. The results show that there is no significant fluctuation in the development level of the coupling system in different cities, and the trends of the coupling coordinative degree in coastal cities maintain stable, but the coordinative relationship differs in different cities. The coupling coordinative degree in most coastal cities will basically present a slight increase in the future.

Tissue−specific responses of antioxidant systems in marine mussels following complex in vivo exposure to heavy metals and BaP

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Organic and inorganic contaminants presented all over the world caused destructive effects to marine organisms and environment. Among them, heavy metals and Benzo[a]pyrene (BaP) are typical persistent pollutants and have been demonstrated to have the ability to induce oxidative stresses in marine organisms. However, current resear−ches on the responses of antioxidative enzymes activities in marine organisms to complex contaminants are rare. The aim of this research is to detect the tissue−specific responses of antioxidant systemsinmodel marine mussel after in vivo exposure to heavy metals and BaP, either single or in combination. The variation of antioxidative enzymeac−tivities were standardized and mea−sured, including the activities of superoxide dismutase (SOD), catalase (CAT), total antioxidant capacity (TAC). Mussels were exposed to complex heavy metals (Cu, Cd, Pb) and/orBaP under in vivo conditions. Samples of single cell suspension, isolated from haemolymph, gills and digestive glands, were collectedfor the observation of the antioxidative enzymes activities. Tissue−specific responses were presented and a higher sensitivity was found in haemolymph. Intimate correlation was found in measured enzymes indicated strong connection of antioxidant system in the stress response in mussels. No significantly increased level of antioxidative enzyme was found after the combined exposure suggesting the damages caused by applied heavy metals and/or BaP may not be completely via the oxidative reactions. As far as we know, this is the first time to use single cell suspension, especially from different tissues of marine mussels, to measure the activities of antioxidative enzyme reactions under the complexenviron−mental contaminants exposure. The results and testing model will provide valuable information and be utilized as a sensitive tool in the explanation of stress responses mechanisms, especially in relation to tissue functions in marine organisms in the future.

Variation of Micobial Community during Succession of M. rubrum to Dinophysis Bloom

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As a causative species of diarrhetic shellfish poisoning (DSP) events, Dinophysis acuminata is widely studied on its growth and toxicity. Prevalence of the diarrhetic shellfish toxins caused by Dinophysis is always attributed to both abiotic and biotic factors in the water column. However, insights have never been given into role of microbial community during the succession of M. rubrum to Dinophysis bloom which involves in intense mixotrophy and toxins release process. In our following trials, we intend to elucidate the two following queries, 1. Mixotrophy−mediated nutrient release andthe potential consequences to the microbial community in Dinophysis culture; 2.Specific connections among nutrients, bacteria, and toxins production of Dinophysis during the succession. All the taxonomic information will be translated into a functional matrix. Inorganic and organic nutrients will be measured as potential explanation for the shift of both taxonomic and functional group in the medium. Toxin content will be an important variation included in our data analysis. Significant connections among biotic and abiotic factors will be plotted in a network based on local similarity analysis which excelled at capturing time−shifted correlations between objectives. Our results will sheld light on the role of microbes in ecological and metabolic process of Dinophysis population and individuals, respectively.

Effects of submergedaquatic macro−phyteMyriophyllum spicatumon−nutrient bioextraction and microalgae growth inhibition in an enclosed sea area of Hangzhou Bay, China

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Myriophyllum spicatumis generally considered as a fresh water submerged−aquatic macrophyte. However, nutrient

bioextraction and microalgae growth inhibition using M. spicatumwas tested at an enclosed sea area of Hangzhou Bay, during the summer and fall of 2016. M. spicatum-could survival and grew well after suspension-cultivated in 0.5m underwater. During the period of cultivation from the end of August to October,M. spicatum grew up to 6.23% day-1. Average tissue carbon (C) , nitrogen (N) and phosphorus (P) contents in the plant dry matter were 39.18%, 3.89% and 0.35%, respectively. The estimates of C, N and P assimilation by M. spicatum over a 70-day growing season were up to 3279.39kg and 360.61kg and 26.97kg, respectively. Concentration of dissolved inorganic nitrogen (DIN) and PO4-P in the enclosed sea with cultivation of M. spicatum significantly lower than in the enclosed sea without cultivation of M. spicatum (p<0.05). The concentration of NH4-N, NO3-N, NO2-N and PO4-P after M. spicatum cultivation was decreased by 47.92%, 58.28%, 36.40% and 55.57%, respectively.The density of phytoplankton in M. spicatum cultivation sea area decreased from 1064.60 × 104 cells L-1 to 12.85 × 104 cells L-1, and significantly lower than non-cultivation sea area. The density of Microcystis aeruginosa and M. incerta, which were the usual species of algal bloom, in the enclosed sea with cultivation of M. spicatum was significantly lower. In addition, species diversity and evenness was significantly increased after cultivation of M. spicatum in the enclosed sea. These results indicated that submerged aquatic macrophyte M. spicatum aquaculture can be a useful technique for nutrient bioextraction and microalgae growth inhibition in wild low salinity sea water.

Keywords: M. spicatum;*Nutrient bioextraction; Enclosed sea area*

Heterologous Expression of Secondary Metabolites Biosynthetic Gene Clusters from Aspergillus sp.Z5

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Marine microorganisms are recognized as a new source of therapeutic leads and are shown to be capable of producing a large number of diverse natural products with novel structure and biological activities. The increasing number of microbial genome sequences demonstrated that their biosynthetic potential is far from being exploited. The vast majority of the bioinformatically discovered biosynthetic gene clusters are silent under the laboratory conditions. We have isolated Aspergillus sp. strain Z5 from the gut of marine isopods. Based on its whole-genome sequencing and bioinformatically analysis, we predicted strain Z5 had 89 secondary metabolite biosynthetic gene clusters, but many were normally silent under currently culture conditions. To awaken these silent gene clusters, we will construct expression cassette of these silent gene clusters by yeast homologous recombination system, placing genes under control of constitutive promoter or inducible promoter, expressing them into A. nidulans. We will clarify the biosynthetic pathway and identify new compounds. Our results will allow the development and application of natural products from the marine Aspergillus sp. strain, and facilitate the biosynthetic research on marine fungal secondary metabolites.

Keywords: *Secondary metabolites; Biosynthetic gene clusters; Silent gene clusters; Aspergillus; Heterologous expression system; Yeast homologous recombination system.*

Poster:

Marine Eco-systems, Bio-resources and their responses to global changes

Complex Genotoxic Effects of Heavy Metals on Marine Mussels

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Marine ecosystem and environment are facing intensified multiple stresses caused by environmental contaminants from human activities. Heavy metal is one of the representative persistent pollutants, which is stable and difficult to break down after introduced into water. A few studies were focused on the toxic effects of single kind of heavy metal to marine environment and organisms, which cannot truly reflect the combined pollution in real world. The aim of this study is to investigate the complex genotoxic effects at different tissues of marine mussels and to explore the correlation between two genotoxicity testing methods. Mytilus spp.was selected as model organisms to analyse the complex genotoxic effects of heavy metals. Mussels species were identified by specific designed molecular probes to avoid the viability caused by species difference. An in vivo exposure to different composition of heavy metals was constructed for 6 days. Triplicated mussels were collected and dissected at day 0, 1, 3, 6. Cells of haemolymph, gill and digestive gland were isolated for the detection of DNA damages using comet assay and micronucleus test. The results showed relative higher damage under complex exposure condition comparing to single chemical exposure, suggesting that marine organisms may employ different response system or biotransformation mechanisms to survive under variety stress. Tissue specific-responses were also detected, indicating that the function of tissues may play a key role during anti-stress procedure. Time-dependent response was also observed during 6 days exposure suggesting the bioaccumulation of heavy metals in mussel tissues which can further causing different genotoxicities. In addition, data of MNi induction was in good agreement with that of comet assay in all isolated cells, which make it possible to shed light on the future mechanism research by comparing the principles of different testing methods.

Keywords: *Marine mussels; In vivo experiment; Genotoxic effect; Combined exposure; Heavy metals*

Cytotoxicity Induced through the Food Chain in Haemolmph of Mytilus sp. after Copper Exposure

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Nowadays, more and more pollutants which can cause severe impacts on the health of marine lives have been discharged into the ocean. Heavy metals (e.g. Cu) are the most important types of marine pollutants and showing relatively high concentrations in marine ecosystem. Previous researches focused on the analysis of the bioaccumulation of Cu in different marine organisms to indicate the concentrations of such pollutants in marine environment. However, marine organisms, especially filter feeder (e.g.

marine mussels) can absorb heavy metals both from water column and feeding microalgae through food chain, and then cause severe damages after the bioaccumulation. This study aimed to detect the biological effects of Cu in marine mussels, and the differences caused through the food chain by measuring sensitive cytotoxicity biomarkers, including cell viability, micronucleus frequency and DNA strand breaks in the haemolymph of Mytilus sp.. The experiments were conducted by setting up 4 different exposure groups, either through the food chain or not, and 1 blank control. After 6 days exposure duration, musssel haemocytes were isolated to measure the cell viability, followed with micronucleus test and comet assay. The results showed that the micronucleus test and comet assay were more sensitive than cell viability assay, indicating the variety of sensitivities of biomarkers. There was no significant responding difference between the exposure of Cu through food chain and directly through water column, indicating that the cytotoxic impacts may be more closely related to the total exposure concentration rather than the food chain. However, more studies are required for further confirmation. The application of the various biomarkers in marine mussels was proved to be informative to indicate the differences of the cytotoxicity response in the haemocytes, which can be utilized in other marine organisms in the future.

Keywords: *Cytotoxicity; Cu; Food chain; Haemocytes of marine mussels*

Genome Mining of Biosynthetic Gene Clusters in Marine Aspergillus sp. Strain and Constructing Its Genetic Transformation System

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Secondary metabolites (SMs) derived from marine fungi have attracted more attention for their novel structure and biological activities. In this study, marine fungus Z5 in the Ligia oceanic intestine was isolated and identified as Aspergillus sp..The genome of Aspergillus sp. Z5 was sequenced using the Illumina Hiseq 2000 technology. Based on the assembly, the genome size was estimated to be 33.8 Mbp with a GC content of 50.5%. A total of 89 SMs biosynthetic gene clusters and partial clusters were predicted in Aspergillus sp. Z5 by antiSMASH analysis, including 10 non−ribosomal peptide synthetase (NRPS) clusters, 10 polyketide synthetase (PKS) clusters, 8 terpene clusters, 2 PKS/NRPS hybrid clusters, 1 terpene/PKS cluster, and 58 clusters designated "putative" or "other". Theresult showed that the strain Z5 potentially synthesize many kinds of SMs. However, most of them were silent under the currently culture condition. In order to explore these SMs of strain Z5 by the genetic manipulation, we optimized the preparation of fungal protoplast with the enzyme mixture, and verified the PEG−mediated transformation method. Our results showed that pretreating hyphae by β−mercaptoethanol, digesting hyphae with the four−enzymes mixture, and then purifying protoplasts by sucrose fractionation could obtain high quantity of regenerative protoplasts. After obtaining the protoplast by our optimized method, the right transformants were yielded by the PEG−mediated transformation. This study is the essential basis of biosynthetic research and application for the marine Aspergillus sp. Z5, and also provides an important resource of novel natural products derived from marine fungi.

Keywords: *Secondary metabolites; Aspergillus; Biosynthesis; Genome sequencing; Gene clusters; Genetic transformation system; Protoplast*

Genotoxic Impacts Induced in vitro by Complex Heavy Metals on Isolated Haemocytes of Marine Mussels

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Along the development of social economics, environmental pollution by xenobiotics can be seen all over the world. In particular, various heavy metals are discharged into marine environment and causing serious impacts on marine organisms and human beings. Currently, model marine organisms, especially marine filter feeders (e.g. Mytilus galloprovincials), are used in the detection of diverse xenobiotics induced toxic effects, however, the experiments are usually time and cost consuming. Aiming to improve the examining conditions, isolated haemocytes were applied as a rapid tool to assess the environmental contaminants induced genotoxic responses in this study. Heavy metals (Cu, Cd, Pb), either single or in combination, were selected as representative environmental contaminants. Two genotoxic biomarkers were detected, including DNA damage measured by single cell gel electrophoresis (SCGE) and chromosome aberration by micronucleus assay (MNi) respectively, in order to verify the ability of the in vitro model. Results showed that single heavy metal can induce increased genotoxic effects in haemocytes, however, the increasing trends were different under different exposure conditions, suggesting the chemical−specific response in haemocytes. Moreover, data for MNi induction was not in good agreement with that of SCGE assay in the in vitro model, indicating it may not be suitable for explaining the relationship between time dependent responses. Increased genotoxic effects were also detected under the combined exposure, suggesting the complex heavy metals may induce addictive genotoxicity in isolated haemocytes. In the comparison of two genetic biomarkers, DNA strand breaks showed significant differences among the different treatments, suggesting higher sensitivity to applied conditions. To our knowledge, this is the first research on complex effects of complex heavy metals using freshly isolated mussel haemocytes. The utilization of the in vitro model could provide a rapid tool to investigate the potential xenobiotics metabolic mechanism in marine invertebrates and monitor environmental health.

Keywords: *Haemocyte ofmarine mussels; In vitro experiment; Genotoxic effect; Complex heavy metals*

Session 3:
Seafloor Resources and Oceanic Crust

Discussion for the Submarine Gas Hydrate Resources in the North-Western Part of Pacific Ocean

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Margins of Pacific Ocean presents numerous gas hydrates sites, distributed as Gas hydrates Provinces (referred to the offshore areas) which can be combined to the East Asia Gas hydrate Belt. Gas (mainly methane) hydrates accumulation induced by varies active geological features determined by geodynamic and tectonic type and seismic state's of Pacific and adjoining lithosphere plate's borders. Bering Sea, Okhotsk Sea, Japan Sea, East-China Sea, South-China Sea and southward to New Zealand offshore exposed methane hydrates distribution in sediments. Hydroacoustic, seismics, coring and geochemistry were a prime methods applied to gas hydrate searching and exploration. Methane hydrates was explored since 86-th (Okhotsk Sea). The distribution of gas hydrates are related genetically with hydrocarbon accumulations within the thick Cenozoic sediment basins (up to 10 km thickness), and controlled particularly by active faulting belongs to transform and convergent plate's borders. Fracture type gas hydrate sediments filling is the most promising (massive gas hydrates). Accretionary prisms along the subduction zones considered lithology gas hydrate filling (dispersed gas hydrates). Modern high seismic activity cause fault's activities that break through the sea floor and create a favorable gas-permeable state along shear zones. Submarine gas seepage usually accompanied by contrast seismic and acoustic anomalies in the sediments and water column (up to 700 gas flares prior to 2015 indicates gas hydrate fracture type accumulation in Okhotsk and Japan Seas). We recovered gas hydrates up to 35 cm thick pieces by hydrocoring. Pleisto-cene–Holocene is most studied gas hydrate bearing sediments (upper hydrate distribution, coring sampled 0–10 meters bsf). Second floor of gas hydrate was proved by drilling e.x. in the northern South-China Sea for 170–230 m bsf (Wu, 2011). Methane origin discussed as mixture of abiogenic, metamorphic, thermogenic and biogenic gases. Methane resources trapped in Western Pacific gas hydrates can be estimated based on latest investigations at least for 5×10^{14} cubic meters, but this under big discussion: sediment filling by gas hydrates are sharply vary and most areas does not saturated more than 0.1% vol. Very new gas hydrates were found by us in the north of Japan Sea and in the south-west of the Sea of Okhotsk in 2015–2016. Joint research will continue in 2017.

Keywords: Gas hydrate; Methane; Resources; East Asia, Western Pacific

Typhoon effects on large-scale coastal-beach morphological patterns

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Coastal evolution is a complex, nonlinear physical process which can take place over a wide range of temporal and spatial scales. While spatial scales of morphological changes are often associated with the temporal scales of coastal processes, storm events with unusual high energy might have potential to break the order or boundaries. This study investigates the large scale spatial variation behavior of beach morphology under the influence of Category 5 super typhoon RAMMASUN using the beach profile data along 600 km shoreline around Hainan Island, China. Field surveys were taken in June 2014 and August 2014 by Trimble RTK-GPS, and the morphological elements including submerged slope, beach slope, shoreline position, beach volume, sediment size and profile azimuth are used to assess the morphological change during this period. Wave, tide and current fields are modeled by TELEMAC to discuss the dynamic mechanism for typhoon induced coastal-beach change. It is found that the beach volume loss was occurred on coast with over 100 km length alongshore, which is the most reliable indicator to describe the coast change while beach slope and shoreline change is related to the beach shape before typhoon. The configuration and submerged slope of coastline play important roles in allocation of wave energy and storm surge, and then varies the storm impact on smaller scales of coast.

Keywords: Typhoon; Beach; Morphology; Hydrodynamic model; South China Sea

On the origins of very high Fe and REE concentrations in some black smoker fluids: Evidence from experiments with gabbro up to 475 ° C, 100 MPa

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Black smoker hydrothermal fluids are typically characterized by high contents of dissolved metals leading to the formation of metal-rich sulfide deposits. In contrast, the rare-earth element (REE) contents of black smoker fluids are typically low. Most hydrothermal MOR vent fluids sampled worldwide have a remarkably uniform, typical REE_{CN} signature, which is characterized by an enrichment of light REEs (LREE, La–Sm) relative to heavy REEs (HREE, Gd–Lu), and a pronounced positive Eu anomaly in chondrite-normalized (REE_{CN}) plots ('typical' pattern in Fig. 1). This typical fluid REE CN pattern appears to be largely independent of host rock lithology suggesting that fluid-rock partitioning of REEs must be largely controlled by their speciation in high temperature low-density fluids.
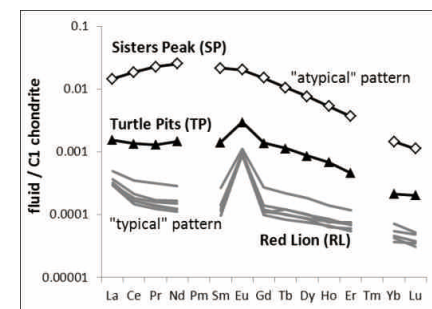
Fig. 1. Chondrite-normalized REE$_{CN}$ patterns of vent fluids emanating at 5° S MAR (Schmidt et al., 2010). Red Lion vent fluids have 'typical' REE$_{CN}$ pattern characteristic for MOR vent fluids worldwide. Fluids from adjacent Sisters Peak vents have very high REE contents and display an 'atypical' REE$_{CN}$ signature.

More recently, black smoker fluids with very high REE concentrations were sampled from Mid-Atlantic-Ridge (MAR) near 5° S (Koschinsky et al., 2008, Schmidt et al., 2010), and at East Scotia Ridge (ESR) back-arc spreading centre (Cole et al., 2014). The REE$_{CN}$ patterns of these fluids are significantly different from the typical REE signature of vent fluids and exhibit a relative enrichment of middle REEs (MREE, Nd–Dy) and no, or even slightly negative, Eu anomaly (atypical pattern in Fig. 1). The MAR 5° S vent fluids with in situ temperatures of more than 407 °C @ 3000 m water depth are at the critical point of seawater. The ESR fluids vent at temperatures of 348–383 °C @ 2400 m water depth and lie, again, on the two-phase boundary of seawater at these depths. All fluid samples from these two vent areas showing evidence for recent volcanic activity have lower than seawater chlorinity as a consequence of phase separation.

To understand if the observed very high concentrations of REE and metals in these fluids are a consequence of the extreme temperature and pressure conditions in these systems or, alternatively, if fluid flux, duration of water rock interaction, and resulting effective w/r have a major control we conducted a time-resolved series of hydrothermal experiments reacting gabbro (Atlantis Massif, IODP Leg 305)

with both normal bottom seawater and synthetic NaCl solutions with and without Mg, Ca from 300–475 °C and 40–100 MPa.

Under the experimental conditions investigated in this study (Beermann et al., 2017) temperature and pressure did not affect fluid REE patterns. In sharp contrast, the w/r ratio dominantly controlled both fluid REE patterns and REE and Fe contents. Fluid REE and Fe, Mn, Si, and Ca contents were highest at a w/r ratio of 5, and within only a few hours of seawater–gabbro interaction. Increasing run duration and decreasing w/r both led to decreasing fluid REE contents and fractionation of REE$_{CN}$ patterns towards relatively higher LREE and lower HREE, respectively. In addition, Eu was increasingly lost from the fluids due to re-deposition in secondary alteration products. We can show that REE fluxes from submarine hydrothermal vent fields are extremely high when acidic fluids react at high w/r ratios with fresh rocks (but also variously altered rocks that are not significantly depleted in REEs).

Such reactions of heated seawater with 'fresh' rocks can be expected in volcanically active areas and along recent volcanic-tectonically actuated crustal faults that are not uncommon along slow-spreading ridges. This suggests that contemporaneous tectonic activity exposing fresh rocks and opening pathways for hydrothermal fluid flow might exert a major control on vent fluid chemistries. Furthermore, our results indicate that temporal variation of vent fluid compositions (notably Fe, Mn) as reported from young post-eruptive systems might rather be a consequence of changes in fluid flux and effective w/r than elevated temperature (Butterfield et

al., 1997; Von Damm, 2000). Consequently, high element fluxes of e.g., REEs and Fe being kinetically driven in such activated systems must be taken into account when modelling chemical fluxes or calculating mass balances for oceanic hydrothermal systems.

Eh sensors technique application in finding active and non-active hydrothermal field

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Seafloor hydrothermal fluid is mainly characterized by its strong acidity (low pH) and reduction (low Eh) compared to the surrounding seawater. Eh sensor technique is a promising method and is currently widely used to discern the plume and track the active hydrothermal field due to the sensor's quick and sensitive response to seawater redox change (ΔEh). This Eh probe was easily fabricated by using elaborated Pt wire as the working electrode and using Ag/AgCl as the reference electrode. In addition, it also can help to find the non-active hydrothermal field. During the 1st Leg of the 26th COMRA cruise on the Carlsberg Ridge of the Northwest Indian Ocean, Eh sensor was deployed on Dayang Yihao R/V together with other temperature, turbidity, H$_2$S sensors, etc. And we found one hydrothermal field located at

3.5~3.8° N on the Carlsberg Ridge in which less investigation has been carried out for seafloor hydrothermal activities. We conclude that Eh value could drop sharply 70–150mV and recover to normal after 1–5 min when the Eh sensor is towed across an active hydrothermal vent; whereas ΔEh only maintains 5–20mV and lasts for 30min–1h or even longer, which means the sensor is going through the non-active hydrothermal field.

Study on the Active noise Control Based on generalized Lorenz System

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For suppressing the energy of ship radiated noise, adding the time-delay feedback control and external incentives (acoustic source) on the classic Lorenz system, this paper investigated the effect of active noise control by using the chaos dynamics. The output dynamic characteristics of generalized Lorenz system after deformation are obtained by Matlab programming, including phase trajectory, bifurcation diagram and

Lyapunov exponent, and the amplitude and frequency parameters of external excitation and the corresponding range which in quasi periodic motion, periodic motion and chaotic motion were analyzed. Implementing active noise control by adding the time−delay feedback control and external incentives(acoustic source) on the classic Lorenz system, not only the amplitude and frequency parameters of external excitation and the corresponding range which in quasi periodic motion, periodic motion and chaotic motion were analyzed, but also presented the chaos dynamic features including phase trajectory, bifurcation diagram and Lyapunov exponent. Then, quantitatively analyze the effect of noise suppression in different incentive by the acoustic energy change in the fixed frequency by spectrum. It is revealed that, the effect of noise suppression is the best when we add the lower frequency of external excitation, and the largest amount of noise reduction was obtained with two external excitation. Therefore, it is believed that we can move the spectrum of noise by adding multiple signal with similar frequency and the feedback control module, finally to achieve the effect of noise suppression.

Keywords: *Active noise control; Chaos; Radiated noise; Spectrum; Phase trajectory; Lyapunov exponent*

Mechanical Performance of Marine Sediments Stabilized with Cement, Lime and Fly Ash

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Most of previous studies concerning solidification of dredged sediments focus mainly on the strength and environmental properties, but the deformation properties have not been fully appreciated. The present study emphasizes the deformation characteristics of marine sediments by using deformation parameters. A series of unconfined compression tests were performed on about 150 standard samples of 13 designed mixes. After analyzing the stress−strain curves of different mixes at 14, 28, 60 and 90 days, the effect of binder content on peak strength and failure strain is discussed. The addition of fly ash improves the mechanical performance of lime−treated sediments, but damages the strength of cement−treated sediments. The lime−fly ash binder can substitute lime and cement−fly ash binder to solidify sediments owing to lower cost, waste recycling and good ability to gain strength. The concept of strength ratio is introduced to evaluate the development of unconfined compressive strength with curing time and binder content. By comparison, the relationship between failure strain and unconfined compressive strength is calculated as $\sigma = (20\sim130)\ \varepsilon_f$ and the failure strain ranges mainly between 1% and 2%. The development of deformation modulus is in accordance with unconfined compressive strength. A quantitative correlation $E_{50} = 119.91\ UCS$ is determined according to large quantities of test results. Finally, the microstructure of solidified sediments is observed by using scanning electron microscopy.

Keywords: *Solidified sediments; Cement/lime/fly ash; Strength; Deformation, microstructure*

Optical Fiber Ocean Bottom Seismometer−Magnetometer

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Fiber optic sensors have become promising instruments for monitoring the ocean bottom due to their high sensitivity, water resistance, feasibility in signal transmission and multiplexing, and low power. In this paper, we report a kind of optical fiber ocean bottom Seismometer−magnetometer (OOBSM) based on fiber laser sensing, which can measure acceleration and magnetic field simultaneously. The principle of the OOBSM and the theory of the decoupling the signals of acceleration and magnetic field are presented. The OOBSM was interrogated using phase−generated−carrier (PGC) method. A test of simultaneously measuring acceleration and magnetic field was performed. The results show that the responding mixed signal achieves a good SNR and prove that the function of the sensor has been realized and the theory of decoupling signal is reliable.

Keywords: *Ocean bottom; Fiber laser; Optical fiber; Seismometer; Magnetometer*

Poster:

The Exploration and Development of Submarine and Seabed Resources

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Submarine resources have been a huge treasure for all countries competing to compete. In order to obtain the ownership of this treasure, many countries have repeatedly disputes, our country on May 15, 1996 approved the "United Nations Convention on the Sea", is the world's first 93 countries that have the acceded to the Conventionhave embraced strong support for maintenance of maritime stability until the introduction of the Deep Sea Law formallyregulates the rights and obligations of country to exploit submarine resources

Keywords: *Seabed resources; Mining; Exploration*

The Seismic Geomorphology and Genesis of the Low Slope Quaternary Submarine Landslide on the Northern Margin of South China Sea

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Based on the 3D seismic datasets from the northern margin of South China Sea, this study has recognized two phases of Quaternary landslides. The older Landslide (S1) and the younger Landslide (S2), are slope−attached landslides which developed on low gradient (<2.5°) slope in water depths larger than 900 m . The older S1 has a large coverage area of ca.1490 km^2, which could be divided into three parts (S 1.1, S 1.2 and S 1.3) based on their source areas. They were sourced from the west, north and south, respectively. The western S1.1 developed on gentle slope with an average gradient of 0.85° . S 1.2 was fed from northern slope with a series of canyons, some of which had direct linkage to the canyon mouths

commonly develop on relatively higher gradient (l.5° − 2.5°) slope. S 1.3, fed from contourite−dominated Yunkai Swell in the south, also developed on the shallower slope with an average gradient of 1° and it was associated with some local faults. Comparing with S 1, S 2 significantly reduced its coverage area to 400 km² and it was almost completely sourced from the northern slope. The weakened tectonic activities and lower accumulation rates of fine grained sediments jointly reduced the coverage area of S 2, which are manifested by the lack of contourites failures from Yunkai Swell. Our results imply that fine grained sediments, including contourites, could be prone to collapse on low gradient slope under the control of strong tectonisms and high sediment accumulation. Our understanding about the origin of submarine landslides on low gradient slope is also significantly helpful in the submarine hazards prediction.

Keywords: *Seismic geomorphology; Submarine landslide; Low slope; South China Sea*

Quantitative Raman spectroscopic investigation of gas concentration in water

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Research has shown that CH_4, CO_2, H_2O, NaCl are important components of geo−fluid. The determination of CH_4, CO_2 concentrations in $CH_4-CO_2-H_2O$ system and $CH_4-CO_2-H_2O-3.5\%NaCl$ system is very significant for the processes of growth and dissolution of gas hydrate. In this paper, JY/Horiba LabRam HR800 Raman and the technology of sealing mercury for preparing samples of CH_4, CO_2 with known concentrations in a high pressure optical capillary cell are adopted to establish the quantitative function between the Raman quantitative factors and CH_4, CO_2 concentrations, to reveal the effects of the pressure, temperature, salinity, CH_4 and CO_2 concentrations on Raman quantitative factors. Our results show that: 1. Based on the comparison between the CH_4-H_2O and CO_2-H_2O system, the $CH_4-CO_2-H_2O$ system can be used to establish the quantitative function between the Raman quantitative factors and gas concentration, pressure and tempera−ture, showing that pressure has no influence on quantitative factor of CH_4 and CO_2 (PAR/mCH_4 and PAR/mCO_2) (Raman peak area ratio (PAR)), CH_4 concentration has no effect on PAR/mCO_2. However, with the increase of CO_2 concentration, PAR/mCH_4 will become smaller. PAR/mCH_4 and PAR/mCO_2 would increase with the temperature increasing. 2. Due to the lack of enough samples, $CH_4-CO_2-H_2O-3.5\%NaCl$ system can be only used to display pressure has no influence on PAR/mCH_4 and PAR/mCO_2, PAR/mCH_4 and PAR/mCO_2 would increase with the temperature increasing.3. Applied quantitative function of $CH_4-CO_2-H_2O$ system for the experiment of the growth of gas hydrate, with a $50\%CH_4-50\%CO_2$ gas mixture in the water within a temperature range from 283.15 to 293.15 K and at a pressures of 40MPa, can be used to calculate CH_4, CO_2 concentrations in hydrate growth process. Comparing with the previous calculations, the function used to calculate CH_4, CO_2 concentrations in this paper is more accurate.

Keywords: *CH_4; CO_2 gas mixture; Quantitative Raman spectroscopic; Quantitative function; quantitative factor; Influence factor*

Numerical Simulation of Multiple−Vent Hydrothermal Plume

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A computational fluid dynamics (CFD) model was developed to simulate the flow field of the multiple−vent plume with different conditions. Large−Eddy Simulation (LES) and Reynolds−averaged Navier Stokes Equations (RANS) based turbulence simulation were respectively used to reproduce the development of buoyant plumes, which were released from a circular source with initial momentum M_0 and buoyancy flux F_0 into a linear stratified environment with constant buoyancy frequency N. The LES and RANS numerical results were compared with the plume experimental results. It is shown that the LES can provide better agreement with the experiment. Meanwhile, a new formula determining the penetration of double−vent plume has been verified by using the numerical results. The characteristics of plume flow fields and turbulence such as turbulent viscosity scaling have been also analyzed quantitatively.

Keywords: *Double-vent plume; Linear stratification; Computational fluid dynamics; Large-eddy simulation; Maximum penetration;*

Session S4−1:
Remote Sensing and Physical Oceanography

An Integrated Hypersptcral and SAR Small Satellite Constellation for Ocean Environment Montoring

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A fully−integrated, Hyperspectral optical and SAR (Synthetic Aperture Radar) constellation of small Earth Observation Satellites will be deployed over multiple launches from last December to next five years. The Constellation is expected to comprise a minimum of 16 satellites (8 SAR and 8 optical) flying in two orbital planes, with each plane consisting of four satellite pairs, equally−spaced around the orbit plane. Each pair of satellites will consist of a hyper−spectral/mutispectral optical satellite and a high−resolution SAR satellite (X−band) flying in tandem. The constellation is expected to offer a number of innovative capabilities for ocean environment montoring. As test case, two hyper−spctral earth observing minisatellites, Spark 01 and 02 were launched together with a third small satellite as secondary payloads with Tansat in December 2016 on a CZ−2D rocket. The satellites feature a wide−range hyperspectral imager. The ground resolution is 50 m, covering spectral range from visible to near infrared (420 nm − 1000 nm) and a swath width of 100km. The imager has an average spectral resolution of 148 channels of 5 nm and a single satellite

could obtain 2.5 million km^2 hyper-spectral imagery per day, with global coverage every 16 days. The data currently is available for reaserch in globe ocean environment montoring.

Potential Deposition of Bio-silicon Source Sediment in the Paleo-Yangtze Grand Underwater Delta Estimated with Satellite Remote Sensing

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Bio-silicon sediment constitutes one of the critical sources of particle income in the oceans. In this paper, satellite remote sensing of primary production, sinking flux, and molar ratio of Si/C were utilized to elucidate potential bio-silicon sediment in the Paleo-Yangtze Grand underwater Delta. Primary production retrieval showed that daily primary production in the Paleo- Yangtze Grand Delta was 3.3−10.8 Mtd−1, with 5.8 Mtd−1 on average. Sinking flux, retrieved with in situ observations and satellite remote sensing, was within the range of 109−657 mg.C.m−2d−1, or about 23% of total primary production, on average. A molar ratio of Si/C of 0.45 was used in the area, for the Paleo-Yangtze Grand Delta was similar to coastal water. Considering that phytoplankton in the Paleo-Yangtze Grand Underwater Delta is mainly diatom (80% on average), about 0.88 billion tons of bio-silicon source sediment is produced in the area annually. With the reduction of land source sediment occurring in recent years in the area, bio-silicon sediment may be the dominant sediment for maintaining the future stability of the Paleo-Yangtze Grand Underwater Delta.

Oceanic Response due to Forest Fires at Riau Islands, Indonesia

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Forest fires and peatland in Riau, Sumatra often occur each year even smoke and dust up of Malaysia and Singapore. The aim of this research was to know the response of plankton due to forest fires. Water sampling was performed in 28 to 29 June 2013 and 30 June 2014 in the waters between Karimun and Batam (Riau Islands). Ocean color data from Aqua MODIS during 2013   2014 were analyzed to know the variation of Chlorophyll−a.
From the result, it was obtained that the chlorophyll−a's content is minimum in wet season (December−January) and maximum in dry season (June−August). The wind that blow in 19 to 28 of June 2013 was moved west to east with average velocity at 0.3 m/s and giving the impact for the spread of forest fire ashes in Riau Province. So the content of the nutrient has increased when forest fire happen compared when it hasn't. From the remote sensing method, it was known that the chlorophyll−a's content while forest fire occur increased compared when no forest fire, especially in June when dry season happen. Then the chlorophyll−a's content was increased at 7−41% when forest fire occurred in May−June and decreased when the wildfire occurred in January−February. If we compare it with chlorophyll−a's annual average, it was increased around 23−89% in June−July (Dry Season) and decreased around 44−50% in January−February (Wet Season).

Climatology of SST Frontal Activity in Eastern Pacific Ocean over the Past Decade

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Distribution of sea surface temperature (SST) fronts are derived from high-resolution MODIS dataset in Eastern Pacific Ocean from 2003 to 2015. Daily distribution of frontal activities shows detailed feature and movement of front and the discontinuity of the track of front cause by cloud coverage. Monthly frontal probability is calculated to investigate corresponding climatology and variability. Frontal probability is generally higher along the coast and decreasing offshore. The frontal activity could extend few hundreds of kilometers near the major capes and central Pacific Ocean. SST gradient associated with front is changing over different latitude with stronger gradient near the mid-latitude and under major topographic effects near tropics. Corresponding results from empirical orthogonal functions (EOF) shows major variability of SST front is found in mid-latitude and central Pacific Ocean. The temporal variability captures a strong interannual and annual variability in those regions, while intraannual variability are found more important at small scale near major capes and topographic features. Frontal probability in Central Pacific is significantly correlated with ENSO index. Front plays an importance role in influencing the distribution of nutrients, the activity of fisheries and the development of ecosystems.

Seasonal and Interannual Variability in Along-shelf and Cross-shelf Circulation in the Northern South China Sea

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Near-surface along-shelf geostrophic velocity anomalies in the Northern South China Sea (NSCS) are computed from along-track Sea Level Anomaly (SLA) time series using satellite altimeter data from Center for Topographic studies of the Ocean and Hydrosphere (CTOH) during 1993 − 2015. The results will be validated using current measurements from in-situ Acoustic Doppler Current Profiler (ADCP) observations. Long-term along-shelf geostrophic current velocity anomaly volume transport shows a seasonal cycle of northeast-ward during

summer and autumn and southwestward during winter and spring. Assuming a mass balance in the control volume of the NSCS continental shelf, cross-shelf volume transport is estimated as the convergence and divergence in along-shelf transport between two altimeter ground tracks. The results suggest that volume transport is inshore in fall and winter and offshore in summer and spring in the east of Hainan Island, while inshore in summer and autumn and offshore in winter and spring in the south of Pearl River Estuary. We will use the multi-linear regression method to evaluate drivers of the along-shelf and cross-shelf circulation and discuss potential effects of monsoon, river diluted water, mesoscale processes in the NSCS. Using control volume theory to investigate seasonal and interannual variability of NSCS coastal current has a significant impact on riverine material transport, thus is essential for understanding biogeochemical processes over the shelf.

Seasonal to Inter-annual Variability of Chlorophyll-a and Sea Surface Temperature in the Yellow Sea using MODIS Satellite Datasets

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The spatial and temporal variability of Chlorophyll-a (Chl-a) and sea surface temperature (SST) in the Yellow Sea (YS) were examined using Empirical Orthogonal Function (EOF) analysis, which was based on the monthly, cloud-free Data INterpolating Empirical Orthogonal Function (DINEOF) reconstruction datasets for 2003 2015. The variability and oscillation periods on an inter-annual timescale were also confirmed using the Morlet wavelet transform and wavelet coherence analyses. At a seasonal time scale, the Chl-a EOF1 mode was dominated by a seasonal cycle of a spring and a fall bloom, with a spatial distribution that was modified by the strong mixing of the water column of the Yellow Sea Cold Warm Mass (YSCWM) that facilitated nutrient delivery from the ocean bottom. The EOF2 mode was likely associated with a winter bloom in the southern region, where it was affected by the Yellow Sea Warm Current (YSWC) that moved from southeast to north in winter. The SST EOF1 explained 99 % of the variance in total variabilities, which was dominated by an obvious seasonal cycle in response to net surface heat flux that was inversely proportional to the water depth. At the inter-annual scale, the wavelet power spectrum and global power spectrum of Chl-a and SST showed significant similar periods of variations at temporal scale. The dominant periods for both spectra were 2 4 years during 2003 2015. A significant negative cross-correlation existed between Chl-a and SST, with the largest correlation coefficient at time lags of 4 months. The wavelet coherence further identified a negative relationship that was significant statistically between Chl-a and SST during 2008 2015, with periods of 1.5 3 years. These results provided insight into how Chl-a might vary with SST in the future.

Turbulent Boundary Layer and Bottom Friction under Solitary Waves

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Solitary wave is often used to represent the tsunami front. The boundary layer and bottom friction characteristics is of fundamental importance to understand sediment transport and bed morphology induced by the wave. In this study, a 2D numerical model was developed to study turbulent boundary layers and bottom friction under solitary waves. The motions of incompressible fluid are governed by the Reynolds averaged Navier-Stokes (RANS) equations, BSL k-w two-equation model is used to accomplish turbulence closure. The model use VOF method to track free surface. The model is capable of simulating laminar, transient and turbulent boundary layers in different flows and bed conditions. The model has been validated against available theories and experiment data. The detailed flow velocity profiles, turbulence characteristics and bottom friction within the boundary layer under solitary waves at different Re regimes are analysed. The maximum positive and negative bottom shear stress under different conditions will be discussed.

Influence of sea surface temperature fronts on the spatial distribution of jellyfish in the Northern Arabian Sea

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Determination of oceanic parameters is an important to understand and ultimately can identify the impact of those parameters on fish population. Identify the species spatial distribution and their association with environmental factors is necessary for conservation and wise management. Jellyfish is an important fishery resources and commercial economic species in Pakistan. During last few years the export of jellyfish increased and mainly exported to China, Vietnam, Singapore and Malaysia. In this study, the fisheries resources survey data of jellyfish catch and oceanographic data was used during October 2010. During present study the entropy-based edge detection algorithm method was used to detect the SST gradient magnitude (GM). The satellite derived SST images were analyzed to detect the SST fronts and GM to determine the impact on jellyfish distribution. It was observed that high SST GM was found throughout the Balochistan coastline at 200 m isobaths. While low SST GM patches were observed along Sindh coastline at 50 m isobaths. The high SST GM patch greater than 0.12 °C km^{-1} from 63.5 °E, 24.8 °N to 65.8 °E, 25.0 °N were observed at Balochistan coast. However, the oceanographic in situ observations, the station 6 was conducted near the SST front area from which low temperature (26.96 °C) and low salinity (36.40 psu) were found while high chlorophyll-a concentration (0.56

mg L^{-1}) was observed compared in the surrounding waters. The strong satellite SST GM (0.09 °C km^{-1}) was observed at near station 6. This phenomenon maybe because of the strong SST fronts uplifts the subsurface nutrient and chl-a rich water uplifted to the surface. The present results shows that the high SST GM greater than 0.06 °C km^{-1} have strong significant correlation R^2 = 0.73 p < 0.001 with jellyfish catch. It was observed that at or near the SST fronts area have 80% more chances to get better and high catch. Mostly the high catches were caught at from up layer depth (50 m). The overall catch

observation have significant correlation (R^2 = 0.58 p < 0.001) with fish catch. It should be noticed that when fishing locations were close to SST fronts area the high catch were observed. Present study results deliver some better understanding that how SST fronts influence jellyfish distribution. On the basis of threshold (0.06 °C km^{-1}) high probability catch map were forecast for better fishing grounds of jellyfish.

Keywords: *Arabian Sea;Sea Surface Temperature; Fronts; Satellite Remote Sensing; Fishing Grounds*

Session S4-2:
Remote Sensing and Physical Oceanography

Application of Ocean Color Remote Sensing on Coastal Water Management

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Ocean color remote sensing has been used in coastal water quality monitoring for more than twenty years, however, application of ocean color remote sensing on water environment management is rarely reported due to the accuracy of water quality retrieval and long term monitoring. Here, we developed a new algorithm for an estuarine water located at west Florida coast to remotely retrieve the spatial and

temporal dynamic of water quality, and developed a management tool for this area. The application of the new algorithm was extended to several estuarine and coastal waters in Gulf of Mexico and East coast of U.S.

Keywords: *Ocean color; Remote Sensing; Costal waters; Phytoplankton*

Use of Ocean Colour Satellite Data to Study the Effect of Typhoons on the Picophytoplankton Composition in the South China Sea

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Phytoplankton plays an important role in the global carbon cycle. At the same time, we know that distinct phytoplankton groups are involved in the global carbon cycle differently. It has been shown earlier by studies based on in situ measurements that typhoons affect different phytoplankton types in a different way. In present research the influence of typhoons on phytoplankton community structure in the South China Sea (SCS) was studied for the first time with the use of ocean colour satellite data spanning the time period 2002 – 2016.

As a first research step the algorithm for retrieval of three phytoplankton types, Prochlorococcus (Pro), Synechococcus (Syn) and picoeukaryotes (Peuk) from MODIS (Moderate Resolution Imaging Spectroradiometer) satellite sensor data was developed. Algorithm is ocean colour spectrum based one and utilises MODIS Level 3 data from NASA ocean colour archive (oceancolor.gsfc.nasa.gov). Standard MODIS derived Chlorophyll-a concentration, Aerosol optical thickness at 869 nm and remote sensing reflectance at 6 wavelength (412, 443, 469, 488, 531, and 555 nm) are used as input data. Xiamen university in situ data on the concentration of the three phytoplankton types was used for the development and validation of the algorithm. The developed algorithm proved to be a successful tool for the retrieval of qualitative estimates of Pro, Syn and Peuk abundances and

studying of temporal and spatial variations of these three phytoplankton types development. Potential for the quantitative estimates and accuracy of concentrations retrieval with the use of the developed algorithm are also discussed.

Seasonal and inter-annual variations of phytoplankton size structure and functional types composition in the South China Sea (SCS) using the ocean colour satellite data were revealed. Case studies of typhoons occurrences in SCS are performed. Satellite data on Sea Surface Temperature and wind speed were used to facilitate the understanding of the processes determining typhoon influence on phytoplankton community structure.

Keywords: *South China Sea; MODIS; Phytoplankton community structure; Algorithm*

Seasonal Characteristics of Net Primary Productivity in Shenzhen Coastal Waters for 2003-2013

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Taking Shenzhen coastal waters as research area and taking MODIS NPP products as data source, the research used singular spectrum analysis to discuss the seasonal characteristics of net primary productivity among the Shenzhen West waters, Mars bay and Daya bay. The results intuitively showed

that the variation coefficient of NPP among the three sea areas had similar fluctuation trend, and it fluctuated obviously between February and May, especially in March, where the difference between the maximum and minimum value could be 4912.83. Moreover, there were obvious yearly periodic variations of NPP values among the three sea areas, which presented stable w-shaped waveform.

Estimation of Suspended Particulate Matter Transport through the Boundary Waters of the Yellow Sea and the East Sea with Satellite Remote Sensing

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Based on the in-situ measurement of suspended particulate matter (SPM) concentration in spring 2003 and the corresponding MODIS satellite remote sensing data in the period in the South of the Yellow Sea and the north of the East China Sea, the statistical retrieval model for SPM concentration with band 4 of MODIS data was established. Upon examination, the average relative errors of the model were 24.7%. In order to calculate the volume transportation of SPM through the boundary of the Yellow Sea and the East China Sea, the vertical distribution model of SPM was also established. Based on the established models, and the known parameters of water depth, vertical SPM concentration distribution and diffusion areas, the quantities of suspended solids transport from the boundary of the Yellow Sea and the East China Sea can be calculated and the results showed that about 153 Mt of SPM transport from the boundary of the Yellow Sea and the East China Sea during SPM transportation period of October 2002 – April 2003.

Impact of Model Resolution on Radar Imaging of Underwater Sand Waves

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SAR images are capable of monitoring varying sea surface roughness due to divergent and convergent current fields flow over underwater sand waves. This manifestation can be simulated through a flow model combined with a radar imaging model by explaining the interaction between bathymetry, surface currents and surface waves. Accuracy of numerical models is usually limited by grid resolution. However, there is a lack of studies on the influence of grid resolution on the combined hydrodynamic and radar imaging model. To examine the role of grid size on imaging of sand ridges and ignore other sources of surface roughness variations in coastal areas, the authors designed an idealized flow model integrated with a radar imaging model with different resolution. The results indicate that model resolution can play an important role in the combined system, thus the grid resolution should be carefully selected to fully present performance of the 2-d (two-dimensional) combined model. This offers a reference to study the application of radar imaging mechanism based on SAR images and the combined system in coastal areas for future work.

A Unified Macroalgae Mapping with Different Date Images using Modified Classification Tree

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Remote sensing is the main approach in classifying and mapping aquatic vegetation nowadays, and classification tree (CT) analysis performs well among various classification methods. Modified CT is developed from traditional CT by adjusting the thresholds based on the statistical relationship between spectral features, so that it can classify different images without ground-truth data. However, we have yet found few studies applied this method into marine vegetation to date. In this study, three Gao-Fen 1 (GF-1) satellite images acquired on 30 January 2014, 5 November 2014, and 21 January 2015 with the same sensor (wide-field-of-view) were selected and two features were adopted to extract macroalgae from seawater. Results show that the overall accuracies of traditional CTs for two images obtained on 21 January 2015 and 5 November 2014 are 94.18% and 93.9% respectively, while the overall accuracies for the two corresponding modified CTs are 93.05% and 89.5%. Therefore the modified CTs can reach the target of mapping the macroalgae with different dates' images and monitor the spatiotemporal distribution of macroalgae in the coastal environment.

Variability of Aerosol Optical Thickness in the Tropical Indian Ocean and South China Sea during Spring Intermonsoon Season

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The variability of Aerosol Optical Thickness (AOT) in the tropical Indian Ocean (IO) and South China Sea (SCS) during the intermonsoon (February – May) is investigated using shipboard and satellite data from 2011 to 2014, in order to understand the mechanisms controlling AOT production and transport and the results are compared to previous studies in other seasons and in other oceanic regions. Overall AOT in tropical