# The 5th China-Japan-Korea IMBER Symposium and Training


## Global Ocean Ecosystem Dynamics, Integrated Marine Biogeochemistry and Ecosystem Research

**22-25 November, 2011**

**Shanghai China**

East China Normal University (ECNU)

State Key Laboratory of Estuarine and Coastal Research, ECNU

The China GLOBEC IMBER Programme

# WELCOME AND ACKNOWLEDGEMENTS

## Welcome from SKLEC

Dear Colleagues,

It is our honour to host the 5th China-Japan-Korea IMBER Symposium. It is also our pleasure to welcome you, our colleagues from Japan, Korea and China, to the State Key Laboratory of Estuarine and Coastal Research (SKLEC) at the East China Normal University (ECNU), Shanghai.

The world's oceans offer a great abundance of resources and essential environments to sustain mankind. Many people are working very hard in order to understand the oceans and yet, many aspects are still not well understood or even remain an enigma. The 5th CJK IMBER Symposium focuses on global ocean ecosystem dynamics, integrated marine biogeochemistry and ecosystem research. I cannot stress enough the importance of this subject, and the relevance of a joint effort between our different countries on this very important issue. Scientists from Japan, Korea and China have a long history of working together on oceanic research. I believe that the 5th CJK Symposium will bring us new ideas and present new findings on the impact of climate change and human forcings on the ocean environment, and how they in turn impose influences on marine ecosystems and human society.

SKLEC has a long and profound history, over a half century, of research and training in estuarine and coastal sciences and their applications. The research focuses mainly in three core areas, which are (1) estuarine evolution and estuarine sedimentation dynamics; (2) coastal dynamic geomorphology and dynamic sedimentary process; and (3) estuarine and coastal ecology and environment. Currently, the laboratory is expanding its research area further into the marine science. SKLEC has strong cooperation links with Japan and Korea. This CJK IMBER Symposium provides an excellent opportunity to make these links even stronger.

I would like to finish by wishing you all a very successful symposium, and I hope that you enjoy your time at SKLEC/ECNU and in Shanghai.

Professor Yunxuan Zhou
Director
State Key Laboratory of Estuarine and Coastal Research
East China Normal University, Shanghai, P.R. China

## Acknowledgements

Scientists from Korea, Japan and China stated to have the meeting series of GLOBEC in early 1990s, in response to the IGBP implementation at regional level and promote the collaborations in marine sciences in East Asia. Later the meeting has changed to GLOBEC and IMBER after the combination of the two sister programs in marine science of IGBP in the period of 2009-2010, and by abbreviation in alphabetical order and simplification the meeting was called as “C-J-K GLOBEC/IMBER Symposium”.

The 5th C-J-K GLOBEC/IMBER Symposium will be held at Shanghai in 22-24 November 2011. The organizing committee of the symposium wishes to acknowledge the generous support provided by the sponsors from East China Normal University through State Key Laboratory of Estuarine and Coastal Research, Ministry of Science and Technology (MOST) through national basic research funding (i.e. “973” Project). This generous support has ensured the continuation of tri-lateral meetings on GLOBEC and IMBER related research activities from East Asia countries, based on the four previous very successful scientific symposiums. For their help in realizing this potential we thank the sponsors, one and all.

The organizing committee would take this opportunity thank our participants to this symposium and believes that the research results presented on the meeting and ideas elaborated in discussion will help reinforce the existing platforms of collaborations and develop new research topics in marine sciences. The organizing committee trusts the results of this symposium will be equally effective to the impacts from previous C-J-K GLOBEC/IMBER Meetings.

Local Organizing Committee &

IMBER Regional Project Office*

*IMBER Regional Project Office
State Key Laboratory of Estuarine and Coastal Research
East China Normal University
3663 Zhongshan Road North
Shanghai 200062, China
Tel: +86 21 5213 5432
Fax: +86 21 5213 5432
imber@ecnu.edu.cn

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# AIM AND STRUCTURE OF THE SYMPOSIUM

## Aim

The aim of the 5th China-Japan-Korea IMBER Symposium and Training is to provide a platform to marine scientists from the three countries to share and discuss the latest scientific achievements in the Global Ocean Ecosystem Dynamics (GLOBEC) and Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) area.

Marine scientists from China, Japan, and Korea have been working actively at the frontier in the areas of GLOBEC and IMBER since the early 1990s. Various scientific workshops and/or training activities have been held periodically by these three countries. Since 2002, the China-Japan-Korea GLOBEC/IMBER symposia have provided GLOBEC, and more recently IMBER, scientists from these countries, with the opportunity to collaborate, exchange, and compare the results of their research. Although GLOBEC ended in 2010, IMBER will continue to facilitate the organization of this symposium series. The 5th China-Japan-Korea IMBER Symposium will focus on the impact of climate change and anthropogenic forcing on physical processes and biogeochemical cycles, ecosystem structure and functions, and fisheries in the northern Pacific region, and how these complex interactions in combination, in turn, influences marine ecosystems and human society in a broad aspect.

## Structure

The 5th China-Japan-Korea IMBER Symposium and Training consists of a 2-days oral and poster presentations, a one-day field trip, and a one-day training courses. Oral and poster presentations are arranged based on the following four sessions:

- Impact of climate change on physicochemical and biological properties of marginal seas
- The impact of anthropogenic activities on marine biogeochemistry and ecosystem dynamics
- Development of the biological indicators to detect and evaluate changes in marine ecosystem structure and function
- The marine end-to-end food web: the impact of environmental changes on marine ecosystems

A discussion session scheduled on 23rd November (Wednesday) afternoon will be dedicated to the discussions on the national and regional activities of IMBER-related research in East Asia and the comparison of ecosystem functions in regional scale.

Session conveners are asked to chair their respective session(s) and provide session report(s) to the Organizing Committee on the last day of the symposium.

As discussed at the 4th China-Japan-Korea GLOBIC/IMBER Symposium in 2010, a training activity is attached to the 5th symposium. The training courses will be given to 20 early career scientists and students which selected from over 50 candidates.

## ORGANIZING COMMITTEE

- **Jianguang Fang:** Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Qingdao, China (fangjg@ysfri.ac.cn)
- **Daji Huang:** The Second Institute of Oceanography, the State Oceanic Administration, China (dajih2001@yahoo.com)
- **Se-Jong Ju:** Deep-Sea & Marine Georesources Research Department, Korea Ocean Research and Development Institute (sjju@kordi.re.kr)
- **Sumei Liu:** Ocean University of China (sumeiliu@ouc.edu.cn)
- **Hiroaki Saito:** Tohoku National Fisheries Research Institute, Fisheries Research Agency, Japan (hsaito@affrc.go.jp)
- **Qisheng Tang:** Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Qingdao, China (ysfri@public.qd.sd.cn)
- **Tian Xiao:** Institute of Oceanology, Chinese Academy of Sciences, China (txiao@qdio.ac.cn)
- **Jing Zhang:** East China Normal University, Shanghai, China (jzhang@sklec.ecnu.edu.cn)

## ORGANIZERS AND SPONSORS

- East China Normal University (ECNU), China
- State Key Laboratory of Estuarine and Coastal Research, ECNU, China
- China GLOBEC-IMBER Group

## SECRETARIAT

- **Ling Tong：** Yellow Sea Fisheries Research Institute, Qingdao, China (tongling@ysfri.ac.cn)
- **Liuming Hu：** IMBER Regional Project Office, Shanghai, China (liumingh@sklec.ecnu.edu.cn)
- **Fang Zuo：** IMBER Regional Project Office, Shanghai, China (imber@ecnu.edu.cn)

# GENERAL INFORMATION

## Venues

***Venue for the symposium***

Room Fu Rong, Jin Sha Jiang Hotel （金沙江大酒店芙蓉厅）

257, Nujiang Road, Shanghai,China （上海市怒江路 257 号）

Hotel telephone number: +86 21 62578888

Website: http://www.jinshahotel.com/default1.htm

***Venue for the training courses***

Room A203, Science Building （理科大楼 A203 室）

East China Normal University （华东师范大学）

3663 Zhongshan Road North, Shanghai （上海市中山北路 3663 号）

## Registration and Information Desk

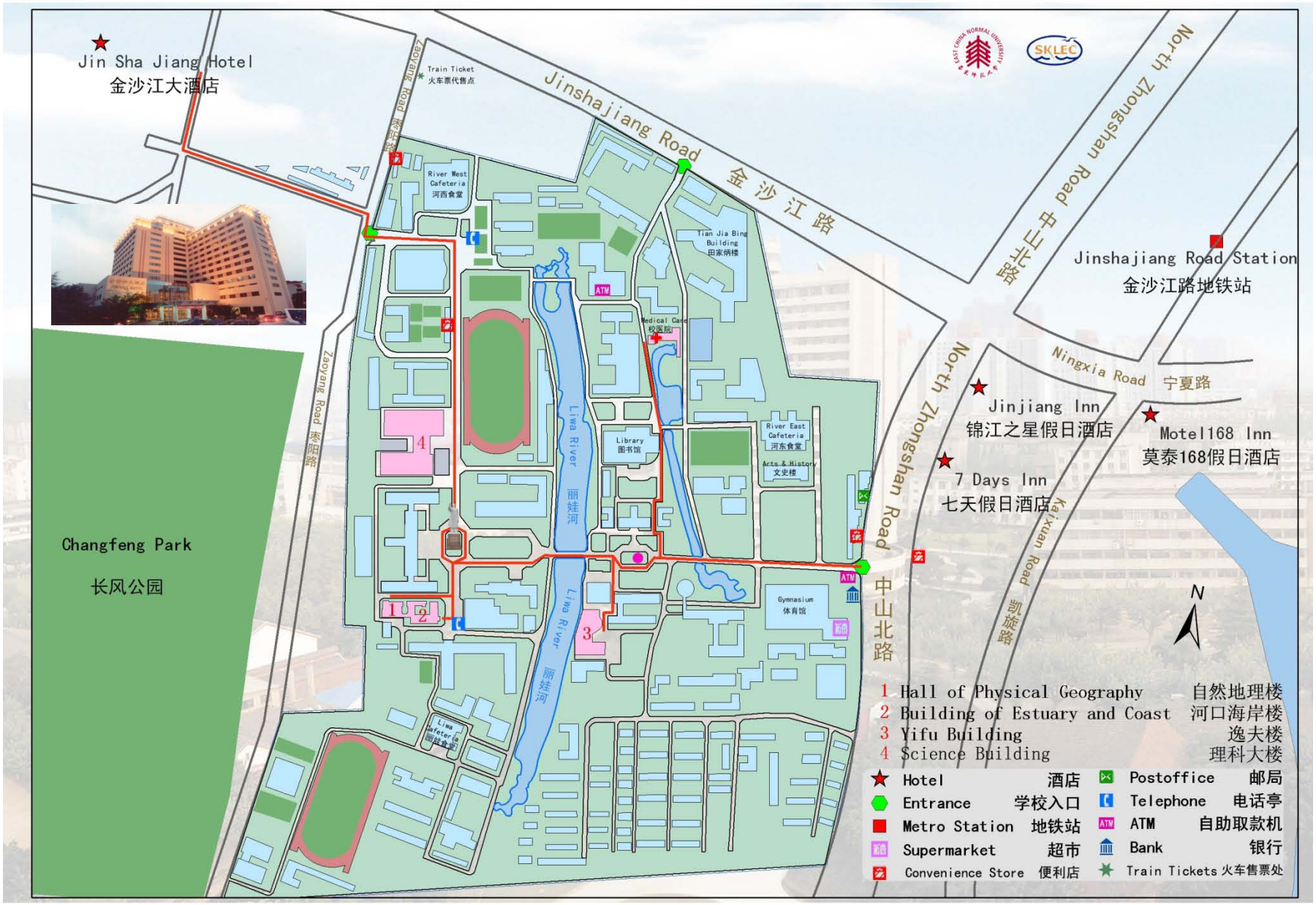
The registration desk in the lobby of Jin Sha Jiang Hotel will be open from 14:00-22:00 on 21 November, 2011 and from 08:00 on 22 November, 2011.

## Poster set up

Posters can be set up from 14:00-20:00 on 21 November, 2011, on the second floor of the Jin Sha Jiang Hotel, and will be displayed for the duration of the meeting.

## Insurance

The meeting Secretariat and Organizers cannot accept liability for personal accidents, loss, or damage to private property of participants, students and accompanying persons, either during or indirectly arising from the 5$^{th}$ China-Japan-Korea IMBER Symposium in November 2011. Participants are advised to make their own arrangements with respect to health and travel insurance.


Jin Sha Jiang Hotel
金沙江大酒店
Train Ticket
火车票代售点
Jinshajiang Road
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North Zhongshan Road
北三路
Jinshajiang Road Station
金沙江路地铁站
Changfeng Park
长风公园
Zaoyang Road
枣阳路
River West Cafeteria
河西食堂
Tian Jia Bing Building
田家炳楼
Medical Care
校医院
Liwa River
丽娃河
Library
图书馆
River East Cafeteria
河东食堂
Arts & History
文史楼
Gymnasium
体育馆
Liwa Cafeteria
丽娃食堂
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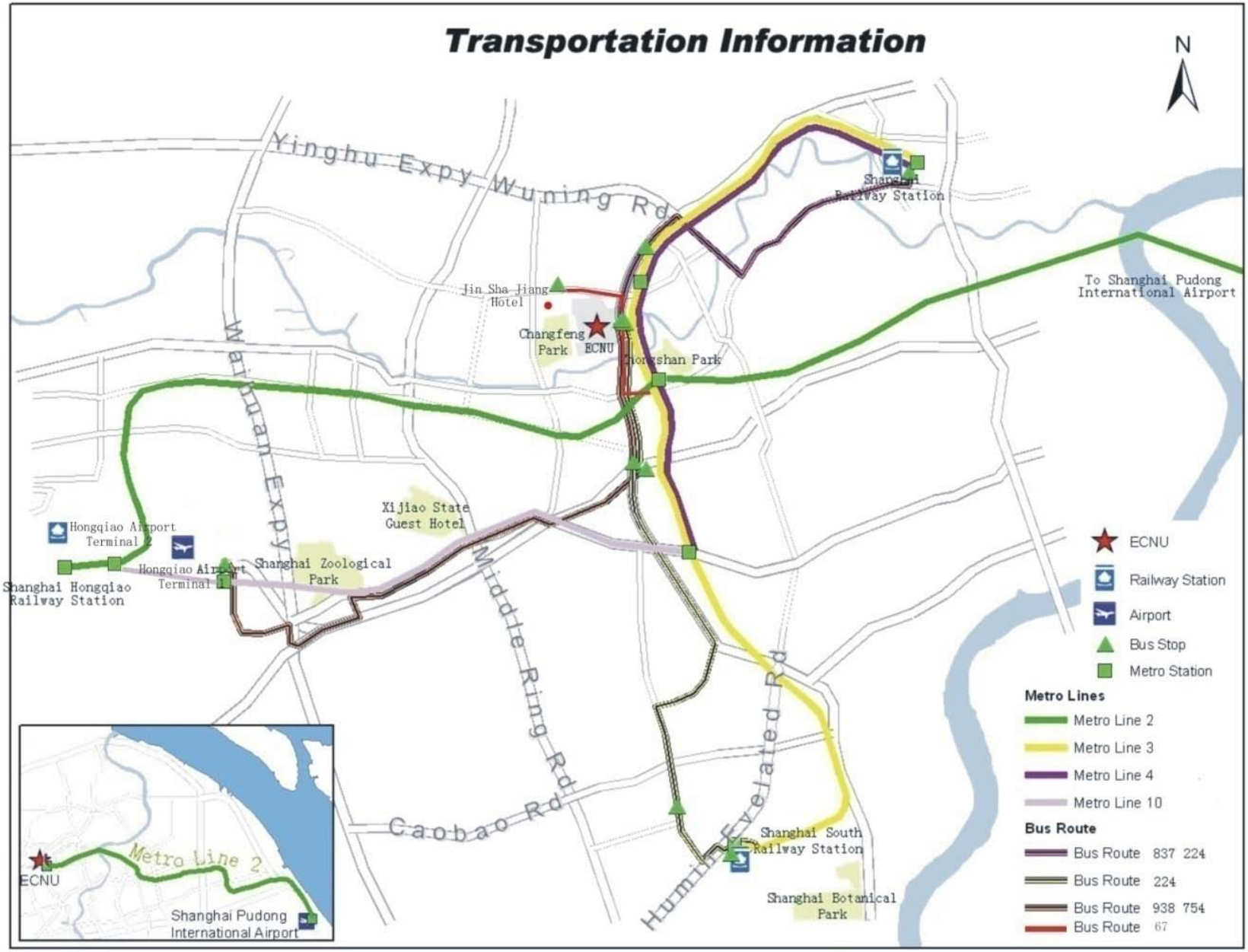
North Zhongshan Road
中山北路
Jinjiang Inn
锦江之星假日酒店
Motel168 Inn
莫泰168假日酒店
7 Days Inn
七天假日酒店
Kaixuan Road
凯旋路
N
1 Hall of Physical Geography 自然地理楼
2 Building of Estuary and Coast 河口海岸楼
3 Yifu Building 逸夫楼
4 Science Building 理科大楼
Hotel 酒店
Entrance 学校入口
Metro Station 地铁站
Supermarket 超市
Convenience Store 便利店
Postoffice 邮局
Telephone 电话亭
ATM 自助取款机
Bank 银行
Train Tickets 火车售票处


Transportation Information
N
Yinghu Expy
Wuning Rd
Waiguan Expy
Middle Ring Rd
Caobao Rd
Humin Elevated Rd
Jin Sha Jiang Hotel
Changfeng Park
ECNU
Zhongshan Park
Shanghai Railway Station
To Shanghai Pudong International Airport
Xijiao State Guest Hotel
Hongqiao Airport Terminal 2
Hongqiao Airport Terminal 1
Shanghai Zoological Park
Shanghai Hongqiao Railway Station
Shanghai South Railway Station
Shanghai Botanical Park
ECNU
Railway Station
Airport
Bus Stop
Metro Station
Metro Lines
Metro Line 2
Metro Line 3
Metro Line 4
Metro Line 10
Bus Route
Bus Route 837 224
Bus Route 224
Bus Route 938 754
Bus Route 67
Metro Line 2
ECNU
Shanghai Pudong International Airport

# SYMPOSIUM PROGRAMME AT A GLANCE

| | MONDAY<br>21 NOV. 2011 | TUESADY<br>22 NOV. 2011 | WEDNESDAY<br>23 NOV. 2011 | THURSDAY<br>24 NOV. 2011 | FRIDAY<br>25 NOV. 2011 |
|---|---|---|---|---|---|
| AM | | Opening | Oral Sessions | Field Trip | Training |
| | | Coffee Break | Coffee Break | | Coffee Break |
| | | Oral Sessions | Oral Sessions | | Training |
| | | Lunch | Lunch | | Lunch |
| PM | Registration<br>&<br>Poster Setting Up | Oral Sessions | Oral Sessions | | Training |
| | | Coffee Break | Coffee Break | | Coffee Break |
| | | Oral Sessions | Discussion Sessions | | Training |
| | | | Meeting Wrap Up | | Discussion |
| Evening | | Reception Dinner | Dinner | Dinner | Dinner |

# TECHNICAL PROGRAMME DETAILS

## Oral / Discussion Sessions

### 22nd NOV, TUESDAY MORNING

| Time | Speaker | Country | Title |
|---|---|---|---|
| Opening | | | |
| 08:30-08:40 | Jing Zhang<br>Yunxuan Zhou | China | Opening remarks |
| 08:40-09:00 | Sumei Liu | China | Introduction to IMBER |
| 09:00-09:20 | Sinjae Yoo<br>Se-Jong Ju | Korea | IMBER Research overview from Korea |
| 09:20-09:40 | Hiroaki Saito | Japan | IMBER Research overview from Japan |
| 09:40-10:00 | Jing Zhang | China | IMBER Research overview from China |
| 10:00-10:20 | Coffee break and Group photo taken | | |
| Oral session: Development of the biological indicators to detect and evaluate changes in marine ecosystem structure and function<br>Convener: Sumei Liu | | | |
| 10:20-10:40 | Se-Jong Ju | Korea | Importance of the bottom cold-water mass as an over-summering refuge for *Euphausia pacifica* in the Yellow Sea |
| 10:40-11:00 | Ganning Zeng | China | Relationship between the upwelling and harmful algal blooms off Zhejiang |
| 11:00-11:20 | Mitsuo Uematsu | Japan | Distribution of radioactive materials in atmosphere and seawater of the North Pacific Ocean: past and present |
| 11:20-11:40 | Xinyu Song | China | Summertime primary production in northwest South China Sea: Interaction of coastal eddy, upwelling and biological processes |
| 11:40-12:00 | Toshiya Katano | Japan | Bloom development of *Chattonella* (raphidophyceae) with reference to the nutrient source in the Ariake Sea, Japan |
| 12:00-13:30 | Lunch | | |

## 22nd NOV, TUESDAY AFTERNOON

| Time | Speaker | Country | Title |
|---|---|---|---|
| Oral session: Development of the biological indicators to detect and evaluate changes in marine ecosystem structure and function (Continued)<br>Convener: Sumei Liu | | | |
| 13:30-13:50 | Min Liu | China | Bacterial and archaeal community in the Changjiang Estuary hypoxia area and the adjacent of East China Sea |
| 13:50-14:10 | Yanhui Yang | Japan | Viral gradient along the meridional overturning circulation |
| 14:10-14:30 | Meiping Feng | China | Influence of fresh water discharge and oceanic water intrusion on planktonic ciliate distribution in a coastal shelf area |
| 14:30-14:50 | Jung-Hoon Kang | Korea | Vertical distribution of the copepod *Calanus sinicus* with characteristics of water column related to Yellow Sea Bottom Cold Water (YSBCW) in the Yellow Sea |
| 14:50-15:10 | Jun Sun | China | Central Yellow Sea Spring Blooms – a scenario |
| 15:10-15:30 | Linbin Zhou | China | Zooplankton size spectrum under the influence of the Pearl River plume and coastal upwelling in the northeastern South China Sea |
| 15:30-15:50 | Coffee break | | |
| Oral session: The impact of anthropogenic activities on marine biogeochemistry and ecosystem dynamics<br>Convener: Hiroaki Saito | | | |
| 15:50-16:10 | Sumei Liu | China | Biogeochemistry of nutrients in the Changjiang Estuary and its adjacent East China Sea |
| 16:10-16:30 | Jinzhou Du | China | Radium tracer study on the environmental processes of estuarine and coastal areas in China |
| 16:30-16:50 | Zhuoyi Zhu | China | Hypoxia off the Changjiang (Yangtze River) Estuary: Oxygen depletion and organic matter decomposition |
| 16:50-17:10 | Zengjie Jiang | China | Effect of shellfish and seaweed aquaculture on marine carbonate system |
| 17:10-17:30 | Zhenke Zhang | China | Coastal sedimentation characteristics and morphological changes at Yuantuojiao Point, estuary of the North Branch, Changjiang River |
| 17:30-17:50 | Shang Chen | China | Identification and valuation of ecosystem services of China coastal waters |
| 17:50-18:10 | Baoping Di | China | Changes of diatom and silicoflagellate assemblages in sediment cores over the last 130 years in Sishili Bay, China |

## 23rd NOV, WEDNESDAY MORNING

| Time | Speaker | Country | Title |
|---|---|---|---|
| Oral session: Impact of climate change on physicochemical and biological properties of marginal seas<br>Convener: Se-Jong Ju | | | |
| 08:30-08:50 | Hiroaki Saito | Japan | Nitrogen dynamics in the surface mixed layer of the Kuroshio Extension region |
| 08:50-09:10 | Daji Huang | China | Analysis of Kuroshio Current at PN/TK sections during 1955-2010 based on observed hydrographic data |
| 09:10-09:30 | Xinyu Guo | Japan | Downstream nutrient transport by the Kuroshio in the East China Sea and its temporal variations |
| 09:30-09:50 | Douding Lu | China | Long term trend of algal community in the East China Sea |
| 09:50-10:10 | Liang Xue | China | Carbonate parameters in the waters dominated by the Yellow Sea Cold Water in the northern Yellow sea during summer |
| 10:10-10:30 | Coffee break | | |
| 10:30-10:50 | Xiping Lian | China | The influence of coastal upwelling and a river plume on the zooplankton spatial distribution in the northeastern South China Sea |
| 10:50-11:10 | Jun Hu | China | Seasonal and interannual variations of phytoplankton community structure in the southern Taiwan strait |
| 11:10-11:30 | Mitsuo Uematsu | Japan | Linkages in biogeochemical cycles between surface ocean and lower atmosphere over the western North Pacific Ocean |
| Oral session: The marine end-to-end food web: the impact of environmental changes on marine ecosystems<br>Convener: Jing Zhang | | | |
| 11:30-11:50 | Sinjae Yoo<br>Joo-Hyung Ryu | Korea | Development of primary production algorithm for GOCI (Geostationary Ocean Color Imager) |
| 11:50-12:10 | Jianguang Fang | China | Effect of marine acidification on calcification and respiration of *Chlamys farreri* |
| 12:10-13:30 | Lunch | | |

## 23rd NOV, WEDNESDAY AFTERNOON

| Time | Speaker | Country | Title |
|---|---|---|---|
| Oral session: The marine end-to-end food web: the impact of environmental changes on marine ecosystems (Continued)<br>Convener: Jing Zhang | | | |
| 13:30-13:50 | Jihong Zhang | China | Kelp *Laminaria japonica* growth model and the effects of extreme low temperatures on it's mariculture in Sungo Bay, China |
| 13:50-14:10 | Keun-Hyung Choi | Korea | Recent collapse of the copepods in the northern East China Sea |
| 14:10-14:30 | Xiaodong Bian | China | Some effects of temperature and salinity on eggs and yolk sac larvae of Pacific cod *Gadus macrocephalus* |
| 14:30-14:50 | Yunrong Yan | China | A preliminary investigation of the fish food web in the Beibu Gulf, South China Sea, using dietary and stable isotope analyses |
| 14:50-15:10 | Yang Yang | China | Modeling research on the ecosystem in the Yangtze Estuary and adjacent areas |
| 15:10-15:30 | Hui Wu | China | Tidal modulation on the Changjiang River Plume in summer |
| 15:30-15:50 | Coffee break | | |
| 15:50-17:30 | Discussion session:<br>1. National and regional activities of IMBER-related research in East Asia<br>2. Comparison of ecosystem functions in regional scale.<br><br>Conveners: Se-Jong Ju; Hiroaki Saito; Jing Zhang | | |
| 17:30-18:00 | Meeting wrap up | | |

## Field Trip

## 24th NOV, THURSDAY

| Field trip (Su Zhou City tour)<br>Visiting sites: Hanshan Temple, The Humble Administrator's Garden, Suzhou Museum | |
|---|---|
| 08:30 | Depart from Jin Sha Jiang Hotel |
| 21:00 | Return to Jin Sha Jiang Hotel |

## Training Courses

### 25th NOV, FRIDAY

| Time | Speaker | Country | Title |
|---|---|---|---|
| Opening | | | |
| 08:30-08:40 | Sinjae Yoo | Korea | Welcome address form IMBER |
| 08:40-09:10 | Trainees | | Introduction |
| 09:10-10:10 | Sinjae Yoo | Korea | Progress in PICES/FUTURE programme |
| 10:10-10:30 | Coffee break (Group photo taken) | | |
| 10:30-12:00 | Hiroaki Saito | Japan | A multidisciplinary ocean science programme SUPRFISH (Study on Prediction and Application of Fish Species Alternation): Implementation strategy and results |
| 12:00-13:30 | Lunch | | |
| 13:30-15:00 | Xinyu Guo | Japan | Volume and nutrient transport across shelf break：A physical approach |
| 15:00-15:20 | Coffee break | | |
| 15:20-16:50 | Jing Zhang | China | Aspects of the biogeochemical dynamics of marginal seas |
| 16:50-17:10 | Break | | |
| 17:10-18:00 | Discussions | | |
| 18:00-18:10 | Wrap up | | |
| 18:30- | Dinner | | |

**Trainees List**

| Name | Affiliation | Country |
|---|---|---|
| Yan Chang | ECNU | China |
| Keun-Hyung Choi | Korea Ocean Research & Development Institute | Korea |
| Ying Cui | ECNU | China |
| Meirong Du | Yellow Sea Fisheries Research Institute | China |
| Meiping Feng | Xiamen University | China |
| Yaping Gao | Yellow Sea Fisheries Research Institute | China |
| Sonal Haldankar | ECNU | India |
| Tao Ji | ECNU | China |
| Yifei Jiang | ECNU | China |
| Zengjie Jiang | Yellow Sea Fisheries Research Institute | China |
| Jiaqi Li | Yellow Sea Fisheries Research Institute | China |
| Ruihuan Li | Ocean University of China | China |
| Zhongqiao Li | ECNU | China |
| Shiquan Lin | Xiamen University | China |
| Tariq Mahmood | ECNU | Pakistan |
| Xiaobo Ni | Second Institute of Oceanography, State Oceanic Administration | China |
| Bin Wu | Ocean University of China | China |
| Yuan Xiong | Xiamen University | China |
| Dingyong Zeng | Second Institute of Oceanography, State Oceanic Administration | China |
| Anyu Zhang | ECNU | China |

## Poster List

| Authors | Country | Poster Title |
|---|---|---|
| Lijun He | China | Evolutionary consequence of Quaternary climatic fluctuations on marine species in the China seas |
| Chanjoo Jang, Sinjae Yoo, Jisoo Park, Taewook Park | Korea | Changes in the mixed layer depth due to global warming and their impacts on primary production |
| Yifei Jiang，Jinzhou Du，Wenxiang Zhang，Jing Zhang | China | Modern environment evolution recorded in the estuary sediment by using 210Pb and 137Cs |
| Huanhuan Liu | China | Study on inorganic carbon of surface water in the Jiaozhou bay |
| Jia Meng | China | Research of different phosphorus species in SPM of Yangtze estuary |
| Jinlong Wang, Jinzhou Du, Yifei Jiang, Jing Zhang | China | The distribution patterns of 7Be, 210Pb and 137Cs of surface sediment and fluid mud in the Changjiang Estuary, China and their environmental implication |
| Chao Xue | China | Distribution and controlling factors of nitric oxide concentrations in surface seawater of the Yellow Sea and the Bohai Sea |
| Jinglong Yao | China | Fronts in the marine ecosystem of the southern South China Sea |
| Chengyi Yuan, Hao Wei, Youyu Lu, Xiaofan Luo, Zhihua Zhang | China | Forcing mechanisms of inter-annual to decadal variability of seawater temperature in the Yellow Sea during 1958 to 2007 |
| Wuchang Zhang, Cuixia Zhang, Feng Zhou, Nan Zhao, Tian Xiao | China | Infuence of seasonal stratification and oceanic water intrusion on the distribution of planktonic ciliates in a temperate marginal sea |
| Zhenke Zhang, Linhua Zhang, Jing Zhang, Mingxing Zuo | China | Adapting climate changes: Reclamation and coastal disaster along the coast of China |
| Xiaoshen Zheng, Hao Wei, Youyu Lu, Yuheng Wang | China | Seasonal and inter-annual variability of surface chlorophyll concentration in the Yellow Sea and the East China Sea |
| Feng Zhou, Jiliang Xuan, Daji Huang, Xiaobo Ni | China | Hydrodynamic factors associated with the interannual variability of hypoxia off the Changjiang (Yangtze River) Estuary |

| Authors | Country | Poster Title |
|---|---|---|
| Jianrong Zhu, Jun Lin | China | Impacts of physical processes on the phytoplankton off the Changjiang Estuary |
| Tao Ji, Xilong Wang, Jinzhou Du, Jing Zhang | China | Distribution patterns of radium isotopes in the mixing zone at the river mouth of Yangtze River |
| Ruihuan Li, Sumei Liu, Guiling Zhang, Jingling Ren, Jing Zhang | China | Nutrient dynamics along coastal of eastern Hainan Island and its influence on ecology and environmental |
| Chaofeng Lin, E. I. Larsen, P. R. Grace, J. J. Smith | China | Iron mobilization and greenhouse gas evolution as influenced by plantation clear-felling and replanting in a subtropical coastal catchment soil |
| Shumin Liu, Qingzhen Yao, Xiaoxiao Hang, Hongtao Chen, Zhigang Yu | China | Temporal and spatial variation of heavy metals in wetlands of the Yellow River Estuary |
| Xiaobo Ni, Daji Huang, Jianfang Chen, Dingyong Zeng | China | A buoy system for monitoring hypoxia off Changjiang Estuary and field results in 2011 |
| Yajun Shi, Dongyan Liu, Hongbing Shao, Jin He, Baoping Di, Yujue Wang, Zhijun Dong, Qianli Sun | China | Dinoflagellate cysts from core sediments of Sishili Bay, Yellow Sea, China: an indication of human activity |
| Bin Wang, Jianfang Chen, Haiyan Jin, Hongliang Li, Xizen Liu, Yanpei Zhuang, Yanqing Xu | China | The discussion of the dissolved inorganic carbon system variation mechanism in Changjiang Estuary and its adjacent sea areas in summer |
| Kui Wang, Jianfang Chen, Haiyan Jin, Fajin Chen, Hongliang Li, Shengquan Gao, Yong Lu | China | The four seasons nutrients distribution in Changjiang Estuary and adjacent East China Sea |
| Kai You, Seung Ho Baek, Toshiya Katano, Myung-Soo Han | China | Assessing the impacts of an artificial breakwater on phytoplankton abudance and community structures: A case study of Sihwa Lake, Korea |
| Yong Zhang, Huixiang Xie, Patrick Poulin, Karine Lemarchand | China | Seasonal variation and kinetics of microbial consumption of carbon monoxide in a subarctic estuarine system |

| Authors | Country | Poster Title |
|---|---|---|
| Yaoling Zhang, E. Michael Perdue, Nelson W. Green, Jinzhou Du | China | Impacts of crude oil and diverted freshwater on dissolved organic matter in Barataria Bay, Louisiana |
| Lijun Hou, Yanling Zheng, Guoyu Yin | China | Anammox bacteria and associated activity in Chongming eastern intertidal sediments of the Yangtze Estuary |
| Shiquan Lin, Yuan Xiong, Lingfeng Huang | China | Weak coupling between heterotrophic nanoflagellate and bacteria in the Yellow Sea |
| Xin Li, Dongyan Liu | China | The environmental indication of biogenic silica and diatom in the surface sediment of Sishili Bay and northern Yellow Sea, China |
| Heng Li, Meizhen Li | China | Effects of nutrients supplies on nitrogen and phosphorus uptakes and growth in three species of macroalgae |
| Bin Wu ,Sumei Liu | China | Dissolution kinetic of biogenic silica in the Yellow Sea sediments |
| Li Zhao, Yuan Zhao, Wuchang Zhang, Feng Zhou, Cuixia Zhang, Jingling Ren, Xiaobo Ni, Michel Denis, Tian Xiao | China | Influences of water masses on picoplankton distribution in the East China Sea in autumn and winter |
| Qian Yang | China | Application of biologic silicon in modern sedimentary section to reconstruction of phytoplankton changes in the East China Sea and the Yellow Sea during last 200 years |
| Xiaoli Zhang, Jun Gong | China | Abundances and distribution of nitrogen-cycling microbes in estuarine sediments of the Laizhou Bay, China |
| Yuan Zhao, Tian Xiao, Li Zhao, Sanjun Zhao, Jiliang Xuan, Chaolun Li, Xiuren Ning | China | Spatial and temporal variation of picoplankton distribution |
| Dongxiao Wang | China | Connection between CLIVAR and IMBER |

# PRESENTATION ABSTRACTS

## Oral presentations

### Importance of the bottom cold-water mass as an over-summering refuge for *Euphausia pacifica* in the Yellow Sea

Se-Jong Ju[1, *], Jinho Chae[2], Dongju Lee[2], Ah-Ra Ko[1], Hyungbeen Lee[1] and Donhyug Kang[1]

[1]*Deep-Sea and Marine Georesources Research, Korea Ocean Research and Development Institute (KORDI), 787 Haean-ro, Sangrok-gu, Ansan, 425-600, R Korea.*
[2]*Korea environmental Research Center for Hydrosphere, 634-1 Yi-dong, Sangnok-gu, Ansan, 426-862, R Korea*
*(*E-mail: sjju@kordi.re.kr)*

**Abstract**
*Euphausia pacifica*, known as a key species in the Yellow Sea, should utilize the bottom cold water mass (YSBCM; ≤ 10°C) as a refuge to survive through the hot summer (subsurface water temperature: > 25°C) because their upper tolerance level for water temperature is 15°C. However, no solid evidence has been reported yet to confirm this distribution. Therefore, we investigated their horizontal and vertical distribution using net and acoustic surveys during spring (YSBCM not formed) versus summer (YSBCM well developed) in 2010 and 2011. Even though the spatial distribution of *E. pacifica* showed interannual variation, eggs and gravid females generally predominated in spring with an active diel vertical migration over the whole water column. In summer, juveniles and adults were concentrated in the YSBCM of the central region with a limited diel vertical migration (below the thermocline). Furthermore, detailed profiles of the dietary lipid biomarkers and gut contents suggest that *E. pacifica* diet shifted from diatoms/dinoflagellates in the spring to microzooplankton such as protozoa in summer. These results suggest that *E. pacifica* may not only utilize the YSBCM as an over-summering site but also switch their diets to survive through the hot summer.

### Relationship between the upwelling and Harmful Algal Blooms off Zhejiang

Ganning Zeng[1, 2, *], Jianxin Lu[3], Yan Zhou[3], Jun Yu[3], Hua Long[3]

[1]*State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography State Oceanic Administration, P. R. China*
[2]*College of Chemical Engineering and Materials Science, Zhejiang University of Technology, Hangzhou, P. R. China*
[3]*Zhejiang Marine Survey and Forecast Center, Hangzhou, P. R. China*
*(*E-mail: gnzeng@zjut.edu.cn)*

**Abstract**
Upwelling systems can be classified according to their physical, chemical and biological characteristics. Understanding the ecology and oceanography of HABs in upwelling systems will benefit from a comparative approach. Understanding the response of harmful algae to perturbations within upwelling systems will assist in prediction, meanwhile, identification of

divergences from predicted responses will also be informative.

As the most famous upwelling system in China, Zhejiang Coastal area were also frequently affected by HABs, which led to the analysis necessity of relationship between the upwelling and HABs. The most frequently HABs species reported in Zhejiang Coastal upwelling areas were resulted from *Skeletonema costatum, Prorocentrum donghaiense, Karenia mikimotoi* Hansen, *Noctiluca scintillans*˙ Whereas, the extent to which HAB species respond in upwelling systems shared various characteristics, especially in different mechanism condition. Based on the long-term statistical information of HABs off Zhejiang (1980-2008), the calculation results of wind-driven upwelling indices were analyzed, to find the relationship between the HABs and the upwelling variation. Meanwhile, with the historical reported tidally induced upwelling results got being considered, the difference response of identical species to wind-upwelling indices were further discussed. And the results indicated that the upwelling system not only bring physical but also chemical effects on the HABs event, meanwhile, the variation of the physical environmental elements may play the different role in HABs.

**Distribution of radioactive materials in atmosphere and seawater of the North Pacific Ocean: past and present**

Mitsuo UEMATSU[1]

[1]*Atmosphere and Ocean Research Institute, The University of Tokyo, Kashiwanoha, Chiba 277-8564, JAPAN*

Prior to the Fukushima nuclear accident in March 2011, the main sources of anthropogenic radioactivity to the earth's ocean and land were fallout from atmospheric nuclear weapon testing and releases from nuclear fuel reprocessing plants and from the Chernobyl accident in 1986.

The artificial radionuclides, $^{90}$Sr, $^{137}$Cs, $^{239,240}$Pu, and other transuranics were used for monitoring and study by many institutes and organizations in many countries. Before the Fukushima accident, $^{137}$Cs in the surface ocean had decreased by two orders of magnitude from its highest levels in the 1950s while the monthly deposition of $^{137}$Cs and $^{90}$Sr had decreased by five order of magnitude from its highest levels in the 1960s.

The Fukushima accident created $^{137}$Cs levels in the surface ocean off the Fukushima Nuclear Power Plant (NPP) site that were several orders of magnitude higher than those prior to the accident. At the end of March 2011, $^{137}$Cs levels in the surface water around the water discharge port rose to $10^7$Bq m$^{-3}$ and decreased to approximately $10^5$Bq m$^{-3}$ by the end of April 2011. The level of $^{137}$Cs in the surface water 30 km offshore of the NPP site ranged from $10^2$Bq m$^{-3}$ to $10^4$Bq m$^{-3}$ in March and April 2011. Atmospheric deposition signals to the sea surface was also found from 22 March to 30 March at the same 30 km offshore sites.

It is important to note that we still do not

have reliable estimates of either the total amount of radionuclides, including $^{137}$Cs, $^{134}$Cs and $^{239,240}$Pu, released directly into the ocean, or the total amount of radionuclides deposited onto both the ocean and land surfaces through the atmosphere. The atmospheric deposition to the ocean surface might be larger than that deposited on land since a large portion of released radionuclides were transported over the ocean by the prevailing westerly wind. To fully evaluate the impact of the release, it is essential to develop comprehensive figures for radionuclide release that are based on both comprehensive field studies and model studies for land and the ocean.

**Summertime primary production in northwest South China Sea: Interaction of coastal eddy, upwelling and biological processes**

Xingyu Song[1, 2], Zhigang Lai[3, 6], Rubao Ji[4], Changsheng Chen[3], Jianlin Zhang[1], Liangmin Huang[1, 2], Jianqiang Yin[1], Youshao Wang[2], Shumin Lian[2], Xuemin zhu[5]

[1]*Key Laboratory of Marine Bio-resources Sustainable Utilization, South China Sea Institute of Oceanography, CAS, Guangzhou, 510301, P. R. China*

[2]*State Key Laboratory of Oceanography in the Tropics, Guangzhou, 510301, P. R. China*

[3]*The School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford, Massachusetts, 02744, USA*

[4]*Department of Biology, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, 02543, USA*

[5]*National Marine Environmental Forecasting Center of China, Beijing, 100081, P. R. China*

[6]*School of Marine Sciences, Sun Yat-Sen University, Guangzhou, 510275, P. R. China*

**Abstract**

The Northwest South China Sea (NWSCS) ecosystem is controlled by multiple physical processes in summer, including the coastal upwelling, the cyclonic eddy off the eastern Leizhou Peninsular (ELP), and the Yuexi Coastal Current (YCC). Understanding the controlling processes of biological productivity is critical to a better estimation of carbon budget and potential fishery production in this region. Using the *in situ* and remote sensing data and numerical modeling results, we examined the patterns and drivers of the spatial variability of phytoplankton biomass and primary production in the NWSCS in summer. The coastal waters off the ELP have higher phytoplankton biomass than that off the eastern Hainan Island (EHI), probably due to the topography and eddy-driven enhancement of nutrient supply and light availability along the ELP. The YCC tends to inhibit phytoplankton growth and thus depresses the surface phytoplankton biomass in the near-shore waters of the ELP, mainly through the stratification-induced nutrient limitation (primarily phosphorous limitation). A small but distinguishably high biomass/productivity area was found at the east side of the Qiongzhou Strait (between the ELP and the EHI). This eddy-shaped feature appears to be separated from the larger high productivity area near the Qiongzhou Strait, and is likely caused by the

interaction of multiple dynamical processes including coastal upwelling, topographically-induced double eddy circulation, the YCC and associated large-scale cold eddy, and possibly tidal mixing in this area. Overall, the physical environment induced variability in the nutrient transport and light penetration are key processes regulating the horizontal and vertical distribution of phytoplankton biomass and productivity in NWSCS.

**Keywords:** northwest South China Sea, primary production, chlorophyll *a*, upwelling, modeling, remote sensing

## Bloom development of *Chattonella* (raphidophyceae) with reference to the nutrient source in the Ariake Sea, Japan

Toshiya Katano[1, *], Makoto Yoshida[2], Kenji Yoshino[1], Souichi Yamaguchi[3], Yuji Ito[1], Yuichi Hayami[1]

[1]*InstituteofLowland and Marine Research, Saga University, 1 Honjo-machi, Saga 840-8502, Japan*
[2]*Seikai National Fisheries Research Institute,1551-8 Taira-cho, Nagasaki 851-2213, Japan*
[3]*Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, 6-1 Kasuga-kouen, Kasuga, Fukuoka, 816-8580, Japan*
*(*E-mail: f9130@cc.saga-u.ac.jp)*

**Abstract**

Genus *Chattonella* is a representative red tide-causing raphidophyte in coastal waters worldwide. Many phytoflagellates, including *Chattonella*, have vertically migrating ability, which enabled them to utilize deeper nutrient pool. Therefore, these migrating species have been considered to overcome diatoms when nutrient concentrations in the surface layer become low in the stratified water column. In the Ariake Sea, located in western part of Japan, severe *Chattonella* bloom frequently occurs in most summer. However, as the sea is the mesotidal, stratification does not develop steadily especially in the innermost area of the sea. Moreover, the sea frequently receives freshwater inputs during rainy season of summer. Such a highly turbulent condition generally favors diatom bloom rather than the *Chattonella* bloom. Hence, bloom developmental process of *Chattonella* is of interest. In the present study, we investigated the bloom developmental process of the *Chattonella* population in the sea with reference to the nutrient source. The field survey was carried out in 2008 and 2010. In 2008, the bloom occurred from late July to middle August. Precipitation in July 2008 was very low (44.5 mm) as compared to usual years. Consequently, both nitrogen and phosphorus nutrients were exhausted in the surface. As *Chattonella* population developed from middle July, nutrient concentrations in deeper layer (>4m depth) gradually decreased. Therefore, nutrient source for the *Chattonella* bloom in 2008 was probably in the deeper layer. In 2010, *Chattonell a*bloom occurred in early July. Just before the bloom, nutrient concentration increased to 43 μmol N $l^{-1}$ due to the high river discharge after the heavy rain. In this case, *Chattonella* seems to utilize the high amount of nutrients in the surface. These results showed that *Chattonella* does not always utilize deeper

nutrient pool as a sole source for their development. In other words, *Chattonella* can form dense bloom using surface nutrients supplied after the heavy rain.

**Bacterial and archaeal community in the Changjiang Estuary hypoxia area and the adjacent of East China Sea**

Min Liu[1], Tian Xiao[1, *]

[1]*Key Laboratory of Marine Ecology and Environmental Sciences, Institute of Oceanology, Chinese Academy of Sciences (CAS), Qingdao 266071, P. R. China*
*(*E-mail: txiao@ms.qdio.ac.cn)*

**Abstract**
Hypoxia causes low macrofaunal diversity and obstructs the vertical distribution and migration of some zooplankton. However, little is known about the effects of hypoxia on the diversity and distribution of bacteria and archaea. We investigated bacterial and archaeal community and the effects of environmental factors on the microbial community distribution in the Changjiang Estuary hypoxia area and the adjacent East China Sea (ECS) in June, August and October, 2006. Microbial community composition were analyzed by denaturing gradient gel electrophoresis (DGGE) of 16S rRNA genes followed by DNA sequence. Bacterial community structure presented spatial variations. Bacterial communities in the Changjiang Estuary hypoxia area were different from those in the non-hypoxia area. Proteobacteria, Bacteroidetes, Firmicutes and Cyanobacteria were dominated in the hypoxia area, while only the first three bacterial clusters were detected in the non-hypoxia area. The predominant bacteria are Flavobacteria in the hypoxia area when hypoxia-occurring. Achaeal community structure presented temporal variations. Most of samples collected in October grouped one cluster, and samples in June and August formed another one. No significant difference on archaeal community structure between in the hypoxia area and non-hypoxia area. Archaeal communities in the Changjiang Estuary hypoxia area and the adjacent ECS were *Euryarchaeota* (mainly Marine Group II) and *Crenarchaeota*. Multivariate analysis indicated a significant relationship between salinity and the archaeal community structure. These results provide useful data to further understand distribution and function of microbial communities in marine ecosystem.

**Viral gradient along the meridional overturning circulation**

Yanhui Yang[1]

[1]*Atmosphere and Ocean Research Institute, The University of Tokyo, Japan*

**Abstract**
Despite increasing recognition that viruses play important roles in the regulation of carbon and other bioelement cycling and microbial community dynamics in diverse marine environments, our knowledge on viral distributions, variations, and the extent of viral-induced mortality of prokaryotes in deep oceanic environments is severely limited. This paucity of data hampers better understanding of the controls of microbe-

and viral-mediated biogeochemical cycles in the ocean's interior where large quantities of carbon and nutrients are remineralized and sequestered to affect variability in the climate of our planet. Here we collected data on full depth distributions of viruses along a cruise track of ~17,000 km in the Southern Ocean and the central Pacific, covering a broad range of biogeochemical provinces. Our data revealed novel features in inter-basin distribution patterns of viruses. The most outstanding feature was the presence of the viral abundance gradient along the path of meridional overturning circulation. This pattern was remarkably consistent with that of dissolved organic carbon. These results lead us to hypothesize that deep ocean viral distributions are largely shaped by the transport of viruses due to deep ocean circulation, accompanied by slow viral decay or removal during the transit. Long-distance transport of viruses along the meridional overturning circulation may provide a means for viruses to spread across oceanic basins and depth layers, and explains locally high, but globally limited viral diversity in the oceans.

**Influence of fresh water discharge and oceanic water intrusion on planktonic ciliate distribution in a coastal shelf area**

Meiping Feng[1, 3], Cuixia Zhang[1, 3], Wuchang Zhang[1, *], Xiaobo Ni[2], Nan Zhao[1, 3], Tian Xiao[1]

*[1]Key Laboratory of Marine Ecology and Environmental Sciences, Institute of Oceanology, Chinese Academy of Sciences, Qindao, 266071, P. R. China*

*[2]State Key Laboratory of Satellite Ocean Environment Dynamics, Institute of Oceanography, State Oceanic Administration, Hangzhou, 310012, P. R. China*

*[3]Graduate University of Chinese Academy of Sciences, 19 Yuquan Road, Beijing, 100049, P. R. China*

*(*E-mail: wuchangzhang@ms.qdio.ac.cn)*

**Abstract**

The relationships between the distributions of ciliate abundance and different water masses in the East China Sea were investigated in summer (18-31August) 2006 and winter (22 February to 11 March) 2007.

In summer, average surface ciliate abundance (942 697 ind. $L^{-1}$) in the Changjiang Diluted Water (CDW) was higher than in the offshore Shelf Mixing Water (SMW) (403 307 ind. L-1) in the Changjiang River Estuary and its adjacent sea. Salinity variation had important effect on the spatial pattern of surface ciliate abundance in the SMW.

In winter on the shelf, average surface ciliate abundance in the SMW (432 645 ind. $L^{-1}$) was higher than in the Kuroshio Water (202 193 ind. $L^{-1}$) and the Coastal Water (CoW) (209 307 ind. $L^{-1}$). Integrated ciliate abundance of 0-30 m in the SMW was not only significantly and negatively correlated with salinity, but also positively with Chlorophyll a concentration.

Over the shelf area, ciliate distribution was characterized by increase of abundance close to the frontal areas. Most tintinnids identified as neritic species did not show discrimination of distribution between two

water masses in the Changjiang River Estuary. However, there were pronounced distribution zones of tintinnid species and some occasional oceanic species might indicate the intrusion route of Kuroshio Water on the continental shelf.

**Keywords:** ecology, abundance, biomass, Yellow Sea, zooplankton

**Vertical distribution of the copepod *Calanus sinicus* with characteristics of water column related to Yellow Sea Bottom Cold Water (YSBCW) in the Yellow Sea**

Jung-Hoon Kang[1, *], MinHo Seo[3], OhYoun Kwon[1] and Woong-seo Kim[2]

[1]*South Sea Branch, Korea Ocean Research and Development Institute (KORDI), 391 Jangmok-ri, Jangmok-myon, Geoje, Gyungsangnam-do, 656-830, R Korea.*
[2]*Office of the Senior Vice President, KORDI, Ansan, P.O. Box 29, 425-600, R Korea*
[3]*Faculty of Marine Technology, Chonnam National University, Dundeok-dong, Yeosu, Jeollanam-do, 550-749, R Korea*
*(*E-mail: jhkang@kordi.re.kr)*

**Abstract**

To understand effects of the Yellow Sea Bottom Cold Water (YSBCW) on the vertical distribution of the copepod *Calanus sinicus*, we surveyed diel vertical migration (DVM) of *C. sinicus* at a fixed station in the Yellow Sea before and after formation of the YSBCW. Cold water (<10°C) was observed in the bottom layer when the water column was thermally stratified in summer, while the water column was thermally well-mixed in spring. Samples were collected from five different layers at 3 hour intervals with an opening-closing net. Identified developmental stages of *C. sinicus* were from copepodite I (CI) to adults (CVI). Adult females (1-155 inds.m$^{-3}$) showed clear DVM through the whole water column in spring, whereas adult males did not migrate. DVM of CV was not clear, while CI-CIV showed maximum residence in the upper 10-20m layer with high concentration of chlorophyll-*a* (chl-*a*). Conversely, clear DVM was not found in adult females (< 30 inds.m$^{-3}$) and adult males in summer. Maximum abundances of CI-CIV also occurred consistently in the subsurface layer (20-40m) with high concentration of chl-*a*. CV (1-272 inds.m$^{-3}$) moved upward nocturnally to the near-surface layer (10-20m) with average temperature of 25.74°C, while it was not found in the surface layer (0-10m) with 28.31°C. These results indicated that existence of the YSBCW affected the vertical distribution of all developmental stages of the copepod, and changed the food-rich depths that were preferred by the earlier developmental stages before and after formation of the cold waters in the Yellow Sea.

**Central Yellow Sea spring blooms – a scenario**

Jun Sun[1, 2, *], Dan Wang[3], Shuqun Song[5], Yuanyuan Feng[1, 2], Yan Jiang[4]

[1]*College of Marine Science and Engineering, Tianjin University of Science and Technology, Tianjin 300457, P. R. China*

[2]*Tianjin Key Laboratory of Marine Resources and Chemistry, Tianjin 300457, P. R. China*
[3]*Qingdao Entry Exit Inspection and Quarantine Bureau, Qingdao, 266002, China*
[4]*Chinese Research Academy of Environmental Science, Beijing 100012, P. R. China*
[5]*Institute of Oceanology, Chinese Academy of Sciences, Qingdao, 266071, P. R. China*

**Abstract**
Based on the phytoplankton bloom species succession from one-month multidiscipline cruises which carried out in spring 2006, 2007 and 2009, a brief scene of spring phytoplankton development in the Central Yellow Sea (CYS) is described in this paper. The CYS blooms were assigned to two types by the surface layer blooms (SB) and the subsurface thin layer blooms (STB). SB was firstly trigged by wind come down and the stability of water column reach a threshold in early spring, and the big-celled chain form diatom such as *Thalassiosira rotula* and *T. pacifica*, would be the blooming species. This big-celled chain form diatom SB will be sequentially annihilated by *Noctiluca* and copepod grazing, and developed to a kind of small-celled chain form diatom bloom, the *Skeletonema* spp. blooms, most of them was *Skeletonema dorhnii*. This *Skeletonema* bloom will be enhance by occasionally occurring dust originating from the northern part of China mainland, which will increase the iron and silicate concentrations in surface water, and further change the nutrients ratios to some intermediate disturb level. After rapid growth of this *Skeletonema* bloom, mass death and quick sinking will occurred flakily due to depletion of nutrients. Overall, the SB were rise and fall continuously in horizontal pattern. When surface layer nutrients were depleted to some extent, STB will fade in whatever, it's formed by shade blooming species, such as some diatom like *Dentinula* or dinoflagellate *Heterocapsa*, when the nutrient concentrations and light intension fit for their optimal level at subsurface waters. But this STB cannot be detected by remote sensing, this will increase the difficulty for monitoring and evaluating its ecological functions. And finally, this STB will definitely fade out with the coming summer. There are still many uncertainties in this hypothesis and further works needs to testifying or correcting.

**Keywords:** spring phytoplankton bloom, Yellow Sea, species succession

## Zooplankton size spectrum under the influence of the Pearl River plume and coastal upwelling in the northeastern South China Sea

Linbin Zhou[1], Yehui Tan[1], Liangmin Huang[1]

[1]*South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, 510301, P. R. China*

**Abstract**
The Pearl River plume and coastal upwelling are common physical phenomenon in the northern South China Sea in summer, their roles in matter transport, chemical and biological processes has attracted much attention. To explore zooplankton response to the influence of the

Pearl River plume and coastal upwelling, mesozooplankton was intensively investigated in the northeastern South China Sea during June 30 to July 11, 2008, and zooplankton abundance size spectra (ASS) were constructed. The intercept and slope values of ASS in the whole area were 8.659 ± 0.727 and -0.816 ± 0.074, respectively. The distribution of zooplankton ASS parameters accorded well with the Pearl River plume and coastal upwelling. On the basis of the ASS parameters, the sampling sites were classified into two main groups which corresponded to the plume-affected and the upwelling-affected areas, respectively. The Pearl River plume and upwelling may influence the zooplankton community through altering nutrient supply for their prey, the phytoplankton. Comparison of zooplankton communities among areas indicated that copepods accounted for most of the abundance difference between the plume-affected and upwelling-affected areas, which may accounted for the high fishery yield in the upwelling area, as copepod is a good food item for fishery organisms. However, higher proportion of jellyfish in the large size fractions and shallower slope values than -1 indicated an energy piling up in the gelatinous organism occurred, which was harmful to the fishery production in the study area.

**Comparative study on the life histories of *Neocalanus* and *Calanus* copepods, and their global distribution**

A. Tsuda[1], S. Shimode[1], K. Takahashi[2]

*[1]Atmosphere and Ocean Research Institute, University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa, Chiba 277-8654, Japan*
*(E-mail: tsuda@aori.u-tokyo.ac.jp; shimode@ aori.u-tokyo.ac.jp)*
*[2]Graduate School of Agricultural and Life Science, University of Tokyo*
*(E-mail: akazutak@mail.ecc.u-tokyo.ac.jp)*

**Abstract**

*Calanus* and *Neocalanus* copepods are large-sized and abundant copepods. They are one of the most important copepods as foods for higher trophic animals and carbon cycling in the world oceans. Life cycles of *Calanus* and *Neocalanus* species in middle and high latitude have been studied well, which are characterized by seasonal occurrence to the surface layer with ontogenetic vertical migration. However, information of low latitude species are limited. First, we investigated life cycle of *Neocalanus gracilis* in the subtropical Pacific. *N. gracilis* showed a continuous reproduction in the epipelagic layer throughout a year. However, spawning in the subsurface layer and small-scale ontogenetic vertical migration were suggested. Moreover, oil-sac was observed in late copepodite stages (C5 and C6 female) and C1, suggesting a reproduction depending on the accumulated materials and lecithotrophic nauplius stages. These life cycle strategies are considered as adaptation to oligotrophic environment (low-food availability) and high predation risk in the surface layer. These oligotrophic-adapted characteristics might facilitate the polar-ward immigration of this genus in the Pacific and the Southern Ocean where is characterized by HNLC

(high nutrient low chlorophyll) environment. Global distribution of *Calanus* and *Neocalanus* is re-considered in relation to the differences of life-cycle strategy of these genus.

**Keywords:** copepod, life cycle, distribution, phytoplankton bloom

## Biogeochemistry of nutrients in the Changjiang Estuary and its adjacent East China Sea

Sumei Liu[1], Xiaohong Qi[1], Xiaona Li[1], Haoran Ye[1], Jingling Ren[1], Ying Wu[2], Jing Zhang[2], Weiyi Xu[3]

[1]*Key Laboratory of Marine Chemistry Theory and Technology Ministry of Education, Ocean University of China, Qingdao, 266100, P. R. China*
[2]*State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, 200062, P. R. China*
[3]*Key Laboratory of Ocean Dynamic Processes and Satellite Oceanography, Second Institute of Oceanography, SOA, Hangzhou, 310012, P. R. China*

**Abstract**

Riverine transport is a principal pathway of particulate and dissolved elements from land to the sea. Excessive nutrient discharges and changes in their ratios caused by land-use transformation and anthropogenic emission have been known to result in eutrophication, hence modifying aquatic food webs and causing severe hypoxic events in coastal environments (Turner and Rabalais, 1994; Turner, 2002; Sundareshwar et al., 2003; Whitney et al., 2005). To better understand the nutrient dynamics and its relationship with the sustainability of ecosystems, water samples were collected in the Changjiang Estuaries and its adjacent East China Sea. Dissolved inorganic and organic nutrients ($NO_3^-$, $NO_2^-$, $NH_4^+$, $PO_4^{3-}$, $Si(OH)_4$, dissolved organic nitrogen (DON) and phosphorus (DOP)), particulate inorganic phosphorus (PIP) and particulate organic phosphorus (POP) were analyzed. Nutrients dynamics in the salt marsh of the Changjiang Estuary were also investigated. In addition, 13 core sediment samples were collected to understand sedimentation and burial of phosphorus. River water samples were collected bimonthly at Datong in the major reaches of the Changjiang. The results indicate that the concentrations of dissolved inorganic nutrient elements, PIP and POP show temporal and spatial distribution, which decreased from the coast to offshore areas. The DON and DOP concentrations show patchy distribution and were consistent with the distribution of phytoplankton. Phosphorus is the major potential limiting element for phytoplankton growth. Among different phosphorus forms, particulate P represented 38-52% of total P. The concentrations of PIP and POP show obvious seasonal variations, similar to the seasonal variation of SPM. The solid-solution partitioning of phosphorus was quantified using the conditional distribution coefficient, which vary up to 200 fold depending on the sites and season. The P accumulation rates show a gradient from coast to offshore region and illustrate quite high values due to high sediment accumulation rate. The total P burial efficiencies, that is ratio of P accumulation rate to the sum of P accumulation rate plus

benthic phosphate flux, were calculated to be almost 100% related to the low benthic phosphate flux and high sediment accumulation rate. Salt marsh is very useful to adjust nutrient transports from the rivers to offshore shelf areas.

**Radium tracer study on the environmental processes of estuarine and coastal areas in China**

Jinzhou Du[1], Ni Su[1], Tao Ji[1], Jing Zhang[1]

[1]*State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, 200062, P. R. China*

**Abstract**

Exchange of material (i.e. trace metal, nutrient) between the continental margin and estuary/coast plays important role in global biogeochemical cycles. Ra isotopes, with half-life times from days to thousands year, is one of powerful tools to study the estuary/costal processes, such as nutrient offshore diffusion, vertical diffusion, submarine groundwater discharge (SGD). Here we report our results on nutrient offshore/vertical diffusion processes, SGD in coastal region of the Yellow Sea, the East China Sea and the South China Sea. Moreover, the influence of SGD on coastal ecology may be more important than once thought, because SGD with carrying contaminants, some time, much high concentration of pollution comparison with river discharge.

**Hypoxia off the Changjiang (Yangtze River) Estuary: Oxygen depletion and organic matter decomposition**

Zhuoyi Zhu[1], Jing Zhang[1], Ying Wu[1], Yingying Zhang[1], Jing Lin[1], Xumei Liu[2], Zongguang Liu[1]

[1]*State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, 200062, P. R. China*

[2]*Key Laboratory of Marine Chemistry Theory and Technology Ministry of Education, Ocean University of China, Qingdao, 266100, P. R. China*

**Abstract**

In an especially dry year (2006) in the Changjiang Estuary, three cruises were conducted between June and October, to study the process of oxygen depletion. Data for the hypoxic zone pooled for 1959 through 2006 suggest that a dramatic increase in the area of hypoxia has occurred in recent years, and that the center of hypoxia moved northwards in 2006. In August, the hypoxic area (dissolved oxygen, or DO, b62.5 μM) in the northern region was 15,400 km2, which is comparable to that in the Gulf of Mexico. A large area of low DO (62.5 μMbDOb94 μM) also was found in the southern region. In near-bottom waters, particulate organic carbon (POC), dissolved inorganic phosphorus (DIP), dissolved inorganic nitrogen (DIN) and apparent oxygen utilization (AOU) showed coupled variation. For example, relationships can be found between AOU and POC/nutrients (POC/DIP: r = − 0.47, POC/DIN: r = − 0.50; pb0.001, n=86), and between AOU and Δσ of the water column (r=0.66, pb0.001, n=86; Δσ=density near-bottom waters− density surface waters). It is interesting that oxygen depletion in the northern and southern

regions developed separately, and they showed distinct differences. A more update observation (i.e. in summer, 2011) for the oxygen depletion is also presented.

**Effect of shellfish and seaweed aquaculture on marine carbonate system**

Zengjie Jiang[1], Jianguang Fang[1]

[1]*Yellow Sea Fisheries Research Institute, CAFS, Qingdao, 266071, P. R. China*

**Abstract**

Marine carbonate system is one of the most important components of the chemical perspective of oceanography, primarily because it controls the acidity of seawater and acts as a governor for the carbon cycle. Within the mix of acids and bases in the Earth-surface environment, the carbonate system is the primary buffer for the acidity of water, which determines the reactivity of most chemical compounds and solids. The carbonate system of the ocean plays a key role in controlling the pressure of carbon dioxide in the atmosphere, which helps to regulate the temperature of the planet.

China is the largest aquaculture country of shellfish and seaweed in the world. The total annual productions of shellfish and seaweed in 2009 are 10.53 and 1.46 million tons, respectively. Shellfish and seaweeds can strongly affect marine carbonate system and $CO_2$ exchange flux across air-sea interface by physiological activity. Shellfish convert bicarbonate to the carbonate they use to build their shells. This calcification process causes shifts in the carbonate system. Consider the chemical reaction

$Ca^{2+} + 2\ HCO_3^- \rightarrow CaCO_3 + CO_2 + H_2O$

which qualitatively indicates that during $CaCO_3$ precipitation $CO_2$ is liberated. Besides that, the respiration activity of shellfish can also increase [$CO_2$] thus affecting the carbonate system.

As for the seaweed, it can serve as a sink for $CO_2$ by photosynthesis, though it will also act as a source too, because of respiration. More generally, the low rates of $CO_2$ diffusion in water, compared to air, may restrict the rate of $CO_2$ supply and this may be enhanced by additional use of bicarbonate. Results showed that a number of marine seaweeds, such as *Laminaria japonica*, *Gracilaria lemaneiformis*, *Grateloupia turuturu*, etc, are able to use bicarbonate ions as an external carbon source for photosynthesis.

The suitable proportion strategy of shellfish and seaweed integrated aquaculture can eliminate the negative effects of releasing $CO_2$ from the respiration and calcification of shellfish. And also, this IMTA model can control the ocean acidification effectively.

**Keywords:** marine carbonate system, calcification, respiration, photosynthesis, integrated aquaculture.

**Coastal sedimentation characteristics and morphological changes at Yuantuojiao Point, estuary of the North Branch, Changjiang River**

Zhenke Zhang[1, *], Li Xie[2], Yunfeng Zhang[1] Jing Zhang[2]

[1]*School of Geographic and Oceanographic*

*Sciences, Key Laboratory of Coast and Island Development of MOE, Nanjing University, Nanjing 210093*
*[2]School of Resources and Environment of Guangdong University of Business Studies, Guangzhou, 510320*
*(*E-mail: zhangzk@nju.edu.cn)*

**Abstract**
The North Branch, separated by the Chongming Island, was once the main channel in the estuary of the Changjiang River. Because of the rapid sedimentation and reclamation along the North Branch channel, the North Branch became narrow and shallow, which lead to the shrinking of the channel. The Yuantuojiao Point is located at the intersecting point connected the North Branch of the Changjiang River and the Jiangsu coastline. The salt marsh occupied by *Spartina alterniflorea* and the typical silt-muddy tidal flat are distributed along the coast of the Yuantuojiao Point. The erosion cliffs are developed between the silt-muddy tidal flat and the salt marsh, and changed quickly in the past few years. The grain size analysis results of the surficial sediments and the two cores samples indicated that the Yuantuojiao Point tidal flat experienced the continuous accumulation. Based on the results of $^{137}Cs$ analysis of the YT Core and YY Core sampled from the tidal flat at Yuantuojiao Point, the average sedimentation rate of YT Core was 2.30 cm/a from 1963 to 2007, and 2.38 cm/a from 1954 to 2007 with the YY Core. Both cores showed the decline trend of the sedimentation rate in the estuary of the North branch, which may response to the decrease of the sediment discharge into the North Branch in the past decades. The average sedimentation rates at Yuantuojiao point were similar to that of the silt-muddy tidal flat in northern Jiangsu coast, but lower than that of the southern Changjiang River Estuary. Because of the large-scale reclamation and *Spartina alterniflorea* trapping sediments, the tidal flat at Yuantuojiao Point experienced the rapid sedimentation process, which lead to the disappearance of cliffs between the slat marsh and the silt-muddy tidal flat. Field morphological investigations from 2006 to 2008 on the salt marsh at Yuantuojiao Point revealed the obvious retreat of cliffs recently. The maximum annual retreat range reached 8-10 m. The severe storm surges were the main force for the recent cliff erosion at Yuantuojiao Point. Sedimentation and morphological changes of Yuantuojiao Point tidal flat not only displayed the retreat of the salt marsh and the disappearance of cliffs, but also accompanied with the rapid sedimentation process of the silt-muddy tidal flat and the salt marsh. The recent changes of sedimentation rates and morphological changes were the responses to the tidal current, storm surges, the sediment trap and large-scale reclamation. The main sediment source at Yuantuoijao Point, estuary of the North Branch is possible from the middle coast of Jiangsu Province.

**Keywords:** sedimentation rate, morphological changes, the tidal flat, salt marsh cliff, seaward reclamation, Yuantuojiao Point, the North Branch of the Changjiang River.

**Identification and valuation of ecosystem services of China coastal waters**

Shang Chen[1], Tao Xia[1], Min Wang[1], Guoying Du[1]

[1]*Research Center for Marine Ecology, First Institute of Oceanography, State Oceanic Administration. 6 Xianxialing Road, Laoshan District, Qingdao, 266061, P. R. China (Email: qdcs@163.com)*

**Abstract**

Marine ecosystem service (MES) is the benefits that human being obtain from marine ecosystem. Marine ecosystem services in China coastal waters consist of four groups of services, i.e. the provisioning, regulating, cultural and supporting services. Provisioning services are material products provided by marine ecosystem, including food production, raw material production, oxygen production and genetic resources provision. Regulating services are the benefits obtained from the regulation of ecosystem processes during the specific period of time, including climate regulation, waste treatment, disturbance regulation and biological control. Cultural services are the nonphysical benefits obtained from ecosystems during the specific period of time, including: recreational activities, scientific service, cultural activities. Supporting services are those that are necessary for the production of all other ecosystem services, including primary production, nutrient cycling and species diversity maintenance. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time.

Eight services were selected to evaluate their value, i.e. food production, raw material production, oxygen production, climate regulation, waste treatment, recreational usage, scientific service and species diversity maintenance. China's coastal ecosystems had provided 1,034 billion CNY of ecosystem services in 2008, which supported 1,740 billion CNY of marine industrial output. The high value show in the waters of eastern Liaoning, eastern Shandong, Zhejiang, Fujiang and middle Guangdong. The 11 provincial coastal waters are classified into 3 kinds of service utilization models. Liaoning, Shandong, Guanxi and Hainan belong to the provisioning-service-dominated utilization model; Heibei and Tianjin belong to the cultural-service-dominated utilization model while Jiangsu, Shanghai, Zhejiang, Fujian and Guangdong belong to the balance utilization model. The service value of China coastal ecosystem show the following distribution patterns: (1) From onshore to offshore, service value decreases gradually; (2) The high value distributing in the maricultural and recreational areas.

## Changes of diatom and silicoflagellate assemblages in sediment cores over the last 130 years in Sishili Bay, China

Baoping Di[1, 2] , Dongyan Liu[1] , YujueWang[1]

[1]*Key Laboratory of Coastal Environmental Processes, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, 264003, Yantai, Shandong, P. R. China*

[2]*Graduate University of the Chinese Academy of Sciences, 100049, Beijing, P. R. China*

**Abstract**

Diatom and silicoflagellate remains were analyzed for the 94-cm coring sediment which was deposited during 1875 and 2008 in Sishili Bay, China, with the aim to discover the changes of local marine environment and explore the changes of climate and human activity intensity during that period. Totally, 67 sub-samples were studied and 53 species were identified including 52 diatoms and 1 silicoflagellate species. The concentrations of fossil remains were less than 5000 before 1977 but experienced a sharp increase to more than 10000 valves/g DW after that year. The concentration distribution shares a similar trend with the total dissolved nitrogen in the sediment. Our analyzed showed that the fossil abundance increase was closely related with the waste water discharge from the sewage plant, which was situated around the coring sediment site. *Paralia sulcata* dominating in the sediment was regarded as an effective indicative species for eutrophication also had a corresponding increase from the late 1970s. Additionally, the increase of mean annual air temperature in northern Yellow Sea since 1960s was also indicated by the increasing concentrations of warming species *Cyclotella stylorum* from that period.

**Keywords**: sediment, diatom, silicoflagellate, human activity, climate change Sishili Bay

**Nitrogen dynamics in the surface mixed layer of the Kuroshio extension region**

Hiroaki Saito[1]

[1]*Tohoku Natl. Fish. Res. Inst., Fisheries Research Agency, Shinhama-cho, Shiogama 985-0001, Japan*

**Abstract**

Kuroshio Extension (KEX) region is the key area of fish species alternation among Japanese sardine, Japanese anchovy and chub mackerel. Previous studies pointed out that SST and winter-time mixed layer depth in the north of Kuroshio. Extension are correlated with the recruitment success of Japanese sardine. It has been suggested that the increase in SST and shoaling in the winter mixed layer depth decrease nutrient supply into the surface mixed layer and then decrease the productivity of prey zooplankton and/or change the timing of spring bloom relative to larval and juvenile fish arrival to the KEX. However, we have limited information of nutrient and plankton dynamics in the KEX. During the SUPRFISH (Studies on prediction and application of fish species alternation) programme, we investigated horizontal and temporal variability in nitrogen inventory by means of measuring nutrients, DON and plankton biomass in the KEX. Nitrate supply at the northern edge of KEX axis was higher than the south of KEX where nutrient depletion prevented phytoplankton growth in May. In the transition zone, chlorophyll concentration was low in spite of high nitrate concentration suggesting iron limitation prevented phytoplankton growth. The trophic transfer efficiency in the northern KEX region where the hot spot of larval and juvenile fish transportation seems to be higher than other regions in the KEX. We will discuss physical, chemical and biological factors controlling the horizontal variability of nitrogen dynamics in the KEX and its influence on the pelagic fish recruitment.

**Analysis of Kuroshio Current at PN/TK sections during 1955-2010 based on observed hydrographic data**

Yanzhou Wei[1], Daji Huang[1, 2, *], Xiaohua Zhu[1, 2]

[1]*State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, 310012, P. R. China*

[2]*Department of Ocean Science and Engineering, Zhejiang University, Hangzhou, 310058, P. R. China*

*(*E-mail: djhuang@sio.org.cn)*

**Abstract**

A consistent time series of geostrophic current of the Kuroshio in the East China Sea (ECS) at the PN section during 1955-2010 and the TK section during 1987-2010 is established with an inverse method from the observed hydrographic data. It is the longest time series of the Kuroshio Current (KC) in the ECS ever established based on observation, which compares well with other published analyses. The volume transport of the KC (VTK) shows consistent mass flux between the PN and TK sections, and fits well with the available moored current observations. The transport of the KC in upper 10m through the Tokara Strait is significantly linearly correlated with the sea level difference across the strait. The estimated geostrophic current exhibits a uniform and decreasing variance from surface to bottom. Based on the established time series of the KC, the variability of VTK, VTK per unit width (uVTK) and current pattern, particularly on interannual to decadal time scales, are investigated using Empirical Orthogonal Function (EOF) and Wavelet Spectrum methods. The VTK is predominated by the interannual variability at 2-5a period with an amplitude of 2.8Sv, followed by decadal variability at about 20a period with an amplitude of 0.33Sv, and an increasing trend at a rate of about 0.009Sv/a. The mean uVTK exhibits a single peak at the PN section with large variability to the seaward side of the peak on interannual to decadal scales, and double peaks at the TK section with large variability at two peaks on interannual to decadal scales. The Kuroshio Axis, defined by the position of the maximum uVTK at a section, is generally stable at the PN section, while it exhibits an interannual fluctuation at the TK section. The two leading EOF modes of current at the PN explain 23% and 17% of the total variance respectively. The temporal and spatial variability at the PN section is primarily by transport mode followed by meander mode. The transport mode is on interannual to decadal scales, and explains the high variability of KC to the seaward of the velocity core with a characteristic of increasing (decreasing) of VTK and expanding (shrinking) of the maximum velocity core seaward (shelf-ward). The meander mode is also on interannual to decadal scales, and explains the high variability of KC at both sides of the velocity core with a characteristic of shifting the maximum velocity core seaward (shelf-ward). The two leading EOF modes of current at the TK section explain 27% and 17% of the total variance respectively. The temporal and spatial variability at the TK section is over-dominated by meander modes on interannual to decadal scales, which explain the high variability of KC at both south and north gaps with a

characteristic of shifting of the maximum velocity core, particularly in the southern gap.

**Downstream nutrient transport by the Kuroshio in the East China Sea and its temporal variations**

Xinyu Guo[1, 2], Xiao-Hua Zhu[2], Qing-Song Wu[2], and Daji Huang[2]

*[1]Center for Marine Environmental Study, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan*
*[2]State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, 310012, P. R. China*

**Abstract**
Using in situ data from 88 cruises from 1987 to 2009 in the East China Sea, downstream nutrient transport by Kuroshio was examined. The velocity was first obtained inversely by assuming conservation of mass and salt within five isopycnal layers in an enclosed area. The nutrient flux density (the product of velocity and the nutrient concentration) was then calculated at a section across the Kuroshio. The presence of a maximum nutrient flux density in the middle layer was confirmed for the section across the Kuroshio in the East China Sea. Its temporal variations were further investigated. Seasonal variation in the nutrient flux density was not significant and was much smaller than interannual variations. The change in the magnitude of Kuroshio's speed and the change in the current structure are major causes for interannual variations in the nutrient flux density. The total downstream nitrate flux transported by the Kuroshio in the East China Sea has a mean value of 170.8 kmol $s^{-1}$. Seasonally, it ranged from ~160 to ~177 kmol $s^{-1}$ and interannually, it varied from ~100 to ~280 kmol $s^{-1}$. The phosphate flux can be approximately estimated by the ratio (13.64) of nitrate concentration to phosphate concentration.

**Long term trend of algal community in the East China Sea**

Douding Lu[1, *], Xinfeng Dai[1], Ping Xia[1], Hongxia Wang[1], Piaoxia He[1]

*[1]Lab of Marine Ecosystem and Biogeochemistry, State Oceanic Administration (SOA), Second Institute of Oceanography, SOA, Hangzhou, 310012, P. R. China.*
*(*E-mail: doudinglu@sio.org.cn*)

On the basis of historical records and investigated data in recent years, the community structure of the benthic macro-algae clearly shifted in the tideland of Nanji island located in the East China Sea, i.e. the proportion of subtropical and warm-temperate species increased, and that of cold-temperate species decreased in the benthic macroalgaeassemblage, particularly the calcareous nullipore became the dominant group. On the other hand, the frequency of red tides caused by micro-algae has been increasing. The scale of red tide in the last decade becomes much more extensive and toxic species have been

recorded more frequently than ever before. Before the decade of 70's of last century, the dominant species in phytoplankton community were mainly diatoms such as species of genera *Chaetoceros, Coscinodiscus*, *Rhizosolenia*, *Skeletonema*, *Thalassiosira* etc. Since 80's of last century, more and more harmful and toxic species particularly dinoflagellates such as *Prorocentrum donghaiense, Karenia mikimotoi,* and species of the genus *Alexandrium,* become dominant in phytoplankton community and formed massive blooms although diatom still keep common in the coastal waters of the ECS. Some cryptic species such as *Karlodiniumveneficum, Cochlodinium polykrikoides* belonging to dinoflagellates and some species in Raphydophytes such as *Heterosigma akshiwo, Chattonella marina, Chattonenaovata* etc have started to form blooms from time to time. The total dinocyst and PSP dinocyst concentration increased during the past 5 decades. The possible inducing factors responsible for the phenomenon are presumably analyzed.

**Carbonate parameters in the waters dominated by the Yellow Sea cold water in the northern Yellow Sea during summer**

Liang Xue[1, 2], Longjun Zhang[2], Weidong Yu[1]

[1]*Center for Ocean and Climate Research, First Institute of Oceanography, State Oceanic Administration, Qingdao 266061, China*

[2]*Key Laboratory of Marine Environmental Science and Ecology, Ministry of Education, Ocean University of China, Qingdao 266100, P. R. China*

**Abstract**

The Yellow Sea Cold Water (YSCW) is one of the most significant and important hydrological phenomena in the Chinese marginal seas. The distribution of carbonate parameters in the YSCW was presented based on the investigation during summer 2006 in the northern Yellow Sea (NYS). Results show that there is a big anomaly in carbonate parameters between the upper layer (0-20m) and the lower layer (30m-bottom) entrenched by the YSCW. pH in the lower layer was significantly lower than that in the surface waters. In contrast, dissolved inorganic carbon (DIC) and partial pressure of $CO_2$ ($pCO_2$) show high values in the lower layer than in the upper layer.

We estimated the contribution of salinity and net biological effect to this carbonate distribution pattern using the relationships of salinity with DIC and total alkalinity (TA), and the phosphate difference between the upper layer and the lower layer. We find the high content of TA, DIC and $pCO_2$, and the low level of pH in the YSCW area was mainly caused by salinity, while the contribution by biological respiration was minor. For example, salinity could explain 78% of the DIC anomaly, and respiration could interpret 21%. We speculate that the relatively contribution of respiration to DIC anomaly was associated with the low temperature, restricting the respiration rate. This could be to a large extent verified by the higher dissolved oxygen (DO) level in the bottom layer of the NYS than that in other river-dominated marginal seas such as the East China Sea and the northern Gulf of

Mexico (hypoxia).

**Keywords:** carbonate parameters, Yellow Sea Cold Water, northern Yellow Sea

**The influence of coastal upwelling and a river plume on the zooplankton spatial distribution in the northeastern South China Sea**

Xiping Lian[1]

[1]*South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, 510301, P. R. China*

**Abstract**

We analyzed the zooplankton community in the northeastern South China Sea (NSCS) during 30th June and 7th July, 2008. Oceanographic data over the cruise indicated that the coastal upwelling was actively occurring during this survey. In additional, the Pearl River plume over a distinctly widen shelf in the NSCS.A total of 180 zooplankton species representing 14 groups were identified, and Copepods were the most dominant groups. Zooplankton abundance was strongly linked to the temperature at 5m. Hierarchical cluster analysis identified three groups during this study: upwelling community, PRE plume community and offshore community. Altogether these analyses suggest that water mass circulation during upwelling and the PRE plume waters are the driving force for structuring spatial patterns of zooplankton distribution. In addition, a vertical distribution of zooplankton suggested that zooplankton, independently of time of the day, tended to remain in a large proportion in near surface waters, possibly constrained by a shallow oxygen minimum layer.

**Seasonal and interannual variations of phytoplankton community structure in the southern Taiwan Strait.**

Jun Hu[1, 2], Bangqin Huang[1], Huasheng Hong[1]

[1]*State Key Laboratory of Marine Environmental Science, Environmental Science Research Center, Xiamen University, Xiamen 361005, P. R. China*
[2]*State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Zhongshan Road North 3663, Shanghai 200062, P. R. China*

**Abstract**

Seasonal and interannual variations of phytoplankton community structure were studied in subtropical coastal upwelling system in the Taiwan Strait (21°N~24°N and 116°E~119.5°E) using HPLC-based photosynthetic pigments during summer upwelling season during 1994, 2004, 2005 and 2006.

Results showed that both phytoplankton pigments and group composition showed significant variations between upwelling seasons in the different years. Diatoms dominated phytoplankton community with 43% and 65% during summers of 2005 and 2006, respectively, while cyanobacteria dominated the community with 35% and 49% during summers of 2004 and 1994,

respectively. Such interannual variation of phytoplankton community was teleconnected to the ENSO events. El Niño strengthened, which was weaker SW monsoon and SW-induced upwelling during summers of 1994 and 2004, while El Niño weakened and La Niña occurred during summers of 2005 and 2006, which was stronger SW monsoon and thus induced stronger upwelling during summers of 2005 and 2006.

**Keywords:** Phytoplankton, Pigment, Taiwan Strait, Upwelling.

**Linkages in biogeochemical cycles between the surface ocean and lower atmosphere over the western Pacific Ocean**

Mitsuo Uematsu[1]

[1]*Atmosphere and Ocean Research Institute, the University of Tokyo, Japan*

**Abstract**

The Pacific Ocean, the world's largest (occupying about 30% of the Earth's total surface area) has several distinguishing biogeochemical features. In the western Pacific, dust particles originating from arid and semi-arid regions in Asia and Australia are transported to the north and south, respectively. Biomass burning emissions from Southeast Asia are exported to the tropical Pacific, and anthropogenic substances flowing out of Asia and Eurasia spread both regionally and globally, affecting cloud and rainfall patterns, air quality, and the radiative balance of downwind regions.

The deposition of atmospheric aerosols containing iron and other essential trace elements is important for biogeochemical cycles in the oceans because this source of nutrients helps sustain primary production and affects food-web structure; these effects in turn influence the chemical properties of marine atmosphere. Dissolved organic matter and particulate material scavenged from the water column and injected into the air by bursting bubbles, can be recycled between ocean and atmosphere.

From an atmospheric chemistry standpoint, sea-salt aerosols produced by strong winds and marine biogenic gases emitted from highly productive waters affect the physicochemical characteristics of marine aerosols. As phytoplankton populations are patchy and atmospheric processes sporadic, the interactions between atmospheric chemical constituents and marine biota vary for different regions as well as seasonally and over longer timescales.

The W-PASS (Western Pacific Air-Sea interaction Study) project was funded for 5 years as a part of IGBP/SOLAS-Japan activity in the summer of 2006 (Fig. 1). We aim to resolve air-sea interaction through field observation studies mainly using research vessels and island observatories over the western Pacific.

Some topics from recent W-PASS activities will be presented such as long range transport of Asian dust, characteristics of various patches of phytoplankton bloom in the semi-pelagic region during the Asian dust season in spring, impacts of atmospheric input of anthropogenic substances to the East China Sea,

biological responses to typhoon passing in the subtropical North Pacific and its marginal seas, and so on.

To address these and other emerging issues, and more generally to better understand the important biogeochemical processes and interactions occurring over the open oceans, more long-term recurrent research cruises with standardized atmospheric shipboard measurements will be needed in the future.

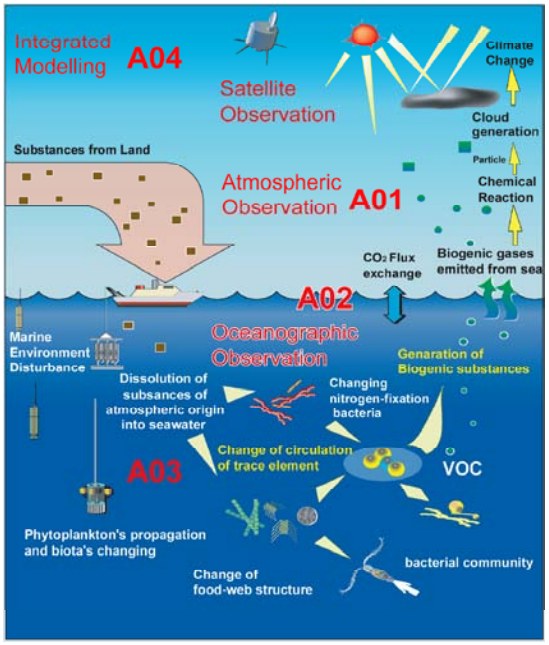



Fig. 1 Schematic drawing of the W-PASS Project

## Development of primary production algorithm for GOCI (Geostationary Ocean Color Imager)

Sinjae Yoo[1], Joo-Hyung Ryu[1]

[1]*Korea Ocean Res. & Dev. Inst., Ansan, South Korea*

### Abstract

Geostationary Ocean Color Imager (GOCI) is the first geostationary ocean color sensor launched in June 2010. Being on a geostationary orbit, it can make observations every hour. This higher temporal resolution,in addition to the finer spatial resolution of 500 m, offers a powerful means useful for monitoring various coastal processes.Its coverage includes a large part of the East Asia: South and North Korea, China, Japan, Russia, and Taiwan.We are developing primary production algorithms for GOCI which require local algorithms for a better utilization. Since chlorophyll-based primary production algorithms are prone to large errors in case-2 waters, we are also developing absorption-based primary production algorithms in addition to chlorophyll-based algorithms. We compare these two different approaches using the data obtained from field observations in the southern coastal region of Korea.

## Effect of marine acidification and respiration of *chlamys farreri*

Jianguang Fang[1], Jihong Zhang[1], zengjie Jiang[1], jiaqi Li[1], meirong Du[1], Yaping Gao[1]

[1]*Yellow Sea Fisheries Research Institute, Chinese Academy of Fisheries Science, Qingdao, 266071, P. R. China*

### Abstract

Marine acidification will be an important environment problem in the near future as a result of persistent emission of $CO_2$ and dissolution into seawater. In this study, we found that calcification and respiration of the Zhikong scallop (*Chlamys farreri*) are likely

to be severely affected by increasing acidification, Calcification and respiration significantly declined as pH decreased. The calcification rate decreased by 33 % when the pH of water was 7.9 compared with a pH of 8.1, and decreased close to 0 when the ph was reduced to 7.3. $CO_2$ and $O_2$ respiratory rates were reduced by 14% and 11%, respectively, when pH decreased from 7.9 to 7.3. Increasing acidification also led to changes in the metabolic pathways of *C. farreri* is likely to be severely threatened in the next few centuries.

**Keywords:** marine acidification, calcification, respiration, Ch*lamys farreri*

**Kelp *Laminaria japonica* growth model and the effects of extreme low temperatures on it's mariculture in Sungo Bay, China**

Jihong Zhang[1, *], Jianguang Fang[1], Yaping Gao[1], Meirong Du[1]

*[1]Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Qingdao, 266071, P. R. China*
*(*E-mail: zhangjh@ysfri.ac.cn)*

**Abstract**

Extreme low temperatures swept through Northern China from January to April, 2010. The purpose of this work was to develop a model capable of simulating the net growth of mariculture kelp *Laminaria japonica* and to understand the key factors that control its growth in Sungo Bay (China). And environmental parameters were monitored in order to understand the influence of this low temperature anomaly on the growth and production of kelp, *Laminaria japonica,* in Sungo Bay, China. Model predictions were well within the observed results in the field. Growth of the kelp was more sensitive to the maximum specific growth rate and optimum temperature for growth. Predictions indicated that the growth of *L. japonica* was seriously temperature limited in winter and that its growth in Sungo Bay will increase if temperature rises. Nutrient limitation was less important than temperature. The model allowed the simulation of temperature and nutrient variation on kelp production. As P concentration increased to 0.48μmol $dm^{-3}$ in March, April and May, the wet weight (WW) of *L. japonica* increased by 4.6%, 17.8% and 17.8%, respectively. Increasing dissolved inorganic N (DIN) did not stimulate kelp growth. Water temperatures lower than 1 °C persisted for a 10 day period during February 2010. Temperatures increased more slowly than normal and did not increase to 5 °C until April 9$^{th}$, 2010. Relative growth rates ranged from -0.54 to 3.87% $day^{-1}$ in 2010 and were consistently lower than in 2009 (ranging from -0.63 to 4.52%$day^{-1}$). Unlike in March of 2009, relative growth rate did not reach a second maximal value in 2010. Throughout April, the individual length, width and fresh weight of *L. japonica* were significantly lower in 2010 than in 2009, which was attributed to a lower temperature during the spring season.

**Keywords:** *Laminaria japonica*, growth model, limiting factor, Sungo Bay

**Recent collapse of the copepods in the northern East China Sea: Effects of Three**

**Gorges Dam?**

Keun-Hyung Choi[1, *], Young-Bak Son[1], Hyung-Ku Kang[1]

[1]*Korea Ocean Research & Development Institute, Ansan P.O. Box 29, Seoul 425-600, Korea*
*(*E-mail: keunhchoi@kordi.re.kr)*

**Abstract**

We investigated long-term trends in zooplankton in a transect off the south of Jeju Island in the northern East China Sea over the past 30 years. Rising seawater temperature was evident with the 18°C isopleth steadily moving northward. Total zooplankton wet weight increased along with the abundances of copepod, chaetognaths, amphipods, and euphausiids. Since early 2006, however, the trends have reversed that all of the zooplankton groups sharply declined in abundance despite a faster increase in total wet weight. Copepods were affected the most with decline in abundance over an order of magnitude, which apparently led to a sharp decrease in chaetognath abundance, a major predator of copepods. Concurrent declines in the abundance of amphipods and euphausids suggested that these systemic effects were driven by bottom-up processes. Chla concentration estimated from satellite image analysis showed an increasing trend since 2003, with a faster rise in spring concentration than in other seasons. Coincidentally, the Changjiang River discharge has decreased since 2003 immediately as impoundment in the Three Gorges Dam at the upper Changjiang River has started. Reduced river flow together with increasing SST could have contributed to increased phytoplankton biomass and proliferation in gelatinous zooplankton, the latter of which may have had over all adverse effects on all other zooplankton groups in the region.

**Keywords:** long-term change, zooplankton community, Changjiang River,

**Some effects of temperature and salinity on eggs and yolk sac larvae of Pacific cod *Gadus macrocephalus***

Xiaodong Bian[1, *], Xiumei Zhang[2], Yasunari Sakurai[3], Xianshi Jin[1], Tianxiang gao[2], Jun Yamamoto[3], Ruijing Wan[1]

[1]*The Key Laboratory for Sustainable Utilization of Marine Fisheries Resource, Ministry of Agriculture, Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Qingdao, 266071, P. R. China;*
[2]*The Key Laboratory of Mariculture, Ministry of Education, Ocean University of China, Qingdao, 266003, China;*
[3]*Faculty of Fisheries, Hokkaido University, Hakodate, Hokkaido 041-8611, Japan*
*(*E-mail: bianxd@ysfri.ac.cn)*

**Abstract**

In a multi-species framework, Pacific cod is considered an ecologically important species in the context of regime shifts, climate change and changing North Pacific trophodynamics. In this study the combined effects of temperature and salinity on eggs and yolk sac larvae of Pacific cod *Gadus macrocephalus* were examined under controlled laboratory conditions. Two

developmental phases were investigated: 1) fertilization to hatch. Artificially fertilized eggs, obtained by induced spawning of captive broodstock at 6°C and 34 psu, were stocked at combinational of constant temperatures (0, 1, 2, 4, 6, 8, 10, 12, 14 °C) and salinities (15, 20, 25, 30, 34 psu). Photoperiod was 11 h light : 13 h dark. Responses of Pacific cod eggs were measured in terms of incubation period, hatchability, and morphological characters at stage of hatching larvae. Additionally, a largely stored Pacific cod eggs were prepared to examine the developing changes in embryo specific gravity, morphological of the micropyle and egg envelope surface. 2) hatch through yolk sac absorption. Time to 50% survival of the newly hatching unfed larvae (incubation at 6°C, 34psu) were studied in a 9 × 5 (temperature × salinity, the same as the egg incubation experiment) array of treatments to determine how environment will influence the survival rate when they were emergence and dispersed into various water mass and the fluctuate sea surface at the time of hatching. The results indicated that "critical periods" of high mortality during the egg development did occur through the gastrula stage to blastopore closure at each temperature checked; temperature 14°C were beyond the tolerance limits for normal embryonic development; hatching rate was moderate to high (53.67–73.66%) at 4°C and 6°C in all salinities. Viable hatch was significantly influenced by the effect of salinity as the upper and lower thermal limits were approached. Though there was no eggs hatching at salinity of 30 psu and 34 psu in 0°C, when the salinity was lower (15, 20, 25 psu) there would still be some hatching; hatching success was moderate under temperature range 8–10°C at the high salinity but the hatching rate was markedly reduced at low salinity 15psu. This indicated that low-temperature–low-salinity synergism, as well as high-temperature–low-salinity inhibitory effects. While data on developmental rates and as influenced by temperature are presented, no significant differences in temperature influences on developmental times between the tested salinities were found. As expected, dome-shaped relationship between size of stage at hatch larvae and the incubation temperature at each salinity level were presented; no such affecting existed when concerned to the affecting of salinity at each tested temperature. Fish larvae hatch asynchronously from egg batches despite experiencing a common environment during their development. In each salinity level at all temperatures, early hatching larvae were smaller but had more yolk storage; late-hatching larvae were generally larger and had smaller yolk sacs than early hatched larvae. Larvae were more tolerant to extreme high temperatures than were newly fertilized eggs, most larval could survival when they were dispersed into various temperature and salinity combination till the yolksac is exhausted. Average time from hatching to 50% survival in unfed larvae was markedly reduced along with the increased temperature, ranged from 39 days in 0°C to 6 days in 14°C, and the influence could be described in all cases by a power function. The temperature of 4°C and 6°C, possibly associated with peak abundance of eggs and larvae in nature, is optimal for culture of Pacific cod embryos and yolk sac larvae. Otherwise, the average of egg specific gravities and egg diameters for the artificially fertilized Pacific cod eggs

sampled in situ were inversely correlated over the course of the developmental period. An estimate of the specific gravity of fertilized Pacific cod eggs yield a value spans the range from 1.0454 to 1.0316 $g \cdot cm^{-3}$, only when towards the end of egg development would they sharply decreased their specific gravity to produce the pelagic larvae. Morphological changes of the egg surface and micropyle occurring after fertilization as observed with the scanning electron microscope (SEM). The micropylar canal was sealed by secretions of the perivitelline fluid and the whole surface becomes roughness. The wrinkles on the outer surface of the envelope were indistinct at the 2 cell stage. Numerous bacilli deposited at the micropyle and the outer surface of envelope at the late germ ring stage and embryo 5/8 around yolk stage, and the micropyle was whole deformed at embryo 5/8 around yolk stage. The dynamic process of the micropyle so and the ultrastructure changes on the envelope surface, both have bio-ecological significance for protecting the Pacific cod embryo in the long incubation period from microorganism infections and mechanical stress. The dynamic process of the adhesive characteristics, the diameters and specific gravities of the Pacific cod eggs were associated with the development process of the embryo and it has bio-ecological significance on influencing the dispersal potential of the eggs in the field.

Together these data suggest that variations in water temperatures within an ecological range can markedly influence development rates, survival and hatching of the eggs also the stage at hatch larvae of Pacific cod. Hence, temporal and spatial heterogeneity in sea temperatures should be considered along with hydrodynamic conditions in estimating chances for survival and hatching of demersal Pacific cod eggs and the dispersal potential of Pacific cod larval in the field. Hatching asynchronously is considered to be an evolutionary strategy of "bet hedging" against such dynamic variation in the Pacific cod.

**Keywords:** Pacific cod *Gadus macrocephalus*, eggs, yolk sac larvae, temperature, salinities, developmental rate, 50% survival time, specific gravity

**A preliminary investigation of the fish food web in the Beibu Gulf, South China Sea, using dietary and stable isotope analyses**

Yunrong Yan[1, 2], Gang Hou[1, 2], Huosheng Lu[1, 2], Bo Feng[1, 2], Zhonglu Li[1, 2]

*[1]College of Fisheries, Guangdong Ocean University, Zhanjiang, 524088, P. R. China*
*[2]Center of South China Sea Fisheries Resources Monitoring and Assessment, Guangdong Ocean University, Zhanjiang 524088, P. R. China*

**Abstract**

Stomach content analyses (SCA) and $\delta^{13}C$ and $\delta^{15}N$ stable isotope analyses (SIA) were used to examine a semi-enclosed gulf fish food web and recognize the web's structure and factors of influence. An anniversary fishery independent investigation with bottom trawl was conducted seasonally in the Beibu Gulf, South China Sea. The

dominant species or guilds in the studied gulf were intensively analyzed, while the others were calculated to assess the variation of the fish food web structure. Results of the SCA indicated small pelagic fish, Japanese scad (*Decapterus maruadsi*), Mauritian sardinella (*Sardinella jussieu*), Shorthead anchovy (*Stolephorus heteroloba*), benthic small fish Big-eye unicorn-cod (*Bregmaceros rarisquamosus*), and cephalopoda, Mitre squid (*Uroteuthis chinensis*), were relatively important in the diet of most piscivorous and carnivorous fish. Nevertheless, stable carbon or nitrogen ratios varied in different zones and seasons, both of intraspecific and interspecific samples. Fish assemblages nitrogen isotope ratios varied from 11.3‰ to 17.6‰ in summer, while from 7.9‰ to 17.1‰ in Autumn. Moreover, the trophic levels calculated by stable isotope enrichment were general lower than by the SCA. The variation of SIA method with *Amussium pleuronectes* as the baseline was also discussed. Generally, SCA shows us the relationships between the predators and prey of the gulf and thus construct the intuitive ichthyological trophic structure. SIA methods shed light on the trophic level determination with $\delta^{15}N$ enrichment and prey source with $\delta^{13}C$ signatures. It can be concluded that the complementation of SCA and SIA will play an import role in evaluating the fish feeding ecology and in constructing the marine food web.

**Modeling research on the ecosystem in the Yangtze Estuary and adjacent areas**

Yang Yang[1]

[1]*Second Institute of Oceanography, State Oceanic Administration, Hangzhou, 310012, P. R. China.*

**Abstract**

Based on the improved POM with a variable boundary, an integrated modeling system was established through joining a cohesive sediment model and an ecosystem based water quality model. The cohesive sediment model includes the suspended sediment and sediment bed. The ecosystem based water quality model simulates both nitrogen and phosphorus cycles using five variables each such as dissolved inorganic nutrient, detritic organic matter, benthic matter, phytoplankton and zooplankton. Both the sediment model and water quality model are three-dimensional, and they are running in conjunction with the improved POM. This integrated modeling system was applied to the Yangtze Estuary. The model domain includes the whole Yangtze Estuary, the Hangzhou Bay and their adjacent areas with a fine resolution in the horizontal and vertical directions. The dry season averaged meteorological and hydrological data were used to initialize and drive model. Comparing the computed results with both the observed data obtained on March, 2003 and other historical data, it can be found that the model results generally represent all those distribution trends of the temperature, salt, sediment, inorganic nitrogen, inorganic phosphorus, chlorophyll and dissolved oxygen both in the horizontal and vertical planes in the Yangtze Estuary during the dry season, and it shows that the model has considered the key part of the dynamical, chemical and biological processes existing

in the Yangtze Estuary. In addition, three controlled numerical experiments illustrate that nitrogen is in plenty while phosphorus and light limit the phytoplankton biomass in the Yangtze Estuary during the dry season.

**Tidal modulation on the Changjiang River Plume in summer**

Hui Wu[1], Jianrong Zhu[1], Jian Shen[2], Harry Wang[2]

[1]*State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, 200062, P. R. China*
[2]*Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Virginia 23062*

**Abstract:**
Tidal effects on the structure of the near-field Changjiang River Plume and on the extension of the far-field plume have often been neglected in analysis and numerical simulations, which is the focus of this study. Numerical experiments highlighted the crucial role of the tidal forcing in modulating the Changjiang River plume. Without the tidal forcing, the plume results in an unrealistic upstream extension along the coast. With the tidal forcing, the vertical mixing increases, resulting in a strong horizontal salinity gradient at the northern side of the Changjiang River mouth, which acts as a dynamic barrier and restricts the northward migration of the plume. Furthermore, the tidal forcing produces a bi-directional plume structure in the near field, with one to the northeast and the other to the south. Such a bifurcated structure is related to the sub-tidal sea surface local high and the tidal rectification. Moreover, the plume varies significantly during a spring-neap cycle, with diluted water extending more offshore during the neap tide while less offshore and being detached during the spring tide.

## Poster Presentations

### Evolutionary consequence of Quaternary climatic fluctuations on marine species in the China seas

Lijun He[1]

[1]*State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, P. R. China*

**Abstract**

Cyclic climatic fluctuations caused sea level changes during the Quaternary. Some shallow continental shelves had also been exposed and flooded repeatedly. For some coastal marine species, sea level's fluctuations influenced their habitat changes and spatial distribution. Glacial lowering sea level pushed marine organisms into reduced sea basins, while interglacial rising sea level would enlarge their habitat. These climatic events were imprinted in the evolutionary history of marine species through influencing their distribution and population size. In the China seas, population expansion and homogeneous genetic structure were revealed from different species. This general biogeography pattern might show the evolutionary effect of climatic and oceanographic fluctuations in the China seas. There is a wide and shallow continental shelf in the East China, Yellow and Bohai Seas (<200m), while a narrow continental shelf in the northern South China Sea. Most of the individuals of different organisms in the East China Sea continental shelf would have been killed during the glaciations, while a more stable population size had been sustained in the South China Sea. Then, postglacial spatial and demographic expansion happened from these glacial refugia (e.g. Okinawa Trough and South China Sea basins). Furthermore, present reverse monsoon currents help populations' dispersion and mixture in the China Seas. Further study from more species and larger spatial scale will provide us a chance to reveal the detailed evolutionary response of marine species to climatic fluctuations in the South China Sea and Northwest Pacific.

**Keywords:** China seas, climatic fluctuations, demographic history, population structure, Quaternary

### Changes in the mixed layer depth due to global warming and their impacts on primary production

Chanjoo Jang[1,*], Sinjae Yoo[1], Jisoo Park[1], Taewook Park[1]

[1]*Korea Ocean Research and Development Institute, 1270 Sa-dong, Ansan, Gyeonggi-do, 426-176, R. Korea.*
*(*E-mail: cjjang@kordi.re.kr)*

**Abstract**

We investigates changes in the mixed layer depth (MLD) in the North Pacific Ocean in response to global warming and their impacts on primary production by comparing outputs from 11 models of the coupled model intercomparison projects phase 3. The MLD in the 21st century decreases in most regions of the North Pacific, whereas the spatial pattern of the MLD is nearly unchanged. The overall shoaling results in part from intensified upper-ocean

stratification caused by both surface warming and freshening. A significant MLD decrease (> 30 m) is found in the Kuroshio Extension (KE), which is predominantly driven by reduced surface cooling, caused by weakening of wind. Associated with the mixed layer shoaling in the KE, the primary production component resulting from seasonal vertical mixing will be reduced by 10.7-40.3% (ranges of medians from 11 models) via decreased nitrate fluxes from below. Spring blooms in most models are projected to initiate earlier in the KE by 0-13 days (ranges of medians from 11 models). Despite the overall trends, the magnitude of changes in primary production and timing of spring blooms are considerably different depending on models and latitudes.

**Modern environment evolution recorded in the estuary sediment by using $^{210}$Pb and $^{137}$Cs**

Yifei Jiang[1], Jinzhou Du[1], Wenxiang Zhang[1], Jing Zhang[1]

*[1]State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, 200062 ˆ P. R. China*

**Abstract**

Based on the depth profiles of $^{210}Pb_{xs}$ and $^{137}$Cs of three sediment cores collected in September 2010, we estimated the average sedimentation rate of east tidal flat of Chongming in the past 100 years. The result showed that east tidal flat of Chongming had a sedimentation rate of 2.9cm/a to 4.5cm/a from excess $^{210}$Pb ($^{210}Pb_{xs}$). The obtained sedimentation rates are well agreement with those from $^{137}$Cs activity peaks occurred in 1963 and 1986. Furthermore, according to the distribution patterns of $^{210}Pb_{xs}$, different models were established to identify the recording of the geological events. Combined with distribution of the particle size of sediments, several natural and human events, such as catastrophic flood, storm surge and dig the channels, were found in the sediment cores.

**Keywords:** sedimentation rate, $^{210}$Pb, $^{137}$Cs, tidal flat

**Study on inorganic carbon of surface water in the Jiaozhou bay**

Huanhuan Liu[1]

*[1]Ocean University of China*

**Abstract**

Inorganic carbon system of Jiaozhou Bay, which is severely affected by human activities, was studied. pH and dissolved inorganic carbon (DIC) content and alkalinity (Alk) in surface water of Jiaozhou Bay were observed from March 2010 to April 2011, and its horizontal distribution and time variation were discussed. The relationships between relevant parameter in carbon dioxide system were also discussed. This work enriched survey data of the Jiaozhou Bay thus formed the foundation for the further research on the biogeochemical process of carbon in marine environment. The distribution trend of DIC and Alk showed unanimous, their concentrations have obvious zoning phenomenon. There was a gradually increasing trend from the

mouth of bay to the inside of bay, and the annual concentration of eastern is higher than that of the west, and concentration gradient showed denser. Season distribution exhibited such a sequence: DIC (winter) > DIC (spring) > DIC (autumn) > DIC (summer), with a highest value in winter and minimum in summer. The seasonal change of Alk: Alk(summer) > Alk(spring) = Alk (autumn) > Alk(winter). DIC and Alk have obviously negative correlation with pH, while DIC and Alk have positive correlation. Along with the increase of longitude, from the west of Jiaozhou Bay to the east. The contents of DIC and Alk are increasing gradually. Along with the increase of latitude, the contents of DIC and Alk are increasing gradually. Correlation analysis on DIC, Alk and temperature, salinity of Jiaozhou Bay in April 2010 show that they both present positive correlation with temperature, but show negative correlation with salinity. Estimate the sea–atmosphere $CO_2$ gas flux in Jiaozhou Bay, which ranged from -0.9225 to 0.4840 $mol \cdot m^{-2} \cdot a^{-1}$. Jiaozhou Bay is a weak $CO_2$ source in autumn, but in spring, summer and winter it is a sink for $CO_2$. Throughout the year, the sea-air flux in Jiaozhou Bay is - $2.254 \times 10^3$ t C.

**Research of different phosphorus species in SPM of Yangtze estuary**

Jia Meng[1]

[1]*Ocean University of China*

**Abstract**

Grain size is an important factor influencing the transportation of particles and the contents of the different particulate phosphorus species. More and more researchers concentrate on the function played by the particles of different sizes in the biogeochemical process .In this study, the suspended particulate matter (SPM) samples were collected in the Yangtze Estuary in July (flood period) and August (dry season), 2011. The SPM was separated into five types using the water elutriation method: very fine silt (<8μm), fine silt (8-16μm), medium silt (16-32μm) and coarse silt (32-63μm) and sand (>63μm). Then the modified SEDEX sequential extraction method was used to obtain six particulate phosphorus species: the exchangeable P, organic P, Fe-bound P, authigenic P, detrital P and refractory P. Similar distribution trend was shown in the flood period and the dry season. The results indicated that the detrital P was the most abundant of the six particulate species. Around the Suspended Sediments Front, the organic P content increased distinctly. The contents of exchangeable P、Organic P, Authigenic P, and the refractory P were negatively correlated to grain zize; The detrital P tended to exist in the coarse silt and sand. While the linear relationship between the content of Fe-band P and the grain size was not obvious.

**The distribution patterns of $^{7}Be$, $^{210}Pb$ and $^{137}Cs$ of surface sediment and fluid mud in the Changjiang Estuary, China and their environmental implication**

Jinlong Wang[1], Jinzhou Du[1], Yifei Jiang[1], Jing Zhang[1]

[1]*State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai 200062, P.R. China*

**Abstract**

Traces study of Particle-active nuclides (i.e. $^{7}$Be, $^{210}$Pb and $^{137}$Cs) is one of important tools to determine the sources, sedimentary/resuspended of particles in estuaries/coasts, and oceans. In the present work, the water component, grain size and activity of $^{7}$Be, excess $^{210}$Pb ($^{210}$Pbxs) and $^{137}$Cs in surface sediment and “fluid mud” in the Changjiang (Yangtze) River estuary were measured. The sampling time were in May of 2011 (before flood season), and August of 2011 (flood season). The ranges of the thickness of fluid mud were 0.0-7.0cm in May and 0.0-19.0cm August, but more large spatial distribution can be found in May. Thickness of fluid mud in north has larger values. Meanwhile, both $^{7}$Be activities of nuclides, thickness of fluid mud are decreased in distance from coast to offshore. No relationship between $^{7}$Be activities in fluid mud and surface sediments indicate that different sediment source exist between fluid mud and surface sediment on seasonal time scale. The activities of $^{7}$Be in fluid mud in May is higher than that in surface sediment, while there is no obviously variety pattern for $^{210}$Pb and $^{137}$Cs.

The results in present work can give out useful information regarding sediment sources and sedimentary/resuspended processes. More work is needed to elucidate sediment transport and sources by more seasonal sampling and incorporate the use of sediment cores analysis in the future.

**Distribution and controlling factors of nitric oxide concentrations in surface seawater of the Yellow Sea and the Bohai Sea**

Chao Xue[1]

[1]*Ocean University of China*

**Abstract**

Distribution of nitric oxide (NO) concentrations in surface and bottom seawater of Yellow Sea and Bohai Sea were studied adopting the chemiluminescence method in June 2011. Based on the data of NO concentrations and related environmental parameters in hydrology, chemistry and biology, the distribution and controlling factors were discussed. The results showed that the means of NO concentrations in surface and bottom seawater of Yellow Sea were (0.135±0.039) nmol·L$^{-1}$ and (0.114±0.049) nmol·L$^{-1}$, respectively. The means of NO concentrations in surface and bottom seawater of Bohai Sea were (0.185±0.038) nmol·L$^{-1}$ and (0.183±0.040) nmol·L$^{-1}$, respectively. The concentrations of NO showed a gradually decreasing trend from inside to outside, which was possibly due to the effect of terrestrial runoff and human activities. The concentrations of NO in the surface seawater exhibited an obvious diurnal variation. The highest concentration of NO appeared at 15:00, which was presumably due to the effect of illumination density. The influencing factors of NO concentration and distribution were complex, including nitrite, pH, light intensity and so on.

**Fronts in the marine ecosystem of the Southern south China Sea**

Jinglong Yao[1]

[1]*South China Sea Institute of Oceanology, Chinese Academy of Sciences, P. R. China*

**Abstract**

Oceanic fronts always induce the variation of biomass in marine ecosystems. As front mapping and characterization are among the most important aspects of physical oceanography, fronts from satellite and *in situ* data in the marine ecosystems would offer a unique perspective to realize the mechanism of ecosystem dynamics. The South China Sea (SCS) features a variety of fronts created by various physical mechanisms, such as tidal mixing, river discharge, wind-induced upwelling, water mass convergence, topographic upwelling etc. The southern SCS (SSCS), defined here as the area south of 12°N, is poorly studied compared to the NSCS, largely because of the extremely difficult navigational conditions in the SSCS due to the presence of hundreds of small islands (mostly coral reefs) and shallow banks, and the absence of accurate bathymetric charts, especially for the notorious dangerous grounds. The major goal of this study is to map the *in situ* fronts and satellite-derived fronts in the SSCS, using 11 CTD surveys from 1987 to 1996, and discuss the influence of the fronts on the distribution of chlorophyll derived by satellite. In the study, synoptic (nearly instantaneous) frontal maps are produced by the sea surface temperature (SST) fields. Since SST fronts are typically collocated with fronts in other water properties such as salinity, density and chlorophyll, digital frontal paths from SST frontal maps can be used in studies of physical–biological correlations at fronts. The West Balabac Strait Front and Vietnam Offshore Jet Front are recognized as important fronts in the SSCS marine ecosystem, and they are noticed to be different types. The proposed classification and analysis lends itself to comparative studies of fronts in the SSCS marine ecosystem.

**Forcing mechanisms of inter-annual to decadal variability of seawater temperature in the Yellow Sea during 1958 to 2007**

Chengyi Yuan[1], Hao Wei[2], Youyu Lu[3], Xiaofan Luo [2], Zhihua Zhang[4]

[1]*College of Physical and Environmental Oceanography, Ocean University of China, Qingdao, 266100, P. R. China*
[2]*College of Marine Science and Engineering, Tianjin University of Science and Technology, Tianjin, 300457, P. R. China*
[3]*Bedford Institute of Oceanography, Department of Fisheries and Oceans, Dartmouth, Nova Scotia, B2Y 4A2, Canada*
[4]*National Marine Environment Forecast Center, Beijing, 100081, P. R. China*

**Abstract**

A two-way nested global-Northwest Pacific NEMO (Nucleus of European Modelling of the Ocean) model was forced with an atmospheric reanalysis product. Analyses are focused on the simulation results in sub-region of the Yellow Sea during 1958-2007. To identify the primary factor,

the sea surface heat transport with atmosphere and the lateral heat transport by oceanic circulation are quantified and compared annually during cooling and heating seasons, respectively. In terms of inter-annul and decadal changes of water temperature, the model results suggest that changes in the regional integrated heat content are primarily caused by changes in surface heat transport. And the spatial distribution of heat is caused by the divergence of ocean circulation. The winter temperature in the Yellow Sea shifted from cold phase to warm phase during 1988/1999, which in principle showed response to the weakening of the East Asian Winter Monsoon. Furtherly, the shift of Arctic Oscillation from positive to negative phases has impacts on changes in the location and strength of the East Asian Trough and the strength of the East Asian Winter Monsoon. The summer temperature is associated with location of West Pacific Subtropical High and East Asian Summer monsoon in the upper mixed layer. And both previous winter temperature and mixing processes in spring could affect the inter-annual and decadal variation of temperature under thermocline.

**Keywords:** seawater temperature, inter-annual and decadal variations, forcing mechanisms, the Yellow Sea

**Influence of seasonal stratification and oceanic water intrusion on the distribution of planktonic ciliates in a temperate marginal sea**

Wuchang Zhang[1, *], Cuixia Zhang[1, 3], Feng Zhou[2, 4], Nan Zhao[1, 3], Tian Xiao[1]

[1]*Key Laboratory of Marine Ecology and Environmental Sciences, Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, P. R. China*

[2]*State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou 310012, P. R. China;*

[3]*Graduate School of Chinese Academy of Sciences, Beijing 100049, P. R. China*

[4]*Department of Ocean Science and Engineering, Zhejiang University, Hangzhou 310027, P. R. China*

*(*E-mail: wuchangzhang@ms.qdio.ac.cn)*

**Abstract**

Monthly variations in the vertical distribution of planktonic ciliate abundance and the feeding of *Calanus sinicus* on ciliates were studied over eight months in 2006 and 2007 in the Yellow Sea Cold Bottom Water (YSCBW) area. The maximum ciliate abundance (14,800 ind. $L^{-1}$) was found at a depth of 10 m at St. 16 in August. The maximum ciliate biomass (8.57 μg C $L^{-1}$) was found in May (50 m depth at St. 16). The vertical distribution of ciliates exhibited a monthly cycle. From December to April, when the water column was well mixed, high ciliate abundance (500 ind. $L^{-1}$) mainly occurred around the coastal front area, while there was low ciliate abundance (<500 ind. $L^{-1}$) in the YSCBW area. In May and June, when the water column began to stratify, ciliates were distributed both inside the YSCBW and in the upper layer. The tintinnid *Tintinnidium primitivum* exhibited a mass occurrence inside the YSCBW. In August, small ciliates occurred with a high abundance and low biomass in surface waters and decreased gradually at greater

depths. In September and October, there was low ciliate abundance (<500 ind. $L^{-1}$) in the YSCBW. The average water column integrated ciliate abundance at the common stations (investigated in every cruise) revealed two peaks, in May and August. However, there was only one peak in the monthly variation of the average water column integrated ciliate biomass at the common stations. Sea water incubations with the addition of *C. sinicus* resulted in a volume swept clear of 85±36 and 108±63 ml ind.$^{-1}$ d$^{-1}$ in May and August, respectively, which means that this species did not halt its grazing activity in the YSCBW. The observed ingestion rate of 0.004-0.145 μg C ind.$^{-1}$ d$^{-1}$ could not offset the energy deficit of *C. sinicus*.

**Keywords:** Zooplankton, ecology, abundance, biomass, Yellow Sea

**Adapting climate changes: Reclamation and coastal disaster along the coast of China**

Zhenke Zhang[1,*], Linhua Zhang[1], Jing Zhang[1], Mingxing Zuo[1]

*[1]School of Geography and Oceanography Sciences, Key Lab of Coast and Island Development of Ministry of Education of China, Nanjing University, Nanjing , 210093 China*
*(*Email: zhangzk@nju.edu.cn)*

**Abstract**
China is experiencing the rapid environmental changes along the coastal region of China because of the large scale of sea reclamation, especially in the past decade. The Chinese government, the State Council has approved plans for Liaoning Coastal Economic Zone, Caofeidian New Area Planing, Tianjin Binhai New Area, Jiangsu Coastal Development Strategy, Guangdong Pearl River Delta Development Plan, Fujian Strait West Coastal Economic Zone, Guangxi's North Bay Economic Zone and Shandong Peninsula Blue Economic Zone, and Zhejiang Coastal Economic Zone. The new plans of coastal development need more land. In the past ten years, the reclamation in the coastal region entered a new era of rocketing development. The examples show the large reclamation projects. Since the establishment of the PRC in 1949, a large amount of artificial land has been reclaimed, mainly on its coastlines. China has built the most artificial land, from 1949 to 1990s, the total area of land reclamations from sea of China was about 12,000 km$^2$. According to the national report of *Sea Level Changes in China (2010),* the average sea level changes along the coast of China is about 2.6 mm/a in the past thirty years. The reclamation activities come into a new era with the characteristics of rapidness, large scale and the mechanization tools used in the land reclamation. The reclamation has caused the disappearance of wetlands the coastal ecosystem with the accelerated reclamation activities. The Storms surges is the potential mega-hazards along the coast of mainland China. The seal level rising will strengthen the impacts of storm surge hazards. With the global sea level rising and global warming, the tropical cyclones is instable and variable. It is lucky to the coastal region of China in the past few years the tropical cyclones had not attacked directly. So the

large reclamation projects were not destroyed by the storm surges. We should pay more attention to the disaster induced by the typhoon storm surge. An example is the typhoon disaster on 21 August, 1994, the typhoon strongly attacked the coast of Zhejiang Province, and resulted in the 1126 persons death, 200 thousands resident rooms destroyed and the typhoon floods affected many cities in Zhenjiang Province. The following questions should be considered in the development of the mainland coast of China: How to assessment the impacts of large scale reclamation on coastal ecosystem? How to prevent the possible coastal disasters of the reclamation land in the background of sea level rising? How do we have efficient adaption to the coastal changes?

**Keywords:** Coastal development, coastal hazards, sea level rising, adaption, climate changes

**Seasonal and Inter-annual variability of surface chlorophyll concentration in the Yellow Sea and the East China Sea**

Xiaoshen Zheng[1, *], Hao Wei[1], Youyu Lu[2], Yuheng Wang[1]

[1]*Tianjin University of Science and Technology,Tianjin,300457*
[2]*Bedford Institute of Oceanography, Canada.*
*(*E-mail: zxs@tust.edu.cn)*

**Abstract**
Chlorophyll concentration in the ocean corresponds to the content of phytoplankton, hence it can be used to quantify variations of marine ecosystem productivity and resources. The Yellow Sea and the East China Sea are located at the western edge of the North Pacific, and have complex structure of terrain, hydrology and circulation. Multi-year observations of ocean color based on satellite remote sensing are analyzed to study the inter-annual variability of chlorophyll concentration. Firstly the Overall seasonal/spatial variations are analyzed in the total area covering 24-400N, 117-1280E. Then the study area is divided into five sub-regions according to the range of the Yellow sea and the East China Sea, water depth and EOF analysis of surface chlorophyll concentration, the Seasonal variations and Inter-annual variability are discussed in five sub-regions.

**Hydrodynamic factors associated with the interannual variability of hypoxia off the Changjiang (Yangtze River) Estuary**

Feng Zhou[1, 2, *], Jiliang Xuan[1], Daji Huang[1, 2], Xiaobo Ni[1]

[1]*State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, 36 Bao-Chu-Bei-Lu, Hangzhou 310012, P. R. China.*
[2]*Department of Ocean Science and Engineering, Zhejiang University, 388 Yu-Hang-Tang Road, Hangzhou 310058, P. R. China*
*(*E-mail: zhoufeng@sio.org.cn)*

**Abstract**
The large area of hypoxia off the Changjiang

(Yangtze River) Estuary in the East China Sea has been reported several times since 2002. The locations and patterns of the hypoxia show significant interannual variability, which implies multiple factors responding for hypoxia events in this area, especially the circulation systems. The cause of the eutrophication in this region is complicated. It may be subject to both the anthropogenic effects and natural changes. The Changjiang effluent is a major source of nutrients in recent decades, while Kuroshio intermediate water is also an un-neglectable contributor in the aspect of the phosphorus. The distribution of the nutrients is controlled by the transportation and diffusion processes, as well as the passive tracer-salinity. So the variability of the eutrophication zone could be indicated by the variant Changjiang Diluted Water (CWD) represented by the sea surface salinity, which plays also a role no less than the solar radiation to the stratification. As revealed by many previous studies, the CWD is influenced by river run-off, wind fields, tides, the Taiwan warm current and the Chinese coastal current et al. Forcing data mentioned above as well as the hydrographical parameters are collected as much as possible in this study, especially for the years with the hypoxia event occurrence and are examined in a comparative way. Tight relationships have been revealed between the dynamical factors and hypoxia zone. A series of convincing evidences were presented especially for the summer of 1999 and 2006. This paper is an attentive approach to verify the association of the hypoxia variability with the variation of the water mass configuration and their competing status in this region. This study suggests that more attention need to be paid to understand the roles of hydrodynamics played upon the hypoxia formation and evolutions in such complicated areas.

**Impacts of physical processes on the phytoplankton off the Changjiang Estuary**

Jianrong Zhu[1], Jun Lin[1]

*[1]State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai 200062, P. R. China*

**Abstract**

The dynamic factors include the huge runoff, monsoon, tidal mixing and continental shelf circulation off the Changjiang Estuary. The phytoplankton ecosystem characteristics there are presented by field observations, data analysis and numerical model simulation, focusing on the analysis of the major limiting factor and the key physical processes on phytoplankton growth. Based on the hydrodynamic model ECOM-si with additional modules of solar radiation, sea surface heat flux and sediment, a $N_2P_2ZD$ ocean ecosystem model was established. In the model, phytoplankton was divided into two groups, diatoms and dinoflagellates. We take the 2006 and 2009 in situ survey area as a reference and set the area 29.5-32.5°N, 122.25-124.0°E as the target area for the ecosystem model study. Phytoplankton growth in the target area is mainly controlled by nutrients, annual changes of water temperature and light conditions, and the grazing pressure of zooplankton which is on the upper food chain. Diatoms have two obvious algal blooms in spring and late

summer, dinoflagellates have bloom only in spring. Water temperature is the key factor of the first bloom occurrence time. After July, the dinoflagellate biomass is at a low level due to the impact of the high water temperature, can not achieve to the level of the basis biomass of the red tide occurrence. In May to September, diatoms maintain a high biomass, which means these months are the time window that red tide of diatoms may occur off the Changjiang Estuary. Growth of diatoms are affected more by light and nutrient limitation, and biomass of dinoflagellates are affected more by water temperature. DIN concentration in target area is affected significantly by the high DIN concentration carried by the Changjiang River, while the PO4-P concentration in the Changjiang river is relatively low, so PO4-P input by the Changjiang River is not the most important source of PO4-P in the target area. The annual average concentration of PO4-P in the target area is affected more by the open sea boundaries. Nutrient supply from the open sea boundaries has a great impact on the annual average biomass of phytoplankton in the target area, especially the PO4-P input from the Taiwan Strait boundary. Nutrients input from the Taiwan Strait boundary is more important than the boundary east of Taiwan, and the effect on diatoms is more than dinoflagellates.

**Distribution patterns of radium isotopes in the mixing zone at the river mouth of Yangtze River**

Tao Ji[1], Xilong Wang[1], Jinzhou Du[1], Jing Zhang[1]

*[1]State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, P. R. China*

**Abstract**

The two naturally occurring short-lived radium isotopes, $^{223}Ra$（$T_{1/2}$=11.4d）and $^{224}Ra$（$T_{1/2}$=3.66d, are great tracers for the study on the velocity of water transport and material exchange between estuary/coast and their adjacent sea on a time scale of 1-10 days. In the present work, we measured the activities of radium isotopes in the mixing zone at the river mouths of the Yangtze River during the tidal periods in July 2010. The activities of radium isotopes varied with the tidal level, demonstrating the river and ocean sources. The relationship between radium isotopes and salinity suggested that Ra isotopes were also provided by particles from river and bottom sediments. The enrichment of radium isotopes in the bottom water near the river mouth may be resulted from the discharge of groundwater. Moreover, a mass balance model based on the $^{224}Ra/ ^{223}Ra$ activity ratio (AR) was constructed in this mixing zone to obtain the residence time and plume age of water.

**Keywords:** Radium isotopes, Yangtze River, mass balance, tidal period

**Nutrient dynamics along coastal of eastern Hainan Island and its influence on ecology and environment**

Ruihuan Li[1], Sumei Liu[1], Guiling Zhang[1], Jingling Ren[1], Jing Zhang[2]

*[1]Key Laboratory of Marine Chemistry Theory and Technology Ministry of*

*Education, College of Chemistry and Chemical Engineering, Ocean University of China, Qingdao, 266100, P. R. China*
*[2]State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, 200062, P. R. China*

**Abstract**
Hainan Island is abundant in tropical ecosystems, such as mangroves and coral reefs. Coastal ecosystems usually have high primary productivity, diverse and complex ecological systems, therefore, nutrient biogeochemical cycles have become the cone theme in ocean science. Riverine outflow and domestic sewage effluent discharge into coast will possibly change the nutrient dynamics and phytoplankton growth along coastal of eastern Hainan Island. Hence, there is a need to know nutrient biogeochemistry in this area in order to understand future impacts. Four cruises were carried out along coastal ecosystems of Eastern Hainan (include rivers, estuaries, lagoons and near-shore waters) to have an overview about nutrients distribution and seasonal variations, in order to examine biogeochemical processes that influence nutrients composition. The input of nutrient from estuaries and lagoons to coastal region is high, especially dissolved silicate. High nutrients input will alter nutrients composition of coastal region. As a result, coastal and offshore environments will be affected, eutrophication would appear and cause coral disease. In addition, untreated municipal sewage from cities and aquaculture are another potential source of dissolved nutrients. And typhoon-induced heavey precipitation can influence nutrients dynamics in estuary and coastal ecosystems.

## Iron mobilization and greenhouse gas evolution potentially impacted by plantation clear-felling and replanting in a subtropical coastal catchment soil

Chaofeng Lin[1, 2, *], E. I. Larsen[1], P. R. Grace[1], J. J. Smith[1]

*[1]School of Earth, Environmental and Biological Sciences, Faculty of Science, Technology, Engineering and Maths; Institute for Sustainable Resources, Queensland University of Technology, 2 George Street, Brisbane, Qld 4001, Australia*
*[2]Environmental Microbiology Laboratory, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, P. R. China*
*(* Email: chflin@gmail.com)*

**Abstract**
Exotic *Pinus* plantation forestry is a major land use on subtropical Southeast Queensland (SEQ, Australia) coastal lowlands. Mature *Pinus* clear-felling followed by replanting are of concern for disturbing soil organic carbon and iron pools, potentially elevating iron-carbon cycling, associated metal mobilization and greenhouse gas ($CO_2$ and $CH_4$) evolution upon flooding. We selected the Poona Creek catchment to study potentials for iron mobilization and $CO_2$/$CH_4$ emissions in a range of *Pinus* soils associated with different forestry practices (mature pine plantation as control, first-rotation clear-felling and second-rotation replanting). Intact, 30 cm-deep soil core microcosms were saturated and incubated for 35 d in the laboratory. Leachate chemical analysis showed substantial pH increases (<5 to >7) and redox potential decreases (>300 to

<200 mV) in all soils over 5–11 d incubation. Mature *Pinus* soil displayed minimal iron and aluminum dissolution, coupled with continuous manganese mobilization throughout the laboratory incubation. In contrast, clear-felled and replanted soils supported progressive iron and aluminum dissolution 3 d post-saturation, with a lack of dissolved Mn over 35 d incubation. Microcosm headspace $CO_2$ and $CH_4$ effluxes were higher in mature *Pinus* soil as compared with clear-felled and replanted soils. The latter functioned as a low $CO_2$ source and $CH_4$ sink upon saturation. Our work demonstrates that elevated iron mobilization can occur in subtropical coastal *Pinus* soils with plantation clear-felled or replanted, although associated practices suppress $CO_2$ and $CH_4$ emissions via microbial and abiotic mechanisms. Further study is needed to examine whether dissolved iron can pass through the coastal catchment via surface and/or ground waters, providing the limit nutrient for potentially toxic algal blooms of cyanobacteria in estuarine-marine systems.

**Keywords:** *Pinus* forest, seasonal flood, clear-fell, replant, iron dissolution, $CO_2$ flux, $CH_4$ flux

**Temporal and spatial variation of heavy metals in wetlands of the Yellow River Estuary**

Shumin Liu[1], Qingzhen Yao[1], Xiaoxiao Hang[1], Hongtao Chen[1], Zhigang Yu[1]

[1]*Key Laboratory of Marine Chemistry Theory and Technology, Ministry of Education, Ocean University of China, Qing-dao 266100, P. R. China*

**Abstract**

The levels of heavy metals (Cu, Pb, Zn, Cr, Cd, As, Hg) in wetlands of the Yellow River Estuary are studied in the work. Except Pb, the heavy metal contents are overall low. The soil environmental quality are in line with the national primary standard. The heavy metals (Cu, Pb, Zn, Cr, Cd, As, Hg) in wetlands of the Yellow River Estuary have obvious time variation. In addition to Pb, the heavy metal content in the dry season is higher than that in wet season; The situation of Pb is the opposite. The heavy metals have significantly spatial variation ,which are influenced by particle size, organic matter content and biological activity, pollution from nearby factories, hydrodynamic conditions and so on.

**Keywords:** Yellow River estuary, wetland sediment, heavy metals, temporal and spatial variation

**A buoy system for monitoring hypoxia off Changjiang Estuary and field results in 2011**

Xiaobo Ni[1], Daji Huang[1], Jianfang Chen[1], Dingyong Zeng[1]

[1]*State Key Laboratory of Satellite Ocean Environment Dynamics (SOED), Second Institute of Oceanography, State Oceanic Administration, China*

**Abstract**

For studying the mechanism in formation of hypoxia off Changjiang estuary in China, we

have found a buoysystem sponsored by National Science and Technology Pillar Program which could acquire the whole seawatercolumn data including many parameters relative to hypoxia closely in real-time.

The buoy system, which observes the profile in five layers from top to bottom, is composed of two parts: a buoy and a sub-mooring. The buoy part supports the monitoring instruments of four layers, the surface cell and the other three cells within thermocline. There are eight parameters (T/S/D/DO/Tu/ Chla/pH/PAR) measured in surface cell with RBR-XRX420 equipped in the bottom of buoy. Five parameters (T/S/D/DO/Chla) are observed in each cell within thermocline with three SBE16plus-IM V2 inductive coupled instruments. The instruments are clipped on a plastic covered steel wire in the upper, middle and lower part of thermocline. The sub-mooring part use a TRBM (Trawl Resistant Bottom Mount) to equip the monitoring instruments in bottom cell which include RBR-XR420, Satlantic ISUS Nitrate and RDI-WHS300 for measuring T/S/D/DO/Tu/ORP, nitrate and current respectively.

The buoy system had a successful test off Changjiang estuary in the summer of 2010. We applied it to monitor hypoxia off Changjiang estuary from 6th June to 25th September in 2011. The system transmitted most of the observed data every half an hour well. The data shows the result and variation of DO, and its response to the environmental factors. The system also got the information of environmental condition when the MEARI and MUIFA typhoon past.

**Keywords:** Hypoxia, Changjiang estuary, Real-time Buoy monitoring, Time-series data

**Dinoflagellate cysts from core sediments of Sishili Bay, Yellow Sea, China: an indication of human activity**

Yajun Shi[1], Dongyan Liu[1,*],
Hongbing Shao [1,2], Jin He[1,2], Baoping Di[1],
Yujue Wang[1], Zhijun Dong[1], Qianli Sun[3]

*[1]CAS and Shandong Provincial Key Laboratory of Coastal Environmental Processes, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, 264003, Yantai, Shandong, P. R. China*
*[2]Graduate University of the Chinese Academy of Sciences, 100049, Beijing, P. R. China*
*[3]State Key Laboratory for Estuarine and Coastal Research, East China Normal University, 200062, Shanghai, P. R. China*
*(*E-mail: dyliu@yic.ac.cn)*

**Abstract**

Based on the assemblage changes of dinoflagellate cysts in three core samples of Sishili Bay, northern Yellow Sea, during the past 100 years, we found that the dinoflagellate cyst assemblages did not obviously change before the middle of 1970s, whereas the dinoflagellate cyst assemblages changed much from 1980s; the cyst abundance and the ratio of heterotrophic and autotrophic dinoflagellate cysts was increased. This result indicated that due to human activities, marine environment changed much from the middle of 1980s. Compared to climatic changes, the effects of human activities were remarkable. Especially, the nutrient variation,

caused by sewage and marine dumping, resulted in remarkable fluctuation of dinoflagellate cysts in the local area.

**The discussion of the dissolved inorganic carbon system variation mechanism in Changjiang Estuary and its adjacent sea areas in summer**

Bin Wang[1], Jianfang Chen[1], Haiyan Jin[1], Hongliang Li[1], Xizhen Liu[1], Yanpei Zhuang[1], Yanqing Xu[1], Haisheng Zhang[1]

*[1]Second Institute of Oceanography, SOA, Laboratory of Marine ecosystem and Biogeochemistry, SOA, Hangzhou 310012, China*

**Abstract**

Based upon the field survey conducted during August 2009, we examined the total alkalinity, dissolved inorganic carbon, pH, chlorophyll a, dissolved oxygen in Changjiang estuary and its adjacent sea areas. This area represents a most dynamic zone of the East China Sea where high $pCO_2$ riverine water meets with highly productive coastal water. The results indicate that the concentration of dissolved inorganic carbon in this area is 1647.1-2236.9 μmol/dm$^3$, with the average value of 2031.2 μmol/dm$^3$; The spatial distribution shows a gradually increase from the river end of Changjiang diluted water to the outer estuary water, which also indicates the great influence by the mixing of the river freshwater and seawater. The vertical distribution of the dissolved inorganic carbon depends on the depth, with a high value in the bottom water and relatively low value in the surface. A high value center in the bottom exists in 122.6°E, 29°N, which is related to the deep water of Taiwan current with the character of low temperature and high salinity. The research about the carbonate system's parameters, such as total alkalinity, DIC also show some important features: within the salinity of 10-25, TAlk and DIC is conservative with the salinity, while the expectation appears in three areas including the neally-0 salinity area, seawater end member area (with the salinity >30) and the river plum area (with salinity of 25~28). Given the fact that these areas meet with the different input from the rivers, the strong hydrodynamic environment and biological activity, we got the explanation. In addition, we calculated the theoretical value of $pCO_2$ on the basis of the carbonate's equilibrium equation. The value of $pCO_2$ in Changjiang estuary and its adjacent sea surface area is 15.4~166.9.6 Pa (154.0~1669.0 μatm), with a low value center in 123°E, 29.5°N. Data represented suggest that the $pCO_2$ in seawater becomes lower than the $pCO_2$ in the atmosphere 39.0Pa (390 μatm)along with the distance far away from the estuary, so, we can considered this offshore centre area as a sink of $CO_2$.

**The four seasons nutrients distribution in Changjiang Estuary and adjacent East China Sea**

Kui Wang[1, 2], Jianfang Chen[1], Haiyan Jin[1], Fajin Chen[1], Hongliang Li[1], Shengquan Gao[1], Yong Lu[1]

[1]*Laboratory of Marine Ecological Systems and Biogeochemistry, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, 310012, China*
[2]*Department of Geoscience, Zhejiang University, Hangzhou, 310012, China*

**Abstract**
the distribution of nitrate ($NO_3^-$), nitrite ($NO_2^-$), ammonium ($NH_4^+$), phosphate ($PO_4^{3-}$), silicate ($SiO_3^{2-}$) recorded during the four cruises(2006 summer and winter, 2007 spring and autumn), indicates that surface nutrients were high west and low east, $NO_3^-$, $PO_4^{3-}$ and $SiO_3^{2-}$ in Changjiang Estuary and Hangzhou bay behaved as double tongue pattern in all seasons, which was regulated by Changjiang River dilution water and offshore water mixing. In summer, nutrients expanded northeast at the River mouth due to the Changjiang River dilution water turning northeast, while there was no such behavior in other seasons. $NO_2^-$, $NH_4^+$ was obvious point source diffusion effected by Shanghai City sewage outfall. There was $NO_2^-$ high value area at 122.5°E to 125°E in autumn, which caused by high concentration nutrients that regenerated from bottom organic matter and brought to the surface through vertical mixing. In winter, the contour was closer to coast than summer due to Kuroshio water invasion into the shelf. Section distribution of $NO_3^-$, $PO_4^{3-}$ and $SiO_3^{2-}$ was mainly controlled by vertical mixing in spring, the stratification was obvious in summer, which began to be broken up in autumn, and vertical mixing turned to be dominated. In winter the nutrients distribution were almost uniform from top to bottom. $NO_2^-$, $NH_4^+$ didn't presented as fierce seasonal variation as the other nutrients. Influenced by the sewage outfall diffusion, coastal $NO_2^-$, $NH_4^+$ high value areas existed along the M1 and M4 section.

**Keywords:** Changjiang Estuary, Nutrients, Distribution

**Assessing the impacts of an artificial breakwater on phytoplankton abundance and community structures: A case study of Sihwa Lake, Korea**

Kai You[1, 2, *], Seung Ho Baek[3], Toshiya Katano[4], Myung-Soo Han[2]

[1]*Fisheries College, Ocean University of China, Qingdao, P. R. China*
[2]*Department of Life Science, Hanyang University, Seoul, Korea*
[3]*Korea Ocean Research and Development Institute/South Sea Institute, Geoje, Korea*
[4]*Ariake Sea Research Project, Saga University, Saga, Japan*
*(*E-mail: youkai77@hotmail.com)*

**Abstract**
In order to assessing the current ecological health of the *Shihwa* artificial estuarine lake, located on the western coast of Korea. A monitoring study covered the inner and outer areas of *Shihwa* artificial breakwater, focused on phytoplankton biomass, community structure and related abiotic factors, was carried out from May 2007 to May 2008.

The result displayed phytoplankton community in inner area was characterized higher abundance with a Chlorophyll *a* (Chl.*a*) annual average of 36.0 μg/l and a range from 1.2 to 342 μg/l in comparison

with an annual average of 9.6 µg/l and a range from 1.2 to 37.7 µg/l in outer area respectively. However, a lower species richness and cell ratio of diatom in total phytoplankton were observed in inner area with a species number average of 22.4 and a diatom ratio average of 55.8% (50.43%) in comparison with 27.2 and 71.4% (73.13%) in outer area respectively. Moreover phyoplankton abundance in inner area had significant relationships with nutrient concentrations, whereas in outer area significant relationships between phytoplankton abundance with nutrient ratios appeared. Moreover, a relatively higher occurring frequency of flagellate blooms, such as *Heterosigma akashiwo* and *Prorocentrum minimum*, was observed in inner area parallelling with a lower occurring frequency in outer area during the study period. The results suggest the current semi-closed inner area, which suffered strong riverine discharges and restricted water-exchange caused by the artificial breakwater, took on different phytoplankton assemblage characters and went with a stronger disturbance of flagellate blooms in comparison with outer area.

**Keywords:** phytoplankton, artificial breakwater, algal blooms, eutrophication, ecological monitoring

## Seasonal variation and kinetics of microbial consumption of carbon monoxide in a subarctic estuarine system

Yong Zhang[1, 2], Huixiang Xie[1], Patrick Poulin[1], Karine Lemarchand[1]

[1]*Institut des Sciences de la Mer, Université du Québec à Rimouski, Rimouksi, Québec, Canada G5L 3A1*

[2]*Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences. Yantai, Shangdong, 264003, P.R. China*

**Abstract**

Microbial consumption of carbon monoxide (CO) is a major control on the concentration and distribution of this compound in marine waters, and hence on its efflux from the ocean to the atmosphere. This study determined the first-order rate constant ($K_{CO}$) of microbial CO consumption and investigated the temperature-dependence and the Wright-Hobbie kinetics of this process in the Estuary of the St. Lawrence and Saguenay Rivers in July 2004 and October 2005. In both seasons, $K_{CO}$ showed an increasing trend along a salinity-gradient transect (salinity range: 31.5 to 0.1) from the Gulf of St. Lawrence to Quebec City and to the organic-rich water in the Saguenay River. $K_{CO}$ for surface waters ranged from 0.067 to 0.61 (mean: 0.32) $h^{-1}$ in July and 0.036 to 0.73 (mean: 0.19) $h^{-1}$ in October. The major intra- and inter-seasonal variances of $K_{CO}$ can be accounted for by variations in water temperature and bacterial or chlorophyll abundance. $K_{CO}$ displayed a moderate temperature dependence, increasing by ca. 40 to 80% (mean: 53%) per 10$^{o}$C of increase in temperature. The activation energy was estimated to be 20-39 (mean: 29) kJ/mol. Microbial organisms in freshwater zones showed less temperature-dependence in relation to CO consumption than organisms in saltwater zones. CO consumption approximately followed Wright-Hobbie kinetics up to 15 nM [CO] and transformed to inhibition kinetics at

higher [CO]. The maximum CO consumption rate (Vmax) in the Wright-Hobbie kinetic equation ranged from 0.31 to 4.3 (mean: 1.2) nM $h^{-1}$ and roughly anti-correlated with salinity. The half-saturation concentration (Km) was in the range 1.9 to 7.9 (mean: 4.6) nM but exhibited no consistent relationships with other measured parameters.

**Impacts of crude oil and diverted freshwater on dissolved organic matter in Barataria Bay, Louisiana**

Yaoling Zhang[1, 2], E. Michael Perdue[2], Nelson W. Green[2], Jinzhou Du[1]

*[1]State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai 200062 ˆ P. R. China*
*[2]School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA 30332-0340, USA*

**Abstract**

The oil spill event of Deepwater Horizon Mississippi Canyon 252 well (DWH MC252) on April 20, 2010 released ~ 7.5 x $10^8$ L of crude oil into the marine environment. At the same time, a massive diversion of Mississippi River water was initiated on 20 April, 2010 through Davis Pond to limit influxes of oil into Barataria Bay, Louisiana which is a major estuary in the Mississippi River Delta. To evaluate the impacts of crude oil and diverted freshwater on dissolved organic matter (DOM) in Barataria Bay, ten water samples and two DOM samples (isolated using the coupled reverse osmosis/electrodialysis method) were collected from relatively pristine waters (BU samples) and 16 water samples and three DOM samples were collected from waters that were strongly impacted by crude oil (BC samples), respectively. UV/visible absorbance and fluorescence were used to analyze the bulk spectral properties of water samples, and potentiometric titration as well as Fourier transform ion cyclotron resonance (FTICR) mass spectrometry were used to analyze the acid-base properties and molecular-level information of the isolated DOM samples, respectively. The results indicate that the spectral properties of 26 water samples (including uncontaminated and contaminated sites) are strikingly similar and present more terrestrial natures because of the input from Mississippi river. The carboxyl contents of the five isolated DOM samples range from 6.0 to 7.1 meq/g C, and the average $pK_a$'s for carboxyl groups range from 3.90 to 4.64. The two BU samples contain more complex mixtures of carboxyl groups than do the three BC samples. The formulae from the mass spectra of the five DOM samples were compared and the unique formulae in BU samples (or BC samples) were listed.

**Anammox bacteria and associated activity in Chongming eastern intertidal sediments of the Yangtze Estuary**

Lijun Hou[1], Yanling Zheng[1], Guoyu Yin[1]

*[1]State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai 200062, P. R. China*
*(E-mail: Ljhou@sklec.ecnu.edu.cn)*

**Abstract**

The present study investigates the community structure and spatial distributions of anaerobic ammonia oxidation (anammox) bacteria in the surface sediments of chongming eastern tidal flat in the Yangtze estuary. Based on the total DNA extracted from the surface sediments of Chongming eastern tidal flat, anammox-specific 16S rDNA fragments were amplified. The molecular microbial analyses show that there were anammox bacteria in the surface sediments of chongming eastern tidal flat, but the anammox species were diverse in different tidal flats: *Candidatus* "*Scalindua* " was the predominant group in the low tidal flat, while *Candidatus* "*Kuenenia*" was the major population in the high tidal flat and the middle tidal flat. In comparison with the high and low tidal flats, the community structure of anammox bacteria was the most complicated in the middle tidal flat. Also, the activities of anammox bacteria were measured by slurry experiments combined with a nitrogen-isotopic technique. The measured anammox rates ranged from 3.21 - 8.31μmol $^{29}N$ $kg^{-1}$ $d^{-1}$. Higher anammox rates in sediments appeared in upper intertidal flat, followed by middle and low intertidal flats. However, the quantitative correlations between the abundances, structures and activties of anammox bacteria need further study.

**Weak coupling between heterotrophic nanoflagellate and bacteria in the Yellow Sea**

Shiquan Lin[1], Yuan Xiong[1],
Lingfeng Huang[1, 2, *]

[1]*Department of Oceanography, Xiamen University, Xiamen, 361005, P. R. China*
*State Key Laboratory of Marine*
[2]*Environmental Science (Xiamen University), Xiamen 361005, P. R. China*
*(*E-mail: huanglf@xmu.edu.cn)*

**Abstract**
In a study on the distribution and trophic role of the heterotrophic nanoflagellate (HNF) assemblage in the microbial food web of the Yellow Sea, abundances, biomass, and bacterivory rates of HNF, were monitored in Oct, 2006. The abundance of HNF ranged from 303～1388 cells/ml, 884 cells/ml in average, with a carbon biomass for about 10.6 ～ 115.6% of that of bacteria. The maximum abundance of HNF mostly occurred in the upper 30 m layer of water and the vertical distribution order was surface > mid-layer > bottom. In contrast to some oligotrophic area, only weak correlation was found between HNF and bacteria. Factor analysis showed that abiotic factors (including temperature and salinity), rather than food supply, was the main regulator to HNF biomass. Ingestion rate of HNF to heterotrophic bacteria, estimated by the fluorescently labeled bacteria uptake approach, varied from 5.33~14.89 $cell \cdot HNF^{-1} \cdot h^{-1}$. HNF removed only 9.27~33.08% of bacterial biomass and 2.66~13.10% of bacterial production, implying that bacterivory by HNF is not the main fate of bacterial biomass in the investigated area. The results support the reports indicating weak or no coupling of HNF and bacteria in more eutrophic systems.

**The environmental indication of biogenic**

**silica and diatom in the surface sediment of Sishili Bay and northern Yellow Sea, China**

Xin Li[1, 2], Dongyan Liu[1]

[1]*Key Laboratory of Coastal Environmental Processes, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, 264003, Yantai, Shandong, P. R. China*
[2]*Graduate University of the Chinese Academy of Sciences, 100049, Beijing, P. R. China*

**Abstract**

Surface sediment samples were collected at 16 stations in Sishili Bay and 10 stations in the northern Yellow Sea during November 2008, September 2009 and May 2010, repectively. The biogenic silica (BSi) and diatoms in surface sediments were studied to explore their indicative role in the environmental changes. The results showed that BSi content in the sediments of Sishili Bay and northern Yellow Sea are 0.25~1.01% and 0.43~1.73%, diatom biomass are respectively 658~20334 valves/g and 968~10334 valves/g. The BSi content displayed a significant positive relation with diatom biomass in spatial pattern. Combined with the related environmental factor, BSi and diatoms in the sediments indicated the intensive human activity and the productivity in the upper water. However, sediment type and hydrodynamic conditions of the upper water need to be considered as influencing factors.

**Keywords:** biogenic silica, diatom, surface sediment, Sishili Bay, northern Yellow Sea

**Effects of nutrients supplies on nitrogen and phosphorus uptakes and growth in three species of macroalgae**

Heng Li[1], Meizhen Li[2]

[1]*College of Chemistry and Chemical Engineering, Ocean University of China, 238 Songling Road,Qingdao, 266100, P. R. China*
[2]*Alage Research Centre, Shandong Mariculture Institute, 47 Guizhou Road, Qingdao, 266002, P. R. China*

**Abstract**

A series of conditional experiments were performed on *Gracilaria verrucosa*, *Gracilaria chouae* and *Grateloupia filicina* to study the effects of nutrients supplies on the nitrogen and phosphorus uptakes and macroalgae growth. The results showed that all the three macroalgae showed quick response to the supply of nitrogen and phosphorus, and the uptake curves yield a first-order kinetic equation. Under the nitrogen level of 50 μmol/L, *G. verrucosa* and *G. chouae* showed maximum uptake rates of 0.739 μmol/(g•h) and 0.648 μmol/(g•h) respectively; under the nitrogen level of 20 μmol/L, *G. filicina* showed maximum uptake rates of 0.614μmol/(g•h). Under the phosphorus level of 1.0 μmol/L, *G. verrucosa* and *G. chouae* showed maximum uptake rates of 0.015 μmol/(g•h) and 0.018 μmol/(g•h) respectively; under the phosphorus level of 0.7 μmol/L, *G. filicina* showed maximum uptake rates of 0.016μmol/(g•h). Considering the results of removal rate constants, *G. chouae* showed higher removal efficiency of nitrogen and phosphorus. All the results from the conditional experiments showed the highest

wet weight increase in *G. chouae* and lowest increase in *G. filicina*. The change of nitrogen supply has a stronger influence than phosphorus on the growth of *G. filicina*. It would provide important theory basis for cleaning water and bioremediation by cultivating the three macroalgae, and large-scale cultivation of them could be a good solution to the problem of eutrophication due to their capability of removing nutrients.

**Dissolution kinetic of biogenic silica in the Yellow Sea sediments**

Bin Wu[1], Sumei Liu[1]

*[1]Key Laboratory of Marine Chemistry Theory and Technology , Ministry of Education , Ocean university of China, qingdao, 266100, P. R. China*

**Abstract**

Silicon is an important nutrition for diatoms to grow. In marginal sea as terrestrial N,P input increases, the Si/N ratio and the Si/P ratio decrease, a shift of limiting nutrients from N and/or P to Si, which changes the composition of phytoplankton and causes the occurance of the harmful algal. So it is necessary to study the production and dissolution of biogenic silica in marginal sea. Flow-through experiments have been performed to study the dissolution kinetic of biogenic silica in the Yellow sea sediments. Based on the flow-through experiments, the apparent solubility and the dissolution rate of biogenic silica in sediments can be obtained. In addition, wet alkaline extration experiments were carried out to acquire the content of biogenic silica. Both techniques were examined on a sediment core. The content of biogenic silica was less than 3%(wt%.$SiO_2$), the apparent solubility in 0-8cm of the core was decrease with depth and the average of it was 143.4 umol/L. The apparent solubility at surface sediment had the highest value 205.6 umol/L.

The solubility and the content of biogenic silica in marginal sea sediment is lower than in the deep-sea. Because marginal sea has abundant detritus material, Al in them may cause the incorporation with biogenic silica to form the aluminosilicate or the reactivity specific surface area decreases with depth.

**Influences of water masses on picoplankton distribution in the East China Sea in autumn and winter**

Li Zhao[1, 2, 5], Yuan Zhao[1], Wuchang Zhang[1], Feng Zhou[3], Cuixia Zhang[1, 2], Jingling Ren[4], Xiaobo Ni[3], Michel Denis[5] , Tian Xiao[1, *]

*[1]Key Laboratory of Marine Ecology and Environmental Sciences, Institute of Oceanology, Chinese Academy of Sciences, Qingdao, 266071, P. R. China;*
*[2]Graduate University, Chinese Academy of Sciences, Beijing, 10086, P. R. China;*
*[3]Key Laboratory of Marine Ecosystem and Biogeochemistry, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, 310012, P. R. China;*
*[4]Key Laboratory of Marine Chemistry Theory and Technology, Ministry of Education, Ocean University of China, Qingdao 266100, P. R. China;*

[5] *Laboratoire de Microbiologie, Géochimie et Ecologie Marines, CNRS UMR 6117, Université de la Méditerranée, Centre d'Océanologie de Marseille, 163 avenue de Luminy, Case 901, 13228 Marseille cedex 09, France*
*(*E-mail: txiao@ms.qdio.ac.cn)*

**Abstract**
The relationship between picoplankton distribution and water masses was investigated in the East China Sea (ECS) in November 2006 and February 2007. The cruise tracks crossed ECS regions that included 3 major water masses: Coastal Water Mass (CWM), Shelf Mixing Water Mass (MWM) and Kuroshio Water Mass (KWM). Picoplankton composition was resolved in 3 main groups by flow cytometry, namely *Synechococcus*, picoeukaryotes and heterotrophic bacteria. The average abundances of *Synechococcus*, picoeukaryotes and heterotrophic bacteria were $10^4$, $10^3$ and $10^5$ cells/ml in autumn and $10^3$, $10^3$ and $10^5$ cells/ml in winter, respectively. Picophytoplankton distribution showed marked variations with respect to water masses with the highest abundance in KWM and lowest abundance in CWM. The average integrated abundance of *Synechococcus* was about fivefold higher in KWM than in CWM, which may be mainly influenced by temperature. Picoeukaryotes were less affected than *Synechococcus* by water mass differences. Heterotrophic bacteria average integrated abundance exhibited the smallest abundance variations regarding different water masses in autumn and winter. In autumn, *Synechococcus* appeared as two subgroups distinguished by their pigment fluorescences at some stations.

**Keyword:** *Synechococcus*, picoeukaryotes, heterotrophic bacteria, water masses, East China Sea

## Application of biologic silicon in modern sedimentary section to reconstruction of phytoplankton changes in the East China Sea and the Yellow Sea during last 200 years

Yang Qian[1, 2], Sun yao[1]

[1]*Yellow Sea Fisheries Research Institute, Qingdao26607,China*
[2]*Key Laboratory of Marine Chemistry Theory and Technology, Ministry of Education, Ocean University of China, Qingdao 266100, China;*

**Abstract**
Based on the two transects in the Southern Yellow Sea ,the content of BSi in the sediment were analyzed for about 200 years in the means of 210Pb. The results showed that: the content of BSi was influenced by the anthropogenic discharge and the hydrological conditions just like the Yellow Sea Warm Current and the Cold Water Mass.

## Abundances and distribution of nitrogen-cycling microbes in estuarine sediments of the Laizhou Bay, China

X. Zhang[1, *], J. Gong[1]

[1]*Laboratory of Environmental Microbiology, Key Laboratory of Coastal Environmental*

*Processes, Yantai Institute of Coastal Zone Research, Yantai, 264003, P. R. China.*
*(*Email: xlzhang@yic.a.cn; jgong@yic.ac.cn)*

**Abstract**

Microbes drive the fixation, transformation, and sink of nitrogen in ecosystems. The Laizhou Bay, Bohai Sea, an inner sea of China, is facing eutrophication problems caused by nitrogen overload, like many other coasts worldwide. We have investigated the nitrogen-cycling populations in estuarine sediments of three rivers that are characterized by different levels of nutrients and heavy metals. The diversity, abundance and distribution of 16SrRNA and functional genes (*amoA*, *nosZ* and *Hzo*) were assessed using clone library analysis, PCR-DGGE and Q-PCR for ammonia-oxidizing bacteria (AOB) and archaea (AOA), denitrifying bacteria (DNB) and anaerobic ammonium oxidization bacteria (AMB). We found that the AOB mainly belonged to *Nitrosomonas*sp. and *Nitrosospira* sp., whereas AOA had greater diversity than AOB. Among several previously reported AMB species, only "CandidatusScalindua spp." was recorded; both the diversity and abundance of *nosZ*genes are much larger than those of other functional genes. Lower abundances of AOA, AOB and DNB were found from the D River, a drainage river with lower ammonia/nitrite, higher nitrate concentration and larger grain size, and the higher concentration of heavy metals. As a whole, this study indicates that the denitrification process predominates the nitrogen transformations in these estuarine sediments, and that nutrient concentrations, and sedimental grain size mostly impact the community structures of nitrogen-cycling microbes.

**Keywords:** eutrophication, 16SrRNA, functional genes, gene copy number, nitrogen removal, diversity; distribution

## Spatial and temporal variation of picoplankton distribution in Yellow Sea, China

Yuan Zhao[1, 2], Tian Xiao[2, *], Li Zhao[2, 3], Sanjun Zhao[2], Jiliang Xuan[4], Chaolun Li[2], Xiuren Ning[5]

*[1]College of Marine Life Sciences, Ocean University of China, Qingdao 266003, P. R. China*
*[2]Key Laboratory of Marine Ecology and Environmental Science, Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, P. R. China*
*[3]Graduate School, Chinese Academy of Sciences, Beijing 10086, P. R. China*
*[4]State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou 310012, P. R. China*
*[5]Key Laboratory of Marine Ecosystem and Biogeochemistry, Second Institute of Oceanography, State Oceanic Administration, Hangzhou 310012, P. R. China*
*(*E-mail: txiao@ms.qdio.ac.cn)*

**Abstract**

Seven surveys were carried out in April, September, October, December 2006 and

March, May, August 2007 in the Yellow Sea, China. Variations in the spatial and temporal distribution of *Synechococcus*, picoeukaryotes and heterotrophic bacteria were quantified using flow cytometry. *Synechococcus* and heterotrophic bacteria were most abundant from late spring to autumn, while picoeukaryotes concentration was high in spring. High abundance values of *Synechococcus* and heterotrophic bacteria were detected in the northwest part of the Yellow Sea in spring and autumn, while picoeukaryotes were homogeneously distributed over the whole study area except a small frontal zone in the coastal area on the west (in spring) and central Yellow Sea (in autumn). Under mixing conditions, the vertical distribution of the 3 picoplankton groups showed a well-mixed pattern. Upon a well established stratification, the maximum abundance of picoplankton occurred above the mixed layer depth (~30 m). Cell sizes were estimated for *Synechococcus* and picoeukaryotes by converting forward scatter signals (FSC) from cytometry analysis to cell diameter, leading to 0.65 to 0.82 μm for *Synechococcus* and 0.85 to 1.08 μm for picoeukaryotes. Average integrated carbon biomasses ranged from 15.26 to 312.62 mgC/$m^2$ for *Synechococcus*, 18.54 to 61.57 mgC/$m^2$ for picoeukaryotes and 402.63 to 818.46 mgC/$m^2$ for heterotrophic bacteria. The distribution of *Synechococcus* and heterotrophic bacteria was temperature dependent, and picoplankton presence was poor in the Yellow Sea cold water mass.

**Keyword:** *Synechococcus*; picoeukaryotes; heterotrophic bacteria; distribution; Yellow Sea Cold Water Mass

**Connection between CLIVAR and IMBER**

Dongxiao Wang[1]
[1]*South China Sea Institute of Oceanology, Chinese Academy of Sciences, P. R. China*

**Abstract**
IMBER project goals to investigate the sensitivity of marine biogeochemical cycles and ecosystems to global change, on time scales ranging from years to decades. As known that the global climate change has more and more significant effects in the marine, to realize the climate variability is so important for researchers to study the marine ecosystem, especially the mechanisms of ecosystem dynamics. CLIVAR is the World Climate Research Programme (WCRP) project that addresses Climate Variability and Predictability, with a particular focus on the role of ocean-atmosphere interactions in climate. The challenges for CLIVAR are to develop our understanding of climate variability, to apply this to provide useful prediction of climate variability and change through the use of improved climate models, and to monitor and detect changes in our climate system. As CLIVAR science advances, it becomes increasingly important and possible to address all aspects of the climate system, including the role of biogeochemical cycles. To enable the necessary scientific interactions, CLIVAR looks to partnership with other international programmes, including the International Programme of Biodiversity Science (DIVERSITAS). This presentation will introduce the cooperation between CILVAR and IMBER in past few years and look forward to the collaborative programmes in the future.

# INDEX OF PARTICIPANTS AND PRESENTATIONS

IMBER区域项目办公室

**IMBER Regional Project Office (RPO)**

**State Key Laboratory of Estuarine and Coastal Research (SKLEC)**

**East China Normal University (ECNU)**

**3663 Zhongshan Road North**

**Shanghai 200062, China**

**Tel: +86 21 5213 5432**

**Fax: +86 21 5213 5432**

**imber@ecnu.edu.cn**

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