3rd International Conference on Quaternary and Future Earth: Harmonious Coexistence of Ocean and Humans

（第三屆地球之第四紀與未來國際研討會：人類與海洋的和諧共存）

National Taiwan Ocean University, Keelung, June 26-27, 2019

Conveners:

- **Min-Te Chen (Chief Convener)**
  Institute of Earth Sciences / College of Ocean Science and Resource,
  National Taiwan Ocean University, Keelung, Taiwan
  **Secretary & Contact Person: Ms. Chia-Ju LIAO (liaochiaju@gmail.com)*

Organized and Sponsored by:

- The Ministry of Science and Technology (MOST)
- The Earth Science Research Promotion Center (ESRPC)
- National Taiwan Ocean University (NTOU)

Program Committee:

The program committee will be composed by the chief convener and appointed members from the College of Ocean Science and Resource of NTOU. The chief convener and program committee will be responsible for reviewing all submitted abstracts and drafting the agenda, and the final report of the workshop. The chief convener will be responsible for submitting proposal of publishing special issue in high quality international journals.

Conference Objectives and Expected Impacts:

The main objective of the proposed ***3rd International Conference on Quaternary and Future Earth: Harmonious Coexistence of Ocean and Humans*** is to bring together a diverse group of researchers who study geological/biological and oceanographic studies, earth and ocean environmental changes, anthropogenic and human settlements in the western Pacific and East Asia, coastal and marine environmental studies, terrestrial and earth processes, biosphere, human history, geography and anthropology, and past and future perspectives of earth and ocean environmental changes since early Quaternary (~2.6Ma). Our recent science findings indicate that the health of the oceanic Earth and the health of humans are highly coupled. Though sustaining life could be in a variety of different ways, oceans provide us, in fundamental, with the air we breathe, the food we eat, even some of the medicines we use to cure disease. Moreover, the oceans are honest recorders

for long-term, past earth climate and environmental history that allows us to distinguish anthropogenic impacts from natural variability over various time scales from deep time in the past to the future. However, imbalance in the oceans can have deleterious effects on human health and our utilizations of marine organic and inorganic resources. In particular, ocean acidifications caused by the increased atmospheric pCO_2, melting of continental ice sheets and rising sea levels, and proliferation of harmful algal blooms and pathogenic micro-organism pollution can cause human illness or, in acute cases, death, while also wreaking economic havoc through beach and fishery closures. Understanding this corollary between the health of the ocean and our own, policymakers and researchers sought to emphasize an inter-disciplinary approach in studying this important relationship, pairing geologists and oceanographers and other scientists with environmental and bio-geological expertizes.

National Taiwan Ocean University (NTOU) is now one of main body to promote the ocean and earth environmental science in Taiwan. The ocean and earth environmental research is a multi-disciplinary science focused on the past and future perspectives of Earth and the future. The inter-disciplinary approach could flourish this particular type of scientific research, and echoes the global scientific communities such as INQUA, PAGES, Future Earth, etc. Currently, scientists from geological/biological and oceanographic studies, earth and ocean environmental changes, anthropogenic and human settlements in the western Pacific and East Asia, coastal and marine environmental studies, terrestrial and earth processes, biosphere, human history, geography and anthropology in Taiwan all work in a cooperative effort in a form of international conference to promote this multi-disciplinary research program that would advance our understanding on human health and its relevance to oceanographic and geological/biological research. NTOU had initiated a successful 1st and 2nd conferences of such in 2016 and 2017. This conference, in order to better attract participants from the countries other than Taiwan, proposes to invite active scientists from **Southeast Asia** with a hope to further expansion of the scope of the conference in the next few years. This time, in particular, we invited faculty members from the School of Marine and Environmental Sciences, **Universiti Malaysia Terengganu (UMT)**, Malaysia to increase cooperation on marine and earth environmental sciences between Malaysia and Taiwan. We plan to hold a series of conferences mainly focusing on better integration of new findings of geological and oceanographic studies, earth and ocean environmental changes, anthropogenic and human settlements in the western Pacific and East Asia, coastal and marine environmental studies, terrestrial and earth processes, biosphere, human history, geography and anthropology, and past and future perspectives of earth and ocean environmental changes since early Quaternary.

The invited speakers will be selected from Southeast Asia and also Japan and Europe. We will plan to invite more international and domestic speakers from Taiwan and other international countries through supports of the other channels to increase the visibility and impact of western Pacific from the multi-disciplinary geological and oceanographic studies, earth and ocean environmental changes, anthropogenic and human settlements in the western Pacific and East Asia, coastal and marine environmental studies, terrestrial and earth processes, biosphere, human history, geography and anthropology, and past and future perspectives of earth and ocean environmental changes since early Quaternary research results to be presented in the conference.

Conference Dates:

June 26-27, 2019 (plus 1 day optional post-conference field trip)

- June 25: Arrival to Keelung (International participants)
- June 26: Meeting (keynote speeches, invited oral, poster presentations), and banquet dinner
- June 27: (optional) Post-conference field trip to the Heping Island Geological Park, Institute of Earth Sciences, and National Museum of Marine Science & Technology.
- June 28: Departure for your home town (international participants) or personal trip

Format and Schedule:

We will spend 1 day on June 26, 2019 for keynote, oral and poster presentations from invited speakers and attendants from both international and domestic. The following themes will be highlighted, but not exclusively in the workshop:

1. Geological, biological and oceanographic studies on Quaternary western Pacific and East Asia;
2. Historical background of anthropogenic and human settlements in the western Pacific and East Asia;
3. Biogeography and endangered biological species;
4. Ecosystem sustainability and environmental pollution;
5. Marine resource and future green energy.

Field Trip:

One day optional post-conference field trip (June 27, 2019) to the *Heping Island Geological Park* (https://www.hpipark.org/copy-of-52), *Institute of Earth Sciences, NTOU*, and *National Museum of Marine Science & Technology* (https://www.nmmst.gov.tw/enhtml/index). (No charge to the participants but any free donations ~100.- to 1.- USD will be very welcomed).

Accommodations:

All international participants will be arranged to live in Keelung Kodak Hotel (柯達大飯店)(http://keelung.khotels.com.tw/en/). We have booked a block of hotel rooms with special discount rate of during the conference week. Please contact Ms Chia-Ju LIAO (liaochiaju@gmail.com) if you want to book hotel rooms for attending this conference as early as possible.

Travel and transportation:

The conference will take place in June 26-27, 2019 at The Second Auditorium（第二演講廳）in Administration Building of National Taiwan Ocean University (NTOU), Keelung. The Keeling City is located at the northern coast of Taiwan. The

connection between Taiwan Tao-Yuan International Airport and Keelung is one hour and 15 minutes by driving. More detailed logistics will be announced later. Our meeting secretary will arrange airport and hotel pickup service for invited international speakers. Please contact the meeting secretary and inform your arrival and departure flight information. The secretary will be also responsible for transportation between the hotel and NTOU (by taxi).

Agenda:

Time	June 26 (Wednesday), 2019	Page
08:00~08:30	Group pick up (invited speaker only) at Kodak Hotel and transport to NTOU	
08:30~09:00	**Registration (The Second Auditorium [第二演講廳], NTOU)**	
09:00~09:20	welcome speech & introduction *Chair: Min-Te Chen*	
09:20~09:40	**Session 1** *Chair: Min-Te Chen* **Marinah Mohd Ariffin (Universiti Malaysia Terengganu, Malaysia)** *Determination of paraben compounds in pharmaceutical samples using Fe_3O_4/Sylgard 309 magnetic solid phase extraction method*	8
09:40~10:00	**Kesaven Bhubalan (Universiti Malaysia Terengganu, Malaysia)** *Application of Marine Bacteria-Derived Biodegradable Polymer for the Production of Microbeads with Dermal Exfoliation Properties: An Alternative for Plastic-Based Microbeads*	9
10:00~10:20	**Hasrizal Bin Shaari (Universiti Malaysia Terengganu, Malaysia)** *Paleoclimate Evolution in East Coast of Peninsular Malaysia During Holocene by Using Alkenone-Paleothermometry*	10
10:20~10:50	Coffee Break (Posters Viewing)	
10:50~11:10	**Session 2** *Chair: Min-Te Chen* **Mahyar Mohtadi (University of Bremen, Germany)** *Quaternary climate of the tropical Indo-Pacific: simulations vs. reconstructions*	11
11:10~11:30	**Yusuke Yokoyama (University of Tokyo, Japan)** *Missing ice problem: a mystery of Antarctic ice sheet related to its volume during the last glacial maximum*	12
11:30~11:50	**Sze Ling Ho (National Taiwan University, Taiwan)** *Are Holocene proxy records reproducible?*	13
11:50~12:10	**Deming Kong (Guangdong Ocean University, China)** *Northern South China Sea SST changes over the last two millennia and possible linkage with solar irradiance*	14
12:10~12:30	**Fatin Izzati Minhat (Universiti Malaysia Terengganu, Malaysia)** *Evaluating the performance of tropical foraminiferal transfer function for high resolution sea level reconstruction in Malacca Straits*	15
12:30~13:30	Lunch (lunch box)	
13:30~13:50	**Session 3** *Chair: Pai-Sen Yu* **Kuo-Yen Wei (Research Center for Future Earth, National Taiwan University, Taiwan)** *Morphological Variation and Trends of Pseudoemiliania lacunosa during 1.3 – 0.5 Ma, ODP1115B, Western Equatorial Pacific*	16
13:50~14:10	**Ong Meng Chuan (Universiti Malaysia Terengganu, Malaysia)** *Heavy Metals Concentration in The Landed Sharks Along East Coast of Peninsular Malaysia*	17
14:10~14:30	**Tan Chun Hong (Universiti Malaysia Terengganu, Malaysia)** *The Effects of Seawater Temperature Variations on The Bleaching Susceptibility of Acropora Latistella*	18
14:30~14:50	**Mohd Uzair Rusli (Universiti Malaysia Terengganu, Malaysia)** *Solving Mysteries of Sea Turtle Life History in the South China Sea*	19
14:50~15:20	Coffee Break (Posters Viewing)	
15:20~15:40	**Session 4** *Chair: Pai-Sen Yu* **Poh Seng Chee (Universiti Malaysia Terengganu, Malaysia)** *Submarine Groundwater Discharge and Associated Nutrients in Coastal Environment*	20
15:40-16:00	**Siti Nur Tahirah Jaafar (Universiti Malaysia Terengganu, Malaysia)** *Proteomic approach of oxidative stress in Scleractinia corals towards stressor*	21
16:00-16:20	**Chih-Kai Chuang (National Taiwan University, Taiwan)** *西赤道太平洋所羅門海域岩芯發現的中更新世鈣質超微化石橋石屬新種Gephyrocapsa kennettii sp. n.*	22
17:30	Break for banquet dinner (Kodak Hotel)	

Poster List				
No.	**Name**	**Organization**	**Abstract Title**	Page
1	Chao Huang	Guangdong Ocean University	全新世气候变化-人类活动-环境演变的相互影响来自南海北部陆架沉积物的记录	24
2	Naoto Fukuyo	University of Tokyo	Paleosealevel and paleoenvironmental reconstruction using the local marine reservoir effect and geophysical modeling in Tongatapu, Kingdom of Tonga	25

More posters are coming in ---

Abstract (Oral)

Determination of paraben compounds in pharmaceutical samples using Fe_3O_4/Sylgard 309 magnetic solid phase extraction method

Norseyrihan Mohd Sohaimi[a], Marinah Mohd Ariffin[a] and Noorashikin Md Saleh[b]

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Abstract

In this work, Fe_3O_4/Sylgard309 magnetic nanoparticles (MNPs) were prepared in laboratory and applied as sorbents for the magnetic solid phase extraction (MSPE) of selected paraben compounds from the different pharmaceutical samples. The elutent containing parabens was analysed by high performance liquid chromatography with variable wavelength detection (HPLC-UV). Under optimal conditions, there is good linear relationship between the concentration and the peak areas in the range of 0.1-1.00 μg mL^{-1} with the correlation coefficients (R^2) > 0.9995 for all parabens. The limit of detection was 0.02-0.03 μg mL^{-1} for all parabens respectively. Satisfactory reproducibility was also achieved with relative standard deviations (RSDs) less than 12% for intraday and interday precision evaluation. The applicability of the method for the analysis of parabens in real sample was justified by the extraction of parabens from pharmaceutical samples. The results analysis demonstrated that the spiked recoveries were in the range of 60%-120% with relative standard deviation values lower than 20%.

Application of Marine Bacteria-Derived Biodegradable Polymer for the Production of Microbeads with Dermal Exfoliation Properties: An Alternative for Plastic-Based Microbeads

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Major environment stressors include the influx of petrochemical-based plastic waste. The waste ranges from large plastic objects such as building debris, to the invisible microplastics. Significant source of microplastics are from the usage of microbeads in market as this material are used in cosmetic scrubs. The possible way to counteract the problem is by substitution of synthetic plastics to natural biodegradable polymer. Polyhydroxyalkanoate (PHA) is a well-known biodegradable polymer which exhibits properties of some common plastics. Poly(3-hydroxybutyrate) [P(3HB)] is the most common type of PHA produced by bacteria under imbalanced growth conditions. In this study, *Massilia haematophilla* UMTKB-2, a brackish water bacterium was used to synthesize P(3HB) in shaken-flask culture up to 0.8 ± 0.05 g/L by using glucose as the sole carbon source. Endotoxins from the polymer was removed using oxidizing agents and was evaluated using E-TOXATE^{TM} kits. The P(3HB) produced was characterized for its thermal properties and mechanical strength by differential scanning calorimetry and tensile machine, respectively. The P(3HB) was found to have a glass transition temperature (T_g) of 6.85 ± 0.1 °C and melting temperate (T_m) of 173.66 ± 1.75 °C. The tensile strength, Young's Modulus and elongation to break of the P(3HB) are 17.33 ± 2.9 MPa, 0.2 ± 0.06 GPa and 2 ± 0.09% respectively. P(3HB) microbeads which are targeted to act as dermal exfoliating substances were prepared by the double emulsion solvent evaporation technique, and when observed under scanning electron microscope for its shape and size with an average diameter of 38.44 µm that ranged from 10.1 -140 µm. *In vitro* cell culture was carried out using human keratinocyte cells (HaCaT) on the P(3HB) microbeads to evaluate the cytotoxicity. The ingestion of P(3HB) microbeads into marine organism (brine shrimp) was also studied. A dermal scrub was formulated with the microbeads by mixing them with a semi-solid base which is known as Hamin. The efficiency of the P(3HB)-based dermal exfoliation agent was tested using DermaLab® Series SkinLab-Combo. The plastic-like properties of P(3HB) makes a potential substitute for the conventional plastic-based microbeads.

Keywords: polyhydroxyalkanoate, biodegradable, microbeads, exfoliation agent, cosmetics

PALEOCLIMATE EVOLUTION IN EAST COAST OF PENINSULAR MALAYSIA DURING HOLOCENE BY USING ALKENONE-PALEOTHERMOMETRY

Nik Hani Shahira Nik Shirajuddin[1], Hasrizal Shaari[1,2*], Norhayati Md. Tahir[1], Mohd Fadzil Mohd Akhir[2], Abdullah Sulaiman[3] and Min-Te Chen[4]

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Marine core sediment TRC3 (~158 cm) was collected from ~49.08 km off the inshore area of Terengganu water, east coast of Peninsular Malaysia to understand the environmental changes based on a high-resolution of sea surface temperature (SST) record on the long-chain alkenone unsaturation index ($U^{K'}_{37}$) in order to understand the variability of paleoclimate evolution during Holocene. The age-sediment of 9,550 cal yr BP was determined based on AMS radiocarbon dating of the intact shell fragments. There are two trends were clearly identified during the early Holocene which is low SST between 9,361 and 8,605 cal yr BP (~19.0˚C), and high SST between 8,479 and 6,211 cal yr BP (~21.1˚C). The SST decreased during mid-Holocene between 5,959 and 4,195 cal yr BP. The SST gradually increase during late Holocene between 4,069 and 2,080 cal yr BP. This record reveals several significant shifts between warm and cold temperature. The major cooling event recorded at the mid Holocene (between 5,959 and 4,195 cal yr BP) which are in agreement with the previous studies from Northern South China Sea and Sarawak waters. We suppose that the major cooling during the mid Holocene in Sunda Shelf was resulted from stronger winter monsoon with the combination of cold surge mechanism and Borneo vortex. The combination between these two systems causes heavy precipitation over the east coast of Peninsular Malaysia region that lead to the cold temperature. The findings obtained from this preliminary study illustrate the importance of the paleoenvironmental reconstruction in the inshore area of Malay Basin.

Quaternary climate of the tropical Indo-Pacific: simulations vs. reconstructions

Mahyar Mohtadi

University of Bremen

The latest generation of climate models predicts a slowdown of the atmospheric circulation over the tropics for the twenty-first century with severe societal and economic consequences. Testing these model results necessitates reconstructions of changes in tropical circulation in the past, as the relatively short historical records and observations are too short to decipher between natural variability and human impact. Both the reconstructions and simulations of the tropical Indo-Pacific climate suggest that various forcing and feedbacks are involved at different timescales, and that the spatiotemporal response to a specific forcing is not uniform. However, model simulations remain equivocal and in part, inconsistent with reconstructions. Understanding the sensitivity of different models to different forcings, and whether and how different proxies at different sites reflect the climate response, remain a critical task for paleoclimate reconstructions and simulations.

Missing ice problem: a mystery of Antarctic ice sheet related to its volume during the last glacial maximum

Yusuke Yokoyama
Atmosphere and Ocean Research Institute, The University of Tokyo

Future behavior of Antarctic ice sheet is a concern for the modern society since it would produce rise in sea level. Studying changes in rates and magnitudes of glaciations/deglaciations during the past is a key to understand the ice sheet dynamics relative to different global climate boundary conditions. Sea level observations from sites far from the former ice sheets (far-field) are well suited due to relatively small influence of surface deformation caused by glacio-hydro-isostatic adjustments (GIA). Sites including Australian coastlines are located in such regions and were targeted in this study. Both off the North Eastern and North Western coasts of Australia, respectively the Great Barrier Reef (GBR) and Bonaparte Gulf, have been investigated. GIA modeling derived global mean sea level (GMSL) from relative sea level records obtained from these regions have shown rapid fluctuations of ice volume during the LGM. These two rapid ice growths can subdivide LGM. Namely the LGM started when GMSL abruptly dropped by about 40 metres at around 31,000 years ago (LGM-a), whereas the sea level at the shelf edge of the Great Barrier Reef then dropped by around 20 metres between 22,000 and 21,500 years ago, to -118 metres below the present and similar changes are observed in Bonaparte Gulf samples (LGM-b). This suggested that the maximum drop in sea level during the LGM was ca. -130m thus at least 20-30 m sea level equivalent ice needs to be situated in Southern Hemisphere, likely in Antarctica. However studies reported for reconstructing Antarctic ice volume suggested only 10-8m sea level equivalent excess ice was formed during the LGM. I will introduce the new sea level results from GBR (Yokoyama et al., 2018) and Bonaparte Gulf (Ishiwa et al., 2019) and discuss problems for near filed ice volume reconstruction studies.

Are Holocene proxy records reproducible?

Sze Ling Ho[1,2], Jeroen Groeneveld[2,3], Gesine Mollenhauer[4], Ricardo De Pol-Holz[5], Dirk Nürnberg[6], Thomas Laepple[2]

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Interpretation of paleoclimate proxy signals in marine sediments can be complicated as the signal may be altered by taphonomic processes during sedimentation, as well as by bioturbation in marine sediments which results in the mixing of proxy signals from different time intervals. These alterations can lead to a lower signal-to-noise ratio which in turns results in a skewed picture of the past environments reconstructed from proxies.

A good handle on the various uncertainties associated with proxy records is especially critical when it comes to reconstructing relatively stable periods like the Holocene where the climate variability may be on the same order of magnitude as the proxy noise. Replicating Holocene proxy records may help disentangle signal from noise but it is not routinely done due to limitations in sample material, resources and time.

Here we present findings from a replicate study, wherein we analyzed several commonly used geochemical temperature proxies on a set of short sediment cores from the same location. We find that Holocene temperature trends are reproducible within proxy type but not between proxies. The downcore variability in these proxy records is generally larger than the analytical uncertainties, suggesting that some portion of proxy variability is due to climate. However, there is substantial spatial variability in radiocarbon ages, with differences up to ~1000 year between replicate cores. The age offset is an order of magnitude larger than the uncertainty associated with measurement and calibration of radiocarbon dates, indicating that the true uncertainty in radiocarbon-based age model may be larger than usually assumed.

Title: Northern South China Sea SST changes over the last two millennia and possible linkage with solar irradiance

Authors:

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Abstract: High-resolution surface temperature records over the last two millennia are crucial to understanding the forcing and response mechanism of Earth's climate. Here we report a bidecadal-resolution sea surface temperature (SST) record based on long-chain alkenones in a gravity sediment core retrieved from the northern South China Sea. SST values varied between 26.7 and 27.5 °C, with a total variability ~1 °C over the last 2000 years. The general SST variation pattern matches well with total solar irradiance (TSI) changes. Relatively warm period between 800 and 1400 AD and cool period 1400-1850 AD could be identified, in agreement with the commonly defined periods of Medieval Warm Period and Little Ice Age. Within chronological uncertainty, notable short cooling events at 640-670 AD, 1030-1080 AD, 1260-1280 AD and 1420-1450 AD, coincide with large volcanic eruption events. The general coincidence of SST changes with TSI and volcanic eruption events suggests strong impact of external forcing on sea surface conditions in the studied area. In addition to the direct TSI changes, volcanic eruptions might have induced oceanic and atmospheric circulation adjustments which might be responsible for the short cooling events as revealed in the alkenone-SST record.

Keyword: alkenone, South China Sea, SST, 2ka, solar irradiance

• Evaluating the performance of tropical foraminiferal transfer function for high resolution sea level reconstruction in Malacca Straits

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Abstract

Foraminifera has been utilized as indicator for sea level reconstruction in many regions and validate sea level models and trends. Their abundance and fossilization characteristic made them among the sea level best indicator. However such study is scarce in the Sunda Shelf but very much needed to estimate the Holocene sea-level changes in this region. This study assesses the performance of foraminiferal based transfer function from tropical waters. Modern foraminiferal data were collected along seven transects on the east coast (Johor waters) and two on the west coast (Langkawi-Kedah waters) of Peninsular Malaysia. Fossil samples were collected from the west coast of Peninsular Malaysia (Kedah waters) and were dated using radiocarbon-14. This study developed transfer function models using Weighted Averaging -Partial Least Square (WA-PLS) technique. The WA-PLS results indicated that the locally derived transfer function from Langkawi-Kedah (R^2=0.591) with root mean squared error of prediction (RMSEP) ± 4.6 m. The transfer function model was applied to core samples to produce early Holocene (9830 cal BP ~ 7960 cal BP) sea-level curve from the Malacca Strait. The reconstruction of high resolution sea-level in this region allowed better understanding of sea-level changes especially between 10000 to 8000 cal BP in the far-field sites. Due to its unique geography and location, the study of foraminifera both modern and fossil deserved much better attention. Future study should focus on solving the questions raised by the foraminiferal data from this region as discussed in this study.

Keywords

benthic foraminifera, Holocene, sea level, transfer functions, far-field sites.

Morphological Variation and Trends of *Pseudoemiliania lacunosa* during 1.3 – 0.5 Ma, ODP1115B, Western Equatorial Pacific

Kuo-Yen Wei[1,2] and Chih-Kai Chuang[1,2]

[1.] Research Center for Future Earth, National Taiwan University
[2.] Dept. of Geosciences, National Taiwan University

Calcareous nannofossil *Pseudoemiliania lacunosa* is one of the most morphologically distinctive and useful age-diagnostic markers for the late Pleistocene. In sediments dated ~1.0 Ma of Ocean Drilling Program Hole 1115B in the western equatorial Pacific there appears to exist transitional forms between the typical *P. lacunosa* and *Reticulofenestra asanoi* to form a diverse morphological complex. Multivariate morphometric analyses were performed on specimens to clarify and characterize different morphotypes in the *P. lacunosa* complex at this particular stratigraphic level. Principal component analysis and cluster analysis reveals that the specimens can be grouped into three morphotypes. Canonical discriminant functions were built for these three morphotypes (A, B and C) and all the individual *Pseudoemiliania* specimens in the stratigraphic levels from 1.3 to 0.5 Ma were classified accordingly. The results show that morphology diversity are more diverse during 1.3 to 0.9 Ma and the A type became predominated afterwards.

The *P. lacunosa* bio-series can be separated into two chronological groups separated by 900 ka. The forms in early samples (1300 to 930 ka) are generally smaller in size with larger proximal shields, whereas the late samples (858 to 500 ka) have larger coccoliths in size with slender proximal shields. For the upper stratigraphic samples younger than 950 ka, they showed two repeated courses of morphological changes by reducing of the size of the central opening and the out margin of the distal shield, one in 936 – 750 ka and the other in 702 – 500 ka. These quantitatively defined morphological groupings and trends in *P. lacunosa* might be useful for further bio-chronological correlation.

HEAVY METALS CONCENTRATION IN THE LANDED SHARKS ALONG EAST COAST OF PENINSULAR MALAYSIA

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Abstract

Heavy metals have constantly threatened the marine environment. Sharks, which consumed by human are believed to have a very high accumulation of heavy metals in their bodies due to their biological traits. Therefore, the concentration of six highly polluted heavy metals in sharks was analyzed in this study. To understand the accumulation pattern of heavy metals in sharks, concentration of six heavt metals across five shark's tissues, purchasing sites and shark species were investigated. Sharks were purchased from five LKIM Fishery Complexes along the east coast of Peninsular Malaysia, where included Tok Bali, Kelantan; Chendering and Pulau Kambing, Terengganu; Kuantan, Pahang and Endau, Johore. Six shark species used in this study comprised Indonesian bamboo shark (*Chiloscyllium hasseltii*), whitespotted bamboo shark (*Chiloscyllium plagiosum*), blackspot shark (*Carcharhinus sealei*), spot-tail shark (*Carcharhinus sorrah*) and milk shark (*Rhizoprionodon acutus*). Six heavy metals (Cu, Zn, As, Cd, Hg and Pb) in five shark's tissues (muscle, fins, gills, stomach and liver) was detected by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) after digested with acid. Current findings revealed that the concentration of As was the highest among all heavy metals. Samples collected from Pulau Kambing had the highest concentration of Cu, Zn, As and Pb. *Chiloscyllium plagiosum* accumulated higher heavy metals compared to other species. Relationship between all studied heavy metals concentration with shark's size were weak. Pollution Load Index (PLI) was applied to determine the pollution severity along five sampling sites and it showed that the pollution status in this study is acceptable. Due to the consumption of shark's meat and fins by human, data were compared with the safety limit established by Malaysia Food Regulation and weekly dietary intake set by World Health Organization. The present study suggests that the consumption of the shark collected from five LKIM Fishery Complexes may pose a health risk to the public because shark's meats and fins obtained in this study were highly polluted with the heavy metals. These findings provide a useful baseline as not many related works were found in east coast of Peninsular Malaysia.

THE EFFECTS OF SEAWATER TEMPERATURE VARIATIONS ON THE BLEACHING SUSCEPTIBILITY OF *ACROPORA LATISTELLA*

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Abstract: The abnormal increased of seawater temperature is the major reason to trigger coral bleaching. Recent mass coral bleaching episodes had severely affect the coral population worldwide. This study examined the bleaching susceptibility and zooxanthellae density of *Acropora latistella* through ex-situ temperature manipulation experiment. Coral colonies were collected from Pulau Bidong and underwent temperature treatments of 28°C (as control tank), 30°C and 32°C for 10 days. Tissue colour and zooxanthallae density of *A. latistella* colonies were recorded pre- and post- experiment as proxy of stress response. At the end of the experiment, colour of coral tissue was found to decrease one scale in control treatment while samples in elevated temperature treatments became five times paler (bleached). Zooxanthellae density reduced in all treatments after the experiment. However, only coral colonies in 32^0C treatment showed statistically significant (ANOVA: $F= 4.624$, $p = 0.047$) lost in zooxanthellae density. This study suggested that increased over 2°C above average annual seawater temperature would cause severe impacts to the coral health.

Keywords: Elevated seawater temperature, bleaching susceptibility, *Acropora* coral, Pulau Bidong

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Title: Solving Mysteries of Sea Turtle Life History in the South China Sea

Abstract: Despite being charismatic animals that cross oceans around the globe, sea turtles begin their life in underground nest. Upon hatched, sea turtle hatchlings must digging out to escape the nest and consumes a large amount of the residual yolk. Over 50 years ago, scientists suggested that 'social facilitation' within the nest played an important role in conserving energy of hatchlings in nest escaping. However, empirical evidence for the existence of mutual benefits to individual hatchlings during nest escape has been limited. Our study provides new insight into sea turtle hatchling synchronous activity during nest escape, and how it influences the energetic cost of nest escape. This study now entered the new niche research area by incorporating animal energetics data into simulation modeling software to predict oceanic dispersal of our hatchlings in the South China Sea.

Submarine Groundwater Discharge and Associated Nutrients in Coastal Environment

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Many studies have shown that submarine groundwater discharge (SGD) contributed significant amount of nutrients to near-shore environment, but, there are big knowledge gaps on the groundwater conditions and processes beneath the continental shelves further offshore. Our research focuses mainly on the South China Sea, where we are working to determine the SGD and its associated chemical loading from a single sub-catchment to basin and reef scales. We believe that improved knowledge on SGD transport mechanisms and its influence on the biogeochemical processes in oceans will help to protect the quality of the marine ecosystem.

Proteomic approach of oxidative stress in Scleractinia corals towards stressor

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Redox proteomics are used to study the effect of oxidative stress (OS) on proteins, the main target of reactive oxygen species (ROS). The redox status of various proteins is now recognized as an important factor in many transduction pathways and for protein-protein interactions. The main protein lesions caused by OS are the oxidation of protein thiols and the oxidation of various amino acids, inserting carbonyl groups in the protein. Oxidative stress producing ROS can modified proteins and thiols of cysteine are mostly susceptible. Production of ROS in corals under stress condition has been recognised as one of the mechanism that can lead to cellular damage and the loss of their zooxanthellae population. Coral samples were collected from three stations in Bidong Island, off coast of Terengganu, Malaysia in the South China Sea. Biomarker such as glutathione S-transferase (GST) and catalase (CAT) assays, were used as a benchmark against thiol oxidation gel separation. Significant interaction was found between different stations for GST ($p<0.05$) and CAT ($p<0.05$) activities. Thiol proteins were labelled with 5-iodoacetamidofluorescein (IAF) and Fluorescein-5-thiosemicarbazide (FTSC) prior to one-dimensional electrophoresis (1DE). 1DE separation of IAF-labelled proteins revealed a decrease in total thiol-containing proteins in samples. Results obtained from this investigation clearly revealed some similarities on a portion of redox proteome across stations indicating oxidative stress mechanism maybe common and the effects are unique for early warning observation. Corals that experienced oxidative stress had higher chaperoning level and protein turnover activity. Further studies should be considered to identify the stressed-protein that response to stressor.

西赤道太平洋所羅門海域岩芯發現的中更新世鈣質超微化石橋石屬新種 *Gephyrocapsa kennettii* sp. n.

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我們以場發式掃描電子顯微鏡仔細觀察所羅門海域的兩根長活塞岩芯 ODP site 1115B 和 MD 052925 站位的大洋沉積物之鈣質超微化石，偶然發現了一種新的鈣質超微化石種，在同一個鈣板 (coccolith) 觀察到了 *Gephyrocapsa* 屬 (橋石屬) 的橋狀構造特徵及 *Pseudoemiliania* 屬外盤的裂縫特徵，其呈現兩屬之間的過渡形態。由岩芯浮游有孔蟲氧同位素地層所建立的年代模式，推知此新種的生存年代約為 520-465 ka。我們暫將其命名為 *Gephyrocapsa kennettii*，以彰顯美國加州大學聖塔芭芭拉分校的 Jame P. Kennett 教授在古海洋學長期的學術貢獻。

本研究以發現於 ODP 1115B 3H2W 90-92cm 的化石樣本 (氧同位素地層年代約為五十萬年前) 為 Holotype (全模樣本)，其形態特徵如下：

(1) 鈣板最長軸平均為 3.26 ± 0.22 μm (n =36)，短軸平均為 2.71 ± 0.21 μm (n =36)，短長軸比例 0.83 ± 0.02 (n =36) ，大致呈現橢圓形的鈣板形態，屬小型 *Gephyrocapsa* 屬 (< 4 μm) 之一員。

(2) 其中心區域為空心，無其他小型 *Gephyrocapsa* 屬常見的網狀結構。

(3) 鈣板其橋狀構造特徵與最長軸呈現約 10 度左右 (10.5° ± 1.5°, n =36) 的夾角。

(4) 鈣板外環的裂縫呈不對稱菱形，不規則分布於外環，裂縫數目少則一個，多則可達廿多個，但大多集中在三個到十八個之數。

此新種化石型態在鈣質超微化石生物地層上幾乎和 *Pseudoemiliania* 屬近乎同時絕滅，其生態意義及其在古生物地理上的分布值得再進一步之探究。

Abstract (Poster)

全新世气候变化–人类活动–环境演变的相互影响来自南海北部陆架沉积物的记录

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自工业革命以来，由于生产力的变革和生产技术的提高，人类改造地表环境的能力不断增强，同时也引发了一系列生态环境问题。例如极端气候事件增加，重金属污染，土壤侵蚀退化，湖泊富营养化以及海洋酸化等。古气候学研究可以从历史的角度探讨这些生态环境问题。因此，过去的气候-人类活动-环境变化相互作用的重建工作不仅可以提供一个与现在进行比较的“基准”，而且有助于我们采取科学合理的举措促进生态环境的可持续性发展。

我们从南海北部陆架泥质区获得沉积岩芯样品，利用铅、铯年代学和 AMS ^{14}C 年代学结果为我们分析的岩芯样品建立非常可靠的年龄框架，进而开展高分辨的全新世气候演化、人类活动以及环境变化之间相互影响的重建工作。我们分别选用 CIA 和 Al/K 作为化学风化强度的代用指标，$\delta^{13}C_{org}$ 和 TOC 指示河流输入的变化。在 7500-2000 cal yr BP 期间，化学风化和河流输入表现出整体减弱的变化趋势，这与我国季风区不同地质载体所记录的夏季风的变化一致，表明该时期我们的海洋沉积记录主要是受到夏季风的影响。然而，近 2000 年以来，我们钻孔记录的化学风化和河流输入逐渐增强。同时，沉积物中的低频和频率磁化率大幅度增加，金属元素 Cu 和 Pb 的含量也迅速增加。这些沉积记录的增加趋势与广东省人口变化基本一致。然而，东亚季风区多种地质载体的研究结果发现，东亚夏季风在近 2000 年呈现出整体减弱的变化。因此，我们推测，由于人口的增加、农业生产的发展以及采矿冶炼活动的扩张，引起土壤侵蚀的增强和金属元素含量（Cu 和 Pb）的增加，进而导致河流输入沉积物的增加。因此，近 2000 年以来，岭南地区逐渐增强的人类活动取代了自然气候条件成为地表生态环境改造的主要控制力量。

Title: Paleosealevel and paleoenvironmental reconstruction using the local marine reservoir effect and geophysical modeling in Tongatapu, Kingdom of Tonga

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Abstract:
Reconstructing the history of Holocene relative sea levels around Tonga provides important constraints on the recent geological evolution of this region and paleoenvironmental context for archaeological studies. However, there are few sea level records currently available from the region and no quantitative paleoenvironmental studies using geochemical/physical methods have been reported. In this study, we reconstruct sea level histories for Tongatapu island using radiocarbon measurements and glacio-hydro-isostatic adjustment (GIA). Our analyses suggest that changes in the average size of bivalves (*Gafrarium tumidum*) are coeval with corresponding changes in the paleoenvironment. These changes also correspond to the timing of increase of local marine reservoir effects (ΔR). Sea surface salinity (SSS) changes within Fanga 'Uta lagoon were also synchronous with these changes caused by a gradual decrease in the exchange of water in and out of the lagoon. Salinity seems to have been higher than present at approximately 2.6 cal kyr BP, suggesting an embayment that was relatively open to the ocean. Predicted mid-Holocene sea level height using GIA modeling indicates less than 1m above sea level in Tongatapu, suggesting that previously reported observations of mid-Holocene high stand require additional factors other than GIA. Furthermore, present day satellite-based observed (ie. GPS) vertical uplift rate in Tongatapu is 10 orders of magnitude higher than the long-term uplift rate obtained from Holocene sea level data.