


2016 年度报告

ANNUAL REPORT

近海海洋环境科学国家重点实验室（厦门大学）

State Key Laboratory of Marine Environmental Science
(Xiamen University)

MEL INTRODUCTION

近海海洋环境科学国家重点实验室（厦门大学）（英文缩写MEL）启动建设于2005年3月，2007年6月通过科技部验收，2010、2015年连续被评为优秀国家重点实验室。实验室瞄准与全球变化有关的重大科学问题，直面国家对海洋环境保护和生态安全的重大需求，立足基础研究，以多学科交叉为基础、以技术创新为动力、主攻海洋生物地球化学过程及其与海洋生态系统相互作用，关注在自然变化和人类活动影响下的海洋生态系统对环境变化的响应和反馈。实验室坚持走国际化发展道路，科学研究力求具备国际视野，管理体系参比国际标准，文化建设崇尚自由宽松，努力建设成为具有重要国际影响力的海洋环境科学研究和创新性人才聚集的基地。

Founded in 1995, the Laboratory of Marine Environmental Science (MEL) was formally promoted to a state key laboratory in March, 2005. MEL consists of 57 scientists and 99 technicians. It is dedicated to cutting-edge and interdisciplinary research related to global and regional environmental changes. MEL's focus is on marine biogeochemistry and its interactions with the marine ecosystem.

实验室学术委员会

主　　任：胡敦欣
副 主 任：洪华生
委　　员：柴　扉、陈镇东、黄荣辉、黄天福、林群声、宋微波、苏纪兰、
　　唐启升、王　辉、徐　洵、赵美训、朱　彤、朱永官

MEL Academic Committee

Director: Dunxin Hu
Associate Director: Huasheng Hong
Members: Fei Chai, C.T. Arthur Chen, Ronghui Huang, George T.F. Wong,
Paul K.S. Lam, Weibo Song, Jilan Su, Qisheng Tang, Hui Wang,
Xun Xu, Meixun Zhao, Tong Zhu, Yongguan Zhu

实验室领导班子

名誉主任：洪华生
主　　任：戴民汉
副 主 任：焦念志、王海黎

MEL Leadership Team

Honorary Director: Huasheng Hong
Director: Minhan Dai
Associate Directors: Nianzhi Jiao, Haili Wang

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序 言

2016年又是一个纷扰之年！欧洲难民危机愈演愈烈，中东局势扑朔迷离，政治的迷茫也扩展到了美国，世界格局正发生着难以预料的变化；大地母亲似乎也对人类的贪婪发出了再次的警示：2016年的地表气温又创新高，刷新多个厦门气象纪录的“莫兰蒂”台风正面袭击翔安，狂风暴雨重创了我们眷恋的校园。这些纷扰提醒了我们，和平、和谐的环境是多么的重要：她关乎人类的生存发展，也直接影响着我们的学术生态。

2016年厦门大学迎来95周年华诞，厦大海洋学科也走过95年的艰难、曲折与辉煌。站在新的历史起点，厦大海洋学科将与厦门大学一道走近跨越百年的征程。2016年厦门大学马来西亚分校正式开始办学，基于厦门大学马来西亚分校的中国–东盟海洋学院正式招生，迈出了我国海洋教育走出国门的历史性步伐。2016年MEL也在平凡与不平凡之中前行。

科研能力持续提升。MEL共发表SCI期刊收录论文214篇。其中，发表于JCR一、二区期刊的论文115篇，发表在JCR界定的顶级期刊（top journals）上的论文53篇。实验室获首批国家重点研发计划“全球变化及应对”重点专项资助两项，分别为黄邦钦为首席的“海洋生态系统储碳过程的多尺度调控及其对全球变化的响应”项目，及张瑶为首席的“近海生态系统碳汇过程、调控机制及增汇模式”项目。

人才队伍发展稳健。“海洋碳循环创新研究团队”入选科技部组织的创新人才推进计划“重点领域创新团队”；张祖麟、汪冰冰入选中组部“青年千人计划”；王大志入选国家科技创新创业领军人才，获得“国家高层次人才特殊支持计划”（万人计划）的支持；刘志宇获批“国家自然科学基金优秀青年科学基金项目”。

平台建设进展显著。2016年5月8日厦门大学3000吨级的海洋科考船在广州广船国际有限公司举行下水仪式，并以“嘉庚”号命名。“嘉庚”号在嘉庚先生后裔的见证下缓缓驶出船坞，终于圆了数代海洋人的梦想，从此，世界的大洋上将有一座移动的厦门大学：“海上厦大”！那一刻历史定格，感动了朱崇实校长、张彦书记，也感动和激励了众多海洋师生和校友为之振奋。

过去五年,在以胡敦欣院士为主任的第二届学术委员会的悉心指导下，实验室继续取得了长足的进步，并于2015年再度获评为优秀国家重点实验室。此间，我们深谙学术委员会在把握实验室发展战略、凝聚学术方向等重大事务中发挥着至关重要的作用。值此实验室第二届学术委员会任期届满之际，实验室全体同仁谨向各位委员致以最崇高的敬意和最诚挚的谢意，我们会始终怀着感恩之心谨记各位委员的支持、指导与点拨，同时也非常真诚地希望各位委员继续关注和关心实验室的发展。

2017年元旦即将来临，MEL即将迎来海洋环境科学青年学者论坛、第三届海洋开放科学大会和新一届学术委员会年会的盛会，敬请期待。

最后，值此新年来临之际，谨代表实验室全体同仁，向所有关心、支持实验室成长的海内外同仁、朋友表示衷心的感谢，并致以最美好的新年祝福！

戴民汉主任
于2016年12月31日

Message from the Director

2016 was a troubling year. The refugee crisis in Europe was intensified, the situation in the Middle East is confusing, and political confusion extended to the United States, resulting in more subtle changes to the global political arena. Mother Earth seemed to issue even more warnings to the greed of human beings: the Earth's surface temperature reached new highs; Typhoon Meranti reset a number of meteorological records in Xiamen, hitting Xiang'an and pounding our beloved campus with heavy wind and rains. All these reminded us of the importance and need for peace and a harmonious environment, relevant to human life and development, and affects our scientific research as well.

In 2016 Xiamen University celebrated its 95th anniversary; our marine science discipline has also gone through a momentous 95 years on the way to its 100-year journey. The university officially opened its Malaysian Campus, where the China-ASEAN College of Marine Sciences began to enroll students, and has taken China's marine education out of the country, marking another milestone.

In 2016, MEL continued to improve our research capabilities. MEL scientists published 214 papers in SCI journals and 53 of them were published in top journals. Two projects led by MEL scientists were funded through the National Key Research and Development Program, the "Marine Carbon Sequestration: Multiscale Regulation and Response to Global Change" led by Bangqin Huang and "Processes and Approaches of Coastal Ecosystem Carbon Sequestration" led by Yao Zhang.

Our research team has developed steadily. The Ocean Carbon Group was awarded the Group of Excellence by the MOST Creative Talents Program; Zulin Zhang and Bingbing Wang were awarded under the National Recruitment Program for Young Professionals; Dazhi Wang was supported by the National High-Level Talents Special Program; Zhiyu Liu received a grant from the NSFC Excellent Young Scientists Fund.

Our infrastructure and facility has made significant progress. We finally launched the new research vessel, the "Tan Kah Kee" on May 8th in Guangzhou. This inspiring moment was witnessed by XMU President Chongshi Zhu, Council Chair Yan Zhang, faculty and students, and descendants of Mr. Tan Kah Kee, XMU's founding farther. The dream of several generations has come true!

In the past 5 years, MEL has made great progress under the supervision of the 2nd Academic Committee led by Prof. Dunxin Hu. The committee has played a significant role in providing suggestions for the overall planning and research direction of MEL. All MEL members would like to thank the committee members for their advice towards MEL's long term development.

As the new year approaches, MEL will host several activities in January, including the Youth Scholar Forum, the Third Xiamen Symposium on Marine Environmental Science (XMAS-III), and the meeting of the new academic committee.

Finally, on behalf of all my colleagues at MEL, I would like to extend my heartfelt thanks to all colleagues and friends for their care and support, and extend my best wishes for the New Year!

Minhan Dai
December 31, 2016

年度焦点

2016 Headlines

1月 January

实验室与香港海洋污染国家重点实验室年度联合学术研讨会在福建古田举办。

The MEL-SKLMP Annual Joint Workshop was held in Gutian, Fujian Province.

3月 March

戴民汉带领的“海洋碳循环创新研究团队”入选科技部组织的创新人才推进计划“重点领域创新团队”。

The Ocean Carbon Cycle Research Group led by Minhan Dai was awarded the Group of Excellence by MOST Creative Talents Program.

张祖麟入选中组部“青年千人计划”。

Zulin Zhang was awarded under the National Recruitment Program for Young Professionals.

5月 May

5月8日，厦门大学3000吨级海洋科考船下水暨命名仪式在广州广船国际有限公司举行。厦门大学校主陈嘉庚先生的四儿媳吴美英女士作为该船的“教母”启用了“嘉庚”号船名，以“嘉庚”命名首艘现代化科考船既是对嘉庚先生创办厦大、泽被万代的感恩缅怀，也期望这座“海上厦大”将嘉庚精神传播至世界各地。

The launch and naming ceremony of the XMU new research vessel took place on May 8th. Mrs. Go Bee Ying (daughter in law of XMU's founding father Mr. Tan Kah Kee) attended the ceremony and named the vessel "Tan Kah Kee", to memorialize Mr. Tan and his spirit and carry the dreams of XMUers all over the world.

6月 June

焦念志首创发起并担任会议主席的“戈登研究论坛”海洋生物地球化学与碳汇分论坛首次会议在香港举行，吸引了来自26个国家、地区的180余位参会者。

Convened and chaired by Nianzhi Jiao, the first Gordon Research Conference on Ocean Biogeochemistry: The Biologically-Driven Ocean Carbon Pumps was held in Hong Kong, attended by 180 participants from 26 countries and regions.

7月 July

实验室获首批国家重点研发计划“全球变化及应对”重点专项资助2项，分别为黄邦钦为首席的“海洋生态系统储碳过程的多尺度调控及其对全球变化的响应”项目和张瑶为首席的“近海生态系统碳汇过程、调控机制及增汇模式”项目。

Two proposals led by MEL scientists were funded through the National Key Research and Development Program. They were the "Marine Carbon Sequestration: Multiscale Regulation and Response to Global Change" led by Bangqin Huang and "Processes and Approaches of Coastal Ecosystem Carbon Sequestration" led by Yao Zhang.

7月 July

王大志入选国家科技创新创业领军人才，入选“国家高层次人才特殊支持计划”（万人计划）。

Dazhi Wang received support from the “National High-Level Talents Special Support Plan”.

8月 August

刘志宇获批“国家自然科学基金优秀青年科学基金项目”。

Zhiyu Liu received a grant under the NSFC Excellent Young Scientists Fund.

东山太古海洋观测与实验站一期主体楼封顶。

Dongshan Swire Marine Station’s main building structure was completed.

9月 September

实验室与海南大学省部共建南海海洋资源利用国家重点实验室签约成为伙伴实验室。

MEL signed the Agreement on Partner Lab Collaboration with the State Key Laboratory of Marine Resource Utilization in the South China Sea (Hainan University).

11月 November

第5届海洋科学开放日在翔安校区举办，吸引约8000名公众参加。

The 5th Annual Ocean Sciences Day was held and attended by about 8000 visitors.

12月 December

为吸引国内外优秀生源，培养杰出的博士研究生，实验室首次启动“博士生奖学金”。

The MEL PhD Fellowship was initiated to attract and encourage outstanding PhD students.

汪冰冰入选中组部“青年千人计划”。

Bingbing Wang was awarded the National Recruitment Program for Young Professionals.

新进人员
MEL New Members

科研人员 New Faculty

张祖麟 博士
Dr. Zulin Zhang

厦门大学博士（2001）
清华大学博士后、助理研究员、副研究员（2001–2006）
英国苏赛克斯大学，居里夫人学者（2004）
英国麦考利研究所，研究员（2007–2012）
英国赫顿研究所，资深研究员（2013–2016）
厦门大学“青年千人计划”教授（2016–）
研究兴趣：有机污染物环境生物地球化学；痕量有机污染物的分析监测新方法；水中新型有机污染物的去除新技术。

PhD, Xiamen University (2001)
Postdoctoral researcher, Assistant and Associate Research Scientist, Tsinghua University, China (2001-2006)
Marie Curie Research Fellow, University of Sussex, UK (2004-2007)
Research Scientist, The Macaulay Land Use Research Institute, UK (2007-2012)
Senior Research Scientist, The James Hutton Institute, UK (2013-2016)
Professor and awardee of National Recruitment Program for Young Professionals, Xiamen University, China (2016-)

Research Interest: Environmental biogeochemical process of organic contaminants; new analytical methods for trace organic contaminants monitoring; novel techniques for emerging contaminants removal in waters.

黄永祥 博士
Dr. Yongxiang Huang

上海大学–法国里尔一大（又名法国里尔科技大学）双博士学位（2009）
比利时布鲁塞尔自由大学博士后（2009–2010）
上海大学讲师（2010–2015）
厦门大学副教授（2015–）
研究兴趣：湍流统计理论，复杂系统中的多尺度统计

PhD in Fluid Dynamics, Lille 1 University, France/Shanghai University, China (2009)
Postdoctoral Research Fellow , Universite Libre de Bruxelles, Belgium (2009-2010)
Assistant Professor, Shanghai Institute of Applied Mathematics and Mechanics, Shanghai University, China (2010-2015)
Associate Professor, Xiamen University, China (2015-)

Research Interest: Statistical theory of turbulence, multiscale statistics in complex systems

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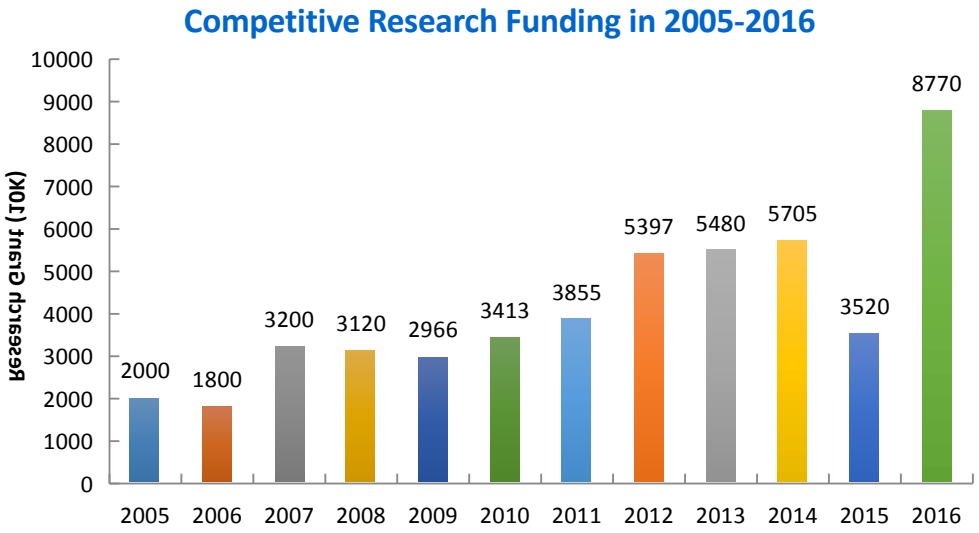
科研课题

Research Projects

2016年度，实验室新增科研课题30项，合同经费约8770万元，经费主要来源于国家自然科学基金委、科技部和国家海洋局等。

In 2016, MEL faculties were awarded 87.7 million RMB in competitive research grants mainly from the National Natural Science Foundation (NSFC), Ministry of Science and Technology (MOST) and State Oceanic Administration (SOA).



部分新增课题
Selected New Projects Funded in 2016

课题名称 Project Title	课题负责人 PI	经费（万元） Budget (10K RMB)
国家重点研发计划重点专项项目 National Key Research and Development Program		
【项目】海洋生态系统储碳过程的多尺度调控及其对全球变化的响应 [Project] Marine carbon sequestration: multiscale regulation and response to global change	黄邦钦 Bangqin Huang	2500
【项目】近海生态系统碳汇过程、调控机制及增汇模式 [Project] Processes and approaches of coastal ecosystem carbon sequestration	张瑶 Yao Zhang	2500
【课题】主被动海洋光学遥感融合反演技术与示范 [Sub-project] Development on fusion and inversion of active and passive ocean optical remote sensing techniques	李忠平 Zhongping Lee	205
【课题】海洋光学遥感产品验证与校正技术 [Sub-project] Verification and correction technology of marine optical remote sensing products	商少凌 Shaoling Shang	98

课题名称 Project Title	课题负责人 PI	经费（万元） Budget (10K RMB)
【课题】海水pCO_2在线监测系统的研制及产业化 [Sub-project] Development and industrialization of *in-situ* pCO_2 monitoring system for seawater	李权龙 Quanlong Li	150
【课题】海洋生源活性气体的生物地球化学循环过程与生态响应 [Sub-project] Biogeochemical cycle process and ecological response of marine biogenic gas	高亚辉 Yahui Gao	380
国家自然科学基金重点项目 NSFC Key Program		
深海遥感及其在近二十年来中深层海洋增暖研究中的应用 Deep ocean remote sensing and its application on research of mid to deep ocean warming during recent 20 years	严晓海 Xiao-Hai Yan	290
国家自然科学基金国家重大科研仪器设备研制项目 NSFC National Key Program for Scientific Facilities and Instrumentation		
深紫外多维激光共聚焦显微荧光光谱系统研制 Research and development of deep UV and multi-dimension laser confocal scanning microscopic fluorescence spectral instrument	张勇 Yong Zhang	708
国家自然科学基金面上项目 NSFC General Program		
九龙江口及厦门近岸水体颗粒物附着微生物生态研究 Ecological study of particle-associated microorganisms in Jiulong River estuarine and Xiamen coastal waters	党宏月 Hongyue Dang	77
温度胁迫对珊瑚生态系统固氮的影响——现生环境与历史记录反演 Thermal stress on nitrogen fixation of coral reef ecosystem - coupling study of modern processes and ancient records	高树基 Shuh-Ji Kao	76
有机磷酸酯阻燃剂在海洋青鳉鱼中的毒理机制和代谢研究 Toxicity and biotransformation of organophosphate ester flame retardants in marine medaka (*Oryzias melastigma*)	洪海征 Haizheng Hong	75
牡蛎铜、锌富集遗传变异分析及关键功能基因研究 Genetic variability analysis and key functional genes study of Cu and Zn accumulation in oyster	柯才焕 Caihuan Ke	68
黑潮溶解有机碳入侵南海北部的交换过程与降解机制研究 Exchange processes and biodegradation mechanisms of dissolved organic carbon derived from Kuroshio Intrusion in the Northern South China Sea	李骁麟 Xiaolin Li	70
铁限制下非编码RNA对束毛藻基因表达调控的分子机制研究 Molecular mechanism of non-coding RNA regulation on *Trichodesmium* gene expression corresponding to iron limitation	石拓 Tuo Shi	67
河口与热液区痕量金属与海洋细菌互作机制研究 The interrelationship between trace metals and bacteria in estuaries and hydrothermal vents	王德利 Deli Wang	74
基于卤素交换作用的钙钛矿量子点荧光波长移动可视化传感研究 Study on colorimetric sensing based on fluorescence wavelength shift via halide exchange of perovskite quantum dots	陈曦 Xi Chen	65

科研课题

Research Projects

课题名称 Project Title		课题负责人 PI	经费 Budget (10K RMB)
国家自然科学基金优秀青年科学基金项目 NSFC Excellent Young Scientists Fund			
海洋混合—陆架海密度跃层内湍流混合的参数化 Ocean mixing: parameterization of pycnocline mixing in shelf seas		刘志宇 Zhiyu Liu	130
国家自然科学青年基金项目 NSFC Young Scientists Fund			
海洋钡稳定同位素组成、分馏效应及其古生产力替代指标可能性研究 On the barium isotopic compositions, fractionation and its potential as a proxy for paleo productivity in the ocean		曹知勉 Zhimian Cao	20
中国沿岸平均海平面的倾斜特征及动力机制 Tilt of mean sea level along the Chinese coast and its dynamics		林宏阳 Hongyang Lin	20
新型光能捕获蛋白视紫红质在赤潮甲藻中的功能及表达调控研究 The function and express regulation study of rhodopsin in red tide harmful algae dinoflagellate		石新国 Xinguo Shi	19
浙闽沿岸流在台湾海峡的营养盐输运及生态效应研究 Nutrient transport of Zhe-Min coastal current and its biological effect in the Taiwan Strait		王佳 Jia Wang	21
海洋甲藻碳同化机制及其在藻华形成过程中的作用 Carbon assimilation mechanism and its roles during the occurrence of marine dinoflagellate bloom		张浩 Hao Zhang	19
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IAEA	国际原子能机构跨地区项目：支持全球海洋酸化观测网络 IAEA Technical Cooperation Inter-Regional Project: Supporting a global ocean acidification observing network towards increased involvement of developing states (Total budget: 400K Euro)	戴民汉 Minhan Dai (China Counterpart)	Not defined

海洋生态系统储碳过程的多尺度调控及其对全球变化的响应
Marine Carbon Sequestration: Multiscale Regulation and Response to Global Change (MARCO)

——国家重点研发计划“全球变化及应对”专项, 2016–2021,首席科学家：黄邦钦

National Key Research and Development Program, 2016-2021, Leading PI: Bangqin Huang

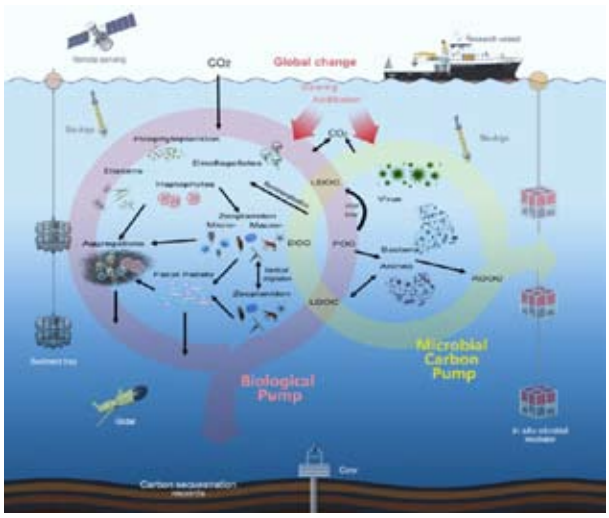
海洋是地表系统中最大的碳库，在全球碳循环中起着举足轻重的作用，显著影响地球气候系统。生物泵和微型生物碳泵是海洋储碳的两个重要途径，其储碳效率在很大程度上决定了海洋和大气中的碳库变动，是碳增汇的关键过程。

该项目目标是阐明海洋固碳过程和储碳机理，诠释海洋酸化对固碳和储碳的影响，建立古海洋沉积碳库变动与全球变化的关联，深入揭示海洋生态系统储碳过程的多尺度调控机理。针对上述关键科学问题和目标，项目围绕核心主题“固碳过程—储碳机制—酸化影响—碳库变动”设置4个课题。

项目将从现代生物地球化学过程入手，以生物群落结构和碳库变动存在显著差异的南海北部陆架、海盆和珊瑚礁三个典型生态系统为研究对象，在不同层级水平上研究海洋生态系统的固碳过程、储碳机制及其对海洋酸化的响应；并结合不同沉积系统近2000年来的碳库变动，以及工业革命以来高分辨率的海水温度、pH和碳库记录，探讨海洋碳库变动对自然变化和人类活动的响应机制，阐明生物泵和微型生物碳泵储碳的调控机理。

Ocean, the largest carbon reservoir in the earth surface, plays an important role in the global carbon cycle, which has significant impact on the earth's climate system. Biological pump (BP) and microbial carbon pump (MCP) are two of the most important pathways for the carbon sequestrations, the efficiency of which modulates determined the carbon stock changes in the ocean and atmosphere.

This project aims to clarify the ocean carbon sequestration mechanism of carbon process and interpretation of ocean acidification effect on carbon sequestration and storage, establish the marine sedimentary carbon stock changes linked to global change, further analysis in the process of marine ecosystem carbon storage multiscale regulation mechanism. According to the key scientific problem and target, 4 themes "process of carbon fixation-carbon storage mechanism - acidification effect - carbon stock changes" were set up around the core scientific question.
Three typical ecological system (continental shelf, basin and coral reefs) in the South China Sea with significant differences of biological community structure and carbon library changes were taken as the study sites. Project will be initiated from the modern biogeochemical process, to demonstrate marine ecosystem carbon process and mechanism of carbon storage and its response to ocean acidification at different levels. Combined with different carbon stock changes of sedimentary systems in 2000 years and high-resolution sea water temperature, pH and carbon library records since the industrial revolution, to explore the ocean carbon stock changes to natural changes and human activities in response mechanism, to clarify regulation mechanism of the biological pump and microbial carbon pump.



The research scheme of MARCO project.

重点项目介绍课题
Projects Highlights

近海生态系统碳汇过程、调控机制及增汇模式
Processes and Approaches of Coastal Ecosystem Carbon Sequestration (PACECS)

——国家重点研发计划“全球变化及应对”专项，2016–2021，首席科学家：张瑶

National Key Research and Development Program, 2016-2021, Leading PI: Yao Zhang

蓝碳，即由海洋生态系统捕获的碳（主要是有机碳），是海洋储碳的重要机制之一。蓝碳最初认识的形式是可见的海岸带植物固碳。但之前没有得到足够重视的、看不见的微型生物（浮游植物、细菌、古菌、原生动物）占海洋生物量90%以上，是蓝碳的主要组分。我国近海占国土总面积的1/3，碳汇潜力巨大，亟待研发。

因此，针对“近海碳汇对缓解气候变化的贡献和意义”这一具有重要战略意义的目标，“近海碳汇增汇要增到哪里？其过程机制及对全球变化的响应如何？是否可能实现可实施的减排增汇生态工程？”成为摆在我们面前的核心科学问题。该项目通过微观与宏观结合、古今链接研究近海碳库变动与全球变化的关系，评估自然过程和人类活动对碳汇的影响；阐明近海碳循环过程与碳源汇变化过程及蓝碳增汇机制，建立海洋碳汇的指标体系和陆海统筹的近海增汇模式。

近海增汇，一是增加颗粒有机碳输出埋藏、二是增强微型生物介导的惰性溶解有机碳的产生（该碳库相当于大气二氧化碳总量）。

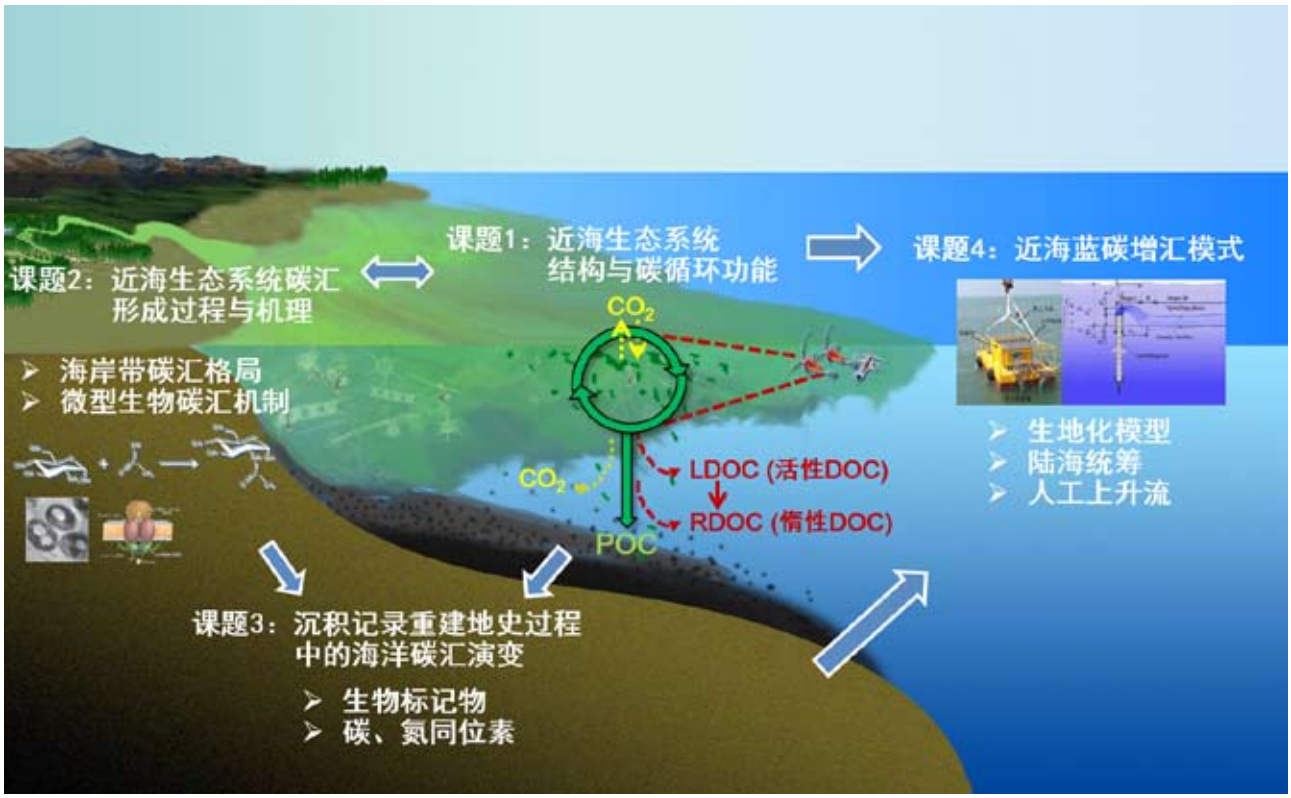
项目共设置四个课题：课题1将摸清环境中群落结构的特征和演替规律；围绕颗粒有机碳输出和惰性溶解有机碳产生的一系列相关碳循环过程，了解和认识微型生物在其中的生态特性及其功能。课题2将从群落、物种、基因、蛋白、代谢产物等水平上分析海洋生物对碳的吸收、合成、转运和释放机制，构建碳代谢关键路径；认识人为活动和陆源氮、磷输入对上述过程的影响。课题3将通过沉积记录（生物标记物和碳、氢同位素），重建地史过程中的海洋碳汇演变，从而古今链接研究近海碳库变动与过去历史上全球变化事件的关系。课题4基于前3个课题的现场调查、理论探索、历史再现，通过生地化模型、全球变化模拟，给出陆海统筹的河口增汇和基于人工上升流的典型陆架海区增汇模式和示范。

Ocean is the largest carbon pool on earth surface, serving as the buffer of global climate change, absorbing about 1/3 of CO_2 produced by human activities. Carbon sink captured by marine ecosystem is called the "Blue Carbon Sink" (hereinafter referred to as "blue carbon"), which is one of the most important mechanisms for the sea to store carbon. The initial form of blue carbon is visible plant carbon sequestration in the coastal zone. As a matter of fact, the invisible microorganisms (phytoplankton, bacteria, archaea, and protozoa), which have always been ignored, account for 90% of the marine biomass and constitute the main component of blue carbon. The marginal sea covers one third of the total territory of China, and it is of urgent need to explore the immense potential of carbon sinks. This project aims at the key processes and mechanisms of the carbon sequestration in coastal ecosystems and ways to increase ocean carbon sink.

An increasing carbon sink, on the one hand, refers to increasing the sinking and burial of particle organic carbon (POC) in sediments; and on the other hand, it is about increasing the production of refractory dissolved organic carbon (RDOC) mediated by microorganisms (the overall amount of the RDOC pool is equal to that of CO_2 in the atmosphere). This project is comprised of four subprojects.

Subproject 1 focuses on community structure and ecosystem function in the carbon cycle, with an emphasis on key processes concerning the POC sinking and the RDOC production.

Subproject 2 focuses on physiological and molecular mechanisms of ocean carbon sinks, such as uptake, transformation, and release of carbon-containing chemical compounds by microorganism at the gene



and protein levels. This subproject also focuses the impact of human activities and input of terrestrial nitrogen and phosphorus on the above processes.

Subproject 3 focuses at re-establishing the evolution process of ocean carbon sinks in geologic history with sedimentary records, which should record organic carbon from burial of sinking POC in sediments studied in subject 1, the RDOC molecules studied in both subproject 1 and 2, and the human activities and input of terrestrial sources studied in subproject 2, and aims at the relationship between ocean carbon sinks and global climate changes in ancient oceans.

Based on field investigation, theoretical analysis and historical representation of the subproject 1, 2, and 3, subproject 4 aims at establishing scenario models for carbon sink dynamics under global warming situation, and providing theoretical and technical foundations for engineering ocean carbon sequestration in the future.

This project is featured in its interdisciplinary cooperation and integration. Potential breakthroughs are especially expected in the following aspects: (1) key processes and regulatory mechanisms of ocean carbon sink and its relationship with environment and global climate changes; (2) an index system for carbon storage including a series of physical-chemical and biological indices and parameters and main core measurements protocols; (3) demonstrations of increasing carbon sink and engineering carbon sequestration in the ocean. These outputs will support the sustainable development of marine ecosystem and national carbon emissions trading.

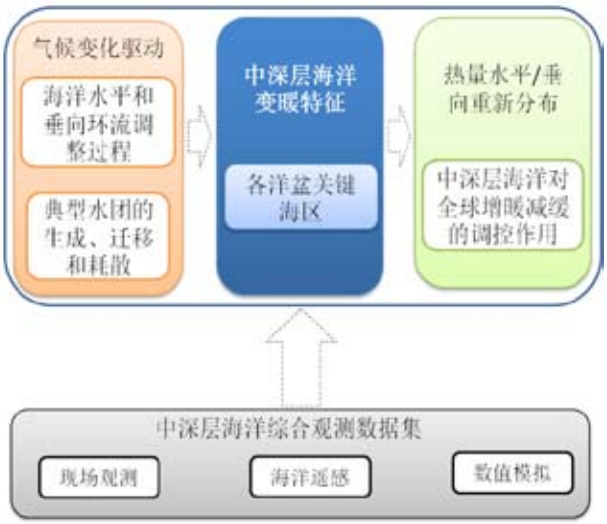
重点项目介绍课题
Projects Highlights

深海遥感及其在近二十年来中深层海洋增暖研究中的应用
Deep Ocean Remote Sensing and its Application on Research of Mid to Deep Ocean Warming during Recent 20 Years

——国家自然科学基金重点项目，2017–2021，项目负责人：严晓海

NSFC Key Program, 2017-2021, Leading PI: Xiao-Hai Yan

新近研究发现近十几年的全球增暖减缓对应着显著的中深层海洋（300–2000 m）变暖趋势，但中深层增暖的过程与机理尚不明确，这在一定程度上增大了年代际气候变化预测的不确定性。本项目将建立融合多传感器和实测数据的海洋内部动力结构反演算法，借助深海遥感技术及现场观测资料，反演90年代初以来的高精度次表层温度结构，为年代际气候变化研究提供新的数据集。在此基础上，量化研究全球增暖减缓期间中深层海温和热含量的变化特征；结合数值模式和动力学诊断方法，分析在海洋环流调整、深对流和潜沉等动力机制作用下，热量向中深层海洋的传输机制；进而阐明热量在中深层的再分配过程与各大洋海盆尺度翻转环流及其物质输运的动力关联。上述研究有利于加深对中深层海洋与上层海洋物质与能量交换的理解，促进对全球增暖减缓机制的认识，对于科学估算全球与区域的气候敏感度，提高气候可预报性具有重要科学意义。



Some new research revealed that during global warming slow-down the subsurface and deeper ocean (300-2000 m) warms up significantly, but the process and mechanism is not clear, which leads to uncertainty in decadal scale climate predictions. This project will use deeper ocean remote sensing technology and in situ observation, along with reanalysis datasets, to reconstruct high-resolution subsurface and deeper ocean temperature since early 1990s, as a new dataset for climate study on decadal scale. Furthermore, this study will quantify the subsurface and deep ocean heat content variation during the global surface warming slow-down; the combination of numerical model and dynamic diagnosis will help understand how heat is transferred into the deeper ocean, during processes such as ocean circulation adjustment, deep convection and subduction; at last to clarify the dynamic relation between deeper ocean heat redistribution, the basin scale overturning, and mass transport. This study will further our understanding on the mass and energy exchange between upper and lower ocean layers, and the mechanism for global surface warming slow-down. It is helpful to scientifically assess the global and regional climate sensitivity, as well as improve our ability to predict the climate change. The current collaborative work has laid a solid foundation for the joint researches. The project is dedicated to improve our understandings on nitrogen and carbon cycles in hypoxia zones and to support China's marine nitrogen cycle research internationally.

海洋混合—陆架海密度跃层内湍流混合的参数化
Ocean Mixing: Parameterization of Pycnocline Mixing in Shelf Seas

——国家自然科学基金优秀青年基金项目，2017–2019 项目负责人：刘志宇

NSFC Fund for Excellent Young Scholars, 2017-2019, PI: Zhiyu Liu

陆架海季节性密度跃层内的湍流混合过程是众多物理、生化过程的核心，但其在区域海洋模型中的参数化尚不完善。本项目拟开展陆架海密度跃层内湍流混合的参数化研究，集成分析近十几年来在西北欧陆架海与我国近海所获取的湍流混合与同步流速、温盐观测资料，揭示不同动力环境下陆架海季节性密度跃层内湍流混合的特征与机理，发展具有一定普适意义的湍流混合参数化模型。

Pycnocline mixing is central to many physical and biogeochemical processes in shelf seas, whereas its parameterization in state-of-the-art ocean models remains trivial. With the aim of developing an updated closure scheme for pycnocline mixing in shelf sea regional models, this project will investigate, quantify and parameterize the processes responsible for mixing in the shelf sea seasonal pycnocline. It will synthesize the extensive datasets collected in the Northwest European Shelf Seas and China Seas over the last two decades. The outcome of this project is expected to significantly improve our capability to simulate the annual cycle of stratification in continental shelf seas.

交流与合作

Exchange and Cooperation

实验室通过学术交流会、访问学者基金与开放课题、“111”引智计划、“凌峰论坛”、“周一午餐交流会”等形式推进实验室成员之间及其与海内外合作者的交流，构架国际化及开放共享的学术平台。

2016年度，共有80余名国内外学者到访实验室，通过学术报告、讲授课程、合作研究等多种形式开展交流与合作。并有实验室科研、技术人员和研究生累计约220人次出访，参加国内外学术研讨会、合作研究、技术培训或联合航次等。

MEL is promoting collaborations by organizing conferences and exchange programs such as the MEL Visiting Fellowship Program, Lingfeng Forum, Luncheon Seminars, and the “111” Collaborative Program. In 2016, more than 80 visitors visited MEL and about 220 MEL members and students went out for academic exchanges, joint research projects, and cruise surveys.

Dr. Ruoying He from North Carolina State University (USA) giving a seminar on April 18th on Observational and modeling study of ocean circulation, air-sea interactions, and biogeochemical processes in the Northwest Atlantic coastal ocean.

Dr. Sinead Collins from the University of Edinburgh (UK), recipient of a MEL Senior Visiting Fellowship giving a seminar on March 7th on Using evolution experiments to understand phytoplankton responses to ocean acidification.

Dr. Chris Bowler from Ecole Normale Supérieure (France) giving a seminar on May 12th on Tara Oceans: eco-systems biology at planetary scale.

Xiaojun Yuan from Lamont-Doherty Earth Observatory of Columbia University, giving a talk on July 4th on Predicting Arctic sea ice by Stochastic models at intra-seasonal to seasonal time scales.

Prof. Willard Moore from the University of South Carolina giving a talk on Applications of marine radioactivity to submarine groundwater discharge studies.

Prof. Kenneth Söderhäll from Uppsala University (Sweden) giving a talk on November 28th on Melanization - an evolutionary old defense system.

Minhan Dai giving a plenary talk on Observational challenges: from global to local, at the 4th International Symposium on the Ocean in a High-CO_2 World, May 3rd-6th, Hobart, Australia.

Yunwei Dong and Kunshan Gao attending the Gordon Research Conference on Ocean Global Change Biology on July 17th-22nd in New Hampshire, USA.

交流与合作
Exchange and Cooperation

合作协议 MoU

实验室推动厦门大学地球科学与技术学部与北海道大学环境科学研究院的交流合作，双方于6月23日签署联合培养项目合作备忘录。

A Memorandum of Understanding on a Contutelle Program between the Faculty of Earth Science and Technology, Xiamen University and the Graduate School of Environmental Science, Hokkaido University was signed on June 23.

实验室组织或承办的会议 SYMPOSIUMS/CONFERENCES MEL ORGANIZED

MEL-SKLMP伙伴实验室联合研讨会/MEL-SKMLP Joint Symposium

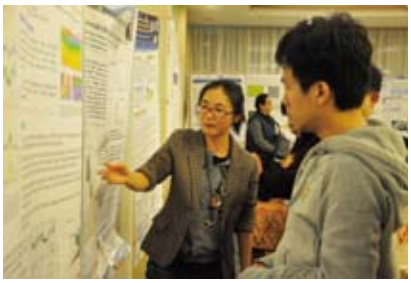
1月6–8日，实验室2015年度学术研讨会暨与香港海洋污染国家重点实验室联合学术研讨会在古田举办。从海洋生态系统的物理胁迫、边缘海和河口的生物地球化学过程、探测海洋：前沿与学科交叉、海洋生态过程的机制、海洋污染与生态毒理等五个专题进行研讨。自2009年建立伙伴实验室关系以来，双方每年联合举办研讨会，加强了实验室成员间的学术交流及合作，并促进实验室学科交叉、融合与知识创新。

The partnership between MEL and the State Key Lab of Marine Pollution (Hong Kong) (SKMLP) was established in 2009, and several joint symposia have been held ever since. The 2015 MEL-SKLMP Joint Symposium was held on Jan 6th-8th in Gutian.

Talks, posters and discussions were presented in five sessions: namely the physical forcing of the marine ecosystem; biogeochemical processes in ocean margins & estuaries; exploring the ocean: frontier & interdisciplinary; fundamentals of the ocean's ecological processes; and marine pollution and ecotoxicology.

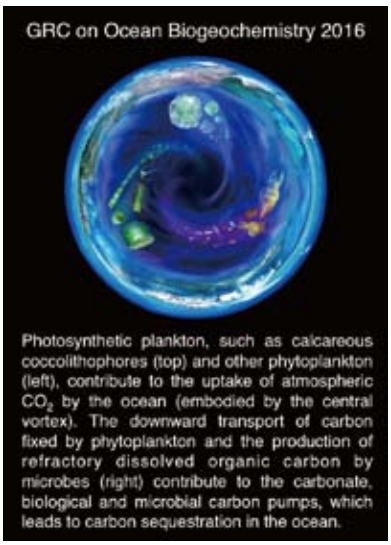






2015 MEL-SKMLP Joint Symposium (Photo: Suwei Weng)

“戈登研究论坛”海洋生物地球化学与碳汇分论坛
Gordon Research Conference on Ocean Biogeochemistry



Photosynthetic plankton, such as calcareous coccolithophores (top) and other phytoplankton (left), contribute to the uptake of atmospheric CO_2 by the ocean (embodied by the central vortex). The downward transport of carbon fixed by phytoplankton and the production of refractory dissolved organic carbon by microbes (right) contribute to the carbonate, biological and microbial carbon pumps, which leads to carbon sequestration in the ocean.

“戈登研究论坛”海洋生物地球化学与碳汇分论坛首次会议于6月12–17日在香港举办，焦念志为论坛的首创发起人及第一次会议主席。论坛吸引了来自26个国家、地区180余位学者参加。会议以“生物驱动的海洋碳泵”为主题，主要围绕9个专题开展研讨，分别为：1）海洋碳泵的古今；2）生物碳泵；3）碳酸盐泵 ；4）微型生物碳泵；5）铁及其他微量金属与碳循环；6）硅、氮和磷与碳循环；7）甲烷和硫与碳循环；8）三种碳泵间相互作用；9）海洋碳泵与社会。

The first Gordon Research Conference on Ocean Biogeochemistry: The Biologically-Driven Ocean Carbon Pumps was held in Hong Kong on June 12th-17th, chaired by Nianzhi Jiao and attended by more than 180 participants from 26 countries and regions.

The conference is devoted to the biologically-driven ocean carbon pumps. In the future, the conference will address the cycles of various chemical elements that are involved in different aspects of life (including N, P, O, Fe, Si, Ca), play active roles in climate (including C, S, N), and participate in the long-term storage of carbon (including C, Ca, Si). It will consider the continuum between the past, present, and future ocean; explore observational, experimental, and modeling approaches; address the neritic, oceanic, and deep environments in the water column, and the sea bottom below; discuss the roles of photosynthetic, chemosynthetic, and heterotrophic organisms; and tackle both fundamental questions and environmental problems of concern to society. By bringing together the marine biogeochemist community, the conference provided a unique, international forum for the development of ocean biogeochemistry, and thus becomes a cradle for novel ideas.

(Photo credit: GRC)

实验室成员组织或协办的其他会议或分会
Other Symposium/Sessions Co-Chaired by MEL Scientists

“国际海洋科学研究委员会第146工作组：海洋中的放射性研究”第二次工作组会议，厦门，6月5–7日（戴民汉为工作组联合主席）
2nd WG Meeting of the SCOR Working Group 146: Radioactivity in the Ocean, 5 decades later (Rio5), June 5th-7th, Xiamen (Minhan Dai as the WG Co-Chair)

“海洋动力学与数值模拟”研讨会，厦门，11月5–6日（刘志宇为召集人）
Workshop on Ocean Dynamics and Modeling, Xiamen, Nov 5th-6th (Chaired by Zhiyu Liu)

中国与印度尼西亚海洋科学可持续发展研讨会，厦门，11月24–25日（刘志宇、戴民汉为召集人）
Workshop on the Sustainable Aspects of Marine Sciences in China and Indonesia, Xiamen, Nov 24th-25th. (Chaired by Zhiyu Liu and Minhan Dai)

第三届海底观测科学大会，青岛，10月28–30日。（MEL为协办单位之一）
The 3rd Seafloor Observation Symposium, October 28th-30th, Qingdao. (MEL was one of the co-organizers)

南海深部计划之“生物地球化学”小组集成工作方案讨论会，厦门，12月30–31日。
Workshop on the Biogeochemistry of the South China Sea: SCS-Deep PI meeting, December 30th-31st.

2016 Ocean Science Meeting, New Orleans, USA, February 21st-26th.

Session B009: Physical-biogeochemical coupling in oceanic eddies and fronts: From submesoscale to mesoscale Processes. Conveners: Peng Xiu, Kuanbo Zhou, Minhan Dai, Arne Biastoch.

Session PC013: US CLIVAR Session on oceanic heat uptake, earth's energy imbalance, and the global warming 'hiatus'. Conveners: Patrick Heimbach, Xiao-Hai Yan.

Session AH001: Anthropogenic impacts on upper ocean biogeochemical processes. Conveners: Richard B Rivkin, Robin Anderson, Louis Legendre, Nianzhi Jiao

AOGS 2016 Annual Meeting, Beijing, July 31st-August 5th.

Session OS28-BG21: Carbon cycling in ocean margins. Conveners: Zhongming Lu, Hongbin Liu, Minhan Dai.

Session OS06: Effects of global change on marine biogeochemistry and ecosystem in marginal seas: a session tribute to Prof. K. K. Liu. Conveners: Gwo-Ching Gong, Jing Zhang, Shuh Ji Kao, Minhan Dai.

2016 AGU Fall Meeting, San Francisco, USA, December 11th-17th.

Session OS027: South China Sea: A nature laboratory for investigating marginal sea tectonic, oceanographic/paleoceanographic, and biogeochemical processes. Conveners: Jian Lin, Zhimin Jian, Minhan Dai, Karl Stattegger.

重要期刊和国际组织任职
Current Services of MEL Faculty on Selected Journals and International Organizations / Programs

北太平洋海洋科学组织–国际海洋考察理事会 “气候变化与生物驱动的海洋碳汇”联合工作组成立于2015年10月，由焦念志、Louis Legendre、Richard Rivkin担任联合主席，来自11个国家的20余位专家已加入工作组。工作组以提升气候变化预测力、给予气候政策建议、提高响应气候变化适应力为长期目标，旨在汇聚使用调查、实验和建模等手段研究、评估生物驱动海洋碳泵及其环境和气候影响的专家，促进海洋碳汇研究领域的跨学科交流。工作组第一次会议于2016年6月17日在香港召开。

Co-chaired by Nianzhi Jiao, Richard Rivkin and Louis Legendre, the PICE-ICES Joint Working Group on Climate Change and Biologically-driven Ocean Carbon Sequestration was funded in October 2015 through 2018. The WG aims to provide forecasts of the effects of climate change on biologically-driven ocean carbon sequestration and provide scientific advice for climate policy makers, by developing approaches and standardized protocols for measuring and reporting key parameters and variables during field studies and laboratory experiments, and integrate results from the laboratory and field studies into numerical modeling. The kick-off Meeting was held on June 17th in Hong Kong.

国际海洋科学委员会第149工作组“变化的海洋生态系统”于2016年成立，由澳大利亚塔斯马尼亚大学Philip Boyd教授担任主席，来自8个国家的10位知名海洋生物学家组成，高坤山为工作组成员之一。工作组旨在聚集科学界不同学科（含进化实验生物学、生态学、生理学、化学、数值模型）的共同努力，更好地整合多种研究方法与手段，制定研究指南，适用于多环境胁迫下的海洋生物及生态系统过程研究，推动全球变化海洋生物学研究，引导科学界认识多种环境变化（multi–stressors）影响生物资源及生态系统服务的作用。工作组第一次会议于7月15–16日在美国新罕布什尔举办。

The SCOR Working Group 149 on "Changing Ocean Biological Systems: How will biota respond to a changing ocean?" was funded in 2016, chaired by Prof. Philip Boyd from the University of Tasmania (Australia) and consists of 10 experts from 8 countries. including Kunshan Gao. The WG aims to raise awareness across different scientific communities (evolutionary experimental biologists, ecologists, physiologists, chemists, modelers) to initiate better alignment and integration of research efforts, develop a multi-driver Best-Practice Guide to move research forward and provide an implementation guide for policy-makers to better understand the role of multiple drivers in altering marine living resources and ecosystem services. The first WG meeting was held on July 15th-16th in New Hampshire, USA.

Serving on International Organizations/Programs

- Minhan Dai, Co-Chair, SCOR 146 Workshop Group: Radioactivity in the Ocean, 5 decades later (RiO5) (2014-2018)
- Minhan Dai, Member-at-large, American Geophysical Union (AGU) Ocean Sciences Section Executive Committee (2016-2018)
- Minhan Dai, Co-coordinator, Chemistry of Ocean (past, present and future) Theme, Goldschmidt 2017
- Minhan Dai, Member of Advisory Board, Ocean Acidification International Coordination Centre (OA-ICC), International Atomic Energy Agency (IAEA) (2013-)
- Minhan Dai, Member, Joint SOLAS-IMBER Ocean Acidification Subgroup (SIOA) (2012-)

• Kunshan Gao, Member, Ocean Acidification international Reference User Group (OAiRUG) (2010-)
• Kunshan Gao, WG Member, SCOR Working Group 149: Changing Ocean Biological Systems (2016- 2019)
• Kunshan Gao, Member, UNEP Environmental Effects Assessment Panel (2013-)
• Nianzhi Jiao (Co-Chair), Yawei Luo and Rui Zhang, WG members, PICES/ICES Working Group on Climate Change and Biologically-Driven Ocean Carbon Sequestration (2015-)
• Selvaraj Kandasamy, Member, Ocean 2K Synthesis Working Group, Past Global Changes (PAGES) (2014-)
• Zhiyu Liu and Guizhi Wang, Ocean Sciences Section Secretaries, Asia Oceania Geosciences Society (AOGS) (2016-2018)
• Fengling Yu, 3rd Project Leader, the IGCP-639 Sea Level Change - From Minutes to Millennia (2016-2020)
• Rui Zhang, Arctic Monitoring and Assessment Programme, Arctic Council Working Group (2014-)

Editorial Responsibilities with Selected Journals

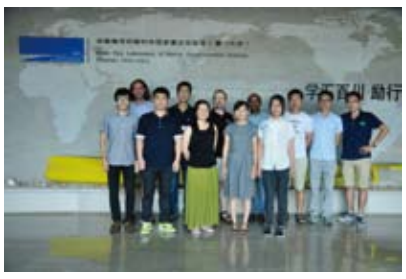
• Xi Chen, Member of Editorial Board, Microchemica Acta (2014-2018)
• Xi Chen, Member of Editorial Board, Journal of Environmental Science and Health, Part C: Environmental Carcinogenesis and Ecotoxicology Reviews (2013-2019)
• Minhan Dai, Member of Editorial Board, National Science Review (2014-2017)
• Minhan Dai, Member of Editorial Board, Biogeosciences (2007-)
• Minhan Dai, Member of Editorial Board, Marine Chemistry (2010-)
• Hongyue Dang, Member of Editorial Board, Applied and Environmental Microbiology (2016-2018)
• Hongyue Dang, Subject Editor, Marine Biology Research (2014-)
• Hongyue Dang, Specialty Chief Editor, Frontiers in Aquatic Microbiology, Frontiers in Marine Science (2016-)
• Kunshan Gao, Member of Editorial Board, Journal of Applied Phycology (1998-)
• Kunshan Gao, Member of Editorial Board, American Journal of Plant Sciences (2010-)
• Kunshan Gao, Member of Editorial Board, Algae (2012-)
• Jianyu Hu, Members of Editorial Board, Acta Oceanologica Sinica (2014-)
• Nianzhi Jiao, Member of Editorial Board, Applied and Environmental Microbiology (2010-2017)
• Nianzhi Jiao, Associate Editor-in-Chief, Science China Earth Sciences (2012-)
• Nianzhi Jiao, Member of Editorial Board, Acta Oceanologica Sinica (2003-)
• Zhongping Lee, Associate Editor, Geoscience and Remote Sensing Letters (2008-)
• Senjie Lin, Associate Editor, Journal of Phycology
• Senjie Lin, Associate Editor, Frontiers in Aquatic Microbiology, Frontiers in Marine Science (2015-)
• Senjie Lin, Member of Editorial Board, Plos One (2012-)
• Senjie Lin, Member of Editorial Board, Acta Oceanologica Sinica
• Zhiyu Liu, Assistant to Editor-in-Chief, Acta Oceanologica Sinica (2016-)
• Xiaohai Yan, Member of Editorial Board, Science China Earth Sciences (2013-)
• Dongxing Yuan, Associate Editor, Trends in Environmental Analytical Chemistry (2016-)
• Yong Zhang, Member of Editorial Board, Science of the Total Environment (2016-)

凌峰论坛
Lingfeng Forum

凌峰论坛自2004年开展以来，持续发挥“启迪新思想，促进学术融合”的重要作用，对实验室的研究方向与学术交流产生深远的影响。2016年，实验室举办了8讲凌峰论坛。

Initiated in 2004, the Lingfeng Forum continues to play an important role as a platform to "initiate new ideas and promote academic fusion" for MEL faculty and students. Eight forums were organized in 2016.

NO	THEME	CONVENERS
#51	近海区域的海洋生态学与生物学 Marine Ecology and Biology in the Coastal Area	柯才焕、游伟伟 Caihuan Ke and Weiwei You
#52	大气化学与气溶胶 Atmospheric Chemistry and Aerosols	汪冰冰、胡敏 Bingbing Wang and Min Hu
#53	季风与生物地球化学的时期变化 Monsoon and Biogeochemical Changes through the Ages	Stephan Steinke and Selvaraj Kandasamy
#54	渔业资源、健康与发展 Fishery Resources and Sustainable Development	王克坚、刘海鹏 Kejian Wang and Haipeng Liu
#55	陆架海与河口动力学及数值模拟 Dynamics and Modeling of Shelf Seas and Estuaries	刘志宇 Zhiyu Liu
#56	MIO-MEL 联合研讨会 MIO-MEL Seminar	高树基、戴民汉 Shuh-Ji Kao and Minhan Dai
#57	微生物海洋学 Microbial Oceanography	焦念志 Nianzhi Jiao
#58	MEL自主研究课题评审与交流 MEL Internal Research Program Progress	王大志、陈纪新、李骁麟、刘志宇、张瑶 Dazhi Wang, Jixin Chen, Xiaolin Li, Zhiyu Liu and Yao Zhang



The 53rd Forum

The 56th Forum

The 57th Forum

交流与合作
Exchange and Cooperation

午餐交流会
Luncheon Seminar

实验室自2014年起启动“周一午餐交流会”，营造宽松自由的气氛，内容涵盖学术探讨、运行管理、平台建设等方面，让更多成员参与学术交流与运行管理。2016年共举办了16讲交流会。

The MEL Weekly Luncheon Seminar Series was launched in 2014 to facilitate interactions among faculty, staff, students and visitors. 16 luncheon seminars were held during the year.

NO	Title	Speaker
#52	Using evolution experiments to understand phytoplankton responses to ocean acidification	Dr. Sinead Collins University of Edinburgh, UK
#53	Molecular mechanisms of biogeochemical processes involving mineral nanoparticles	Dr. Juan Liu Peking University
#54	The effects of aluminum on marine phytoplankton: implication for a revised Iron Hypothesis	Dr. Linbin Zhou South China Sea Institute of Oceanology, CAS
#55	Observational and modeling study of ocean circulation, Air-sea interactions, and biogeochemical processes in the Northwest Atlantic Coastal Ocean	Dr. Ruoying He North Carolina State University, USA
#56	Rare earth elements and Nd isotopes in the ocean and their palaeoceanographic applications	Dr. Xinyuan Zheng University of Wisconsin–Madison, USA
#57	I/Ca as an oxygenation proxy: co-evolution of life and planet	Dr. Zunli Lu Syracuse University, USA
#58	Utilizing ultrahigh resolution mass spectrum to characterize the molecular composition of water soluble organic carbon in the aerosols from China coastal seas to Northwestern Pacific Ocean	Dr. Hongyan Bao Hanse-Wissenschaftskolleg (HWK), Germany
#59	Predicting Arctic sea ice by stochastic models at intra-seasonal to seasonal time scales	Dr. Xiaojun Yuan Columbia University, USA
#60	Nutrient-limited growth of marine phytoplankton: Monod or not?	Dr. Edward Laws Louisiana State University, USA
#61	Using multibeam acoustic remote sensing for the mapping of marine geology and ecology	Dr. Zhi Huang Geoscience Australia, Australia
#62	Have typhoons in the western North Pacific shifted more poleward in recent decades?	Dr. Leo Oey National Taiwan Central University
#63	The Abyss - deepest part in the ocean	Dr. Rulong Liu Ocean University of Shanghai
#64	Frontal instabilities in the South Atlantic subtropical front and the ir impact on phytoplankton blooms	Dr. Paulo Henrique Rezende Calil Universidade Federal do Rio Grande, Brazil
#65	Sedimentary responses to anthropogenic alterations within the Nakdong and Yeongsan Estuaries, South Korea	Dr. Joshua R. Williams Virginia Institute of Marine Science, USA
#66	Deep sea mining and beyond	Prof. Kim Juniper, University of Victoria, Canada Dr. Kening Zhang, Xiamen University
#67	Net community production determined from in-situ oxygen measurements on profiling floats	Dr. Bo Yang University of Washington

访问学者与开放课题基金
Visiting Fellowship Program

实验室自2009年起设立“杰出访问学者基金（包括‘郑重’杰出访问学者基金）”、“高级访问学者基金”和“青年访问学者基金”，支持国内外知名专家及青年学者到实验室开展1至6个月的学术交流与合作。2016年，访问学者基金委员会修订了申请指南和经费管理办法。本年度共有28名学者获该项基金资助。

The MEL Visiting Fellowship Program was launched in 2009. The program has supported visiting fellows to conduct collaborative studies with MEL scientists for durations of 1 to 6 months, providing research funds and travel and living expenses. 28 fellowships were awarded in 2016.

Recipients of the 2016 MEL Visiting Fellowship Program

Distinguished Visiting Fellow		
Cindy Lee	Distinguished Professor Emeritus	Stony Brook University, USA
Legendre, Louis	Professor emeritus	Pierre & Marie Curie University, France
David Hutchins	Professor	University of Southern California, USA
Senior Visiting Fellow		
Wei Fan	Associate Professor	Zhejiang University
Yuping Guan	Senior Scientist	South China Sea Institute of Oceanology, CAS
Leila Tirichine	Associate Professor	École Normale Superieure, France
Walter E. Helbling	Researcher	Consejo Nacional de Investigaciones Cientificasy Tecnicas, Argentina
Virginia Estela Villafañe	Researcher	Consejo Nacional de Investigaciones Cientificasy Tecnicas, Argentina
Haiwei Luo	Assistant Professor	Chinese University of Hong Kong
Robin Robertson	Senior Lecturer	University of New South Wales, Australia
Scott Gallager	Associate Scientist	Woods Hole Oceanographic Institution, USA
Feixue Fu	Research Associate Professor	University of Southern California, USA
LIM Po Teen	Associate Professor	University of Malaya, Malaysia
Jean-Philippe Bellenger	Associate Professor	University of Sherbrooke, Canada
Sven Kranz	Assistant Professor	Florida State University, USA
Pei Sun Loh	Associate Professor	Zhejiang University
Zhanfei Liu	Senior Lecturer	The University of Texas at Austin, USA
Young Scientist Visiting Fellow		
Agustin Rustam	Researcher	Ministry of Maritime Affairs and Fisheries, Indonesia
Devi Dwiyanti Suryono	Researcher	Ministry of Maritime Affairs and Fisheries, Indonesia
Changwei Bian	Assistant Professor	Ocean University of China
Tao Wang	Assistant Professor	Hohai University
Zhaoyun Chen	Research Scientist	Sun Yat-Sen University (Guangzhou)
Feifei Deng	Postdoc	University of Oxford, UK
Yushi Lin	Associate Professor	National Sun Yat-Sen University (Kaohsiung)
Qinsheng Wei	Associate Scientist	First Institute of Oceanography, SOA
Ke Huang	Associate Scientist	South China Sea Institute of Oceanology, CAS
Yuan Dong	Associate Scientist	South China Sea Institute of Oceanology, CAS
Dongdong Zhang	Associate Professor	Zhejiang University

第三届厦门海洋环境开放科学大会
Upcoming event: The Third Xiamen Symposium on Marine Environmental Sciences (XMAS-III)

杰出博士后基金
MEL Outstanding Postdoctoral Fellowship

实验室于2014年设立“杰出博士后基金”，吸引国内外优秀的博士毕业生开展博士后研究，以此促进学科交叉，鼓励探索热点研究，同时提高人才培养能力。该基金常年接受申请，每年审批的申请截止时间为5月31日及10月31日。2016年，共有11人申请，2人获批，分别为来自香港城市大学的刘迟迟博士及印度加尔各答大学的Manab Kumar Dutta博士，将于2017年入站工作。

Aiming to foster innovative research and interdisciplinary collaborations, MEL initiated the Outstanding Postdoctoral Fellowship Program in 2014.

The Fellowship funds innovative, ground-breaking projects that have the potential to advance knowledge in marine environmental sciences and other interdisciplinary research that fits into MEL's research scopes. Applicants for the Postdoctoral Fellowship must have already obtained or be currently working towards a research doctorate degree

The review process is held twice a year with submission deadlines on May 31st and October 31st. We received 11 applications in 2016 and 2 were funded. They are Dr. Chichi Liu from City University of Hong Kong, and Dr. Manab Kumar Dutta from the University of Calcutta, India and are expected to start their postdoc research in 2017.

More at: http://mel.xmu.edu.cn/postdoc

博士生奖学金
MEL PhD Fellowship Program

为吸引国内外优秀生源，培养杰出的博士研究生，实验室于2016年12月设立“博士生奖学金”，每年9月面向国内外高校优秀的硕士毕业生、直博生及所有读博申请者开放申请，资助海洋环境科学相关领域及与实验室主攻方向相关的其他学科领域。

Aiming to attract and encourage academically qualified PhD students, MEL initiated the MEL PhD Fellowship in December of 2016. The Fellowship is offered in marine environmental sciences and other interdisciplinary research that fits into MEL's research scopes. Applicants must have already obtained or be currently working towards a master degree and all candidates who are seeking admission as new full time PhD students.

More at: http://mel.xmu.edu.cn/education_type.asp?id=23

海洋放射性化学国际讲习班
Training Course on Marine Radiochemistry

实验室于2016年6月8–10日举办“海洋放射性化学国际讲习班”。讲习班由国际海洋科学研究委员会第146工作组（海洋中的放射性研究）主办，由戴民汉、王桂芝与美国伍兹霍尔海洋研究所的Ken Buesseler、美国南卡罗来纳大学Claudia Benitez–Nelson共同组织，工作组的10名专家及我实验室的5名教师共同为来自17个国家的28名学员开展前沿理论教学及实验课程指导。阐述了与放射性相关的基础概念，深入到延伸应用，详细解读了相应的数据库管理、方法与仪器研发，并开设α光谱、β检测仪、镭延迟符合计数器、γ检测仪及MC–ICP–MS等实验操作课程。该讲习班的开展，为对放射性化学研究与管理感兴趣的研究生及青年科研人员提供系统的理论课程和实践，尤其为发展中国家学员在核辐射方面的研究和管理提供科学基础与支持。

The Training Course on Marine Radiochemistry was organized by the SCOR 146 Working Group: Radioactivity in the Ocean, 5 decades later (RIO5), hosted by MEL on June 8-10, 2016 and convened by Minhan Dai, Ken Owen Buesseler (Woods Hole Oceanographic Institution, USA), Claudia Benitez-Nelson (University of South Carolina, USA) and Guizhi Wang. 10 WG members along with 5 MEL scientists and technicians gave in class lectures and hands-on experiments in the laboratory equipped with a variety of measurement tools for 28 participants from 28 countries. Subjects covered included natural, anthropogenic, and cosmogenic radioisotopes in marine environments; radioanalytical methods; and tracer and dating techniques. The purpose of this Training Course was to train graduate students and young professionals who are interested in or will pursue radiochemistry research and management.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1/ Dr. Benitez-Nelson giving a talk on basics of radioactivity.
2/ Drs. Buesseler and Pinghe Cai demonstrating lab practical on beta radiation to participants.
3/ Dr. Masque explaining gamma radiation to participants.
4/ Training course group photo.

(Photo: Vera Shi)

“海洋环境健康与安全”暑期学校
Summer School on Marine Environmental Health

2016年7月5–14日，实验室与香港海洋污染国家重点实验室、北京大学环境模拟与污染控制国家重点实验室、台湾海洋大学海洋中心联合举办“海洋环境健康与安全”暑期学校。暑期学校邀请了境内外的19名专家学者，为来自26个高校研究所的65名中外学生授课。

暑期学校采取理论课程与前沿讲座、学生分组报告、海报展示等多种形式，内容涵盖海洋生态毒理学、海洋污染、环境影响评价和人体健康风险评估、海洋地球和大气界面交互作用等国际关注的前沿命题。

http://mel.xmu.edu.cn/school

The 2016 Summer School on Marine Environmental Health and Safety was held from July 5th-14th, jointly organized by MEL, the Hong Kong State Key Laboratory in Marine Pollution (City University of Hong Kong), State Key Joint Laboratory of Environmental Simulation and Pollution Control (Peking University), and Center of Excellence for the Ocean (National Taiwan Ocean University).

Thematic lectures by 19 leading scientists were delivered to 65 graduate students and young scientists from 26 institutions. A series of presentations, forums, student group presentations and poster sessions were organized, stimulating discussions on cutting-edge research subjects between researchers and students.


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1/ Group photo of the summer school participants
2/ Prof. Markus Hecker from University of Saskatchewan, Canada giving a lecture on Environmental & human health risk assessment
3/ Prof. Andreas Wahner from Research Center Jülich, Germany giving a talk on atmospheric chemistry in Europe and Asia
4/ Student poster session

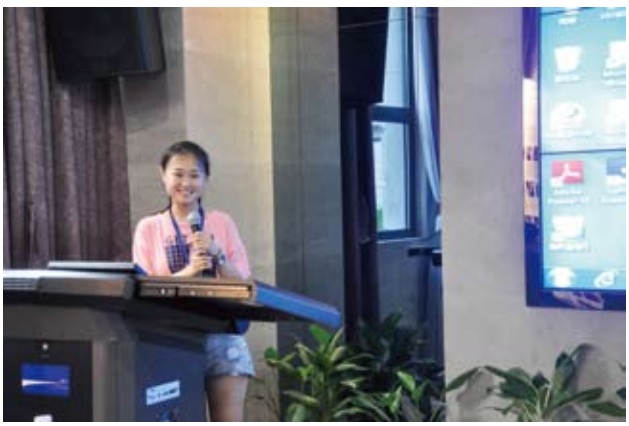
(Photo: Suwei Weng & Vera Shi)

MEL首届研究生学术论坛
The 1st MEL Graduate Forum

2016年7月19–20日，实验室首届研究生学术论坛召开。共36名硕、博士研究生参加，含口头报告33个，海报9个，围绕“海洋生态过程与机制”、“多尺度水动力过程与生物地球化学响应”、“海洋生物及其毒理效应”、“技术创新与政策制定”四个专题进行了探讨。最后通过师生共同投票，评选出优秀口头报告4名。“圆桌讨论”也促进了师生交流。论坛以学生为主体进行组织，意在为广大研究生提供学术展示平台。

The First MEL Graduate Forum took place on July 19-20, attended by 35 graduate students, with 33 oral presentations and 9 posters. The forum discussed marine ecological process and mechanisms, multi-scale hydrodynamic process and biogeochemical responses, marine biology and toxicological effects, technology and policy making.

Salon session between students and invited scientists



Yuanyuan Li , PhD student, chairing a session

(Photo: Ehui Tan)

第八届UCAS高校研究生水环境科学研讨会
The 8th UCAS Postgraduate Symposium

2016年3月7–11日，第八届高校研究生水环境科学研讨会在台北召开。该研讨会是在实验室与香港大学太古海洋研究所签订的合作框架下，由研究生自行发起。“水环境科学研究高校联盟（UCAS）”自2009年以来，轮流在香港、厦门和台湾组织研讨会，在两岸三地的师生中获得了很好的反响。

研讨会以“水生系统： 生态、保护和挑战”为主题，涉及生态与生物多样性、生态毒理学、生物地球化学、渔业与水产养殖、环境风险评估与管理等领域，采取个人报告、嘉宾演讲和分组辩论等多种形式，并评出最佳演讲者和最佳辩论队。此次会议有来自厦门大学、香港大学、台湾海洋大学和意大利佛罗伦萨大学等4所高校的50余位研究生参会。

UCAS的持续开展，促进了学生交流与人才成长，参加两校第一届交流活动的厦门大学研究生王贵华、本科生洪媛媛、李迅等人分别前往香港大学求学。2016年喜讯传来，他们将逐个完成学业，并期于2017年获得博士学位。

The 8th UCAS (University Consortium on Aquatic Sciences) Postgraduate Symposium was held in Taipei from March 7th-11th, 2016. The theme was "Aquatic systems: ecology, conservation and challenges". More than 50 graduate students from 4 institutions attended: Xiamen University, the University of Hong Kong, National Taiwan Ocean University, and Universita degli Studi di Firenze. Participants were very enthusiastic in sharing their research work and collaborating with each other.

UCAS was established in 2009 and is run entirely by a group of passionate postgraduate students from the University of Hong Kong and Xiamen University, with students from the National Taiwan Ocean University joining in 2013. Since then, UCAS has organized 8 annual symposia, aiming at building confidence of young scientists in presenting their research in English and encouraging interdisciplinary networking amongst aquatic scientists across institutions. Student oral and poster presentations, invited talks, debates, and ecotours were organized to facilitate intellectual and social interactions among participants, to promote critical thinking, and to broaden their horizons.

Serving as a continuously developing collaboration between MEL and SWIMS, UCAS has become a platform for students who would like to seek further study and exchanges. Mr. Guihua (Samuel) Wang, Miss Yuanyuan (Circle) Hong and Mr. Xun Li, who initially organized and attended UCAS series activities (Symposia and HKU Field Courses), are about to complete their degrees and expect to obtain their doctoral degrees in 2017 from HKU. All three are former XMU students.

UCAS Symposium group photo

A student giving an oral presentation

(Photo: Szuiwei Lee)

http://ucas.xmu.edu.cn

奖学金与学生教育

Fellowships & Education Programs

海洋环境科学本科生暑期科研奖学金项目
MEL Summer Undergraduate Research Fellowship

为鼓励本科生尽早进入科研训练活动，更好地培养本科生的创新能力和学术精神，激发优秀学生科学兴趣，并为其提供继续深造的平台和机会，实验室自2014年起启动“MEL海洋环境科学本科生暑期科研奖学金”。2016年录取了来自台湾中山大学、复旦大学、浙江大学、中山大学、中国海洋大学等15所高校的22名本科生。项目以科研项目为导向，本科生在导师的指导下进行学习、开展实验，组委会还为本科生组织了系列学术讲座、技术安全讲座和出海调查，并定期开展学术沙龙，以全方位培养学生的科研能力和科学表达交流能力，并帮助其拓展国际化的视野。

Initiated in 2014, the MEL Summer Undergraduate Research Fellowship in Marine Environmental Science (URF) encourages undergraduate students to pursue science and technology careers by providing research experiences at MEL. 22 undergraduate students from 15 universities joined the program in 2016 working on mini projects with individual supervisors. They also received training on lab safety and facility usage, attended interactive seminars and participated in field studies.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1/ URF students sampling water and plankton in Xiamen Bay and estuary aboard the R/V Ocean II (Photo: Weidi Yang)
2/ URF student salon (Photo: Xinya Xu)
3/ Hongwei Zhao presenting his project progress in Caihuan Ke’s group on DNA methylation of Haliotis discus exposed in acid conditions for a long time (Photo: Miaoqin Huang)
4/ Wei Xia presenting project report in Huasheng Hong’s group on the Construction of marine meteorological data warehouse and its application (Photo: Xi Wu)

More at: http://mel.xmu.edu.cn/URF

公众教育
Outreach Programs

中国海洋科学卓越教育伙伴计划（COSEE China）于2010年8月建立，旨在通过科学家和教育工作者之间的密切合作，推广海洋科学与文化教育，向公众普及海洋科学知识，提高全民海洋意识，进而推动海洋科学研究和教育的发展，提升海洋科学在国家发展战略中的地位，并促进国际海洋科学与文化的交流合作。

2016年度，实验室以COSEE China办公室为依托，开展了海洋核辐射科普讲座、水生科学暑期生态营、海洋科学开放日等一系列公众开放活动，并组织学者为中小学开设科普讲座与调研。

The Center for Ocean Sciences Education Excellence China (COSEE China) was established in 2010. It aims to bridge the gap between scientists and educators. By forging links between these groups, it aims to enhance public awareness about the ocean and cultivate the next generation of ocean scientists and a scientifically literate citizenry. Several programs were conducted through COSEE China throughout the year that enables these goals to be met, such as the radioactivity outreach series, Aquatic Sciences Eco-Learning Programme and Ocean Sciences Day. In addition, school visits by several scientists and staff broadened our public imapct reach.


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1. Emily King giving a talk on marine pollution in Binglang Middle School (Photo: Feng Chen)
2. Haili Wang giving a talk on using autonomous underwater vehicles for ocean study, in Yanwu Primary School (Photo: Jiannan Cai)
3. Weifeng Chen giving a lab tour to students from Guangzhou Tieyi High School (Photo: Suwei Weng)

公众教育
Outreach

海洋核辐射公众教育活动
Outreach on Marine Radioactivity poster!

6月11日，国际海洋科学研究委员会第146工作组的科学家们面向学生及公众开设了一场关于核辐射真相与误区的科普讲座，与公众面对面进行交流，解答疑问。Claudia Benitez-Nelson与Andy Johnson通过与学生互动，介绍了核辐射基础知识；Ken Buesseler博士用有力的数据支撑呈现福岛放射性物质的传播路径和途径；戴民汉直面中国公众的疑虑，阐述福岛第一核电事故可能会对中国产生的影响；Sabine Charmasson博士通过检测海洋中的有毒有害物质，对海洋环境污染进行评估，告知公众海洋环境污染现状。

此外，Andy Johnson教授于6月8-10日在厦门大学海洋科技博物馆及厦门3所小学进行有关辐射知识的演讲与互动。

共有300多名学生及公众从以上活动中受益。多样化的公众活动对大中小学生及市民起到一定的教育和知识普及作用，填补公众的认识空白，提高公众的科学素养。活动被人民网、新华社、中新社、中央人民广播电台等十五家媒体报道，所覆盖的公众面更加广泛。

The public outreach portion of the SCOR WG 146 meeting was conducted on June 8th-11th, and consisted of 2 phases. Phase 1 involved going into classrooms at 3 primary schools and performing demonstrations and conducting hands on activities about radioactivity and radiation with the students, spearheaded by Dr. Andy Johnson (Black Hills State University). Phase 2 was a public panel lecture delivered by Ken Buesseler, Claudia Benitez-Nelson, Sabine Charmasson, and Minhan Dai as panelists, speaking on a variety of radioactivity topics including: A General Introduction to Marine Radioactivity; Fukushima 5 Years Later: A View from the Ocean; Radioactivity and Marine Organisms; Marine Radioactivity and Our Living Environment: Radioactivity in China Seas.

Between the two programs, roughly 300 people were directly educated (about 200 during the panel discussion, and 100 during the classroom visits and museum programs).

The primary purpose of these events was to educate the local public about radiation and radioactivity as there are many misconceptions and fears surrounding this topic. The events were reported on by several national and local media, including Xinhua News Agency, the China News Service, and People's Daily.



Left: Ken Buesseler giving a talk the radioactivity in Fukushima and its impact
Middle: Minhan Dai giving a talk on the marine radioactivity in China seas
Right: Class visit by Andy Johnson and Hui Lin (MEL graduate student) to Yanwu Primary School
(Photo: Suwei Weng & Emily King)

海洋科学开放日
Ocean Sciences Day

11月13日，“探索海洋—第五届厦门大学海洋科学开放日”在翔安校区周隆泉楼、希平楼及环境与生态学院大楼举行，短短七小时内共吸引约8000名公众参与。约400名师生投入工作，50余个实验室和学生展览摊位开放，内容包括海洋观测技术与仪器设施、海洋生物活体与标本、海洋化学实验演示、海洋生态、海洋酸化、海洋污染等主题。活动邀请王洁、陶毅、郑连明、徐鹏、韩国栋等五位学者开设讲座，涉及水下摄影、水生通信、水母、海洋渔业、潮间带等主题，同时开设螯虾解剖、浮标制作等团队合作项目，公众可观看视频、图片、实物，也可通过参与实验、游戏等方式全方位学习海洋科学。经过五年的实施，海洋科学开放日已成为厦门国际海洋周不可或缺的组成部分，为市民提供了一场科学盛宴。

On November 13th, over 8000 visitors flooded the Zhou Long Quan Building, Xiping Building, and Environment and Ecology Building during the 5th Xiamen University Ocean Sciences Day.

Over 50 laboratories and specially designed interactive booths covering a wide range of ocean science and marine environmental topics were available. The goal of all of these exhibits was to increase the citizenry's level of ocean literacy. Over 400 faculty, staff, students, and volunteers were involved in the day.

Guests were able to conduct experiments which explained the impact of increased nutrients in our waterways, examine key local coastal and near-shore ecosystems, learn about the wide diversity of marine life that exists, as well as learn about new technologies used in ocean science research. Each exhibit also highlighted the importance of their own behaviors and taught visitors how they too can be better stewards of the ocean.

In addition to the exhibits and labs, speakers gave talks throughout the day. Some were scientific in nature - jellyfish taxonomy and their ecology; the ecology of the intertidal zone - while others had a more socio-economic angle, such as the state of global and China's fisheries development. Yet others focused on the grandeur and mystery of the ocean in general, the ocean as viewed through the eyes of an underwater photographer.

In its 5th iteration, Xiamen University's Ocean Sciences Day is an integral part of Xiamen's World Ocean Week and a highlight among Xiamen's annual list of events.


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1. A child using a salinometer to test the water salinity

2. The graduate student demonstrating an underwater robot

3. A visitor observing the seawater stratification

4. Pupils playing the fluid dynamics demonstration devices to show basic picture of fluid dynamics, such as Karman Vortex Street

(Photo: You Jiang & Molin Wang)

公众教育
OUTREACH

水生科学暑期生态营
Aquatic Sciences Eco-Learning Programme

7月25–29日，2016年“水生科学暑期生态营”在厦门大学海洋科技博物馆举办，共有来自厦门市各中学的30名学生参加。生态营从“什么是海洋”入手，向营员介绍不同的海洋环境，并设立4个主题：“认识潮间带”、“快乐红树林”、“浮游生物采样及工具制作”和“海洋观测技术与浮标制作”，通过课堂教学、讨论、团队合作与野外实践，让学生们在充满乐趣的活动中收获科学知识。

紧接着，第一期“厦大太古红树林夏令营”在8月1–2日举行，来自厦门太古飞机工程有限公司的20名初中生参加并赴 “太古–厦大红树林修复基地”开展野外观察与实践。自2009年以来，在卢昌义教授的指导下，实验室与太古公司在九龙江口的龙海浮宫溪山村开展连续7年的湿地复种与保育活动，已成林并成为科普活动基地。

This year also saw the 4th Aquatic Sciences Eco-Learning Programme take place on July 25-29. 30 middle school students from Xiamen joined COSEE China counselors for a 5 day camp which introduced them to several local aquatic ecosystems such as mangroves, the intertidal zone, and taught them basic science and engineering skills. Each student was given ample opportunity to explore and received one-on-one interaction with the counselors and Xiamen University faculty who were involved as well.

Later on, the first XMU-HAECO Mangrove Summer Camp was held on August 1-2. 20 middle school students from the HAECO employed families joined the camp and went to the HAECO-XMU Mangrove Restoration Site for the field studies. The site was established in Xishan Village in Longhai along the Jiulong River estuary, after 7 years of restoration efforts, by HAECO employees as advised by Prof. Changyi Lu.


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1/Haoyang He giving a general talk on basics of phytoplankton
2/Campers make their own buoys in teams
3/Campers observing the collected plankton samples from the Furong Lagoon
4/Changyi Lu giving an introduction to the mangrove
5/Participants going into the XMU-HAECO Mangrove Restoration Site

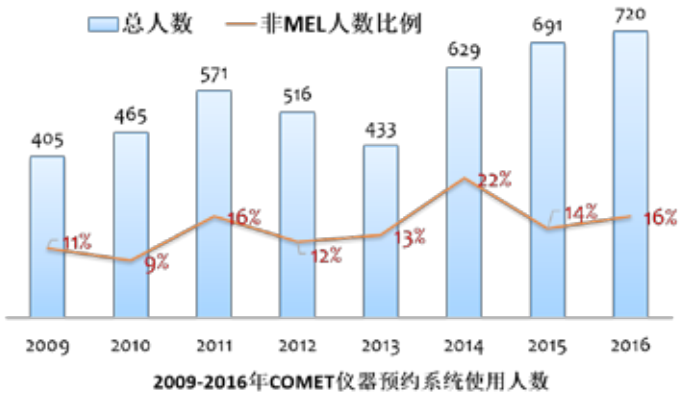
(Photo: Vera Shi)

大型仪器与技术服务中心
COMET

More information on: http://mel.xmu.edu.cn/comet

至2016年，COMET已成功运行8年有余，共有180余台大型预约共享设备面向校内外科研人员开放共享，注册会员1300余人，平均每年预约数达1.5万余次。在科研人员和技术人员的大力支持下，COMET建立了一个良好的仪器运行管理体系，基本解决了创新性科研发展过程中使用大型仪器难、维修费和运行费过高等困难，使实验室仪器得以运转顺利，为科学研究提供更好的技术支撑服务。

COMET has been successfully run for the last 8 years. 180 facilities are available online, and 1300 users have registered in the system. With strong support from faculty and technical staffs, COMET has established a higher efficiency system with lower running cost and better maintenance. COMET will continue to strive for excellence as an infrastructure for research and teaching and to inspire innovative research discoveries.



2009-2016年COMET仪器预约系统使用人数

为继续鼓励技术人员的技术创新，实验室2016年资助四项技术开放基金，分别为科考船分布式走航数据采集系统（戴君伟工程师）、自然海水中氨基酸分析方法的研发（张子莲高级工程师）、基于藻种库的纯种藻光学信息数据集的构建（陈纪新高级工程师）和科考船现场观测科学信息系统的重构开发（李立焰工程师），研究期限为两年。其中李立焰的“科考船现场观测科学信息系统的重构开发”连续获得两期资助，主要基于2016年南海春季共享航次搭建“嘉庚”号科考船海上科考系统基本结构，已初步实现系统管理模块，含海上现场数据录入、查询、应用等功能。

此外，COMET长期关注技术队伍素质建设，有效提升科研工作质量。2016年实验室共派出30余人次到国内外参加各类专业培训或技术交流。

Four projects were supported by Technology and Innovation Funds in 2016 for 2 years. They were: the R/V distributed continuous data acquisition system (Junwei Dai), Development of analytical methods for amino acids in natural seawater (Dr. Zilian Zhang), Construction of bio-optical dataset of phytoplankton based on Algae Collection Center (Dr. Jixin Chen), and Reconstruction and development of R/V *in situ* observation information system (Liyan Li). Among the four projects, Li's project has been funded twice since 2014. It aims to construct a new information system for the new RV Tan Kah Kee based on existing cruise experiences. Several functional modules such as *in situ* data entry, inquiry and applications have been realized.

COMET is dedicated to the capacity building of the technical support team. In 2016, there are over 30 technical staff had opportunities to be sent to institutions in China and abroad for training, collaboration or exchanges.

科考航次
MEL at Sea

2016年实验室组织和参与了17个科考航次，120余名师生在南海、东海、台湾海峡、西北太平洋等海域及河口开展400多天的海上调查。

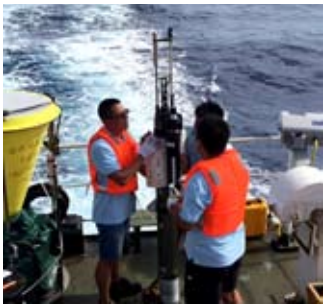
In 2016, MEL organized and participated in 17 cruises. About 120 scientists, technicians and students spent more than 400 days at sea. The investigation areas covered the South China Sea, East China Sea, the Taiwan Strait, Northeast Pacific and several estuaries.



MEL Scientists deployed 4 sets of submerged buoys in the northern South China Sea in August during the cruise to the Taiwan Strait aboard R/V Yanping II. The buoys will be used for the observation of hydrodynamic and biogeochemical elements from northeastern South China Sea to coastal oceans in the region, and provide data for the typhoon response, near-inertial oscillations, internal waves, and intercontinental transportation processes. (Photo: Longqi Yang)



Liguo Guo, MEL engineer, visited with GEOMAR's Hermann Bange from September to November 2016 for training and N_2O/CH_4 intercomparison study. She also participated in the SCOR Working Group 143 intercalibration cruise for continuous measurement and discrete sampling for methane and nitrous oxide aboard R/V Elisabeth Mann Borgese. (Photo credit: R/V EMB)


Left: Shuai Gu (master student in ocean chemistry) sampling in the South China Sea aboard Dongfanghong II (Phto: Weifang Chen)
Middle: A new Bio-Argo (NKE Provar CTS5) is deployed in the South China Sea (Photo: Lei Wang)
Right: Fangtao Zhang and Xin Liu are deploying a home made floating sediment trap in the Taiwan Strait (Photo: Zhaozhang Chen)

海洋观测新装备
New Facilities

厦门大学海洋科学考察船建设
Xiamen University New Research Vessel

厦门大学3000吨级的海洋科考船于2016年5月8日在广州广船国际有限公司举行下水仪式，并以“嘉庚”号命名。下水后，“嘉庚”号正式进入码头建造阶段，全面展开舱室内部涂装、管装、机装、电装和舾装等各项工作。

6月26日科考船进坞，进行多波速、浅剖、测深仪、鱼探仪、水听器及ADCP等科考船底部声学换能器的安装，至7月8日顺利出坞。出坞后开始进行机舱机械设备的调试及开展船舶内装。机舱设备里的主柴油发电机组、锅炉、空压机、焚烧炉、分油机、舵机、生活污水处理装置、升降鳍、推进电机等所有船用设备已调试完毕，内部装修部分，目前已完成房间的壁板安装、地板的敷设以及居住舱室的家具安装，下一步将进行实验室家具的安装工作。科考设备的甲板支撑系统已开始进入调试阶段，各个系统都已节点试车完毕；其中艏艉辅助吊、20T主吊已调试完毕；绞车及科考吊机正在调试中，预计2017年1月中旬完成调试。

船厂于2016年12月30日–2017年1月中旬组织试航，期间将对“嘉庚”号航速、操纵性、设备及其他安全特性进行测试。如进展顺利，即将在试航完成后正式交船。

“嘉庚”号科考船自建设以来，承蒙社会各界贤达、厦大校友师生的关注和支持。从1989级财金系校友首笔捐款开始，各界人士纷纷为科考船的建设贡献力量；开放认捐空间后更是得到了广大校友的响应——1986级海洋生物班、1978级海洋化学系友、1988级校友先后认捐“嘉庚”号会议室、休闲厅、洁净分析实验室和电子实验室。

The R/V is launched from the shipyard into the Pearl River

Tan Kah Kee's family attending the R/V launching ceremony. From left: Dr. Chongshi Zhu (XMU President), Mrs. Go Bee Ying (Mr. Tan Kah Kee’s daughter-in-law and the R/V's 'godmother'), Dr. Yan Zhang (XMU Council Chairman) and Mr. Tan Dib Jin (Mr. Tan Kah Kee’s eldest grandson).

科研设施与实验观测

Facilities and Field Observation

XMU launched its own scientific research vessel on May 8th, 2016. The vessel was christened 'Tan Kah Kee', in memory of XMU's great founding father, Mr. Tan Kah Kee.

After the launch, vessel outfitting, equipment commissioning, docking tests and sea trials began. During the docking period from June 26th -July 8th, all research acoustic transducers including the multi-beam echo sounder, parametric sub-bottom profiler, single-beam echo sounder, split-beam scientific echo sounder, hydrophones, acoustic doppler current profiler, were installed and settled on the hull bottom.

After undocking, debugging of mechanical equipment in the engine room and accommodation outfitting for watercraft began. Electromechanical devices in engine room equipment such as the three master diesel generating sets, boiler, air compressor, incinerator, oil separator, control actuator, domestic sewage treatment device, flipper were all debugged. Major equipment in the engine room are all in place. The equipment in the cab are all in place and debugging is underway. For the interior design, wallboard installation and laying of the floor have completed.

Deck machinery launch and recovery system for scientific research equipment is being debugged. The fore and aft whipline has been debugged. The winch launch & recovery system has all been wired and electrified. All debugging will be finished in the middle of January 201y.

The sea trials are organized by the shipyard from December 30 till mid-January in order to test the navigational speed, steering ability, equipment and other safety properties of 'Tan Kah Kee'. The vessel will be formally delivered to XMU in early 2017 after sea worthiness trials.

The construction of 'Tan Kah Kee' has gained enthusiastic attention and support from the public, XMU alumni, faculty, staff, and students. The first donations towards its construction were from alumni in the Department of Finance Class of '89, followed by contributions from people of all circles. Alumni from Marine Biological Class of '86, Marine Chemistry Class of '88 successively donated funds for the meeting room & lounge, analytical (clean) laboratory and electronics laboratory of 'Tan Kah Kee'.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1/2 Dr. Haili Wang (left) along with Mr. John Edger (CEO) and Mr. Timothy Leach (project manager) from Glosten inspecting the R/V construction
3/ Workers are cleaning the R/V's hull
4/ Transducer of sub-bottom profiler being set up in the vessel
5/ Website design of the R/V
(Photo: Xiaolong Lin & Suwei Weng)

痕量元素与同位素采水系统即将投入运行
Getting ready for full scale trace level work

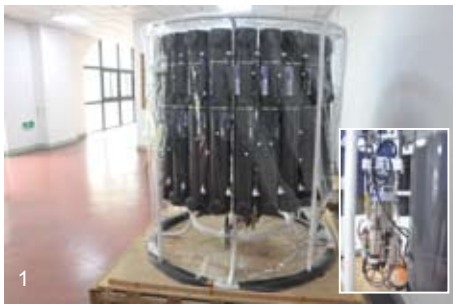
痕量元素及其同位素在调节海洋生态系统、全球碳循环、全球变化等过程研究中起着重要作用，也是研究诸多海洋过程的示踪物。而无沾污、大体积的采样系统是获取高质量、高精度痕量元素及其同位素数据的前提。适逢“嘉庚”号科考船建设，实验室搭建了国内首套海洋痕量元素样品采集、分样、预处理和船基分析系统。

该系统主要由两部分组成，一为绞车和缆绳单元，绞车为电动直拉式，配套8000米直径15.25毫米直读式Vectran缆绳；二为采水单元，包括洁净采水器和船载洁净柜，采水器配备24套Niskin-x采水瓶，24套OTE C-free采水瓶，2套温盐深探头，1套溶氧、叶绿素、C-star探头等；洁净柜分为分样和分析洁净柜，前者主要完成样品过滤、分装，后者用于样品前处理及海上在线分析，如海水铁含量分析等。整套系统均为非金属材质或做非金属涂层处理。

该系统预计于2017年在“嘉庚”号科考船上完成海试。随着系统的就绪及进一步完善，实验室将携手与国内外同行，在中国海及全球开阔大洋全面开展痕量元素及其同位素生物地球化学过程研究。

Trace elements and their isotopes (TEIs) are widely recognized to play an important role in regulating marine ecosystem function, global carbon cycle and climate change, and to serve as useful proxies of various oceanographic processes. The development of a large-volume, non-contaminating sampling system is critical to enhance scientists' abilities to obtain accurate and high resolution distribution of TEIs along ocean basin-wide sections in a timely manner. To improve Chinese capacity to conduct research on marine biogeochemistry of TEIs as part of GEOTRACES activities, MEL worked closely with international TEI geochemists to build the first Trace Elements and Isotopes Sampling System in China. The system consists of a winch unit with an 8000 meter Vectran conducting cable, a commercially available CTD unit designed for TEI sampling with twenty-four 12 liters Niskin-X or OTE C-Free bottles mounted on an epoxy-coated aluminum carousel, a 20' subsampling clean van, and a 20' analytical clean van for a microwave-assisted digestion instrument and a Fe(II)Lume FIA analyzer. The sampling system is expected to be launched in mid-2017 together with the new R/V Tan Kah Kee. With the sampling system ready, scientists in MEL and China will have the full capacity to explore TEI biogeochemistry along the ocean sections in the Chinese marginal seas and global open oceans and will make significant contributions to the international GEOTRACES program.


分样及分析洁净柜
Subsampling & Analysis Clean Labs

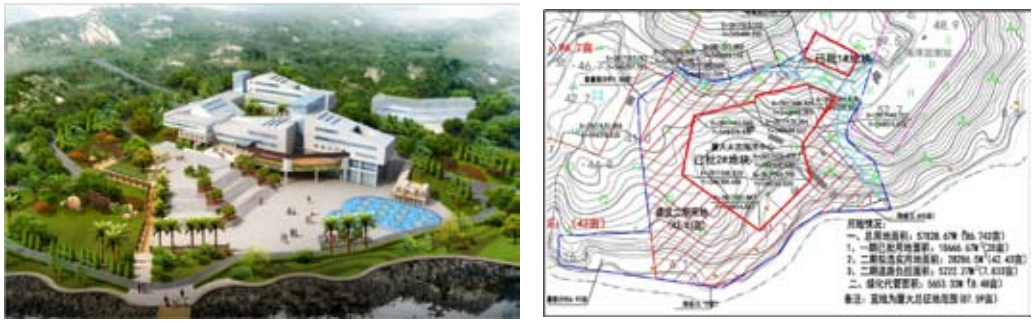


1. Trace metal clean sampling rosette with 8000 meter Vectran conducting cable and CTD, DO, Chla, C-Star sensors
2. FIA FeLume (II) Analyzer 3. Microwave pro (Photo: Vera Shi & Liguo Guo)

厦门大学东山太古海洋观测与实验站
Dongshan Swire Marine Station, Xiamen University

厦门大学东山太古海洋观测与实验站（以下简称“东山站”）项目自2011年启动，获得了太古集团慈善信托基金与东山县政府的大力支持。

2016年1月，厦门大学与东山县政府及相关部门确定了东山站二期建设用地范围，明确在项目一期用地的相邻地块划拨约42.5亩土地作为该项目二期建设用地，一、二期建设用地合计约70亩。 8月，东山站一期主体楼封顶，封顶后开始进行室内装修，目前填充墙砌筑已完成。11月，东山站的外部交通东山县环岛路苏峰山路段修建完成。一期主体楼预计于2017年6月完工。



Left: 3D concept rendering of D-SMART; Right: D-SMART layout

The Dongshan Swire MARine sTation (D-SMART) project was initiated in 2011 with support from the Swire Group and the government of Dongshan County. Its purpose is to monitor the effects of global climate change and anthropogenic environmental changes to marine ecology. The station will act as a long-term land-sea-air boundary environmental elements observation station, an open marine science and technology lab, and a marine observation instruments testing site.

Working with other relevant XMU institutions, a body of labs and centers have been designed, including a specimen room, an exhibition center, a center for marine archaeology, and a dive center, which will fulfil the needs of student interns and public education.

In January, the Dongshan government agreed to transfer an additional 7 acres of land surrounding Phase I (~4.6 acres) for the Phase II construction. Begun in 2015, the section of Dongshan Island Ring Road near D-SMART was completed in November 2016. The entrance of D-Smart connects to the Sufeng Mountain Exit, which ensured the convenience of transportation. The building's main structure was completed in August 2016. Further construction work including plumbing, electricity and embellishments are proceeding. Phase I construction completion is expected in June 2017.

The Dongshan Island Ring Road and the construction site of D-SMART (Photo: Xinya Xu)

Four monitoring wells targeted to 4 aquifers had been established since 2015. The Submarine Groundwater Discharge (SGD) Group organized field investigation in Dongshan from July 10 to 14, 2016. The parameters included dissolved radium, nutrients, dissolved inorganic carbon and dissolved organic carbon. This work researched the SGD biogeochemical effects on coastal islands and provides background data for D-SMART long term subterranean estuary monitoring. (Photo: Shengyao Sun and Guizhi Wang)

联合遥感接收站
Joint Remote Sensing Receiving Station

厦门大学–特拉华大学联合海洋遥感中心于2016年建成直径7.5米、数据率高达1200Mbps、具有L和X双频段的遥感卫星跟踪接收及信号处理地面站，并于12月通过验收，能对轨道高度在400～1000Km内的遥感卫星和气象卫星进行全天时、全天候、全自动的捕获和跟踪，具备接收、获取解调和记录高精度卫星遥感数据的能力，为海洋和海岸带遥感的科研和教学任务提供多种不同模态的微波和光学卫星遥感数据，可应用于气候变化、物理、地球生物化学海洋遥感、大洋和沿海海洋动力学、海洋环境监测、城市规划与地理信息系统开发、农林资源调查、农作物长势评估、土地利用分析等。

The Joint Center for Ocean Remote Sensing (JC-ORS) of Xiamen University - University of Delaware has built a satellite data acquisition, processing and visualization system with a 7.5-meter diameter antenna and a data transmission rate of 1200Mbps. This receiving station has the capability to work at L and X dual-band to track meteorological and oceanic satellites working at 400~1000km orbital height, as well as receive and process signals. The receiving station will run all-day, in all weather conditions and is fully automated. It has the ability to acquire, process and archive high-precision satellite remote sensing data, which will provide a variety of modes for scientific research and teaching tasks in ocean and coastal remote sensing. The station can provide multi-purpose microwave or visible-light satellite images, which can be applied to climate change, physical, geo-bio-chemical ocean remote sensing, open and coastal ocean dynamics research, marine environmental monitoring, urban planning and geographic information system development, agriculture and forestry resources survey, crop growth assessment, and land use analysis.

Remote Sensing Visualization Center (Lab) (Photo: Shihui Lee)

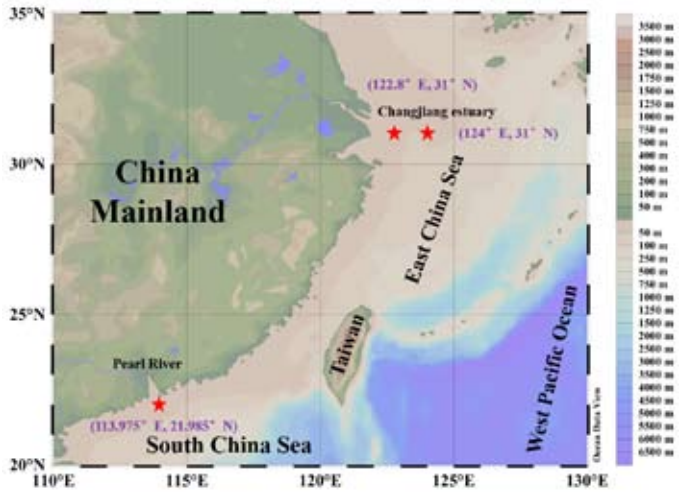
海气二氧化碳通量–海洋酸化监测浮标
CO_2 and Ocean Acidification Monitoring Buoy

2012年以来，实验室同上海气象台、国家海洋局第二海洋研究所、香港科技大学霍英东研究院合作，于东海外陆架海域（124°E、31°N）、缺氧区海域（122.8°E、31°N）和珠江口Plume区域（113.975°E、21.958°N）陆续成功布放并运行了三套海气二氧化碳通量–海洋酸化监测浮标。观测参数包括海水表层和大气CO_2分压、温度、盐度、海流、溶解氧、pH、叶绿素和有色可溶性有机物CDOM等。实时观测数据通过海事卫星通信系统实时传输回岸基接收站。

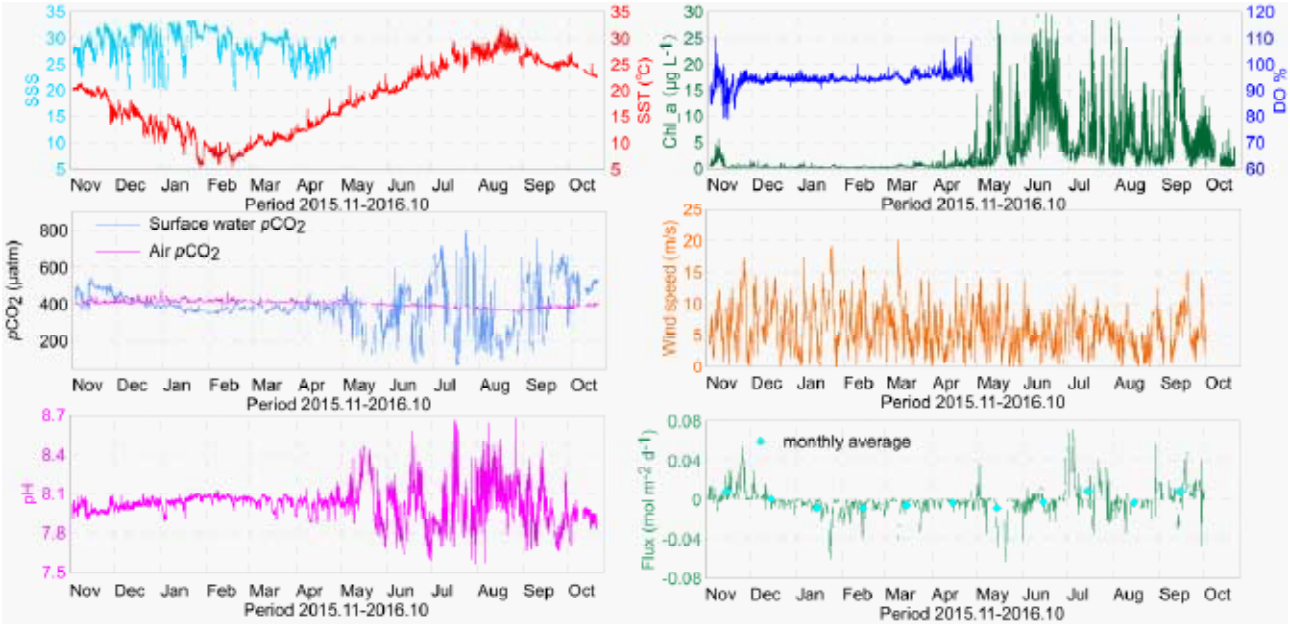
在原有浮标的基础上，在线式浮标–潜标联用系统的研制正在进行。升级改造后的系统将具有对研究海域表、底层水文和水化学参数长时间、同步、高频观测能力，并可将数据通过卫星通讯方式准实时传输至岸基数据观测站（双向）。

In collaboration with the Shanghai Marine Meteorological Center, SOA Second Institute of Oceanography, and Fok Ying Tung Research Institute of The Hong Kong University of Science and Technology, three CO_2 and ocean acidification monitoring buoys have been deployed since 2012 in the outer shelf (124°E, 31°N), anoxic zone (122.8°E, 31°N) of the East China Sea and Pearl River plume (113.975°E, 21.958°N. Monitored parameters include current sea-air pCO_2, SST, SSS, velocity, DO, pH, Chla and CDOM. Data is continuously transmitted back in real-time to the land-based data center and is used to evaluate regional carbon models.

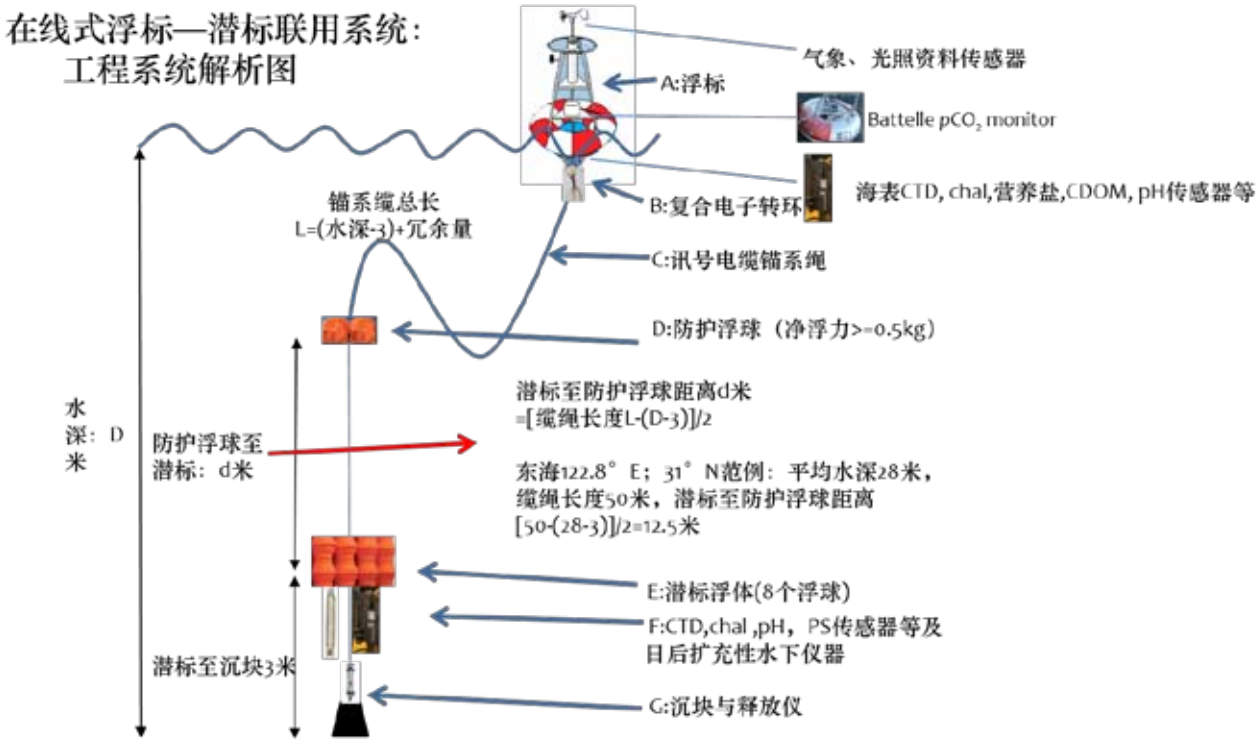
The online submerged buoy coupling system is under development based on existing buoys. The new system will collect hydrological and water chemistry data from the sea surface and bottom with synchronicity and high frequency. Data will be transmitted to the land base in real time via satellite (bi-directional).



The location of the buoys (Photo: Yi Xu)



Data form anoxic zone (122.8°E, 31°N) in 2015-2016



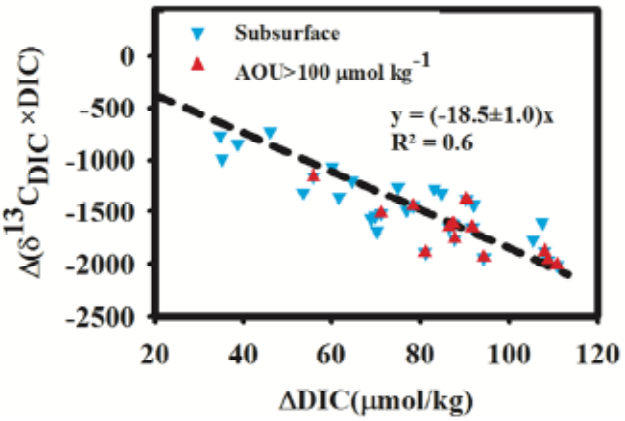
Schematic diagram of the submerged buoy coupling system

海洋生物地球化学
Marine Biogeochemistry

Eutrophication-driven hypoxia in the East China Sea off the Changjiang estuary

Wang, HJ; Dai, MH; Liu, JW; Kao, SJ; Zhang, C; Cai, WJ; Wang, GZ; Qian, W; Zhao, MX; Sun, ZY. ***ENVIRONMENTAL SCIENCE & TECHNOLOGY***, 2016. 50: 2255-2263.

Abstract: Coastal hypoxia is an increasingly recognized environmental issue of global concern to both the scientific community and the general public. We assessed the relative contributions from marine and terrestrially sourced organic matter that were responsible for oxygen consumption in a well-studied seasonal coastal hypoxic zone, the East China Sea off the Changjiang Estuary. Our fieldwork was conducted in August 2011 during reinstatement of a subsurface hypoxia, when we observed a continuous decline of dissolved oxygen along with production of dissolved inorganic carbon resulting from organic carbon remineralization. On the basis of a three end-member mixing model and determinations of the stable isotopic compositions of dissolved inorganic carbon ($\delta^{13}C_{DIC}$), the end product of particulate organic carbon (POC) degradation, we quantified the $\delta^{13}C$ value of the remineralized organic carbon ($\delta^{13}C_{OCx}$), which was -18.5 ± 1.0‰. This isotopic composition was very similar to the $\delta^{13}C$ of marine sourced POC produced in situ (-18.5 ± 0.3‰) rather than that of the terrestrially sourced POC (-24.4 ± 0.2‰). We concluded that marine-sourced organic matter, formed by eutrophication-induced marine primary production, was the dominant oxygen consumer in the subsurface hypoxic zone in the East China Sea off the Changjiang Estuary.



Fukushima Daiichi-derived radionuclides in the ocean: transport, fate, and impacts

Buesseler, K., M. Dai, M. Aoyama, C. Benitez-Nelson, S. Charmasson, K. Higley, V. Maderich, P. Masqué, D. Oughton, and J.N. Smith. ***ANNUAL REVIEW OF MARINE SCIENCE***, 2016. 9: 1-31.

Abstract: The events that followed the Tohoku earthquake and tsunami on March 11, 2011, included the loss of power and overheating at the Fukushima Daiichi nuclear power plants, which led to extensive releases of radioactive gases, volatiles, and liquids, particularly to the coastal ocean. The fate of these radionuclides depends in large part on their oceanic geochemistry, physical processes, and biological uptake. Whereas radioactivity on land can be resampled and its distribution mapped, releases to the marine environment are harder to characterize owing to variability in ocean currents and the general challenges of sampling at sea. Five years later, it is appropriate to review what happened in terms of the sources, transport, and fate of these radionuclides in the ocean. In addition to the oceanic behavior of these contaminants, this review considers the potential health effects and societal impacts.

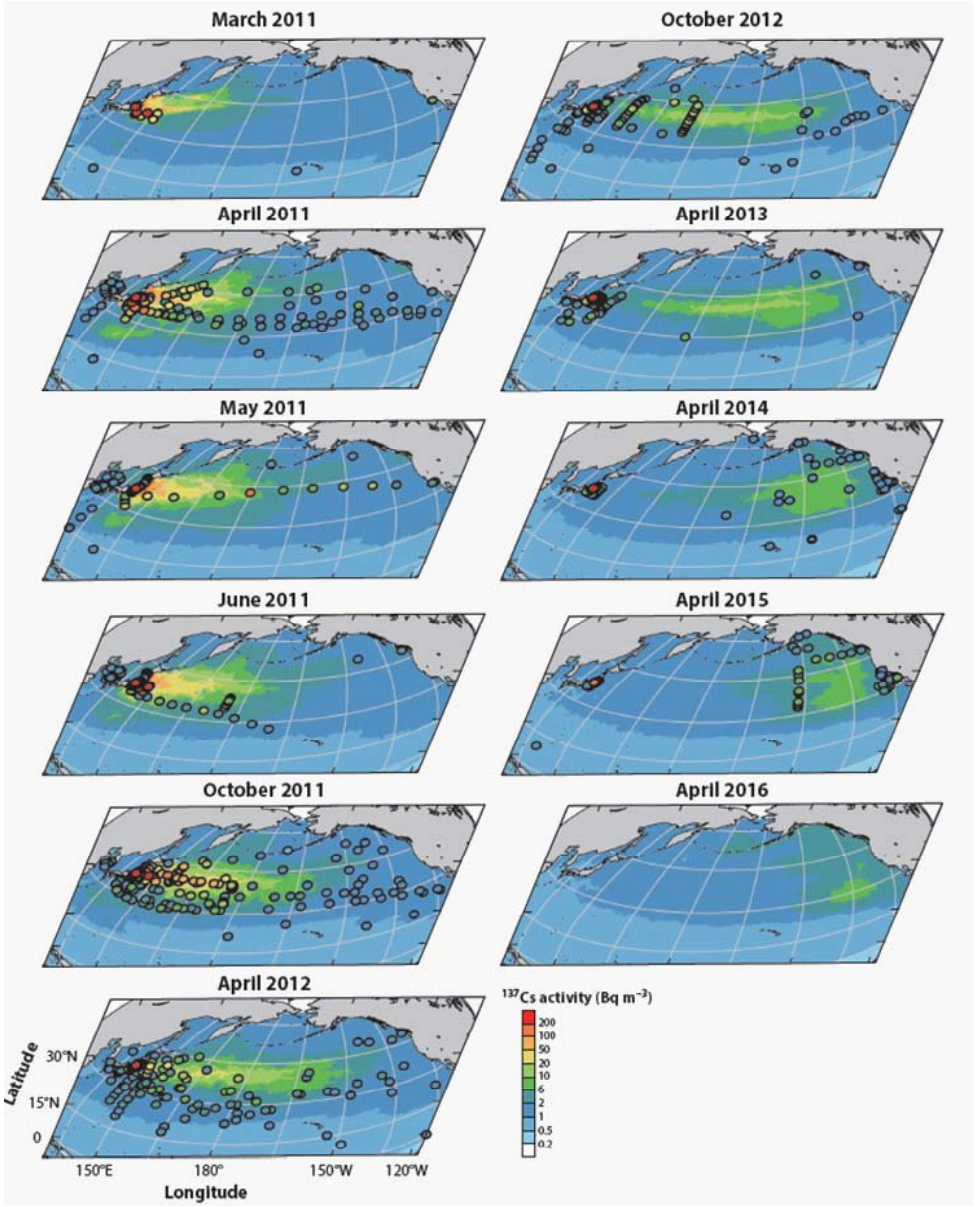


Fig. 2 | Time series of measured ^{137}Cs activities in surface seawater (circles) overlain on model-derived predictions (Tsubono et al. 2016) that includes ^{137}Cs levels from before the Fukushima Daiichi nuclear power plant releases. The color bar applies to both the observations and the model-derived predictions. The observations are from the Historical Artificial Radionuclides in the Pacific Ocean and Its Marginal Seas (HAM) database (Aoyama & Hirose 2004) and updates to that database (Buesseler et al. 2012; UNSCEAR 2014; IAEA 2015b, extracted and provided by P.J. Morris in March 2016; Yoshida et al. 2015; Aoyama et al. 2016), as well as unpublished data from J.N. Smith and Our Radioactive Ocean (http://ourradioactiveocean.org/results).

Nitrogen speciation in various types of aerosols in spring over the northwestern Pacific Ocean

Luo, L; Yao, XH; Gao, HW; Hsu, SC; Li, JW; Kao, SJ. ***ATMOSPHERIC CHEMISTRY AND PHYSICS***, 2016. 16: 325-341.

Abstract: The cumulative atmospheric nitrogen deposition has been found to profoundly impact the nutrient stoichiometry of the eastern China seas (ECSs: the Yellow Sea and East China Sea) and the northwestern Pacific Ocean (NWPO). In spite of the potential significance of dry deposition in those regions, shipboard observations of atmospheric aerosols remain insufficient, particularly regarding the compositions of water-soluble nitrogen species (nitrate, ammonium and water-soluble organic nitrogen WSON). We conducted a cruise covering the ECSs and the NWPO during the spring of 2014 and observed three types of atmospheric aerosols. Aluminum content, air mass backward trajectories, weather conditions, and ion stoichiometry allowed us to discern dust aerosol patches and sea-fog-modified aerosols (widespread over the ECSs) from background aerosols (open ocean). Among the three types, sea-fog-modified aerosols contained the highest concentrations of nitrate (536 ± 300 nmol N m^{-3}), ammonium (442 ± 194 nmol N m^{-3}) and WSON (147 ± 171 nmol N m^{-3}); furthermore, ammonium and nitrate together occupied similar to 65% of the molar fraction of total ions. The dust aerosols also contained significant amounts of nitrate (100 ± 23 nmol N m^{-3}) and ammonium (138 ± 24 nmol N m^{-3}) which were obviously larger than those in the background aerosols (26 ± 32 for nitrate and 54 ± 45 nmol N m^{-3} for ammonium), yet this was not the case for WSON. It appeared that dust aerosols had less of a chance to come in contact with WSON during their transport. In the open ocean, we found that sea salt (e.g., Na^+, Cl^-, Mg^{2+}), as well as WSON, correlated positively with wind speed. Apparently, marine dissolved organic nitrogen (DON) was emitted from breaking waves. Regardless of the variable wind speeds from 0.8 to as high as 18ms^{-1}, nitrate and ammonium, by contrast, remained in narrow ranges, implying that some supply and consumption processes of nitrate and ammonium were required to maintain such a quasi-static condition. Mean dry deposition of total dissolved nitrogen (TDN) for sea-fog-modified aerosols (1090 ± 671 µmol N m^{-2} d^{-1}) was 5 times higher than that for dust aerosols (190 ± 41.6 µmol N m^{-2} d^{-1}) and around 20 times higher than that for background aerosols (56.8 ± 59.1 µmol N m^{-2} d^{-1}). Apparently, spring sea fog on the ECSs played an important role in removing atmospheric reactive nitrogen from the Chinese mainland and depositing it into the ECSs, thus effectively preventing its seaward export to the NWPO.

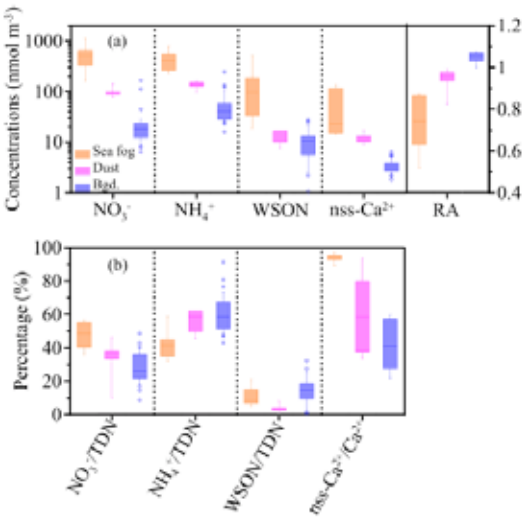


Fig. 2 | Box plots for (a) concentrations of NO_3^-, NH_4^+, WSON and nss-Ca^{2+}, and RA, and (b) fractions of nitrogen species in total dissolved nitrogen and proportion of nss-Ca^{2+} in Ca^{2+}, in sea-fog-modified, dust and background aerosols. The large boxes represent the interquartile range from the 25th to 75th percentile. The line inside the box indicates the median value. The whiskers extend upward to the 90th and downward to the 10th percentile.

Abundance and sinking of particulate black carbon in the western Arctic and Subarctic Oceans

Fang, ZM; Yang, WF; Chen, M; Zheng, MF; Hu, WJ. ***SCIENTIFIC REPORTS***, 2016. 6, doi:10.1038/srep29959.

Abstract: The abundance and sinking of particulate black carbon (PBC) were examined for the first time in the western Arctic and Subarctic Oceans. In the central Arctic Ocean, high PBC concentrations with a mean of 0.021±0.016 μmolL^{-1} were observed in the marginal ice zone (MIZ). A number of parameters, including temperature, salinity and ^{234}Th/^{238}U ratios, indicated that both the rapid release of atmospherically deposited PBC on sea ice and a slow sinking rate were responsible for the comparable PBC concentrations between the MIZ and mid-latitudinal Pacific Ocean (ML). On the Chukchi and Bering Shelves (CBS), PBC concentrations were also comparable to those obtained in the ML. Further, significant deficits of ^{234}Th revealed the rapid sinking of PBC on the CBS. These results implied additional source terms for PBC in addition to atmospheric deposition and fluvial discharge on the western Arctic shelves. Based on ^{234}Th/ ^{238}U disequilibria, the net sinking rate of PBC out of the surface water was -0.8 ± 2.5 μmol m^{-3} d^{-1} (mean ± s.d.) in the MIZ. In contrast, on the shelves, the average sinking rate of PBC was 6.1 ± 4.6 μmol m^{-3} d^{-1}. Thus, the western Arctic Shelf was probably an effective location for burying PBC.

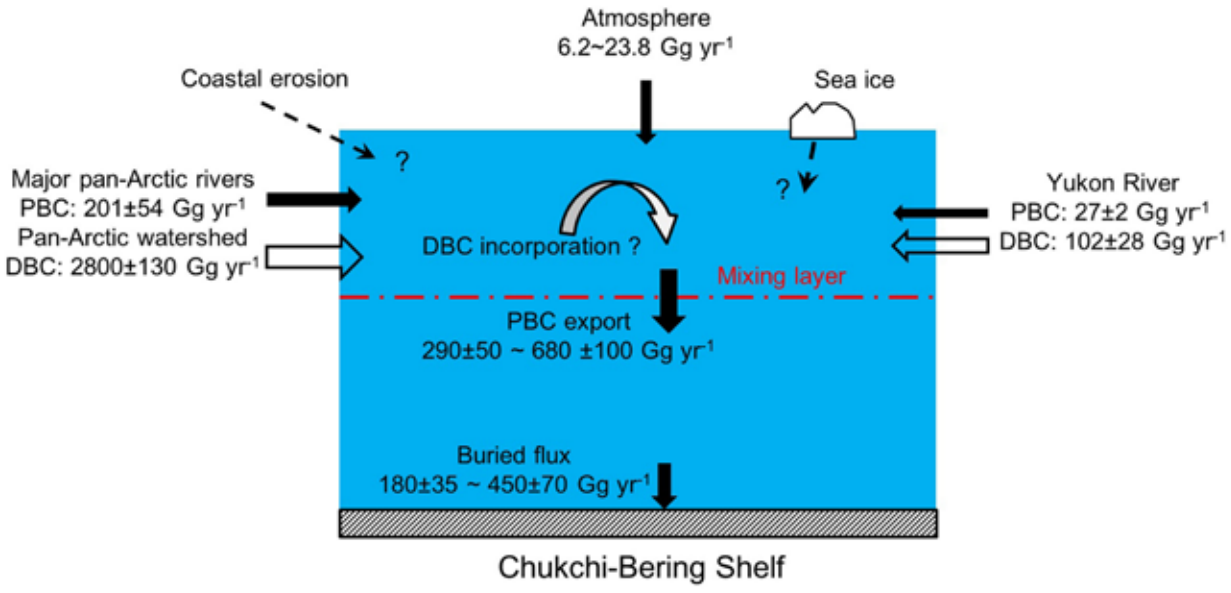


Fig. 3 | Budget of PBC on the Chukchi and Bering shelves.

Floodplain influence on carbon speciation and fluxes from the lower Pearl River, Mississippi

Cai, YH; Shim, MJ; Guo, LD; Shiller, A. ***GEOCHIMICA ET COSMOCHIMICA ACTA***, 2016. 186: 189-206.

Abstract: To investigate the floodplain influence on carbon speciation and export to the northern Gulf of Mexico, water samples were collected monthly from two sites in the East Pearl River (EPR) basin during 2006-2008. Additionally, four spatial surveys in the river basin between those two sites were also conducted. Compared with the upstream sampling site at Bogalusa, MS, dissolved inorganic carbon (DIC) and particulate organic carbon (POC) concentrations were 36% and 55% lower, respectively, and dissolved organic carbon (DOC) concentration was 49% higher at the downstream Stennis Space Center (SSC) site. In addition, the bulk DOC pool at SSC had a higher colloidal fraction than at Bogalusa (75% vs. 68%). Detailed spatial surveys revealed the differences between the upstream and downstream stations resulted both from input from Hobolochitto Creek, a tributary of the EPR, and from influence of the swamp-rich floodplain. The contributions from Hobolochitto Creek to the carbon pool in the EPR basin were lowest during a high flow event and reached a maximum during the dry season. Meanwhile, the floodplain in the EPR basin acted as a significant sink for DOC, POC and particulate nitrogen during summer and for suspended sediment during a high flow event. However, the floodplain was converted into a source of suspended sediment, DOC, and POC to the EPR during winter, revealing a dynamic nature and seasonality in the floodplain influence. Consistent with its dominant forest coverage, abundant wetlands along the river corridor, and mild anthropogenic disturbance, the Pearl River basin above Bogalusa generally had higher yields of DOC and POC (1903 and 1386 kg-C km^{-2} yr^{-1}, respectively), but a lower yield of DIC (2126 kg-C km^{-2} yr^{-1}) compared to other North American rivers. An estimation based on a mass balance approach suggests the interactions between floodplain and the main river stem could reduce the annual DIC and POC export fluxes from downstream of the EPR by 24% and 40%, respectively, but enhance the annual riverine DOC export by 25%. Similar scenarios likely occur in other wetland-rich coastal rivers and are capable of significantly altering the current estimation of riverine carbon export.

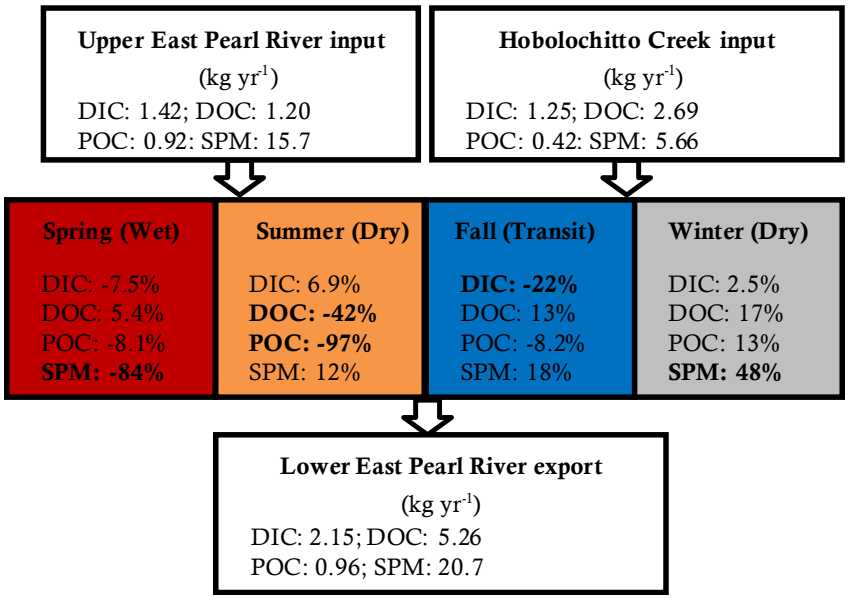


Fig. 4 | A schematic demonstrating carbon and SPM mass balances in the East Pearl River basin and the role of the floodplain in altering the annual and seasonal carbon and SPM export fluxes. The numbers in the figure denote the carbon and SPM fluxes from the individual sources in the East Pearl River basin with a unit of kg yr^{-1} whereas the percentages denote the capacity of the East Pearl River Basin to alter the annual and seasonal export fluxes of carbon species and SPM.

Linking biochemical properties of particles to particle-attached and free-living bacterial community structure along the particle density gradient from freshwater to open ocean

Zhang, Y; Xiao, W; Jiao, NZ. ***JOURNAL OF GEOPHYSICAL RESEARCH-BIOGEOSCIENCES***, 2016. 121: 2261-2274.

Abstract: To test the hypothesis that particle composition has a stronger influence on the community structure of particle-attached than free-living bacteria, elemental (C/N, $\delta^{13}C$, and $\delta^{15}N$) and chemical composition of particles and the size-fractionated bacterial community composition were examined along the particle density gradient from the Pearl River to the open basin in the South China Sea. Microbial communities were collected at the three size fractions of 0.2-0.8, 0.8-3, and > 3 μm, and the community composition was analyzed using high-throughput sequencing of the 16S rRNA gene (V3-V4 regions). Multivariate analysis evaluating the similarities of bacterial community composition and chemical composition of particles revealed their general consistent spatial variations along the particle density gradient from freshwater to the sea basin. However, compositions of particulate organic matter were more strongly related to the free living than to the particle-attached bacterial community composition, which was composed of relatively abundant anaerobic bacteria and those taxa preferring low-oxygen conditions. This latter result might be caused by low-oxygen microzones in particles. Community network models further revealed tighter interactions within the particle-attached than in free-living bacterial communities, suggesting that a relatively confined space in particles is more favorable for interactions within the community. These analyses indicated that particle microniche properties might be important in shaping particle-attached community structure. In contrast, particulate organic matter compositions significantly influenced the free-living bacterial community probably through the release of labile or semilabile organic matter from particles contributing to the bioavailability of dissolved organic carbon.

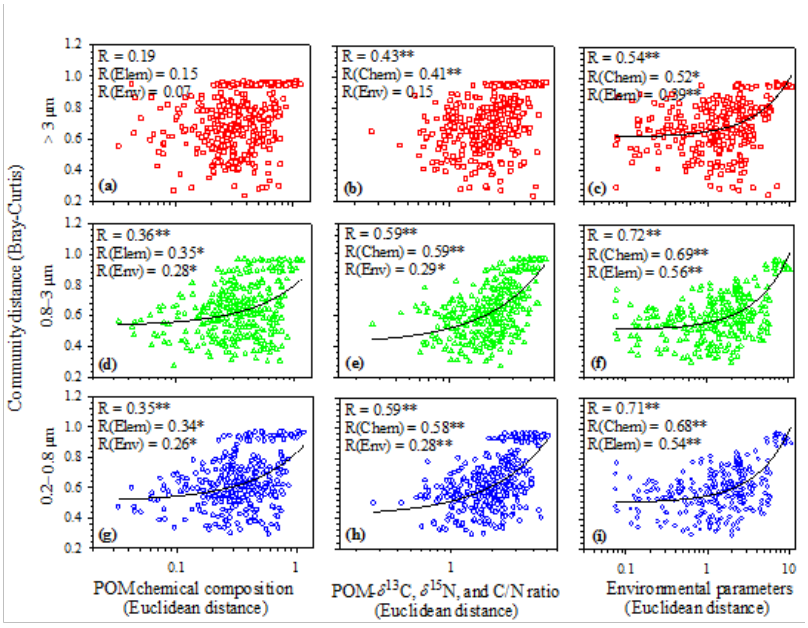


Fig. 5 | Correlations between bacterial community composition and POM chemical composition, POM elementary composition ($\delta^{13}C$, $\delta^{15}N$, and C/N ratio), or environmental parameters distance between samples. Pearson correlation coefficient (R) values are shown for regular (first value) and partial Mantel (second and third) tests. The P-values were calculated using the distribution of the Mantel test statistics estimated from 999 permutations. *P < 0.05; **P < 0.01. Matrix of POM chemical composition was calculated according to the six types of compounds: aromatics, fatty acids, alkanes/alkenes, carbohydrates, phenols, and N-compounds. Matrix of environmental parameters included POC, PON, total Chl a, DOC concentration, and the basic hydrological parameters (temperature, salinity, and depth).

Ecological genomics of the uncultivated marine *Roseobacter* Lineage CHAB-I-5

Zhang, Y; Sun, Y; Jiao, NZ; Stepanauskas, R; Luo, HW. ***APPLIED AND ENVIRONMENTAL MICROBIOLOGY***, 2016. 82: 2100-2111.

Abstract: Members of the marine *Roseobacter* clade are major participants in global carbon and sulfur cycles. While roseobacters are well represented in cultures, several abundant pelagic lineages, including SAG-O19, DC5-80-3, and NAC11-7, remain largely uncultivated and show evidence of genome streamlining. Here, we analyzed the partial genomes of three single cells affiliated with CHAB-I-5, another abundant but exclusively uncultivated *Roseobacter* lineage. Members of this lineage encode several metabolic potentials that are absent in streamlined genomes. Examples are quorum sensing and type VI secretion systems, which enable them to effectively interact with host and other bacteria. Further analysis of the CHAB-I-5 single-cell amplified genomes (SAGs) predicted that this lineage comprises members with relatively large genomes (4.1 to 4.4 Mbp) and a high fraction of noncoding DNA (10 to 12%), which is similar to what is observed in many cultured, nonstreamlined *Roseobacter* lineages. The four uncultured lineages, while exhibiting highly variable geographic distributions, together represent >60% of the global pelagic roseobacters. They are consistently enriched in genes encoding the capabilities of light harvesting, oxidation of "energy-rich" reduced sulfur compounds and methylated amines, uptake and catabolism of various carbohydrates and osmolytes, and consumption of abundant exudates from phytoplankton. These traits may define the global prevalence of the four lineages among marine bacterioplankton.

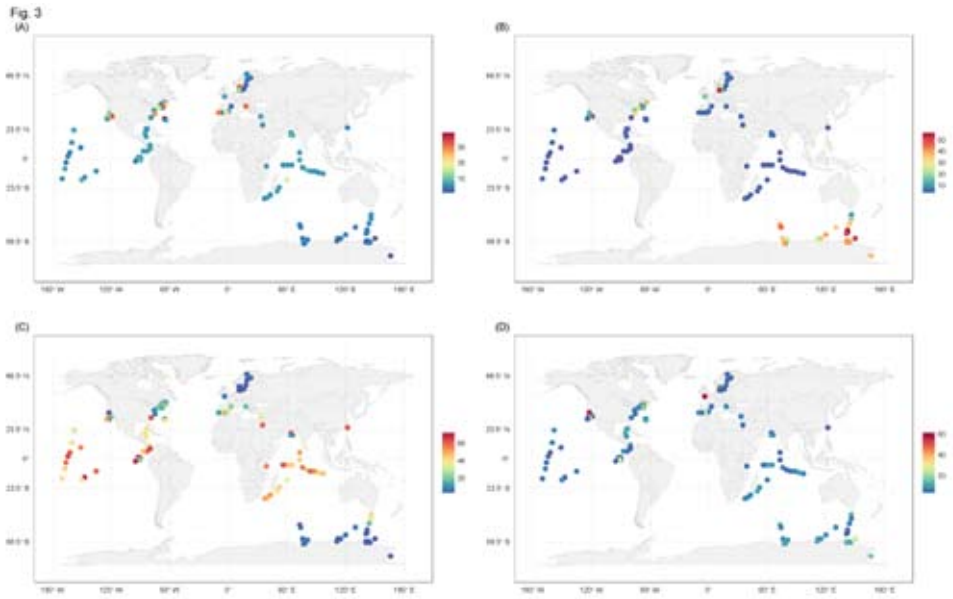


Fig. 6 | Geographic distribution of the metagenomic samples and the relative abundance of CHAB-I-5 (A), DC5-80-3 (B), SAG-O19 (C), and NAC11-7 (D) at each location. The equator and boundaries of the main climate zones (tropic, temperate, polar) are marked in dashed lines. Each solid dot represents at least one metagenomic sample observed within the ±0.5° latitude/longitude range represented by the center of the dot and is colored according to the relative abundance of a particular lineage in the Roseobacter community. Colors are assigned in distinct steps in each panel, according to the different scales of the estimated population proportion. Only metagenomic samples with at least 50 reads (within the 1,206 gene families) mapped to the Roseobacter clade are displayed. Maps were created using the R package rworldmap.

Comparative transcriptomic analysis reveals novel insights into the adaptive response of *Skeletonema costatum* to changing ambient phosphorus

Zhang, SF; Yuan, CJ; Chen, Y; Chen, XH; Li, DX; Liu, JL; Lin, L; Wang, DZ. ***FRONTIERS IN MICROBIOLOGY***, 2016. 7, doi:10.3389/fmicb.2016.01476.

Abstract: Phosphorus (P) is a limiting macronutrient for diatom growth and productivity in the ocean. Much effort has been devoted to the physiological response of marine diatoms to ambient P change, however, the whole-genome molecular mechanisms are poorly understood. Here, we utilized RNA-Seq to compare the global gene expression patterns of a marine diatom *Skeletonema costatum* grown in inorganic P-replete, P-deficient, and inorganic- and organic-P resupplied conditions. In total 34,942 unique genes were assembled and 20.8% of them altered significantly in abundance under different P conditions. Genes encoding key enzymes/proteins involved in P utilization, nucleotide metabolism, photosynthesis, glycolysis, and cell cycle regulation were significantly up regulated in P-deficient cells. Genes participating in circadian rhythm regulation, such as circadian clock associated 1, were also up-regulated in P-deficient cells. The response of *S. costatum* to ambient P deficiency shows several similarities to the well-described responses of other marine diatom species, but also has its unique features. *S. costatum* has evolved the ability to re-program its circadian clock and intracellular biological processes in response to ambient P deficiency. This study provides new insights into the adaptive mechanisms to ambient P deficiency in marine diatoms.

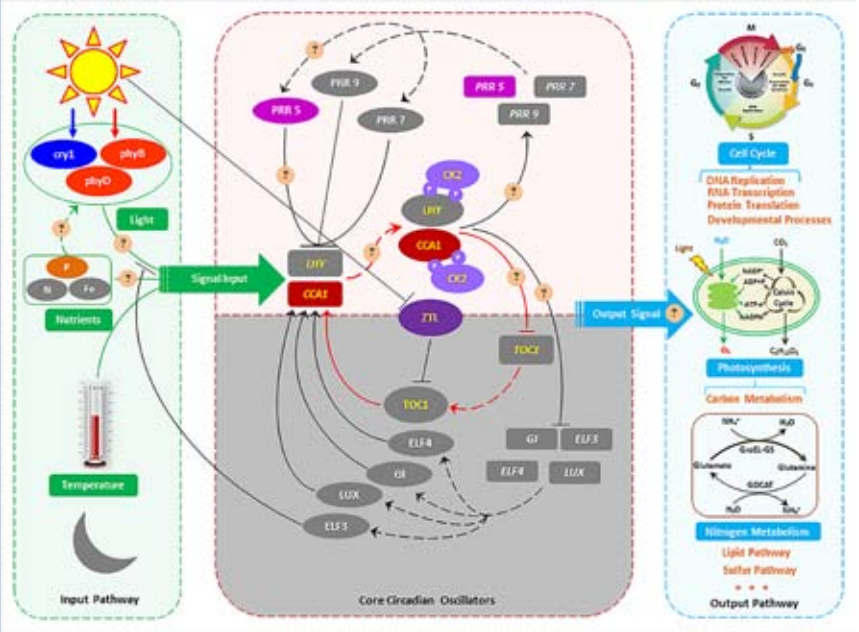


Fig. 7 | The proposed molecular model of circadian rhythms in *S. costatum*. Genes are indicated using oblong shapes with the italic gene names in the shape. Proteins are indicated using oval shapes with the protein name in the shape. Transcription and translation is indicated by dashed lines. Positive action is indicated by solid lines with lines ending in arrowheads, and negative action is indicated with lines ending in perpendicular dashes. The core CCA1 (circadian clock associated 1)/LHY/TOC1 circadian oscillator is highlighted in red lines. Phosphorylation of LHY and CCA1 by CK2 (casein kinase II) is indicated with circled P's in purple. The shaded area indicates activities peaking in the nighttime, and the white area activities peaking in the daytime. The gray oblong and oval shapes represent the genes or proteins that are identified in *Arabidopsis thaliana*, but not identified in the *S. costatum* transcriptome in our study. Because the sampling was conducted in the daytime, so the genes which are active in the nighttime were not detected in this study. In part of the input pathway, light, temperature and nutrient (N, Fe, etc.) have been identified as the main input signal, but P as the input signal has not been reported. For the output pathway, the metabolic pathways affected by circadian rhythms that are demonstrated in the green alga *Chlamydomonas reinhardtii*, the flagellate *Euglena gracilis*, the cyanobacterium *Synechococcus elongata*, and the dinoflagellate *Gonyaulax polyedra* and *Arabidopsis thaliana* might also be affected in *S. costatum*. The circles and questions marks indicate possible regulatory mechanisms of circadian rhythm in *S. costatum* responses to ambient P changing.

Responses of phytoplankton communities to environmental variability in the East China Sea

Liu, X; Xiao, WP; Landry, MR; Chiang, KP; Wang, L; Huang, BQ. ***ECOSYSTEMS***, 2016. 19: 832-849.

Abstract: We investigated seasonal and spatial patterns of phytoplankton variability in the East China Sea in order to understand biomass and compositional responses to environmental factors in the contemporary ocean. We used satellite imagery from 2002 to 2013 to define the mean seasonal climatology of sea surface temperature and chlorophyll α. Phytoplankton and environmental measurements were synthesized for the study region and four seasons from 11 cruises conducted from 2006 to 2012. The results of CHEMTAX analyses on group-specific phytoplankton composition were consistent with those of microscopy and flow cytometry observations, revealing three patterns of seasonal variability. Canonical correspondence analysis and generalized additive models (GAMs) were used to resolve the spatiotemporal variations of major phytoplankton groups and their relationships to month, temperature, salinity, nutrients, mixed layer depth, and bottom depth. Monsoon forcing drove the distributional patterns of environmental factors and was critical to explaining phytoplankton dynamics at the seasonal scale. Compared to autumn and winter, significantly higher chlorophyll α concentrations were observed during spring and summer, associated with the spring bloom and the Changjiang (Yangtze) River plume, respectively. Diatoms dominated biomass over the East China Sea, especially during the summer months influenced by the Changjiang (Yangtze) River plume, whereas dinoflagellates were especially important during spring blooms. GAMs analysis showed the differences in their responses to environmental variability, with a clear mid-range salinity optimum (similar to 31) and a more pronounced temperature effect for dinoflagellates. The photosynthetic bacteria, Prochlorococcus and Synechococcus, both increased strongly with warming, but Prochlorococcus showed stronger sensitivity to variations in physical environmental parameters, whereas Synechococcus was more responsive to chemical (nutrient) variability, with broader tolerance of low-salinity conditions.

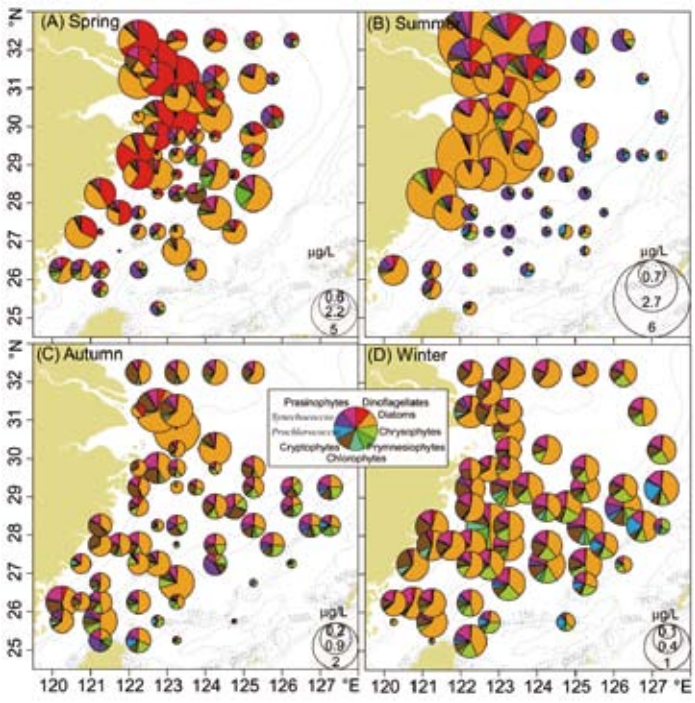


Fig. 8 | Seasonal distributions of phytoplankton community biomass and composition in surface water samples from 11 cruises in the East China Sea from 2006 to 2012. Pie graph diameter is proportional to the mean total chlorophyll α (TChl α), and composition reflects the contributions of different phytoplankton groups to TChl α determined from CHEMTAX assessment of diagnostic pigments. All data are averaged over 0.5°×0.5°grid boxes.

Phosphorus deficiency inhibits cell division but not growth in the Dinoflagellate *Amphidinium carterae*

Li, MZ; Shi, XG; Guo, CT; Lin, SJ. ***FRONTIERS IN MICROBIOLOGY***, 2016. 7, doi:10.3389/fmicb.2016.00826.

Abstract: Phosphorus (P) is an essential nutrient element for the growth of phytoplankton. How P deficiency affects population growth and the cell division cycle in dinoflagellates has only been studied in some species, and how it affects photosynthesis and cell growth remains poorly understood. In the present study, we investigated the impact of P deficiency on the cell division cycle, the abundance of the carbon-fixing enzyme Rubisco, and other cellular characteristics in the Gymnodiniales peridinin-plastid species *Amphidinium carterae*. We found that under P-replete condition, the cell cycle actively progressed in the culture in a 24-h diel cycle with daily growth rates markedly higher than the P-deficient cultures, in which cells were arrested in the G1 phase and cell size significantly enlarged. The results suggest that, as in previously studied dinoflagellates, P deficiency likely disenables *A. carterae* to complete DNA duplication or check-point protein phosphorylation. We further found that under P-deficient condition, overall photosystem II quantum efficiency (Fv/Fm ratio) and Rubisco abundance decreased but not significantly, while cellular contents of carbon, nitrogen, and proteins increased significantly. These observations indicated that under P-deficiency, this dinoflagellate was able to continue photosynthesis and carbon fixation, such that proteins and photosynthetically fixed carbon could accumulate resulting in continued cell growth in the absence of division. This is likely an adaptive strategy thereby P-limited cells can be ready to resume the cell division cycle upon resupply of phosphorus.

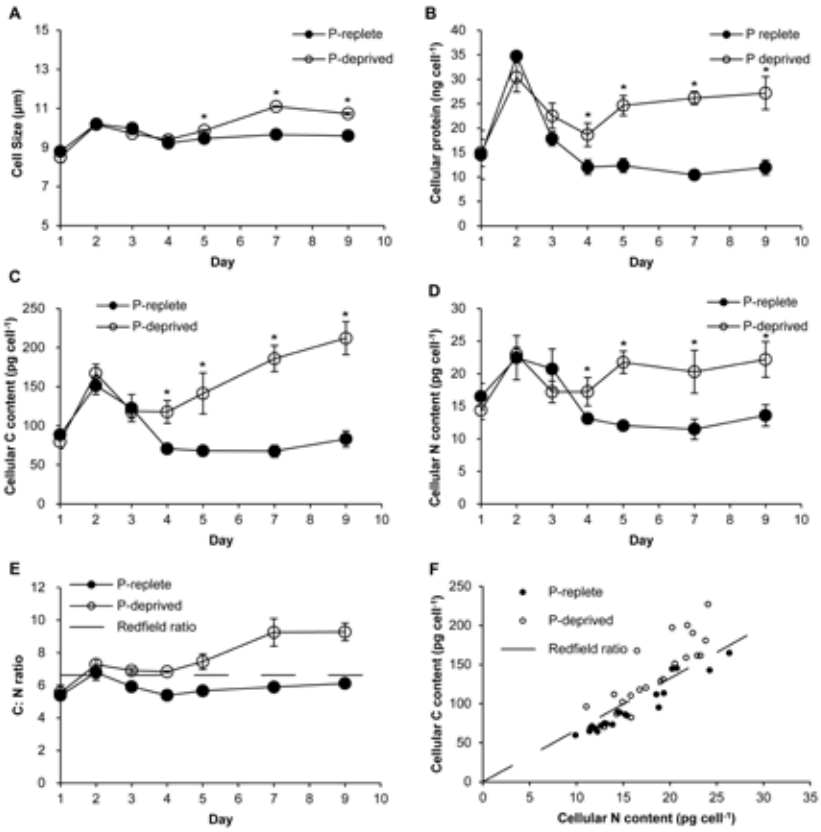


Fig. 9 | Cellular parameters of *A. carterae* grown under the P-replete and P-deprived conditions. (A) cell sizes; (B) cellular protein content; (C) cellular carbon content; (D) cellular nitrogen content; (E) cellular *C: N* ratio; the dashed line depicts Redfield *C: N* ratio; (F) correlation between carbon and nitrogen contents; the dashed line depicts Redfield *C: N* ratio. Except in (F), data shown are means ± standard deviations (error bars) from the triplicated cultures. Asterisks represent that significant differences between P-replete and P-deprived conditions were detected ($p < 0.05$).

Genomic, physiologic, and proteomic insights into metabolic versatility in *Roseobacter* clade bacteria isolated from deep-sea water

Tang, K; Yang, YJ; Lin, D; Li, SH; Zhou, WC; Han, Y; Liu, KS; Jiao, NZ. ***SCIENTIFIC REPORTS***, 2016. 6, doi:10.1038/srep35528.

Abstract: *Roseobacter* clade bacteria are ubiquitous in marine environments and now thought to be significant contributors to carbon and sulfur cycling. However, only a few strains of roseobacters have been isolated from the deep-sea water column and have not been thoroughly investigated. Here, we present the complete genomes of phylogentically closed related *Thiobacimonas profunda* JLT2016 and *Pelagibaca abyssi* JLT2014 isolated from deep-sea water of the Southeastern Pacific. The genome sequences showed that the two deep-sea roseobacters carry genes for versatile metabolisms with functional capabilities such as ribulose bisphosphate carboxylase-mediated carbon fixation and inorganic sulfur oxidation. Physiological and biochemical analysis showed that *T. profunda* JLT2016 was capable of autotrophy, heterotrophy, and mixotrophy accompanied by the production of exopolysaccharide. Heterotrophic carbon fixation via anaplerotic reactions contributed minimally to bacterial biomass. Comparative proteomics experiments showed a significantly up-regulated carbon fixation and inorganic sulfur oxidation associated proteins under chemolithotrophic conditions compared to heterotrophic conditions. Collectively, rosebacters show a high metabolic flexibility, suggesting a considerable capacity for adaptation to the marine environment.

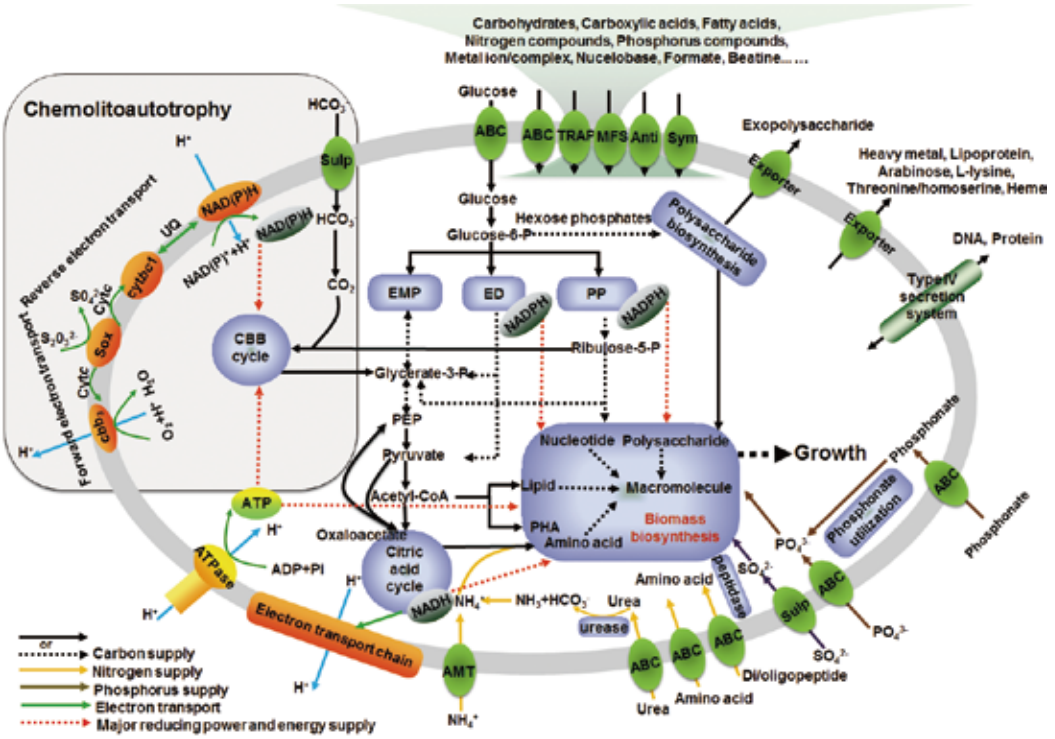


Fig. 10 | Metabolic pathways and transporter systems shared by *T. profunda* JLT2016 and *P. abyssi* JLT2014 based on functional genomics.

Decreased photosynthesis and growth with reduced respiration in the model diatom *Phaeodactylum tricornutum* grown under elevated CO_2 over 1800 generations

Li, FT; BeardallL J; Collins, S; Gao, KS. ***GLOBAL CHANGE BIOLOGY***, 2016. doi:10.1111/gcb.13501.

Abstract: Studies on the long-term responses of marine phytoplankton to ongoing ocean acidification (OA) are appearing rapidly in the literature. However, only a few of these have investigated diatoms, which is disproportionate to their contribution to global primary production. Here we show that a population of the model diatom *Phaeodactylum tricornutum*, after growing under elevated CO_2 (1000 µatm, HCL, pHT: 7.70) for 1860 generations, showed significant differences in photosynthesis and growth from a population maintained in ambient CO_2 and then transferred to elevated CO_2 for 20 generations (HC). The HCL population had lower mitochondrial respiration, than did the control population maintained in ambient CO_2 (400 µatm, LCL, pHT: 8.02) for 1860 generations. Although the cells had higher respiratory carbon loss within 20 generations under the elevated CO_2, being consistent to previous findings, they downregulated their respiration to sustain their growth in longer duration under the OA condition. Responses of phytoplankton to OA may depend on the timescale for which they are exposed due to fluctuations in physiological traits over time. This study provides the first evidence that populations of the model species, *P. tricornutum*, differ phenotypically from each other after having been grown for differing spans of time under OA conditions, suggesting that long-term changes should be measured to understand responses of primary producers to OA, especially in waters with diatom-dominated phytoplankton assemblages.

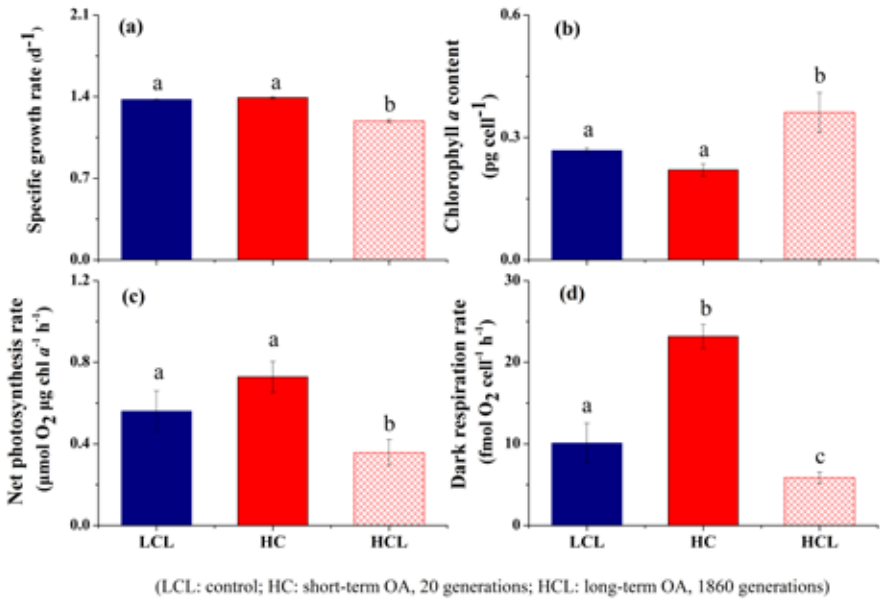


Fig. 11 | Growth rate (a), chlorophyll a content (b), net photosynthesis (c) and dark respiration rates (d) of *Phaeodactylum tricornutum* cells from LCL, HC and HCL populations. LCL, long-term ambient air exposure; HC, short-term elevated CO_2 exposure; HCL, long-term elevated CO_2 exposure.

Effects of varying growth irradiance and nitrogen sources on calcification and physiological performance of the coccolithophore *Gephyrocapsa oceanica* grown under nitrogen limitation

Tong, SY; Hutchins DA, Fu, FX; Gao, KS. ***LIMNOLOGY AND OCEANOGRAPHY***, 2016. 61: 2234-2242.

Abstract: *Gephyrocapsa oceanica* is a widespread species of coccolithophore that has a significant impact on the global carbon cycle through photosynthesis and calcium carbonate precipitation. We investigated combined effects of light (50, 190 and 400 μmol $m^{-2}s^{-1}$) and the nitrogen sources and NH_4^+ on its physiological performance under nitrogen-limited conditions. The specific growth rate was highest at the mid-range light level of 190 μmol $m^{-2}s^{-1}$, where it was further accelerated by NH_4^+ relative to NO_3^-. There were no significant growth rate differences between NO_3^- and NH_4^+ grown cells at the two light levels either above or below this optimum irradiance. Cellular particulate organic carbon (POC) and nitrogen (PON) content were not significantly affected by different light intensities and nitrogen sources. However, both the cellular particulate inorganic carbon (PIC) content and the PIC to POC ratio were greatly decreased by increased light levels, and were further decreased by NH_4^+ only at the highest light level. Non-photochemical quenching (NPQ) increased with increasing light intensity, and was higher in NO_3^- rather than in NH_4^+ grown cells at medium and high light intensities. Our results demonstrate that under low, relatively realistic oceanic nitrogen concentrations, increasing light intensity and the replacement of NO_3^- and NH_4^+ would have a significant negative effect on the calcification of the coccolithophore *G. oceanica*. If these findings are also applicable to other coccolithophore species, the future ocean carbon cycle may be greatly affected.

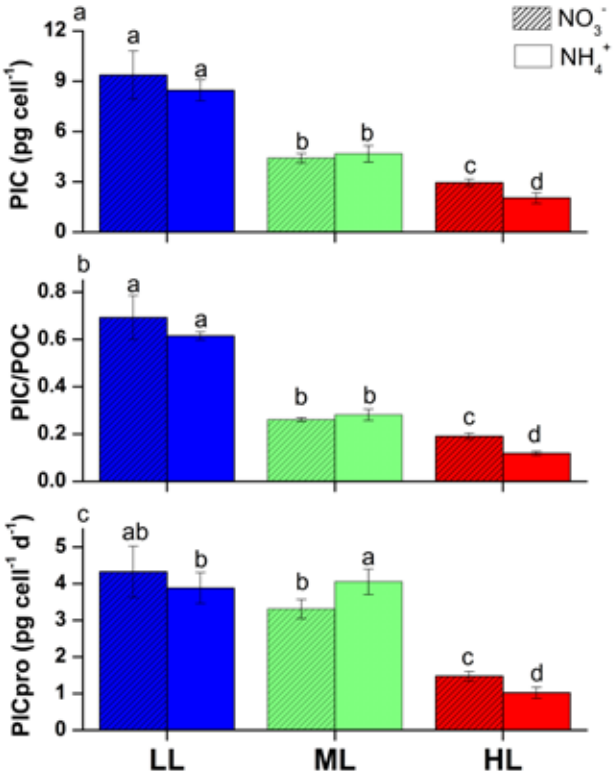


Fig. 12 | Cellular PIC content (a), PIC/POC ratio (b) and PIC production rate (c) in and -grown cultures under nitrogen limited conditions at LL (50 μmol $m^{-1}s^{-1}$), ML (190 μmol $m^{-1}s^{-1}$) and HL (400 μmol $m^{-1}s^{-1}$). The different letters above the bars indicate significant differences among the treatments ($p < 0.05$). The values are the means and error bars are standard deviations for triplicate cultures at each treatment.

Ecological relevance of energy metabolism: transcriptional responses in energy sensing and expenditure to thermal and osmotic stresses in an intertidal limpet

Dong, YW; Zhang, S. ***FUNCTIONAL ECOLOGY***, 2016. 30: 1539-1548.

Abstract: 1. For rocky intertidal species that experience changes in a number of potential stressors seasonally and during the tidal cycle, sensing cellular energy status and modulating it adaptively may be crucial for responding to stressor effects. However, the responses of energy metabolism of intertidal species to multiple sublethal stressors are still unclear. 2. Here, we examined gene expression profiles of biomarkers related to sensing of cellular energy status and regulation of catabolism and energy expenditure in a mid-intertidal limpet *Cellana toreuma* for elucidating the species' cellular energy responses stresses from high temperature, desiccation and rainfall. 3. Expression levels of genes encoding metabolic regulators [two subunits of AMP-activated protein kinase, ampkα, ampkβ; Fu gene inhibition axis formation, axin; two sirtuins, NAD-dependent deacetylase sirtuin-1 (sirt1); NAD-dependent deacetylase sirtuin-5 (sirt5)], metabolic enzymes (hexokinase, hk; pyruvate kinase, pk; isocitrate dehydrogenase, idh) and heat shock protein 70 (hsp70) were quantified in specimens exposed to different temperatures and aerial/freshwater spray conditions. 4. Based on the gene expression patterns, all individuals could be divided into three groups with divergent cellular energy status, indicating that the selected target genes are appropriate indicators of cellular metabolism. The divergent gene expression patterns indicated a sequence in which individuals from group 1, group 2 and group 3 were faced with increasing energy stress. 5. The frequency distributions of individuals in the three groups were different among different time points and treatments, indicating that high temperature, desiccation, and rainfall, singly or in combination, could cause energy stress. 6. Compared to the high percentage (100%) of individuals placed in the highest-stress group (group 3), after 2 h of freshwater spray at 18 degrees C, the lower percentage (77.8%) of individuals in group 3 after 2 h of freshwater spray at 30 degrees C indicated the existence of interactive effects of high temperature and rain; high temperature resulted in a lower response of cellular energy metabolism to rainfall. 7. Sublethal environmental stresses from single stressors such as temperature or osmotic challenges can lead to cellular energy stress. Interactions among stressors may lead to a complex overall effect on cellular energy status in intertidal species.

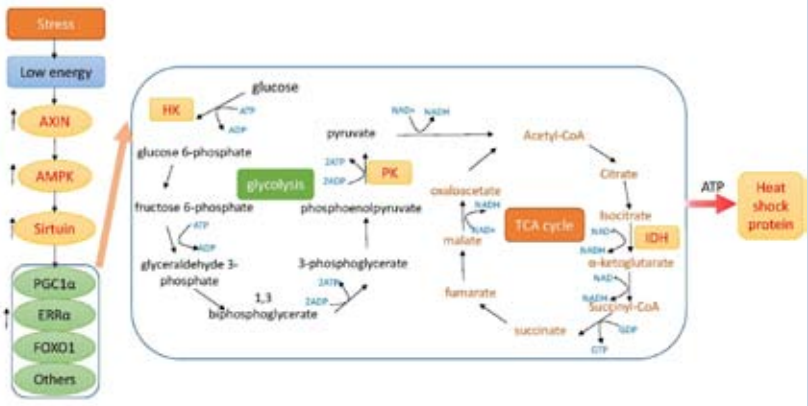
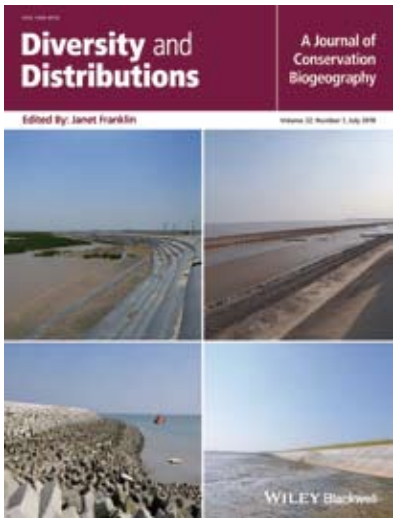


Fig. 13 | Scheme showing the action of metabolic sensors, enzymes involving glycolysis and the tricarboxylic acid cycle (TCA cycle), and heat shock proteins. In low cellular energy status (high AMP/ATP ratio), AMP can induce the upregulation of AXIN, AMP-activated Kinase (AMPK) and Sirtuins (SIRT). AXIN plays an essential role for AMPK activation by orchestrating AMPK and serine-threonine liver kinase B1 (LKB1) (Zhang et al. 2013). AMPK and SIRT can activate each other. The impact of AMPK and SIRT1 on peroxisome proliferator-activated receptor-γ coactivator 1α (PGC-1α), oestrogen-related receptor α (ERRα), forkhead box O (FOXO) and other transcriptional regulators will then affect carbohydrate and lipid metabolism to produce ATP for stress responses (Cantó et al. 2009).

The marine 'great wall' of China: local- and broad-scale ecological impacts of coastal infrastructure on intertidal macrobenthic communities

Dong, YW; Huang, XW; Wang, W; Li, Y; Wang, J. ***DIVERSITY AND DISTRIBUTIONS***, 2016. 22: 731-744.

Abstract: Aim Increasing areas of artificial infrastructure are being built along coastlines for purposes of land reclamation and coastal defences. Impacts of these structures on intertidal communities could be severe. Here, we tested the hypothesis that artificial structures can alter intertidal community composition by providing hard substrata for rocky intertidal species, and can serve as 'stepping stones' that facilitate broad-scale migration of rocky intertidal species and may weaken a phylogeographic transition. Location: Chinese intertidal ecosystem. Methods: Three-year field ecological survey of macrobenthic species and phylogeographic analyses of three common species found on artificial structures and nearby natural rocky shores. Results: (1) Artificial substrata were rapidly colonized by rocky intertidal species, and in the mid-and high-intertidal zone, habitats were occupied by some widely distributed rocky intertidal species. (2) Distance to the nearest rocky shore and age of the artificial structures were important for species richness and community composition on the artificial structures. (3) Both ecological and genetic data showed that most populations on the artificial structures north of the Yangtze River estuary were derived by migration from natural rocky shores south of the Yangtze River estuary. This estuary formed a phylogeographic and biogeographic transition for intertidal species along China's coastline. Main conclusions: (1) Artificial structures associated with large-scale land reclamation along China's coastline provide appropriate habitats for rocky shore species; (2) because artificial structures are ubiquitous world-wide, the biogeography of rocky shore species and other ecological impacts of this infrastructure along global coastlines should be reconsidered under the coupled impacts of climate change and human activities.



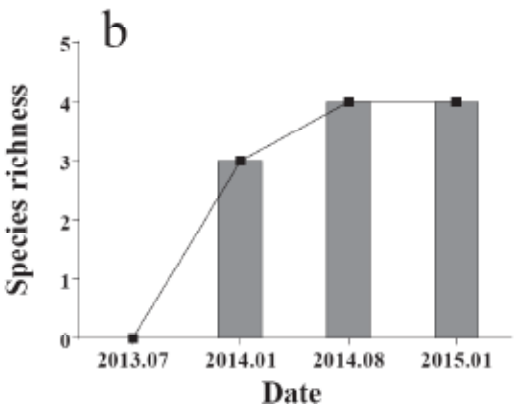


Fig. 14 | (a) Zhonganpeng, an artificial structure that was built in July 2013; (b) the species richness on the artificial structure in Zhonganpeng from July 2013 to January 2015.

Data compilation on the biological response to ocean acidification: an update

Yang, Y; Hansson, L; Gattuso, JP. ***EARTH SYSTEM SCIENCE DATA***, 2016. 8: 79-87.

Abstract: The exponential growth of studies on the biological response to ocean acidification over the last few decades has generated a large amount of data. To facilitate data comparison, a data compilation hosted at the data publisher PANGAEA was initiated in 2008 and is updated on a regular basis (doi: 10.1594/PANGAEA.149999). By January 2015, a total of 581 data sets (over 4 000 000 data points) from 539 papers had been archived. Here we present the developments of this data compilation 5 years since its first description by Nisumaa et al. (2010). Most of the study sites from which data have been archived are in the Northern Hemisphere and the number of archived data from studies from the Southern Hemisphere and polar oceans is still relatively low. Data from 60 studies that investigated the response of a mix of organisms or natural communities were all added after 2010, indicating a welcome shift from the study of individual organisms to communities and ecosystems. The initial imbalance of considerably more data archived on calcification and primary production than on other processes has improved. There is also a clear tendency towards more data archived from multifactorial studies after 2010. For easier and more effective access to ocean acidification data, the ocean acidification community is strongly encouraged to contribute to the data archiving effort, and help develop standard vocabularies describing the variables and define best practices for archiving ocean acidification data.

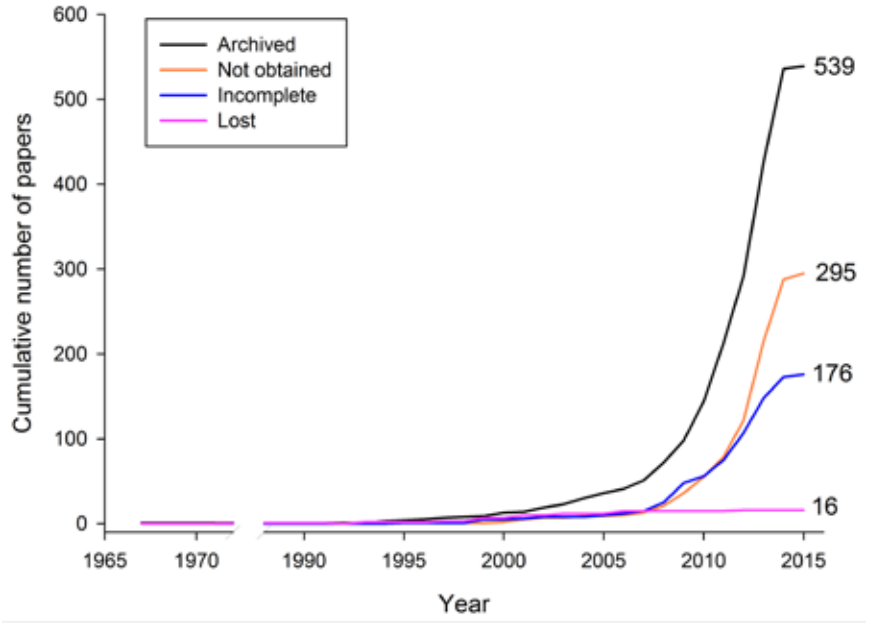


Fig. 15 | Cumulative number of papers for which data have been included in the compilation ("archived"), papers for which data could not be obtained ("not obtained"), papers which reported less than two carbonate system parameters ("incomplete") and papers for which the data have been lost ("lost").

海洋污染与生态毒理
Marine Ecotoxicology

The potential immune modulatory effect of chronic bisphenol A exposure on gene regulation in male medaka (*Oryzias latipes*) liver

Qiu, WH; Shen, Y; Pan, CY; Liu, S; Wu, MH; Yang, M; Wang, KJ. ***ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY***, 2016. 130: 146-154.

Abstract: Bisphenol A (BPA) is a well-known estrogenic endocrine disrupting chemical (EDC) ubiquitously present in various environmental media. The present study aims to identify the responsive genes in male fish chronically exposed to low concentrations of BPA at the transcription level. We screened genes from a suppression subtractive hybridization library constructed from male medaka (*Oryzias latipes*) livers after 60-d exposure to 10 μg/L BPA under the condition at which changes of hepatic antioxidant parameters have been previously reported. The identified genes were predicted to be involved in multiple biological processes including antioxidant physiology, endocrine system, detoxification, notably associated with the immune response processes. With real time PCR analysis, the immune-associated genes including hepcidin-like precursor, complement component and factors, *MHC class I*, *alpha-2-macroglobulin* and *novel immune-type receptor* 6 isoform were significantly up-regulated in a nonmonotonic dose response pattern in livers upon exposure to different concentrations of BPA (0.1, 1, 10, 100, 1000 μg/L). Our results demonstrated a negative impact on gene regulation in fish chronically exposed to relatively low and environmentally relevant concentrations of BPA, and suggested the potential immune modulatory effect of chronic EDC exposure on fish. The immunotoxicity of BPA and other EDCs should be much concerned for the health of human beings and other vertebrates exposed to it.

Influences of humic acid on the bioavailability of phenanthrene and alkyl phenanthrenes to early life stages of marine medaka (*Oryzias melastigma*)

Liu, YZ; Yang, CH; Cheng, PK; He, XJ; Zhu, YX; Zhang, Y. ***ENVIRONMENTAL POLLUTION***, 2016. 210: 211-216.

Abstract: The influences of humic acid (HA) on the environmental behavior and bioavailability of parent polycyclic aromatic hydrocarbons (PAHs) and alkyl PAHs were investigated and compared using the early life stages of marine medaka (*Oryzias melastigma*, *O. melastigma*). It was demonstrated that the binding affinity of parent phenanthrene (PHE) with HA was smaller than that of 3-methyl phenanthrene (3-MP) and 9-ethyl phenanthrene (9-EP). Furthermore, the bioaccumulation of the three PAHs and the levels of lipid per oxidation (LPO) were calculated to study the changes in bioavailability of PAHs in presence of HA. The results indicated that the addition of HA significantly decreased the bioaccumulation and toxicity of PAHs by decreasing free PAHs concentrations. The bioavailable fractions of HA-bound PAHs in bioaccumulation (α) and toxicity (β) were evaluated, indicating that the HA-bound 3-MP and 9-EP show higher bioavailability in bioaccumulation and lower bioavailability in toxicity relative to those of PHE. The beta/alpha values were less than 1 for all PAH treatment groups containing HA, suggesting that the fraction of HA bound PAHs contributing to bioaccumulation was higher than that of HA-bound PAHs inducing toxic effect. In addition, we proposed that the free PAHs generated by desorption from HA in the cell were toxic by showing that the β/α ratio values are correlated with the log Kow values (p = 0.007 and R^2 = 0.8355). Thus, oil spill risk assessments should consider both alkyl PAHs and the factors that influence the bioavailability and toxicity of PAHs in the natural aquatic environments.

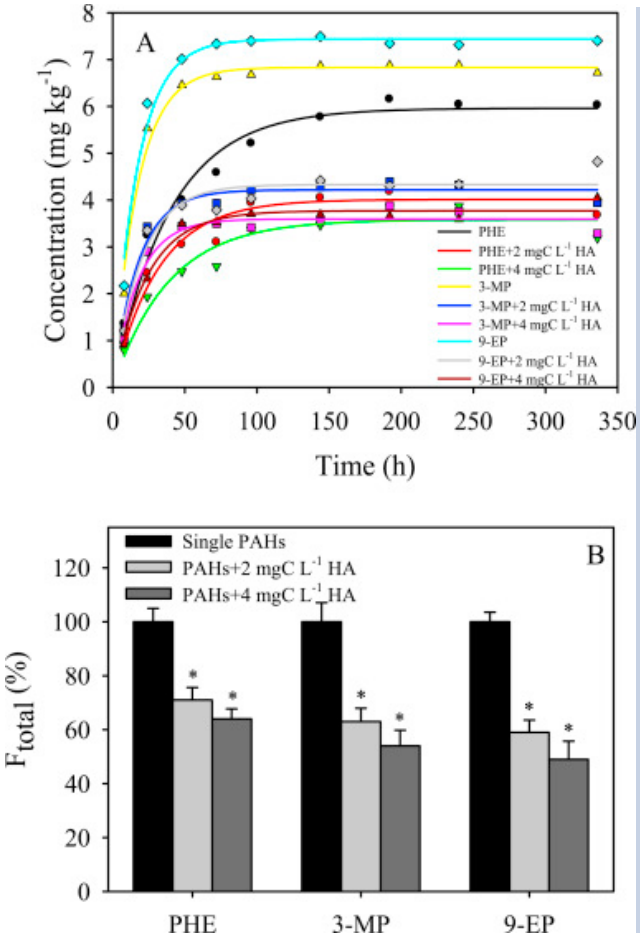


Fig. 16 | Effects of HA on the bioaccumulation of PAHs. (A) Uptake kinetics of the PAHs by O. melastigma in the absence and presence of HA. Data points correspond to mean values (n=3 trials; measurement replicated 3 times^{-1}). Normalized bioaccumulation factors (F) of the PAHs to fish based on the total (B) and free (C) PAHs in different treatment groups containing nominal PAHs concentrations of 2.0 × 10^{-6} mol L^{-1}. Bars correspond to mean values; error bars represent SEM (n=3 replicates; 3 measurements replicate−1). The asterisk (*) indicates significant difference relative to the test systems without HA ($p < 0.05$).

In situ visualization and quantitative investigation of the distribution of polycyclic aromatic hydrocarbons in the micro-zones of mangrove sediment

Li, RL; Zhu, YX; Zhang, Y. ***ENVIRONMENTAL POLLUTION***, 2016. 219: 245-252.

Abstract: The distribution of polycyclic aromatic hydrocarbons (PAHs) in the micro-zones of mangrove sediment is a predominant factors determining PAH bioavailability. In this study, a novel method for the in situ visualization (via microscope) and quantitative investigation of the PAH distribution in the micro-zones of mangrove sediment was established using microscopic fluorescence spectral analysis combined with derivative synchronous fluorescence spectroscopy (MFSA-DSFS). The MFSA-DSFS method significantly suppressed the background fluorescence signal of the sediment (the S/N values increased by over two orders of magnitude). The proportion of the nonpolar organic carbon content in the particulate organic matter (POM) rather than its content in the total organic matter (TOM) showed a significantly positive correlation with the uneven PAH distribution (Relative DC-M values) evaluated using the established method ($p < 0.05$). The extent of the uneven PAH distribution in the micro-zones of aged sediment was higher than that in the spiked sediment. Moreover, the distribution pattern of the PAHs within the mangrove sediment changed to become more homogeneous in the presence of low-molecular-weight organic acids (LMWOAs), which primarily contribute to increasing the POM content.

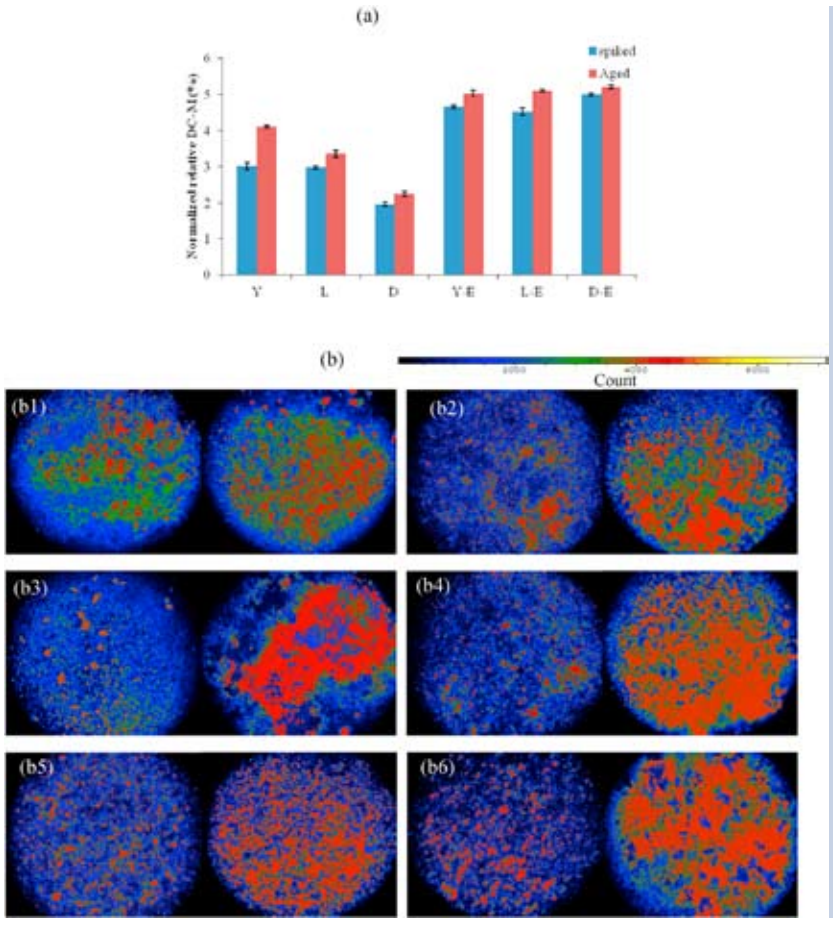


Fig. 17 | Results of normalized relative DC-M and FM images of Ant on micro-zones of mangrove sediment (n = 30) (a) the normalized relative DC-M value of Ant on micro-zones of spiked and aged mangrove sediment (n = 30) (b) the fluorescence images (b1, b2, b3 b4 b5 and b6 represents the lowest (left) and highest (right) concentration of Ant on micro-zones of spiked mangrove sediment (Y), (L), (D), (Y–E), (L–E) and (D–E), respectively).

On instability and mixing on the UK Continental Shelf

Liu, ZY. ***JOURNAL OF MARINE SYSTEMS***, 2016. 158: 72-83.

Abstract: The stability of stratified flows at locations in the Clyde, Irish and Celtic Seas on the UK Continental Shelf is examined. Flows are averaged over periods of 12-30 min in each hour, corresponding to the times taken to obtain reliable estimates of the rate of dissipation of turbulent kinetic energy per unit mass, epsilon. The Taylor Goldstein equation is solved to find the maximum growth rate of small disturbances to these averaged flows, and the critical gradient Richardson number, Ri_c. The proportion of unstable periods where the minimum gradient Richardson number, Ri_{min}, is less than Ri_c is about 35%. Cases are found in which $Ri_c < 0.25$; 37% of the flows with $Ri_{min} < 0.25$ are stable, and $Ri_c < 0.24$ in 68% of the periods where $Ri_{min} < 0.25$. Marginal conditions with $0.8 < Ri_{min}/Ri_c < 1.2$ occur in 30% of the periods examined. The mean dissipation rate at the level where the fastest growing disturbance has its maximum amplitude is examined to assess whether the turbulence there is isotropic and how it relates to the wave-turbulence boundary. It is concluded that there is a background level of dissipation that is augmented by instability; instability of the averaged flow does not account for all the turbulence observed in mid-water. The effects of a horizontal separation of the measurements of shear and buoyancy are considered. The available data do not support the hypothesis that the turbulent flows observed on the UK shelf adjust rapidly to conditions that are close to being marginal, or that flows in a particular location and period of time in one sea have stability characteristics that are very similar to those in another.

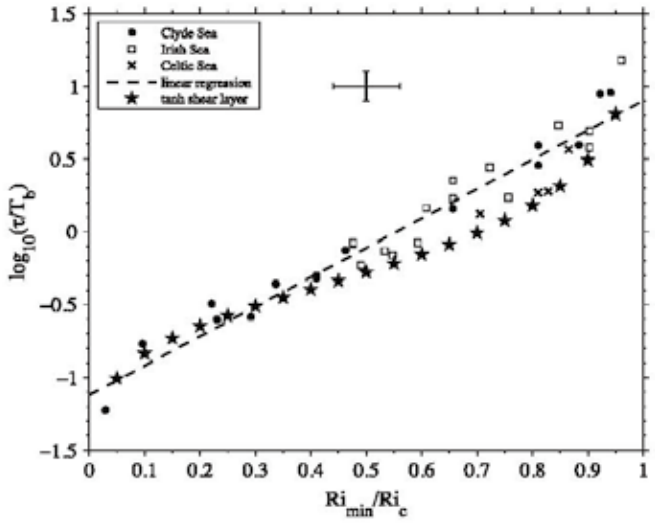


Fig. 18 | The variation of $\log_{10}(\tau/Tb)$ with Ri_{min}/Ri_c ($= (1+\Phi_c)^2$). Data from the three seas are shown as: • Clyde, □Irish and × Celtic. The cross indicates uncertainty of the estimated values. The uncertainty in Ri_{min}/Ri_c(about 0.06) shown in the figure is estimated from the uncertainties in estimates of Ri due to the separation of the ADCP and FLY data, judged to be about 0.03 as for Rimin in Appendix A. (Since $Ri_{min}/Ri_c = (1+\Phi_c)^2$, an estimated uncertainty of $\Delta\Phi_c \approx 0.02$ in Φ_c gives an uncertainty in Ri_{min}/Ri_c of about $2(1+\Phi_c)\Delta\Phi_c < 0.08$, since $|\Phi_c|$ is generally < 1, reasonably consistent with the above estimate.) Data for a simple hyperbolic tangent shear layer is shown as☆ .

Deep-reaching thermocline mixing in the equatorial Pacific cold tongue

Liu, CY; Kohl, A; Liu, ZY; Wang, F; Stammer, D. ***NATURE COMMUNICATIONS***, 2016. 7, doi: 10.1038/ncomms11576.

Abstract: Vertical mixing is an important factor in determining the temperature, sharpness and depth of the equatorial Pacific thermocline, which are critical to the development of El Nino and Southern Oscillation (ENSO). Yet, properties, dynamical causes and large-scale impacts of vertical mixing in the thermocline are much less understood than that nearer the surface. Here, based on Argo float and the Tropical Ocean and Atmosphere (TAO) mooring measurements, we identify a large number of thermocline mixing events occurring down to the lower half of the thermocline and the lower flank of the Equatorial Undercurrent (EUC), in particular in summer to winter. The deep-reaching mixing events occur more often and much deeper during periods with tropical instability waves (TIWs) than those without and under La Niña than under El Niño conditions. We demonstrate that the mixing events are caused by lower Richardson numbers resulting from shear of both TIWs and the EUC.

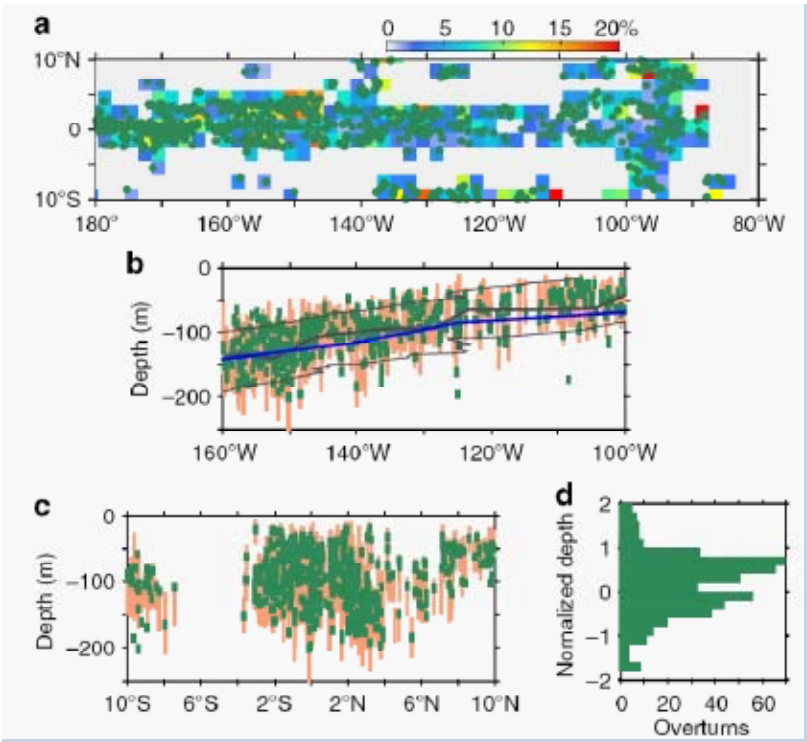


Fig. 19 Spatial distribution of detected density overturns in the equatorial Pacific cold tongue. (a) Occurrence probability (colour) and horizontal locations of overturns (dark green dots). (b) Depth and sizes (in metres) of the overturns (dark green bars) occurred between 3°S and 6°N, and the corresponding PLs (light orange bars) from a latitudinal view. The blue curve denotes the mean depth of the EUC core (averaged over ±1°; data are obtained over the 1990s (ref. 70)). The thick black curve and thin black curves denote the centre (depth of maximum N2;N2max) and bounds (depths of half N2 max) of the mean pycnocline. N2 is calculated from sample mean density that is meridionally averaged from all fine-resolution Argo profiles over ±1°. (c) The same as in b but assembled from data between 160 and 100°W (curves of average variables are not added due to large zonal variation). (d) Histogram of overturns at the referenced and normalized vertical coordinate.

Progress on upwelling studies in the China seas

Hu, JY; Wang, XH. ***REVIEWS OF GEOPHYSICS***, 2016. 54: 653-673.

Abstract: East Asian marginal seas surrounding China exhibit rich ocean upwelling, mostly in response to the southwesterly summer monsoon. Upwelling in the China seas, namely, the South China Sea, the Taiwan Strait, the East China Sea, the Yellow Sea, and the Bohai Sea, has become increasingly important because the potential changes in the upwelling may have dramatic ecosystem, socioeconomic, and climate impacts. This paper reviews the progress of upwelling studies in the China seas since the year 2000, by presenting the principal characteristics and new understanding of 12 major upwelling regions in the China seas. Upwelling exhibits long-term variability at intraseasonal to multidecadal scales as well as short-term variability frequently caused by tropical cyclones. It is also associated with the El Niño-Southern Oscillation, local environmental variation, and biogeochemical factors. The coastal upwelling around Hainan Island and the upwelling or cold dome northeast of Taiwan Island are specifically highlighted because they have attracted great interest for decades. This paper summarizes upwelling mechanisms in terms of wind, topography, tide, stratification, and background flow, with applications mostly to the China seas. Finally, we propose some topics for future upwelling research, i.e., potential intensification of coastal upwelling under global climate change, downwelling, intrusion of upwelling into coastal embayments, and the influence of upwelling on fishery and biogeochemical processes.

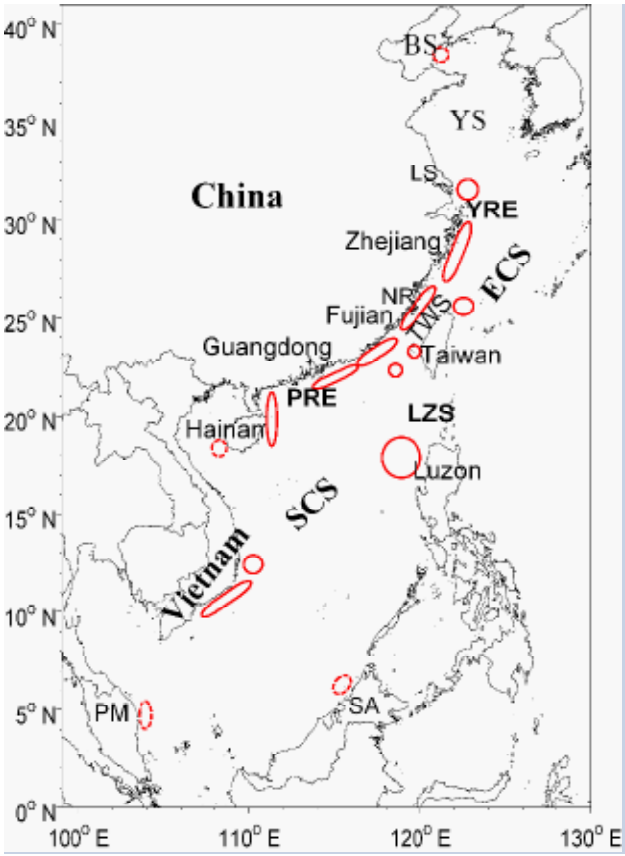


Fig. 20 | Map of the China seas, including the South China Sea (SCS), the Taiwan Strait (TWS), the East China Sea (ECS), the Yellow Sea (YS), and the Bohai Sea (BS). In the figure, the Yangtze River Estuary and the Pearl River Estuary are indicated by YRE and PRE, respectively. PM stands for the Peninsular Malaysia; LZS for Luzon Strait; and LS, NR, and SA for Lüsi, Nanri, and Sabah, respectively. The red ellipses or circles schematically mark locations of the major upwelling regions in the China seas. The ellipses or circles in dashed lines are upwelling regions that are sometimes mentioned.

The global warming hiatus: Slowdown or redistribution?

Yan, XH; Boyer, T; Trenberth, K; Karl, TR; Xie, SP; Nieves, V; Tung, KT; Roemmich, D. ***EARTH'S FUTURE***, 2016. 4, doi:10.1002/2016EF000417.

Abstract: Global mean surface temperatures (GMST) exhibited a smaller rate of warming during 1998–2013, compared to the warming in the latter half of the 20th Century. Although, not a "true" hiatus in the strict definition of the word, this has been termed the "global warming hiatus" by IPCC (2013). There have been other periods that have also been defined as the "hiatus" depending on the analysis. There are a number of uncertainties and knowledge gaps regarding the "hiatus". This report reviews these issues and also posits insights from a collective set of diverse information that helps us understand what we do and do not know. One salient insight is that the GMST phenomenon is a surface characteristic that does not represent a slowdown in warming of the climate system but rather is an energy redistribution within the oceans. Improved understanding of the ocean distribution and redistribution of heat will help better monitor Earth's energy budget and its consequences. A review of recent scientific publications on the "hiatus" shows the difficulty and complexities in pinpointing the oceanic sink of the "missing heat" from the atmosphere and the upper layer of the oceans, which defines the "hiatus". Advances in "hiatus" research and outlooks (recommendations) are given in this report.

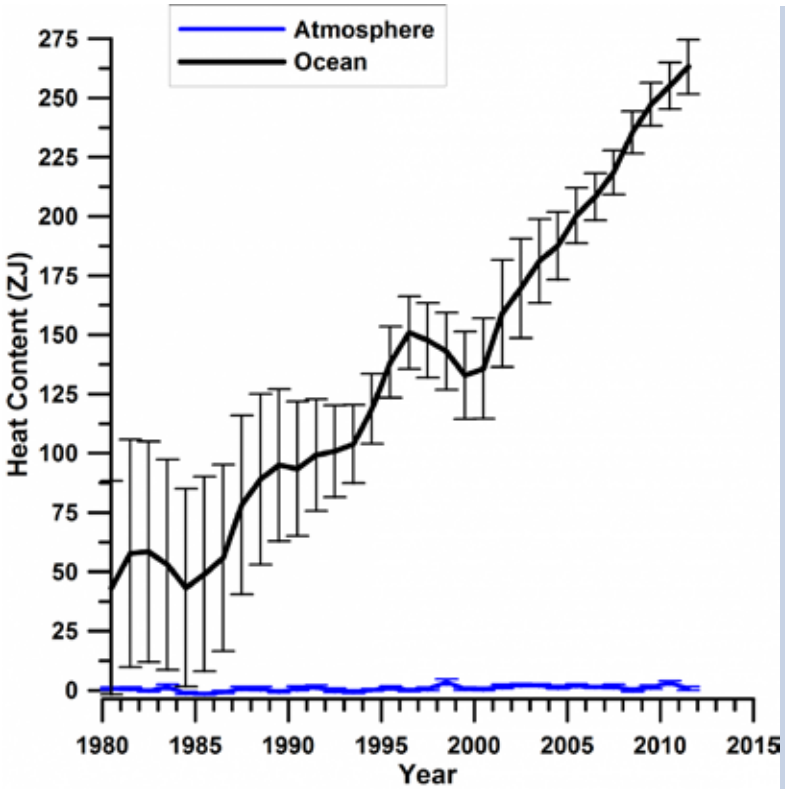


Fig. 21 | Yearly ocean (black) and atmosphere (blue) heat content anomaly (data from IPCC AR5 report) shows the vast amount of heat absorbed by the ocean compared to the atmosphere. Ocean heat content combines upper and deep ocean heat content values for each year computed from IPCC AR5 report. Support of the subsurface ocean observing system including Argo profiling floats and subsurface remote sensing, and more coastal responses research were recommended.

Dynamical link between the Barents-Kara sea ice and the Arctic Oscillation

Yang, XY; Yuan, XJ; Ting, MF. ***JOURNAL OF CLIMATE***, 2016. 29: 5103-5122.

Abstract: The recent accelerated Arctic sea ice decline has been proposed as a possible forcing factor for midlatitude circulation changes, which can be projected onto the Arctic Oscillation (AO) and/or North Atlantic Oscillation (NAO) mode. However, the timing and physical mechanisms linking AO responses to the Arctic sea ice forcing are not entirely understood. In this study, the authors suggest a connection between November sea ice extent in the Barents and Kara Seas and the following winter's atmospheric circulation in terms of the fast sea ice retreat and the subsequent modification of local air-sea heat fluxes. In particular, the dynamical processes that link November sea ice in the Barents and Kara Seas with the development of AO anomalies in February is explored. In response to the lower-tropospheric warming associated with the initial thermal effect of the sea ice loss, the large-scale atmospheric circulation goes through a series of dynamical adjustment processes: The decelerated zonal-mean zonal wind anomalies propagate gradually from the subarctic to midlatitudes in about one month. The equivalent barotropic AO dipole pattern develops in January because of wave-mean flow interaction and firmly establishes itself in February following the weakening and warming of the stratospheric polar vortex. This connection between sea ice loss and the AO mode is robust on time scales ranging from interannual to decadal. Therefore, the recent winter AO weakening and the corresponding midlatitude climate change may be partly associated with the early winter sea ice loss in the Barents and Kara Seas.

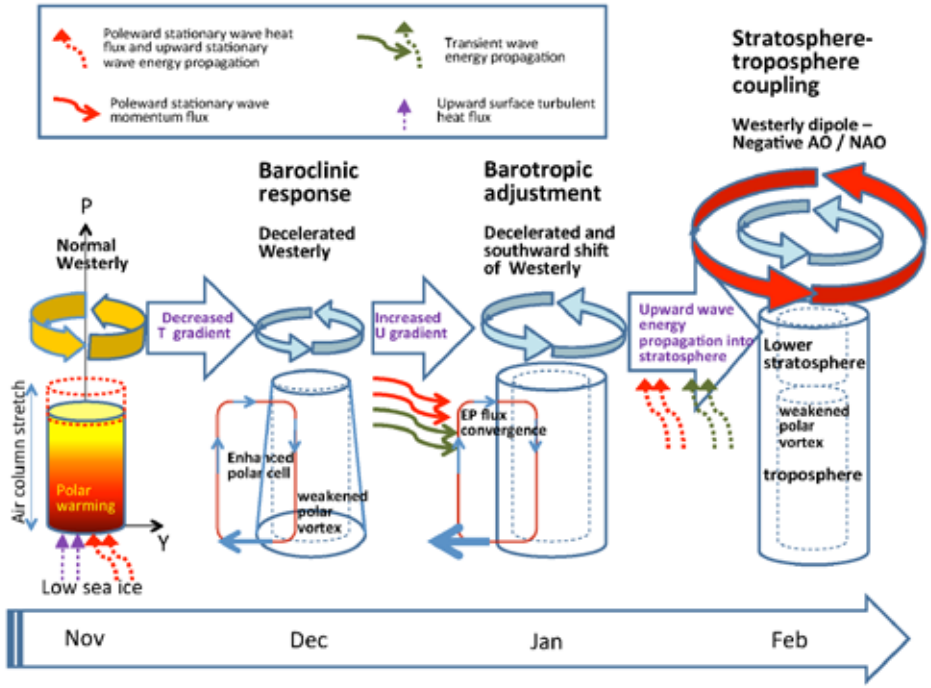


Fig. 22 | Schematic diagram depicting the winter atmospheric circulation response to the November BK sea ice retreat. The seasonal evolution from November to February is marked across the bottom, with by the corresponding atmospheric circulation responses above, and the cylinders denoting the polar air columns. The key processes responsible for transmitting the atmospheric anomalous signals through time are labeled within the big blue arrows. Normal, decelerated, and accelerated westerlies are shown as yellow, blue, and red circular arrows, respectively.

Changes in water clarity of the Bohai Sea: Observations from MODIS

Shang, SL; Lee, ZP; Shi, L; Lin, G; Wei, GM; Li, X. ***REMOTE SENSING OF ENVIRONMENT***, 2016. 186: 22-31.

Abstract: Water clarity, which is commonly and widely represented by the Secchi depth (Z_{sd}), is an important quality parameter for all aquatic environments. To evaluate the variation of water clarity of the Bohai Sea (BHS) in the past decade (2003–2014), Z_{sd} is derived from MODIS-Aqua ocean color data with an innovative mechanistic model. The resulted Z_{sd} product from MODIS is found within 23% differences of match-up in situ measurements that span a range of 2–12 m. Based on this validated MODIS Zsd product of the BHS, valuable findings regarding water clarity of the BHS over the period of 2003–2014 are obtained for the first time. For the central BHS, the climatological mean Z_{sd} in August of 2003–2014 (3.9 m) is found strikingly lower than that observed in situ in August of 1982–1983 (8.7 m), 1959–1979 (8–12 m) and 1972–1987 (8–14 m). This implies substantial deterioration of water clarity in the central BHS after the late 1980s, an unpleasant byproduct of rapid economic development in the BHS surrounding regions initiated in the mid-1980s. On the other hand, no significant variations in Z_{sd} in the central BHS is detected for the period of 2003–2014, suggesting deterioration of water clarity of this water body is not continued. Results fromthis effort highlight the value of both the analytically-derived Z_{sd} product and satellite ocean color remote sensing in monitoring water quality of coastal seas.

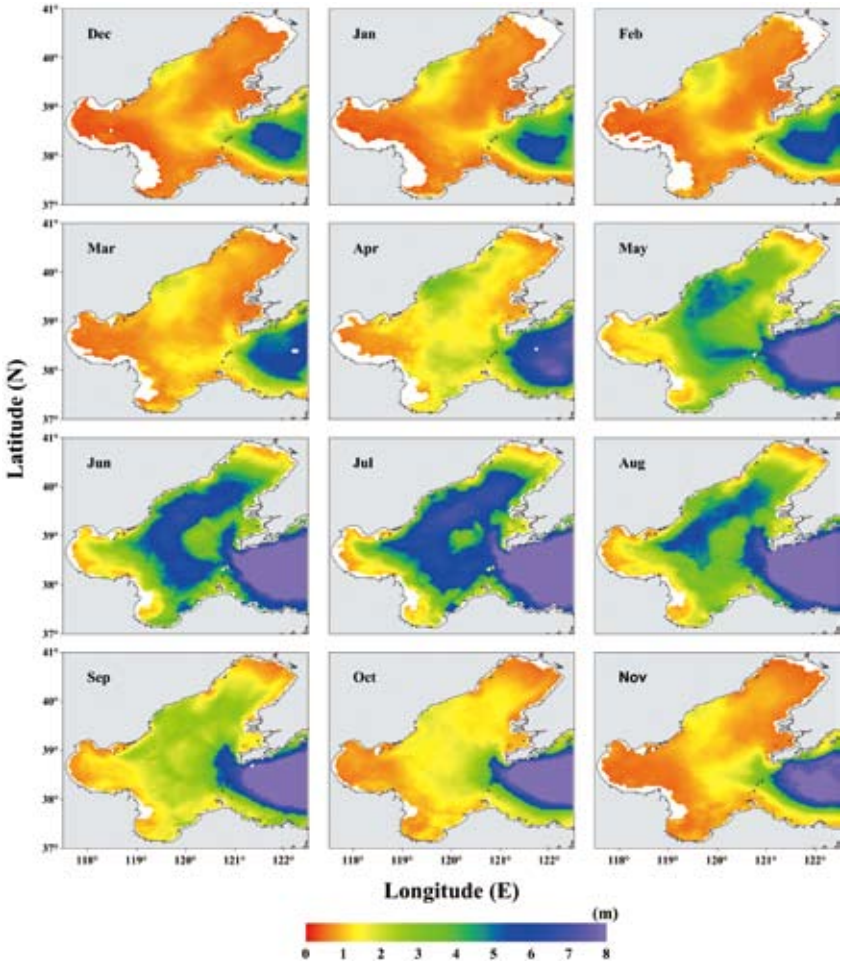


Fig. 24 | Climatological monthly mean Zsd in the Bohai Sea during 2003–2014.

Automated determination of nitrite in aqueous samples with an improved integrated flow loop analyzer

Liu, BM; Su, HT; Wang, S; Zhang, Z; Liang, Y; Yuan, DX; Ma, J. ***SENSORS AND ACTUATORS B-CHEMICAL,*** 2016. 237: 710-714.

Abstract: A compact loop flow analyzer was developed for automated determination of nitrite in aqueous samples based on Griess reaction and spectrophotometric detection. The integrated system employed a customized single chip microcomputer based hardware and laboratory-programmed software written by LabVIEW to control the injection valve, pumps and optical detection module. Experimental parameters related to nitrite analysis, including the reagent volume, sample temperature and salinity were evaluated and optimized. This fully automated analyzer showed a limit of detection as low as 0.02 μM with sample throughput of 15 h^{-1}. The calibration curves prepared in pure water and low nutrient seawater were consistent over the linear range of 0-10 μM (R^2=0.999), showing insignificant interference from the common ions in seawater. Different aqueous samples were successfully analyzed using both the present analyzer and the standard benchtop method, and the results from the two techniques showed no significant difference according to the statistical t-test (*P*=0.95). This compact automatic analyzer is simple, fully integrated, and user-friendly, making it highly suitable for field applications, such as on-line environmental monitoring and underway analysis.

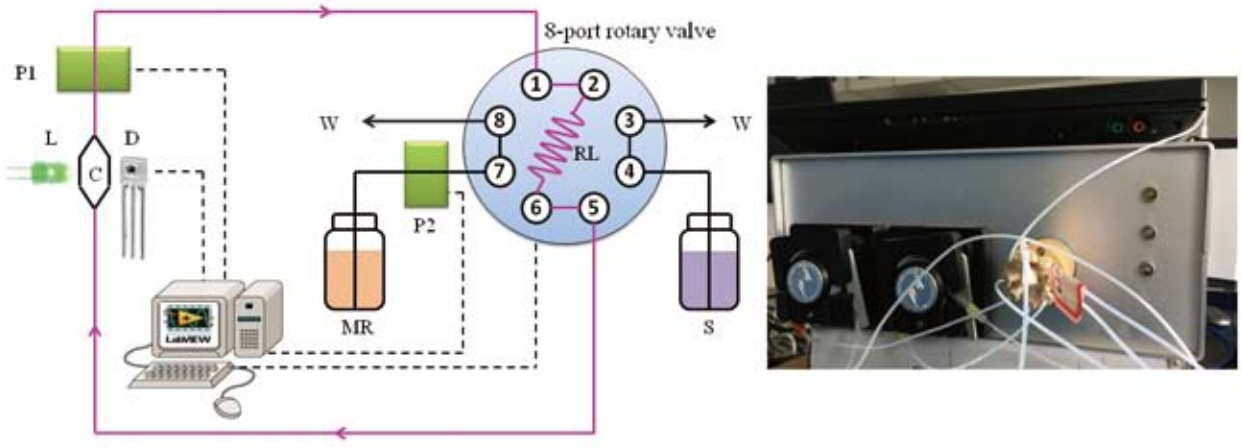


Fig. 25 | Schematic diagram of the integrated loop flow analyzer. PP1/2: peristaltic pump 1/2; L: light source; C: cell; D: detector; W: waste; RL: reagent loop; MR: mixed reagent; S, sample. The volumes of reaction loop and sample loop are 75 μL and ~3 mL, respectively.

A simple and cost-effective manual solid phase extraction method for the determination of nanomolar dissolved reactive phosphorus in aqueous samples

Yuan, Y; Wang, S; Yuan, DX; Ma, J. ***LIMNOLOGY AND OCEANOGRAPHY-METHODS,*** 2016. 14: 79-86.

Abstract: Phosphate is a typical limiting nutrient in oligotrophic oceans and its concentration can be as low as the nanomolar level, especially in surface seawater. Different techniques for nanomolar level phosphate determination have been studied, most of which are automatic and high throughput methods based on flow analysis. However, these techniques need expensive commercial or laboratory-made instruments, and experienced operators. This study reports an operationally convenient, sensitive and practical method for the determination of nanomolar dissolved reactive phosphorus in aqueous samples, based on classic phosphomolybdenum blue chemistry and solid phase extraction methodology. Under acidic conditions, the formed phosphomolybdenum blue can be preconcentrated on a hydrophilic-lipophilic balance solid phase cartridge, eluted with 0.2 M NaOH, and detected at 700 nm after color recovery with the addition of more reagents. After optimization of the recovery reagents volumes, the effectiveness of the method was evaluated. This simple manual method is sensitive (detection limit of 3.0 nM using 50 mL sample, which can be lowered to similar to 1 nM by preconcentrating more sample), reproducible (relative standard deviation of 2.6%, n=81, with different operators), free of interferences from salinity (0-35), silicate (up to 200 μM) and arsenate (up to 100 nM) and suitable for different aqueous matrixes. The effects of a series of phosphorus-containing compounds (n=13) were evaluated, with more than half showing hydrolysis during the experiment. This method was applied to determine the phosphate concentration in samples collected from the Western Pacific.

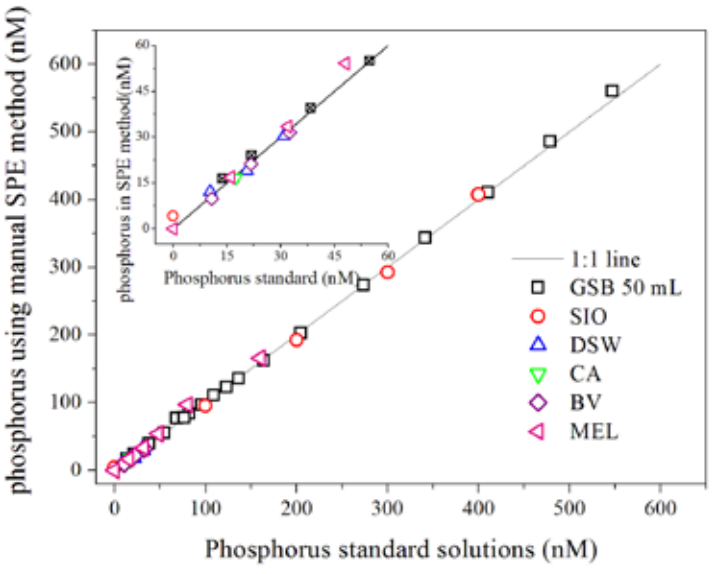


Fig. 26 | Determination of different kinds of phosphate standard solutions. GSBZ: phosphate standards from Institute for Environmental Reference Materials; GBW: phosphate standards solution from Second Institute of Oceanography; DSW: reference in seawater collected in the North Pacific Ocean at 1400 m; CA and BV: phosphate standards in seawater Lot. CA and BV from the General Environmental Technos; MEL: phosphate standards prepared from the State Key Laboratory of Marine Environmental Science.

The discovery of the hydrogen bond from p-Nitrothiophenol by Raman spectroscopy: Guideline for the thioalcohol molecule recognition tool

Ling, Y; Xie, WC; Liu, GK; Yan, RW; Wu, DY; Tang, J. ***SCIENTIFIC REPORTS***, 2016. 6, doi:10.1038/srep31981.

Abstract: Inter- and intra-molecular hydrogen bonding plays important role in determining molecular structure, physical and chemical properties, which may be easily ignored for molecules with a non-typical hydrogen bonding structure. We demonstrated in this paper that the hydrogen bonding is responsible for the different Raman spectra in solid and solution states of p-Nitrothiophenol (PNTP). The consistence of the theoretical calculation and experiment reveals that the intermolecular hydrogen bonding yields an octatomic ring structure $R_2^2(8)$ of PNTP in the solid state, confirmed by the characteristic S-H---O stretching vibration mode at 2550 cm^{-1}; when it comes to the solution state, the breakage of hydrogen bond of S-H---O induced the S-H stretching vibration at 2590 cm^{-1}. Our findings may provide a simple and fast method for identifying the intermolecular hydrogen bonding.

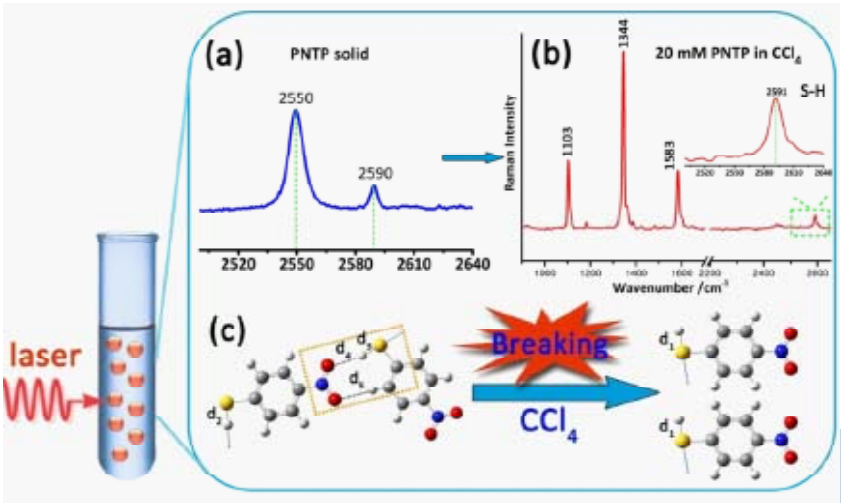
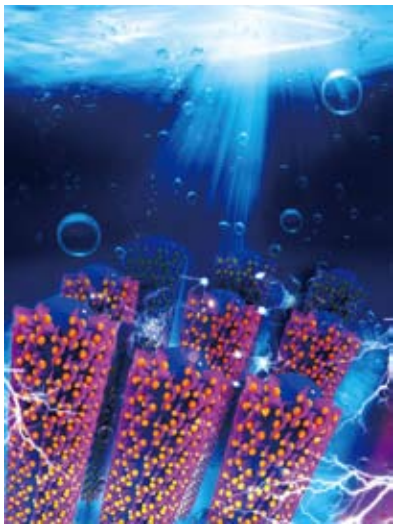


Fig. 27 | (a) Normal Raman spectra of the PNTP solid. (b) Normal Raman spectra of PNTP dissolved in CCl_4. Inset: zooming in the region 2500-2640 cm^{-1}. (c) Schematic illustration of hydrogen bond structure and breakage into two PNTP molecules.

Enhanced performance of photoelectrochemical water oxidation using a three-dimensional interconnected nanostructural photoanode via simultaneously harnessing charge transfer and coating with an oxygen evolution catalyst

Cai, ZX; Li, FM; Xu, W; Jiang, YQ; Luo, F; Wang, YR; Chen, X. ***NANO ENERGY***, 2016. 26: 257-266.

Abstract: The most important factors dominating photoelectrochemical (PEC) water splitting performance include light absorption, charge separation and transport, and surface chemical reactions. In order to meet these factors, a novel $Fe_xNi_{1-x}O$/Bi_2MoO_6/Si nanowire hierarchical nanostructure was produced using a metal-assisted chemical-etching and hydrothermal growth process, in which Si nanowires were used as backbones, Bi_2MoO_6 nanosheets as coating, and $Fe_xNi_{1-x}O$ nanoparticles (NPs) as surface catalysts. This integrated three-dimensional (3D) hierarchical nanostructure was applied as a photoanode in a PEC water reaction, and higher photostability and photocurrent density were gained. The excellent PEC performance was due to the 3D hierarchically structural effect, resulting in the enhancement of the surface-to-volume ratio, light harvest and high speed electron transport, and at the same time, terminal $Fe_xNi_{1-x}O$ NPs played the role of the surface catalyst effectively in order to accelerate the water splitting reaction and enhance photostability. Based on such an environmentally friendly hierarchical nanostructure, the study provided an efficient route to improve water-splitting performance and it could also be a model structure for similar electrode materials.



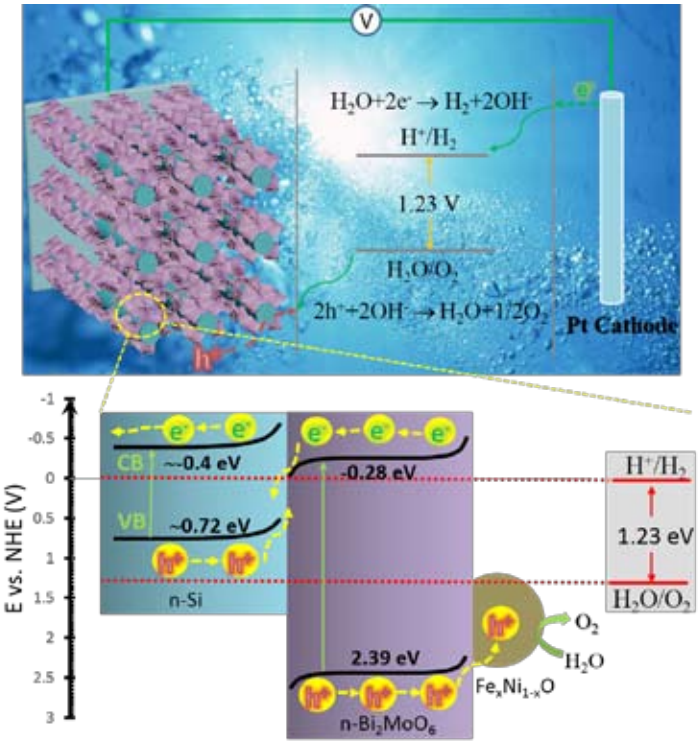


Fig. 28 | Schematic illustration for (a) photoelectrochemical water splitting and (b) the transfer of charge carriers of the hierarchical FexNi1-xO/Bi_2MoO_6/SiNW heterojunction photoanode.

A phytic acid induced super-amphiphilic multifunctional 3D graphene-based foam

Song, XH; Chen, YY; Rong, MC; Xie, ZX; Zhao, TT; Wang, YR; Chen, X; Wolfbeis, OS. ***ANGEWANDTE CHEMIE INTERNATIONAL EDITION***, 2016. 55: 3936-3941.

Abstract: Surfaces with super-amphiphilicity have attracted tremendous interest for fundamental and applied research owing to their special affinity to both oil and water. It is generally believed that 3D graphenes are monoliths with strongly hydrophobic surfaces. Herein, we demonstrate the preparation of a 3D super-amphiphilic (that is, highly hydrophilic and oleophilic) graphene-based assembly in a single-step using phytic acid acting as both a gelator and as a dopant. The product shows both hydrophilic and oleophilic intelligence, and this overcomes the drawbacks of presently known hydrophobic 3D graphene assemblies. It can absorb water and oils alike. The utility of the new material was demonstrated by designing a heterogeneous catalytic system through incorporation of a zeolite into its amphiphilic 3D scaffold. The resulting bulk network was shown to enable efficient epoxidation of alkenes without prior addition of a co-solvent or stirring. This catalyst also can be recovered and re-used, thereby providing a clean catalytic process with simplified work-up.

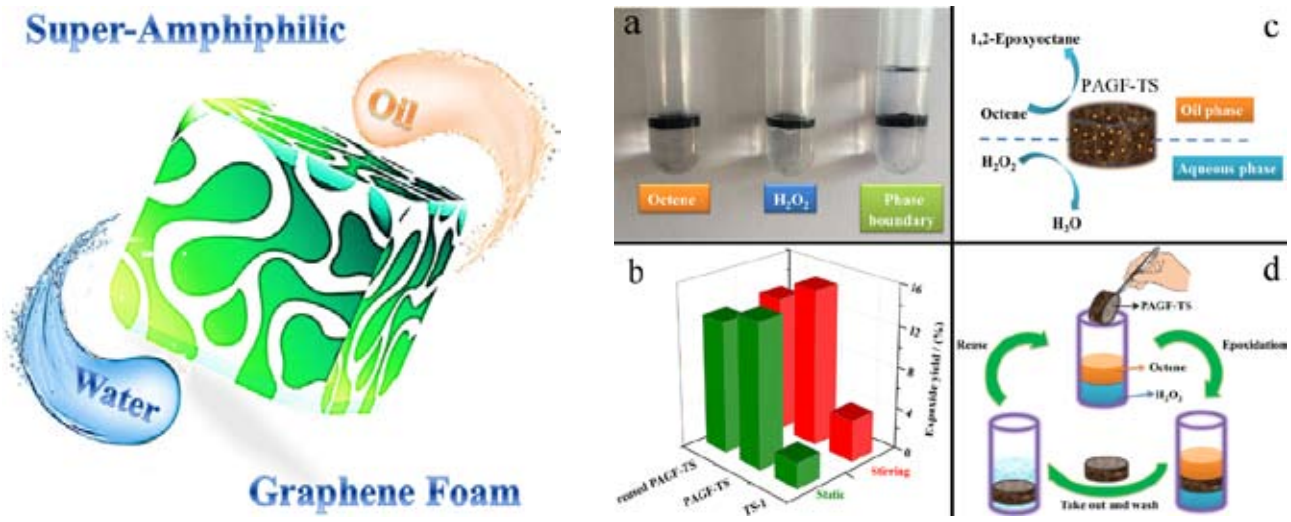


Fig. 29 | a) Photograph of the PAGF-TSs pellets suspended in octene, aqueous H_2O_2, and at the octane/H2O2 interface. b) The effect of various reagents on the yield of epoxide. c) Proposed action of the interface catalyst (PAGF-TS). d) Illustration of the reusability of the PAGF-TS catalyst. The reactions were carried out with TS-1, PAGF-TS, and recycled PAGF-TS.

论文
Papers published in SCI Journals

Abbott, BW; Jones, JB; Schuur, EAG; Chapin, FS; Bowden, WB; Bret-Harte, MS; Epstein, HE; Flannigan, MD; Harms, TK; Hollingsworth, TN; Mack, MC; McGuire, AD; Natali, SM; Rocha, AV; Tank, SE; Turetsky, MR; Vonk, JE; Wickland, KP; Aiken, GR; Alexander, HD; Amon, RMW; Benscoter, BW; Bergeron, Y; Bishop, K; Blarquez, O; Bond-Lamberty, B; Breen, AL; Buffam, I; Cai, YH; Carcaillet, C; Carey, SK; Chen, JM; Chen, HYH; Christensen, TR; Cooper, LW; Cornelissen, JHC; de Groot, WJ; DeLuca, TH; Dorrepaal, E; Fetcher, N; Finlay, JC; Forbes, BC; French, NHF; Gauthier, S; Girardin, MP; Goetz, SJ; Goldammer, JG; Gough, L; Grogan, P; Guo, LD; Higuera, PE; Hinzman, L; Hu, FS; Hugelius, G; Jafarov, EE; Jandt, R; Johnstone, JF; Karlsson, J; Kasischke, ES; Kattner, G; Kelly, R; Keuper, F; Kling, GW; Kortelainen, P; Kouki, J; Kuhry, P; Laudon, H; Laurion, I; Macdonald, RW; Mann, PJ; Martikainen, PJ; McClelland, JW; Molau, U; Oberbauer, SF; Olefeldt, D; Pare, D; Parisien, MA; Payette, S; Peng, CH; Pokrovsky, OS; Rastetter, EB; Raymond, PA; Raynolds, MK; Rein, G; Reynolds, JF; Robards, M; Rogers, BM; Schadel, C; Schaefer, K; Schmidt, IK; Shvidenko, A; Sky, J; Spencer, RGM; Starr, G; Striegl, RG; Teisserenc, R; Tranvik, LJ; Virtanen, T; Welker, JM; Zimov, S. Biomass offsets little or none of permafrost carbon release from soils, streams, and wildfire: an expert assessment. ***ENVIRONMENTAL RESEARCH LETTERS***, 2016. 11, doi: 10.1088/1748-9326/11/3/034014.

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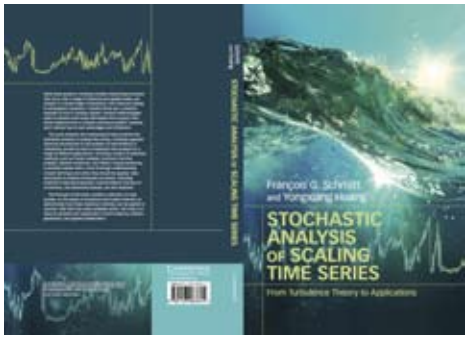

学术委员会期满换届

Academic Committee

学术委员会在把握实验室发展战略、凝聚学术方向等重大事务中发挥着至关重要的作用。由胡敦欣院士担任主任的第二届学术委员会任期至2016年12月。过去五年中，在学术委员会的悉心指导下，实验室取得了长足的进步，并于2015年再度获评为优秀国家重点实验室。实验室所有成员在此向第二届学术委员会全体委员致以最诚挚的谢意。

根据《国家重点实验室建设与运行管理办法》，实验室完成了第三届学术委员会的聘任工作，由吴立新院士担任主任的17名委员组成，第一次会议将于2017年1月12日举行。

Led by Prof. Dunxin Hu, the 2nd Academic Committee sat from January 2011 to December 2015, providing suggestions for the overall planning and research direction of MEL. All the MEL members would like to thank the committee members for their advice toward MEL's long term development.

As required by the Ministry of Science and Technology, MEL has appointed the 3rd committee with 17 members, who will advise MEL's future development for the next term. The next academic committee meeting will be held on January 12th, 2017.

Dunxin Hu chairing the 2015 Academic Committee Meeting (Photo: Suwei Weng)

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人才计划、晋升与奖项
Recognitions, Promotions and Awards

王大志入选国家科技创新创业领军人才，获“国家高层次人才特殊支持计划”（万人计划）的支持。

Dazhi Wang received the support from the National High-Level Talents Special Support Plan.

张祖麟、汪冰冰入选中组部“青年千人计划”。

Zulin Zhang and Bingbing Wang were awarded the “National Recruitment Program for Young Professionals”.

刘志宇获批“国家自然科学基金优秀青年科学基金”项目。

Zhiyu Liu received a grant under the NSFC Excellent Young Scientists Fund.

陈曦、黄邦钦入选福建省科技创新领军人才支持计划，马剑入选福建省高等学校新世纪优秀人才支持计划。

Xi Chen and Bangqin Huang were awarded the Fujian Provincial Program for Leading Scientists. Jian Ma was awarded the Fujian Program for New Century Excellent Talents.

陈曦课题组研究成果“功能纳米材料在环境有害物质微富集与传感的应用研究”获中国分析测试协会科学技术奖二等奖。

Xi Chen's Research on the "Application of functional nanomaterials in micro-enrichment and sensing of hazardous substances in the environment" won the 2nd prize in the China Association for Instrumental Analysis (CAIA) Science and Technology Awards.

刘海鹏获中国水产学会颁发的“中国水产青年科技奖”。

Haipeng Liu was granted the Young Fisheries Science and Technology Award by the China Society of Fisheries.

王德利、杨小怡晋升为厦门大学教授，孙振宇晋升为厦门大学高级工程师。

Deli Wang and Xiaoyi Yang were promoted to XMU Professors, and Zhenyu Sun was promoted to XMU Senior Engineer.

封面图释：多手段观测海洋。封面左上图起，分别为：“嘉庚”号科考船、遥感接收站、CTD采水器、潜标及光学剖面浮标。封底为东山太古海洋观测与实验站的效果图。

Cover images: multi-tools for ocean observation. From top left, R/V Tan Kah Kee, Remote Sensing Receiving Station, CTD, submerged buoy and bio-argo. The back cover image is the concept rendering of the Dongshan Swire Marine Station.

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